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Appendix B

1993 Monitoring Report

Division of Geological & Geophysical Surveys

PUBLIC-DATA FILE 93-40

INVESTIGATION OF STREAM SEDIMENT LOADS RELATED TO PLACER MINING IN THE UPPER BIRCH CREEK BASIN, ALASKA: PRELIMINARY TMDL DATA COLLECTION

by

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INTRODUCTION

The 1992 Clean Water Act Section 303(d)(1)(A)and (B) requires states to submit a list of waters which persistently exceed the criteria and/or impairment of uses to EPA. The list for Alaska placer mining was submitted to the U.S. Environmental Protection Agency (EPA) by the Alaska Department of Environmental Conservation (DEC) on April 1, 1992. The list included 12 streams in four basins. Ten of these streams are in the Birch Creek and Crooked Creek basins north of Fairbanks. These waters are subject to the Total Maximum Daily Load (TMDL) process if existing enforceable controls (NPDES permit limitations) do not assure meeting water quality standards within a reasonable period of time. The TMDL process is a watershed management plan that seeks to identify and control sources of pollution as necessary to bring the water body into compliance with water quality standards.

The state has a mandatory duty under the CWA to identify water quality limited segments and set a TMDL for them. A water quality limited stream has persistently exceeded the criteria and/or exhibit impairment of designated uses for all or part of its length. EPA has a non discretionary duty to ensure the state's compliance, or to initiate its own TMDL process. As a result of a lawsuit filed by several environmental groups, on June 2, 1992, the Court issued an order to compel EPA to perform its mandatory duties under Section 303(d) of the Clean Water Act.

A detailed assessment is required to confirm or refute the applicability of the TMDL process to each individual situation. A waterbody/watershed assessment represents a starting point for determining whether or not segments of concern need additional water quality-controls and evaluates existing or available data and information. It describes background information, water quality issues, pollutant sources and levels, existing controls, and any possible additional controls. The assessment also determines whether technology-based effluent (NPDES permit) limitations or more stringent enforcement of the NPDES limitations would be adequate to achieve applicable water quality standards. If not, other enforceable pollution control requirements would be instituted under the TMDL process.

EPA and the state are working together to perform problem assessments of all water quality limited segments. The two agencies signed a Memorandum of Understanding in 1992 describing the TMDL process. The agreement described upper Birch Creek as a high priority waterbody targeted for beginning the assessment/TMDL process. This assessment must be completed by April 1, 1993 according to the court approved schedule.

ADEC and ADNR-DOW reviewed existing water quality data from Birch Creek and recognized that additional information would assist in making the required decisions. Existing information provided adequate data on overall water quality on Birch Creek but was not adequate to determine the sources of sediment and define the effect of controls on the water quality of Birch Creek. The agencies undertook this project to:

1. Determine the sediment, turbidity and flow input from point sources to the upper Birch Creek drainage;

2. Determine the sediment, turbidity and flow input for tributaries to the upper Birch Creek drainage;

3. Determine the degree of compliance from each point source discharge and its influence on the water quality of Birch Creek; and

4. Estimate the sediment and turbidity from non-point sources to the upper Birch Creek drainage.

The information provided will be used in developing the upper Birch Creek assessment report.

STUDY LOCATION

The lower limit of the study area was set at Birch Creek above Twelvemile Creek. The entire drainage was studied above this site. Table 1 lists the grab site locations along with the identifying number which corresponds to the site location on Figure 1. A majority of the Birch Creek tributaries were included in the study. Willow, Bear, Butte, Fish, Gold Dust, Ptarmigan and Eagle creeks comprise 72.7 mi^2 of the 88.7 mi^2 of drainage area above Birch Creek above Twelvemile Creek.

Table 1. Grab sample sites with basin area above the site. The site number corresponds to the site location on Figure 1.

	Site	Area (mi^2)
1	Birch Cr ab 12 Mile Cr	88.7
2	Birch Cr be Willow Cr	85.9
3	Willow Cr	3.3
4	Bear Cr	9.7
5	Birch Cr ab Bear Cr	67.0
6	Butte Cr	9.7
7	Mine #1 Effluent	
8	Birch Cr ab Mine #1 Effluent	54.8
9	Mine #2 Effluent	
10	Fish Cr	6.8
11	Birch Cr ab Fish Cr	47.6
12	Gold Dust Cr	12.9
13	Birch Cr ab Gold Dust Cr	32.1
14	Ptarmigan Cr ab Eagle Cr	18.1
15	Eagle Cr ab Ptarmigan Cr	12.2
16	Mine #4 Effluent	
17	Eagle Cr ab Mine #4	11.0
18	Cripple Cr	1.6
19	Eagle Cr ab Cripple Cr	8.3
20	Miller Fork	3.6
21	Mastodon Fork	3.7

Table 2 lists the location of the automated sampling sites with identifying number which corresponds to the site location on Figure 2. Six of the eight sites are located along Birch and Eagle creeks.

Table 2. Automated sampling sites with basin area above the site. The site number corresponds to the site location on Figure 2.

	Site	Area (mi^2)
1	Birch Cr ab 12 Mile Cr	88.7
2	Birch Cr ab Butte Cr	55.6
3	Birch Cr ab Fish Cr	47.6
4	Gold Dust Cr	11.9
5	Ptarmigan Cr ab Eagle Cr	18.1
6	Eagle Cr ab Ptarmigan Cr	12.2
7	Eagle Cr be Cripple Cr	10.2
8	Miller Fork	3.6

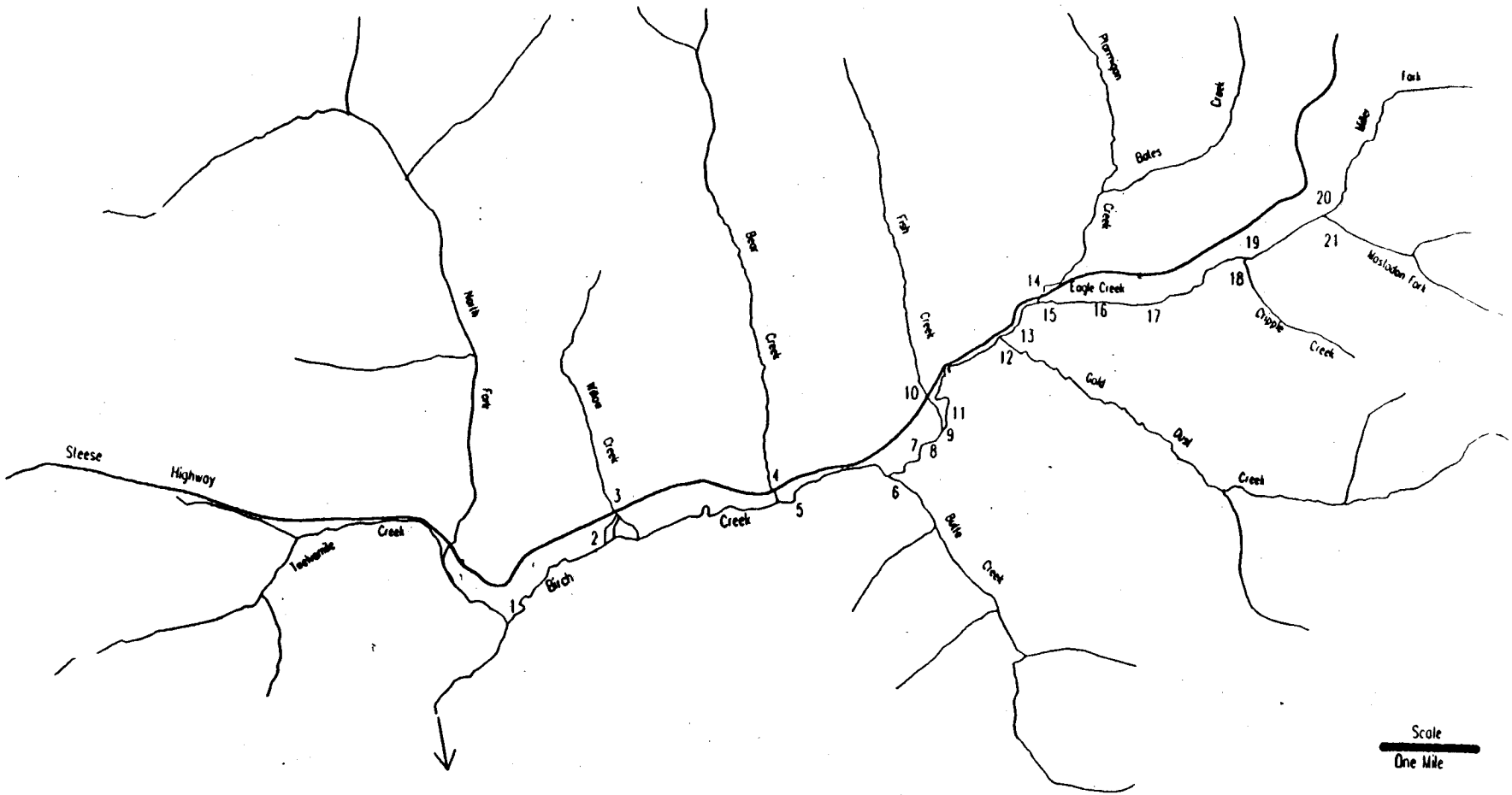


Figure 1. Location of the 21 grab-sample sites. The numbered sites correspond with the site numbers in Table 1.

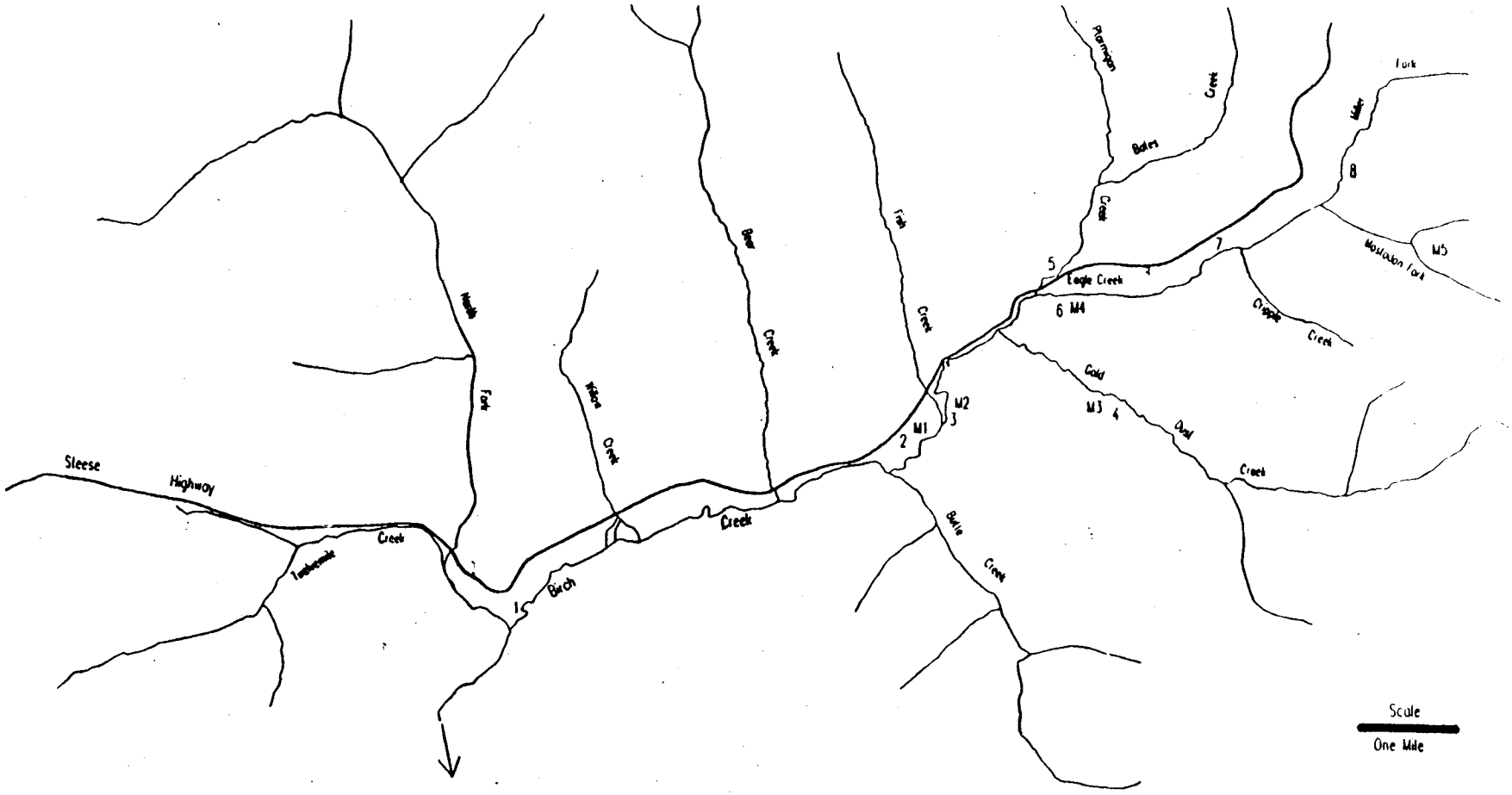


Figure 2. ***Location of the eight automated sampler sites. The numbered sites correspond with the site numbers in Table 2. The site numbers preceeded by the letter "M" indicate the location of an active mine.***

METHODS

Discharge

Stream velocities used in the calculation of discharge were measured with a Price pygmy meter. Velocities were measured at six-tenths depth, with sufficient number of sections such that no one section contained over ten percent of the total flow. If the depth was greater than 2.5 feet, measurements were made at two-tenths and eight-tenths depth. The average of the two readings was interpreted as the mean velocity. Discharge was calculated using the standard midpoint method (US Dept. of Interior, 1981).

Continuous stage recorders were installed at the automated sites. The small, battery operated device can measure water levels from 0 to 10 feet in intervals of one-hundredth of a foot. The data are stored on EPROM microchips, which are then read by a computer at the lab.

High flow events which were not directly measured were estimated using the indirect slope-area method (Dalrymple and Benson, 1984).

Sediment

Samples for sediment analysis were obtained using a hand-held depth-integrating sampler and a churn splitter (USDI, 1977). Composite samples were collected from the churn splitter. Samples were collected at the downstream sites first, working upstream during the day on the July 22 and August 13 sampling trips. Samples were collected starting at the upstream sites, working downstream on the September 3 sampling trip.

Sediment samples at the automated sites were collected with Isco automated water samplers. Four samples were collected each day at 3:00 and 9:00 A.M. and at 3:00 and 9:00 P.M. The four samples were composited in one bottle.

Laboratory Analyses

The sediment samples were analyzed at the Alaska Division of Water - Water Quality Laboratory at the University of Alaska Fairbanks campus. The laboratory is a participant in the USEPA Performance

Evaluation program as well as the USGS Standard Reference Water Quality Assurance program. Samples were analyzed for turbidity and total suspended solids.

RESULTS

Grab Samples

Appendix A lists the results of all the grab samples collected with the measured flow at the time of collection. Table 3 summarizes these results along the direction of flow of Eagle and Birch creeks. Table 3 also shows where the active mines are in relation to the sampling sites. The stream load was highest on the July sampling and lowest on the August sampling. The flows were similar during each of the sampling trips (Appendix A) with the flows at Birch Creek above Twelvemile Creek ranging from 30.1 cfs in August to 38.9 cfs in September. Turbidity in Birch Creek was generally low for the August and September samplings, but was somewhat elevated during the July sampling, primarily due to mining activity.

Table 3. Turbidity and stream load results from the grab samples collected during the three sampling trips.

	Site	22 Jul		13 Aug		3 Sep	
		Turb (NTU)	Load (g/sec)	Turb (NTU)	Load (g/sec)	Turb (NTU)	Load (g/sec)
	Mine #5						
21	Mastodon Fork	39	2.86	110	4.98	27	0.99
19	Eagle Cr ab Cripple Cr	8.2	1.52	12	0.07	2.3	0.06
17	Eagle Cr ab Mine #4	15	8.41	4.5	0.57	3.6	0.31
16	Mine #4	4,400	92.1				
15	Eagle Cr ab Ptarmigan Cr	150	30.3	3.9	0.79	2.3	0.81
13	Birch Cr ab Gold Dust Cr	39	13.0	1.3	0.55	1.1	0.67
	Mine #3						
11	Birch Cr ab Fish Cr	18	9.60	1.5	1.14	2.1	1.63
9	Mine #2					470	10.8
8	Birch Cr ab Mine #1 Effluent	8.5	9.22	1.7	1.00	9.2	3.51
7	Mine #1	800	25.4	11.0	0.17	24	0.38
5	Birch Cr ab Bear Cr	12	5.41	1.9	1.11	8.1	3.63
2	Birch Cr be Willow Cr	9.7	11.7	1.7	0.84	5.4	1.77
1	Birch Cr ab 12 Mile Cr	15	9.20	1.5	0.85	5.7	3.50

Automated sites

The results from the eight automated sites are found in Appendix B. The appendix contains the daily average turbidity, TSS and discharge. The daily load is also reported.

The results are summarized in Table 4 for the period of July 17 through September 5 because all the automated equipment was functioning during this period of time (except at Ptarmigan Creek above Eagle Creek). The number of samples reported in the table refers to the number of days sediment samples were collected.

Mean turbidity for the unmined streams (Miller Fork and Ptarmigan Creek) was less than 1.5 NTU. The Isco at Gold Dust Creek was located above the active mine, but the basin has been extensively disturbed from previous mining operations above the site. Although the disturbed area has been partially reclaimed, the creek flows through old settling ponds. The mean turbidity of Gold Dust Creek was 2.7 NTU. The mean turbidity at the other sites on Eagle and Birch creeks (all affected by active placer mines) were in the teens. Eagle Creek above Ptarmigan Creek was the exception with a mean turbidity of 54 NTU. This mean was elevated by two storm events. The median turbidity was generally less than 5 NTU at all sites except for Birch Creek above Butte Creek (12 NTU).

Table 4. The results from the automated samplers for the period of July 17 through September 5. The number of samples refers to the number of sediment samples collected.

Site	Turbidity mean (NTU)	Turbidity median (NTU)	Average Discharge (cfs)	Total Load (tons)	Number of Samples
Birch Cr ab 12 Mile Cr	12	5.3	46.6	1156	51
Birch Cr ab Butte Cr	29	12	30.4	878	48
Birch Cr ab Fish Cr	17	4.6	27.7	610	49
Gold Dust Cr	2.7	1.8	8.40	67.6	51
Ptarmigan Cr ab Eagle Cr	0.80	0.60	8.19	0.08	27
Eagle Cr ab Ptarmigan Cr	54	3.1	10.8	578	51
Eagle Cr be Cripple Cr	14	3.6	5.72	89.2	51
Miller Fork	1.4	0.85	3.48	2.95	49

Two high-flow events occurred during the period of July 17 through September 5. The first was on July 20. This event did not occur basin wide and appears to be caused by scattered thunderstorms. The event was small in the basins in which it occurred. The second event was much larger and did occur in all basins. A large frontal system was preceded by a few days of thunderstorms, resulting in peak flows of 500 cfs at Birch Creek above Twelvemile Creek on July 30. The flows during the remainder of the summer were generally within summer baseflow conditions.

The maximum six hour precipitation which fell on July 29 at Eagle Creek above Ptarmigan Creek was 0.80 inches. Miller (1963) reported that the five-year, six-hour precipitation event for this region is approximately 1.25 inches, and the two-year, six-hour event is 0.75 inches. From these data, it appears that the high-flow event on July 30 was slightly greater than a two-year event. The NPDES limitations do not apply during a five-year, six-hour or greater precipitation event.

DISCUSSION

Grab Sites

The grab site data provides information from three separate sampling trips during the summer. These "snapshots" do provide useful information since the source of sediment is traceable. A problem does exist with these data. The July 22 and August 13 samplings were from downstream at Birch above Twelvemile Creek working upstream. If a travel time of 12 hours is assumed from Miller Fork to Birch above Twelvemile Creek, then the sample collected at the lower site was influenced by what was occurring up to 12 hours earlier upstream. It also takes 10 to 12 hours to sample all the sites, with the upstream sites last. The total elapsed time is approximately 24 hours. This potential problem may have existed during the July sampling. Three of the five mines had significant sediment discharges. The turbidity at Birch Creek above Twelvemile Creek was 15 NTU and the load was 9.2 g/sec. The loads from the mine effluents were much higher. The sporadic nature of the mine water discharges suggests that these effluents had not been discharging too long, or the turbidity and load would have been higher at Birch Creek above Twelvemile Creek. This was not evident during the August sampling, as the load remains constant after the input of sediment. The September sampling trip was sampled from upstream, working downstream, eliminating this potential problem.

Mastodon Fork always had high turbidity readings, ranging from 27 to 110 NTU. The high turbidity readings are attributed to a placer mine operating in old tailings on Mastodon Fork. The porous nature of the material prevented good water control. Due to the disturbed nature of the mid and upper reaches of the Eagle Creek basin, much of the stream flows subsurface in various reaches. This filters much of the sediment before the next mine downstream. Turbidity at Eagle Creek above Cripple Creek ranged from 2.3 to 12 NTU.

The downstream water quality was the worst during the July sampling where the turbidity at Birch Creek above Twelvemile Creek was 15 NTU. Three mines in the valley had high sediment discharges, with two measured out of compliance. The turbidity at Birch Creek above Twelvemile Creek in September was 5.7 NTU. This is good water quality with two mines contributing to the sediment load (in addition to the mine on Mastodon Fork). The turbidity at Birch Creek above Twelvemile Creek in August was 1.5 NTU. Only one

mine was contributing sediment (in addition to the mine on Mastodon Fork). The mine was well within compliance which resulted in outstanding water quality downstream.

Automated Sites

Although the unmined creeks comprise approximately 50 percent of the total basin area, they contribute only a small percentage of the total load at Birch Creek above Twelvemile Creek (Table 5). Miller Fork carried 0.3 percent of the total load while it comprises 4.1 percent of the total basin area. The sediment yield was less than one ton/mi^2. Gold Dust Creek carried a much higher load and contributed 5.8 percent of the total load with a sediment yield of 5.7 tons/mi^2. This is much higher than the unmined streams, yet not as high as the sites with upstream active placer mines. Those sites have sediment yields of greater than 10 tons/mi^2, with the sediment yield at Eagle Creek above Ptarmigan Creek of 47 tons/mi^2. The area above this site contributes 50 percent of the total sediment load, but only comprises 14 percent of the basin area. The area above this site is presently mined in three locations. Most of the basin has recently been disturbed, with very little undisturbed streambed or old tailings in place.

The greatest load of 42.3 percent occurred between Eagle Creek above Ptarmigan Creek and Eagle Creek below Cripple Creek (basin area of three percent). One active mine was located between these points.

Table 5. *The load, discharge and basin area for seven automated sample sites for the period of July 17 through September 5. The basin area percentage refers to the basin area of the site divided by the area of the Birch Creek above Twelvemile Creek site.*

Site	Load		Sediment Yield	Average Discharge		Basin Area
	tons	%	tons/mi^2	cfs	%	%
Birch Cr ab 12 Mile Cr	1156	100	13.0	46.6	100	100
Birch Cr ab Butte Cr	878	76	15.8	30.4	65	63
Birch Cr ab Fish Cr	610	53	12.8	27.7	59	54
Gold Dust Cr	67.6	5.8	5.68	8.40	18	13
Eagle Cr ab Ptarmigan Cr	578	50	47.4	10.8	23	14
Eagle Cr be Cripple Cr	89.2	7.7	8.75	5.72	12	11
Miller Fork	2.95	0.3	0.82	3.48	7.5	4.1

The maximum turbidity at Gold Dust Creek was 20 NTU. This was similar to the Miller Fork site even though the Gold Dust Creek sediment yield was much higher. This may indicate that much of the fine-grain sediment in the Gold Dust Creek basin has been removed, and that the sediment load is comprised of larger-grain sediment.

Most of the sediment load transported by the streams occurs over a short period of time. Table 6 gives the maximum percentage of the total sediment load transported for various short time intervals. For example: 84 percent of the total sediment load for the period of July 17 through September 5 was transported in one day at Birch Creek above Twelvemile Creek. For the sites with active placer mines upstream, 70 to 80 percent of the total sediment load was transported in one day (two percent of the total time); 80 to 90 percent in three days (six percent of the time); and 90 to 95 percent in five days (10 percent of the time). Gold Dust Creek (no active placer mine upstream, but extensively disturbed by past mining) was lower at the one-day interval with 64 percent, but was the same as the active mined sites for the longer time intervals. The unmined basin (Miller Fork) did not yield as much sediment in the shorter time intervals, with only 62 percent of the total load transported in five days.

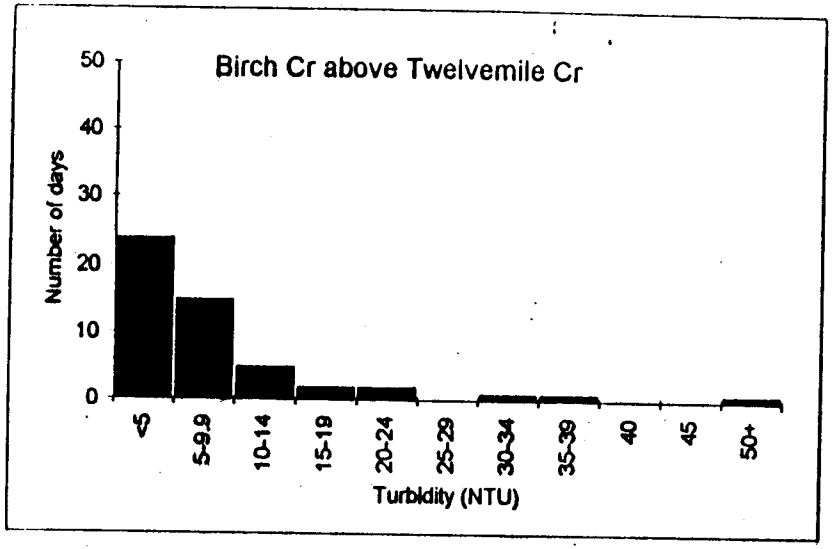
Table 6. The highest percentage of the total sediment load transported over short periods of time for seven automated sample sites for the period of July 17 through September 5.

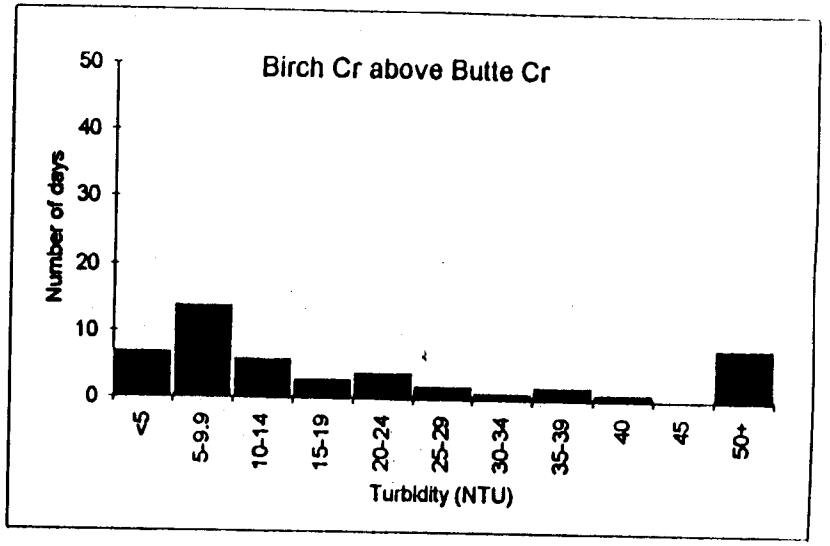
Site	Days			
	1	3	5	10
Birch Cr ab 12 Mile Cr	84	94	95	97
Birch Cr ab Butte Cr	76	87	91	95
Birch Cr ab Fish Cr	78	89	93	97
Gold Dust Cr	64	83	92	97
Eagle Cr ab Ptarmigan Cr	72	83	91	97
Eagle Cr be Cripple Cr	35	78	91	97
Miller Fork	24	53	62	74

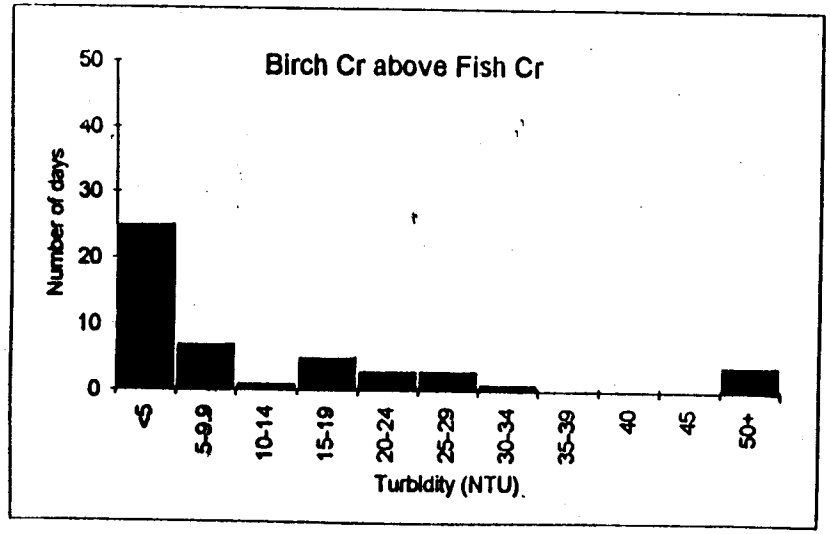
Just as the majority of the load is transported over a short period time, the high turbidity levels occur in similar short time intervals. Turbidity was low most of the time. Figures 3 and 4 show the frequency distributions for the turbidity data collected from seven automated sites (Ptarmigan Creek not included) from

July 17 through September 5. The turbidity range with the most number of days at all sites (except Birch Creek above Butte Creek) was less than five NTU. At Birch Creek above Butte Creek, the turbidity range with the highest number of days was 5.0 to 9.9 NTU. It is expected that this site would have the highest turbidity because this site has two active mines immediately above the Isco sampler, with two others a short distance upstream. The total number of days for this site with turbidity below 25 NTU was 34 days (out of 48). This was the fewest days for any of the sites. Birch Creek above Twelvemile Creek had 48 out of 51 days below 25 NTU. The mean number of days below 25 NTU of the seven sites in Figure 3 was 44 out of 50 days.

As part of the placer mining NPDES wastewater discharge permits, a mine may receive a turbidity modification based on dilution in the receiving water. The modification is calculated using the low-flow estimate of the stream and an estimated discharge rate provided by the miner. The low-flow calculation is for a three-day, two-year flow (3Q2) and is based on an equation developed by Ashton and Carlson (1983) and used by the Alaska Division of Mining for the turbidity modification. The equation is based on the size of the basin. The calculated low-flow rates for the eight automated sites are (listed numerically in Table 2): 27 cfs, 19 cfs, 17 cfs, 5.7 cfs, 7.9 cfs, 5.8 cfs, 5.0 cfs and 2.0 cfs. The three-day low-flow at Birch Creek above Twelvemile Creek was 19.1 cfs with an average turbidity of 2.8 NTU during that period. All the sites recorded periods where the three-day low-flow was less than the calculated 3Q2 flow. During the lowest three-day low-flow at each automated site, the three-day average turbidity at all the sites was less than 5 NTU. This suggests that even though the streams had less water in them than calculated in the turbidity modification, they still maintained good water quality. Most of the water quality problems occurred at higher flows.







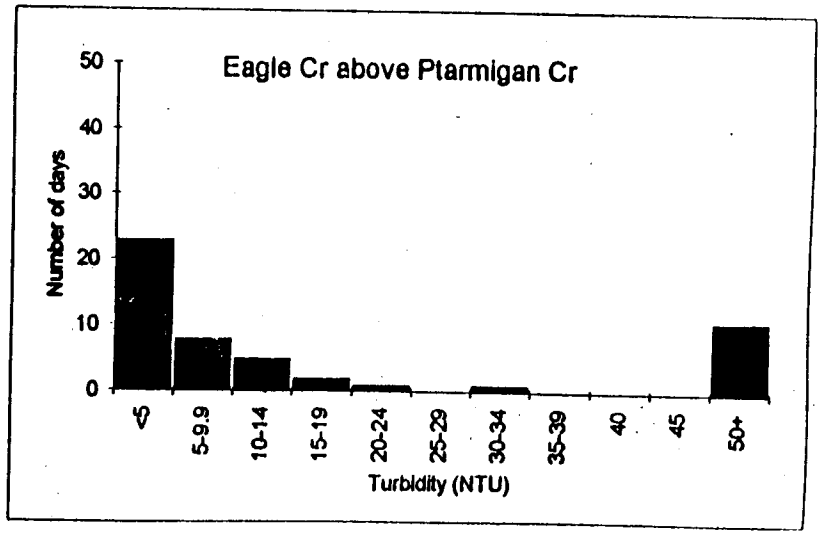


Figure 3. ***Frequency distributions of the turbidity data for seven of the automated sampling sites.*** *Data are from samples collected from July 17 through September 5.*

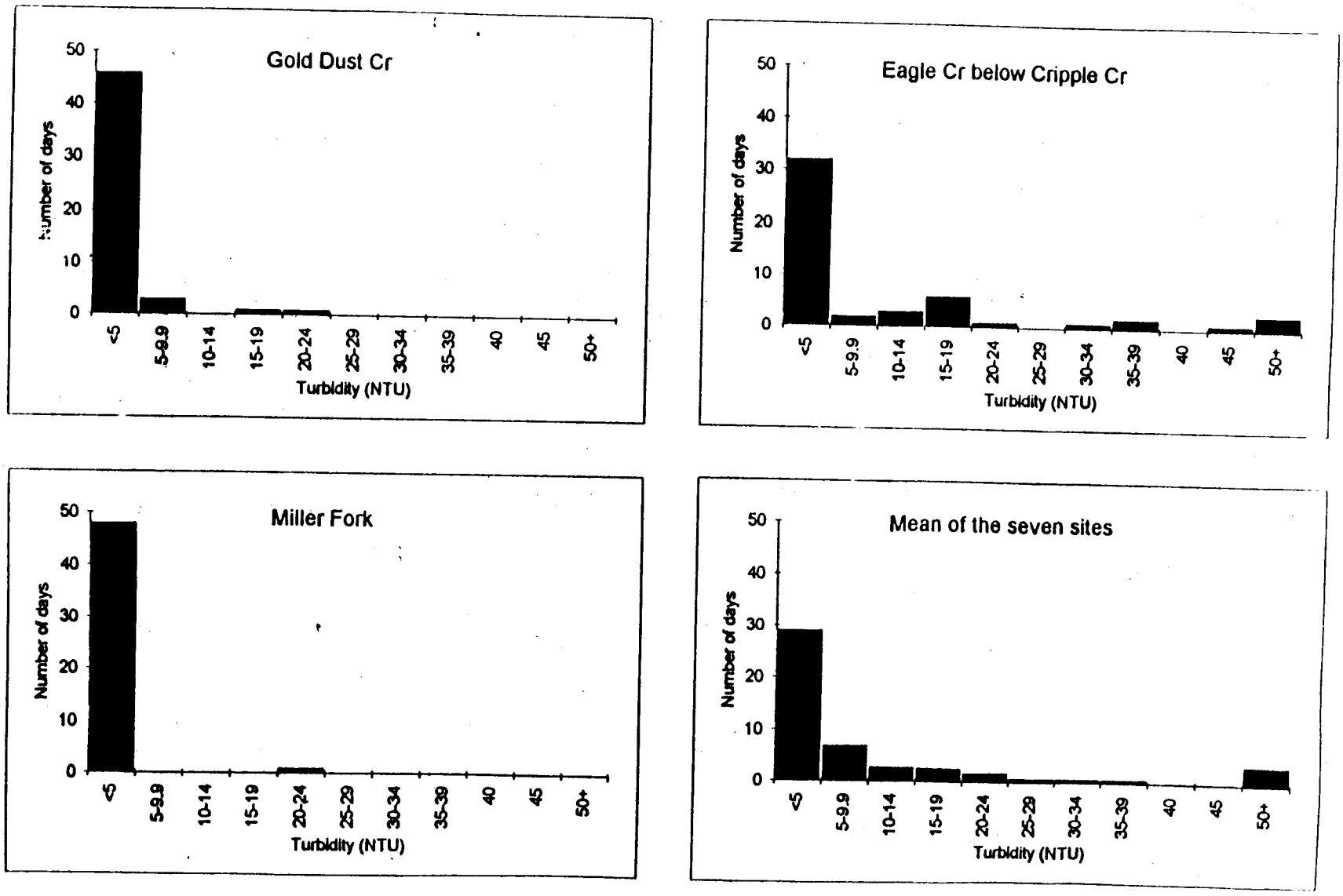


Figure 4. Frequency distributions of the turbidity data for seven of the automated sampling sites. Data are from samples collected from July 17 through September 5.

SUMMARY

The original plan for this project included eight grab-sample periods. Because of late receipt of project funds and an unusually late break-up, only three grab-sample trips were completed. Also, the automated sites were monitored for a shorter period as a result of the delayed start of the project. Although the sediment, turbidity, and flow input for all the possible sources were not specifically determined, sufficient information was collected to determine relative loading from these various sources. Additional key points are summarized in the following:

1. Creeks which are extensively disturbed but with no active mining contribute sediment for transport at a higher rate than unmined streams but not as high a rate as actively mined streams;

2. A large percentage of the sediment is transported in short periods of time during high stream flows (storm events). At most sites, 90 percent of the sediment was transported in ten percent of the time;

3. During the reporting period, the mean turbidity for the abandoned mine site (disturbed) stream, Gold Dust Creek, was higher than the undisturbed stream, Miller Fork (2.7 and 1.4 NTU, respectively). The water quality standard of 5 NTU was exceeded only twice during the reporting period at Gold Dust Creek. It was exceeded once at Miller Fork; and

4. Active mining operations had the greatest impact on downstream water quality (Birch Creek above Twelvemile Creek). In July, three mines were not in compliance with their NPDES permit limits and the downstream turbidity was 15 NTU. In September, two mines were not in compliance and the downstream turbidity was 5 NTU. In August, only one mine was not in compliance and the downstream turbidity was 1.5 NTU.

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APPENDIX A

Site	Date	Time	Turb (NTU)	TSS (mg/L)	Q (cfs)	Load (g/sec)
Birch Cr ab 12 Mile Cr	22-Jul-92	1040	15	10.0	32.5	9.20
Birch Cr be Willow Cr	22-Jul-92	1148	9.7	14.6	28.2	11.7
Willow Cr	22-Jul-92	1124	2.3	2.40	0.50	0.03
Bear Cr	22-Jul-92	1124	0.60	0.21	2.32	0.01
Birch Cr ab Bear Cr	22-Jul-92	1145	12	6.60	27.5	5.14
Butte Cr	22-Jul-92	1330	0.70	0.59	2.09	0.03
Mine #1 Effluent	22-Jul-92	1410	800	887	1.01	25.4
Birch Cr ab Mine #1 Effluent	22-Jul-92	1400	8.5	15.0	21.7	9.22
Mine #2 Effluent			NONE			
Fish Cr	22-Jul-92	1630	0.95	1.21	0.45	0.02
Birch Cr ab Fish Cr	22-Jul-92	1515	18	15.7	21.6	9.60
Gold Dust Cr	22-Jul-92	1545	1.5	1.76	6.13	0.31
Birch Cr ab Gold Dust Cr	22-Jul-92	1600	39	29.7	15.4	13.0
Ptarmigan Cr ab Eagle Cr	22-Jul-92	1800	0.55	0.79	6.12	0.14
Eagle Cr ab Ptarmigan Cr	22-Jul-92	1840	150	106	10.1	30.3
Mine #4 Effluent	22-Jul-92	1900	4400	6020	0.54	92.1
Eagle Cr ab Mine #4	22-Jul-92	2000	15	32.5	9.12	8.41
Cripple Cr	22-Jul-92	2100	1.7	1.78	1.16	0.06
Eagle Cr ab Cripple Cr	22-Jul-92	2130	8.2	15.2	3.52	1.52
Miller Fork	22-Jul-92	2200	0.35	1.20	1.19	0.04
Mastodon Fork	22-Jul-92	2145	39	45.3	2.23	2.86
Birch Cr ab 12 Mile Cr	13-Aug-92	900	1.5	1.00	30.1	0.85
Birch Cr be Willow Cr	13-Aug-92	950	1.7	0.94	31.4	0.84
Willow Cr	13-Aug-92	1010	0.40	0.20	0.54	0.00
Bear Cr	13-Aug-92	1025	0.20	0.20	2.75	0.02
Birch Cr ab Bear Cr	13-Aug-92	1045	1.9	1.48	26.6	1.11
Butte Cr	13-Aug-92	1115	0.50	0.57	2.02	0.03
Mine #1 effluent	13-Aug-92	1137	11	5.30	1.12	0.17
Birch Cr ab Mine #1 effluent	13-Aug-92	1140	1.7	1.81	19.6	1.00
Mine #2 Effluent			NONE			
Fish Cr	13-Aug-92	1320	0.95	1.90	0.58	0.03
Birch Cr ab Fish Cr	13-Aug-92	1325	1.5	2.02	20.0	1.14
Gold Dust Cr	13-Aug-92	1355	2.8	1.43	4.09	0.17
Birch Cr ab Gold Dust Cr	13-Aug-92	1411	1.3	1.39	14.0	0.55
Ptarmigan Cr ab Eagle Cr	13-Aug-92	1430	0.30	0.15	7.69	0.03
Eagle Cr ab Ptarmigan Cr	13-Aug-92	1445	3.9	4.55	6.10	0.79
Mine #4 Effluent			NONE			
Eagle Cr ab Mine #4	13-Aug-92	1530	4.5	3.74	5.35	0.57
Cripple Cr	13-Aug-92	1555	1.0	0.65	0.47	0.01
Eagle Cr ab Cripple Cr	13-Aug-92	1611	12	1.28	1.96	0.07
Miller Fork	13-Aug-92	1645	0.30	0.29	1.42	0.01
Mastodon Fork	13-Aug-92	1620	110	72.3	2.43	4.98

Site	Date	Time	Turb (NTU)	TSS (mg/L)	Q (cfs)	Load (g/sec)
Birch Cr ab 12 Mile Cr	03-Sep-92	1730	5.7	3.17	38.9	3.50
Birch Cr be Willow Cr	03-Sep-92	1630	5.4	1.6	38.1	1.77
Willow Cr	03-Sep-92	1600	0.25	0.11	0.83	0.00
Bear Cr	03-Sep-92	1500	0.30	0.20	4.41	0.02
Birch Cr ab Bear Cr	03-Sep-92	1230	8.1	4.10	31.2	3.63
Butte Cr	03-Sep-92	1430	0.50	0.10	3.11	0.01
Mine #1 effluent	03-Sep-92	1340	24	11.4	1.18	0.38
Birch Cr ab Mine #1 effluent	03-Sep-92	1330	9.2	4.64	26.7	3.51
Mine #2 effluent	03-Sep-92	1300	470	209	1.83	10.8
Fish Cr	03-Sep-92	1245	0.80	2.06	0.61	0.04
Birch Cr ab Fish Cr	03-Sep-92	1230	2.1	2.30	25.1	1.63
Gold Dust Cr	03-Sep-92	1215	4.6	3.17	5.51	0.49
Birch Cr ab Gold Dust Cr	03-Sep-92	1200	1.1	1.27	18.6	0.67
Ptarmigan Cr ab Eagle Cr	03-Sep-92	1130	0.25	0.10	6.43	0.02
Eagle Cr ab Ptarmigan Cr	03-Sep-92	1115	2.3	2.67	10.7	0.81
Mine #4 effluent			NONE			
Eagle Cr ab Mine #4	03-Sep-92	1015	3.6	1.90	5.67	0.31
Cripple Cr	03-Sep-92	945			0	
Eagle Cr ab Cripple Cr	03-Sep-92	945	2.3	0.59	3.35	0.06
Miller Fork	03-Sep-92	910	0.30	0.10	2.50	0.01
Mastodon Fork	03-Sep-92	900	27	11.8	2.95	0.99

APPENDIX B

Site	Date	Turb (NTU)	TSS (mg/L)	Discharge (cfs)	Load (tons/day)
Birch Cr ab 12 Mile Cr	09-Jun-92	60	164	206	91.4
Birch Cr ab 12 Mile Cr	10-Jun-92	50	210	246	140
Birch Cr ab 12 Mile Cr	11-Jun-92	45	168	225	102
Birch Cr ab 12 Mile Cr	12-Jun-92	38	127	200	68.5
Birch Cr ab 12 Mile Cr	13-Jun-92	31	83.3	175	39.4
Birch Cr ab 12 Mile Cr	14-Jun-92	25	52.8	142	20.3
Birch Cr ab 12 Mile Cr	15-Jun-92	22	57.8	159	24.8
Birch Cr ab 12 Mile Cr	16-Jun-92	110	456	379	467
Birch Cr ab 12 Mile Cr	17-Jun-92	40	178	399	191
Birch Cr ab 12 Mile Cr	18-Jun-92	17	73.5	247	48.9
Birch Cr ab 12 Mile Cr	19-Jun-92	8.6	46.8	152	19.2
Birch Cr ab 12 Mile Cr	20-Jun-92	8.8	20.5	124	6.88
Birch Cr ab 12 Mile Cr	21-Jun-92			114	
Birch Cr ab 12 Mile Cr	22-Jun-92			212	
Birch Cr ab 12 Mile Cr	23-Jun-92			185	
Birch Cr ab 12 Mile Cr	24-Jun-92	14	151	132	53.6
Birch Cr ab 12 Mile Cr	25-Jun-92	9.8	55.9	121	18.3
Birch Cr ab 12 Mile Cr	26-Jun-92	22	229	151	93.5
Birch Cr ab 12 Mile Cr	27-Jun-92	13	34.7	110	10.3
Birch Cr ab 12 Mile Cr	28-Jun-92	6.6	32.2	88.8	7.71
Birch Cr ab 12 Mile Cr	29-Jun-92	4.2	24.4	75.8	4.99
Birch Cr ab 12 Mile Cr	30-Jun-92	2.8	13.8	66.6	2.48
Birch Cr ab 12 Mile Cr	01-Jul-92	2.3	9.77	58.4	1.54
Birch Cr ab 12 Mile Cr	02-Jul-92	1.7	10.0	52.7	1.42
Birch Cr ab 12 Mile Cr	03-Jul-92	1.7	7.21	47.8	0.93
Birch Cr ab 12 Mile Cr	04-Jul-92	1.8	5.13	44.6	0.62
Birch Cr ab 12 Mile Cr	05-Jul-92	1.6	6.67	39.2	0.71
Birch Cr ab 12 Mile Cr	06-Jul-92	1.4	6.47	34.4	0.60
Birch Cr ab 12 Mile Cr	07-Jul-92	1.5	15.5	31.0	1.29
Birch Cr ab 12 Mile Cr	08-Jul-92	2.3	24.2	31.2	2.04
Birch Cr ab 12 Mile Cr	09-Jul-92	2.0	15.1	30.6	1.25
Birch Cr ab 12 Mile Cr	10-Jul-92	2.5	14.9	27.3	1.09
Birch Cr ab 12 Mile Cr	11-Jul-92	2.5	13.9	29.8	1.12
Birch Cr ab 12 Mile Cr	12-Jul-92	2.5	10.6	39.5	1.13
Birch Cr ab 12 Mile Cr	13-Jul-92	1.5	18.7	35.8	1.80
Birch Cr ab 12 Mile Cr	14-Jul-92	1.9	13.5	32.7	1.19
Birch Cr ab 12 Mile Cr	15-Jul-92	1.1	10.9	29.1	0.86
Birch Cr ab 12 Mile Cr	16-Jul-92	1.9	9.88	24.1	0.64
Birch Cr ab 12 Mile Cr	17-Jul-92	1.6	3.65	22.7	0.22
Birch Cr ab 12 Mile Cr	18-Jul-92	1.4	3.33	23.2	0.21
Birch Cr ab 12 Mile Cr	19-Jul-92	1.6	4.72	23.7	0.30
Birch Cr ab 12 Mile Cr	20-Jul-92	22	36.0	52.2	5.07
Birch Cr ab 12 Mile Cr	21-Jul-92	16	22.5	40.6	2.46
Birch Cr ab 12 Mile Cr	22-Jul-92	13	15.2	33.6	1.37
Birch Cr ab 12 Mile Cr	23-Jul-92	6.2	10.0	32.5	0.88
Birch Cr ab 12 Mile Cr	24-Jul-92	7.2	13.1	33.4	1.18
Birch Cr ab 12 Mile Cr	25-Jul-92	5.5	6.89	34.4	0.64
Birch Cr ab 12 Mile Cr	26-Jul-92	2.6	4.44	36.6	0.44

Site	Date	Turb (NTU)	TSS (mg/L)	Discharge (cfs)	Load (tons/day)
Birch Cr ab 12 Mile Cr	27-Jul-92	21	37.0	67.3	6.71
Birch Cr ab 12 Mile Cr	28-Jul-92	11	18.2	71.6	3.51
Birch Cr ab 12 Mile Cr	29-Jul-92	33	39.6	89.6	9.57
Birch Cr ab 12 Mile Cr	30-Jul-92	240	921	391	972
Birch Cr ab 12 Mile Cr	31-Jul-92	39	159	198	85.0
Birch Cr ab 12 Mile Cr	01-Aug-92	19	77.9	118	24.9
Birch Cr ab 12 Mile Cr	02-Aug-92	11	34.7	83.6	7.83
Birch Cr ab 12 Mile Cr	03-Aug-92	6.5	22.7	65.4	4.00
Birch Cr ab 12 Mile Cr	04-Aug-92	5.9	16.7	54.6	2.46
Birch Cr ab 12 Mile Cr	05-Aug-92	3.2	10.0	47.7	1.29
Birch Cr ab 12 Mile Cr	06-Aug-92	3.0	9.15	44.4	1.10
Birch Cr ab 12 Mile Cr	07-Aug-92	2.6	6.91	38.3	0.71
Birch Cr ab 12 Mile Cr	08-Aug-92	5.0	9.57	34.2	0.88
Birch Cr ab 12 Mile Cr	09-Aug-92	2.0	6.21	33.3	0.56
Birch Cr ab 12 Mile Cr	10-Aug-92	2.8	7.68	31.7	0.66
Birch Cr ab 12 Mile Cr	11-Aug-92	2.3	6.02	28.0	0.45
Birch Cr ab 12 Mile Cr	12-Aug-92	2.7	5.12	29.4	0.41
Birch Cr ab 12 Mile Cr	13-Aug-92	3.3	5.92	27.2	0.43
Birch Cr ab 12 Mile Cr	14-Aug-92	2.6	5.77	29.0	0.45
Birch Cr ab 12 Mile Cr	15-Aug-92	2.4	6.33	27.3	0.47
Birch Cr ab 12 Mile Cr	16-Aug-92	2.5	4.20	24.9	0.28
Birch Cr ab 12 Mile Cr	17-Aug-92	5.3	10.9	24.0	0.71
Birch Cr ab 12 Mile Cr	18-Aug-92	3.1	6.67	24.4	0.44
Birch Cr ab 12 Mile Cr	19-Aug-92	2.1	6.12	22.6	0.37
Birch Cr ab 12 Mile Cr	20-Aug-92	5.5	12.8	22.3	0.77
Birch Cr ab 12 Mile Cr	21-Aug-92	2.0	5.77	21.3	0.33
Birch Cr ab 12 Mile Cr	22-Aug-92	1.6	10.9	22.4	0.66
Birch Cr ab 12 Mile Cr	23-Aug-92	1.1	8.94	20.4	0.49
Birch Cr ab 12 Mile Cr	24-Aug-92	1.4	6.81	19.6	0.36
Birch Cr ab 12 Mile Cr	25-Aug-92	1.4	4.25	19.1	0.22
Birch Cr ab 12 Mile Cr	26-Aug-92	5.6	30.3	18.5	1.51
Birch Cr ab 12 Mile Cr	27-Aug-92	2.0	7.01	23.7	0.45
Birch Cr ab 12 Mile Cr	28-Aug-92	8.1	10.3	27.1	0.75
Birch Cr ab 12 Mile Cr	29-Aug-92	6.0	6.40	24.8	0.43
Birch Cr ab 12 Mile Cr	30-Aug-92	13	13.2	24.7	0.88
Birch Cr ab 12 Mile Cr	31-Aug-92	7.6	7.90	26.5	0.56
Birch Cr ab 12 Mile Cr	01-Sep-92	3.7	7.52	27.6	0.56
Birch Cr ab 12 Mile Cr	02-Sep-92	12	52.2	31.9	4.49
Birch Cr ab 12 Mile Cr	03-Sep-92	5.4	15.6	37.3	1.57
Birch Cr ab 12 Mile Cr	04-Sep-92	8.7	28.4	34.6	2.65
Birch Cr ab 12 Mile Cr	05-Sep-92	6.4	17.6	33.4	1.58
Birch Cr ab 12 Mile Cr	06-Sep-92	4.5	11.1	32.2	0.96
Birch Cr ab 12 Mile Cr	07-Sep-92	5.7	13.9	29.4	1.11
Birch Cr ab 12 Mile Cr	08-Sep-92	14	75.7	25.4	5.19
Birch Cr ab 12 Mile Cr	09-Sep-92	4.2	15.1	24.4	0.99
Birch Cr ab 12 Mile Cr	10-Sep-92	15	46.9	23.0	2.91
Birch Cr ab Butte Cr	16-Jul-92	1.6	1.49	14.2	0.06
Birch Cr ab Butte Cr	17-Jul-92	1.3	0.88	14.8	0.04
Birch Cr ab Butte Cr	18-Jul-92	0.90	1.23	15.1	0.05

Site	Date	Turb (NTU)	TSS (mg/L)	Discharge (cfs)	Load (tons/day)
Birch Cr ab Butte Cr	19-Jul-92	90	182	17.0	8.36
Birch Cr ab Butte Cr	20-Jul-92	60	151	30.5	12.4
Birch Cr ab Butte Cr	21-Jul-92	65	59.5	24.2	3.88
Birch Cr ab Butte Cr	22-Jul-92	70	152	21.2	8.71
Birch Cr ab Butte Cr	23-Jul-92	23	31.8	19.1	1.64
Birch Cr ab Butte Cr	24-Jul-92	27	25.7	17.9	1.24
Birch Cr ab Butte Cr	25-Jul-92	11	9.70	20.5	0.54
Birch Cr ab Butte Cr	26-Jul-92	15	15.3	22.4	0.92
Birch Cr ab Butte Cr	27-Jul-92	55	228	41.3	25.5
Birch Cr ab Butte Cr	28-Jul-92	32	45.1	39.6	4.82
Birch Cr ab Butte Cr	29-Jul-92	110	327	59.4	52.4
Birch Cr ab Butte Cr	30-Jul-92	350	1190	207	665
Birch Cr ab Butte Cr	31-Jul-92	60	164	95.3	42.1
Birch Cr ab Butte Cr	01-Aug-92	27	63.2	66.1	11.3
Birch Cr ab Butte Cr	02-Aug-92	10	26.6	52.9	3.79
Birch Cr ab Butte Cr	03-Aug-92	11	19.0	44.8	2.29
Birch Cr ab Butte Cr	04-Aug-92	14	25.8	37.6	2.61
Birch Cr ab Butte Cr	05-Aug-92	7.3	8.91	32.8	0.79
Birch Cr ab Butte Cr	06-Aug-92	5.6	6.64	29.1	0.52
Birch Cr ab Butte Cr	07-Aug-92	6.3	10.4	27.2	0.76
Birch Cr ab Butte Cr	08-Aug-92	4.7	10.1	24.4	0.67
Birch Cr ab Butte Cr	09-Aug-92			24.1	
Birch Cr ab Butte Cr	10-Aug-92			23.1	
Birch Cr ab Butte Cr	11-Aug-92	12	5.17	22.2	0.31
Birch Cr ab Butte Cr	12-Aug-92	7.4	20.8	21.8	1.22
Birch Cr ab Butte Cr	13-Aug-92	7.5	14.0	21.6	0.81
Birch Cr ab Butte Cr	14-Aug-92	7.0	9.85	21.4	0.57
Birch Cr ab Butte Cr	15-Aug-92	2.8	5.15	20.4	0.28
Birch Cr ab Butte Cr	16-Aug-92	5.6	8.02	20.3	0.44
Birch Cr ab Butte Cr	17-Aug-92	13	37.8	19.8	2.02
Birch Cr ab Butte Cr	18-Aug-92	7.2	18.5	20.5	1.03
Birch Cr ab Butte Cr	19-Aug-92	22	27.6	17.8	1.32
Birch Cr ab Butte Cr	20-Aug-92	6.7	8.62	18.5	0.43
Birch Cr ab Butte Cr	21-Aug-92	1.6	2.50	18.2	0.12
Birch Cr ab Butte Cr	22-Aug-92	2.7	9.48	18.0	0.46
Birch Cr ab Butte Cr	23-Aug-92	4.4	4.97	16.3	0.22
Birch Cr ab Butte Cr	24-Aug-92	17	56.7	17.6	2.69
Birch Cr ab Butte Cr	25-Aug-92	5.0	10.7	17.2	0.50
Birch Cr ab Butte Cr	26-Aug-92	7.3	8.47	17.8	0.41
Birch Cr ab Butte Cr	27-Aug-92	22	51.7	20.6	2.87
Birch Cr ab Butte Cr	28-Aug-92	40	34.0	19.3	1.77
Birch Cr ab Butte Cr	29-Aug-92	38	36.6	20.2	1.99
Birch Cr ab Butte Cr	30-Aug-92	39	45.9	20.6	2.56
Birch Cr ab Butte Cr	31-Aug-92	9.2	12.2	21.3	0.70
Birch Cr ab Butte Cr	01-Sep-92	6.8	11.4	22.5	0.69
Birch Cr ab Butte Cr	02-Sep-92	9.2	14.0	25.4	0.96
Birch Cr ab Butte Cr	03-Sep-92	16	19.4	26.8	1.40
Birch Cr ab Butte Cr	04-Sep-92			27.7	
Birch Cr ab Butte Cr	05-Sep-92	20	23.5	27.1	1.72
Birch Cr ab Butte Cr	06-Sep-92	26	27.5	26.4	1.96

Site	Date	Turb (NTU)	TSS (mg/L)	Discharge (cfs)	Load (tons/day)
Birch Cr ab Butte Cr	07-Sep-92	20	20.3	25.0	1.37
Birch Cr ab Butte Cr	08-Sep-92	8.9	12.3	24.3	0.81
Birch Cr ab Butte Cr	09-Sep-92	19	21.5	24.3	1.41
Birch Cr ab Fish Cr	24-Jun-92	20	88.6		
Birch Cr ab Fish Cr	25-Jun-92	15	45.1		
Birch Cr ab Fish Cr	26-Jun-92	37	125		
Birch Cr ab Fish Cr	27-Jun-92	17	40.4		
Birch Cr ab Fish Cr	28-Jun-92	9.0	19.0		
Birch Cr ab Fish Cr	29-Jun-92	5.3	12.7		
Birch Cr ab Fish Cr	30-Jun-92	2.4	6.50		
Birch Cr ab Fish Cr	01-Jul-92	2.3	6.92		
Birch Cr ab Fish Cr	02-Jul-92	2.7	3.57		
Birch Cr ab Fish Cr	03-Jul-92	2.9	4.46		
Birch Cr ab Fish Cr	04-Jul-92	1.5	2.44		
Birch Cr ab Fish Cr	05-Jul-92	2.2	7.21		
Birch Cr ab Fish Cr	06-Jul-92	1.6	7.50		
Birch Cr ab Fish Cr	07-Jul-92	0.60	2.59		
Birch Cr ab Fish Cr	08-Jul-92	0.95	1.28		
Birch Cr ab Fish Cr	09-Jul-92				
Birch Cr ab Fish Cr	10-Jul-92				
Birch Cr ab Fish Cr	11-Jul-92				
Birch Cr ab Fish Cr	12-Jul-92				
Birch Cr ab Fish Cr	13-Jul-92				
Birch Cr ab Fish Cr	14-Jul-92				
Birch Cr ab Fish Cr	15-Jul-92				
Birch Cr ab Fish Cr	16-Jul-92	1.0	2.75	13.6	0.10
Birch Cr ab Fish Cr	17-Jul-92	1.0	1.32	14.1	0.05
Birch Cr ab Fish Cr	18-Jul-92	1.0	1.80	14.3	0.07
Birch Cr ab Fish Cr	19-Jul-92	1.0	64.5	16.1	2.79
Birch Cr ab Fish Cr	20-Jul-92	29	162	27.5	12.0
Birch Cr ab Fish Cr	21-Jul-92	80	72.9	22.1	4.35
Birch Cr ab Fish Cr	22-Jul-92	65	22.2	19.5	1.17
Birch Cr ab Fish Cr	23-Jul-92	19	9.95	17.7	0.48
Birch Cr ab Fish Cr	24-Jul-92	2.9	4.10	16.7	0.18
Birch Cr ab Fish Cr	25-Jul-92	1.9	5.12	19.0	0.26
Birch Cr ab Fish Cr	26-Jul-92	2.7	3.37	20.6	0.19
Birch Cr ab Fish Cr	27-Jul-92	23	73.3	37.0	7.31
Birch Cr ab Fish Cr	28-Jul-92	13	23.7	35.4	2.27
Birch Cr ab Fish Cr	29-Jul-92	18	221	54.3	32.3
Birch Cr ab Fish Cr	30-Jul-92	270	940	187	474
Birch Cr ab Fish Cr	31-Jul-92	50	158	84.1	35.9
Birch Cr ab Fish Cr	01-Aug-92	30	86.3	58.4	13.6
Birch Cr ab Fish Cr	02-Aug-92	17	36.3	46.9	4.59
Birch Cr ab Fish Cr	03-Aug-92	15	23.6	39.9	2.54
Birch Cr ab Fish Cr	04-Aug-92	5.3	9.88	33.6	0.90
Birch Cr ab Fish Cr	05-Aug-92	5.0	11.2	29.5	0.89
Birch Cr ab Fish Cr	06-Aug-92	4.6	5.40	26.4	0.38
Birch Cr ab Fish Cr	07-Aug-92	6.0	5.48	24.7	0.3
Birch Cr ab Fish Cr	08-Aug-92	3.1	3.33	22.3	0.20

Site	Date	Turb (NTU)	TSS (mg/L)	Discharge (cfs)	Load (tons/day)
Birch Cr ab Fish Cr	09-Aug-92				
Birch Cr ab Fish Cr	10-Aug-92			21.2	
Birch Cr ab Fish Cr	11-Aug-92			22.1	
Birch Cr ab Fish Cr	12-Aug-92	9.2	21.3	20.4	1.17
Birch Cr ab Fish Cr	13-Aug-92	5.3	10.5	20.1	0.57
Birch Cr ab Fish Cr	14-Aug-92	0.75	2.66	19.9	0.14
Birch Cr ab Fish Cr	15-Aug-92	1.0	1.46	19.7	0.08
Birch Cr ab Fish Cr	16-Aug-92	1.1	1.53	18.9	0.08
Birch Cr ab Fish Cr	17-Aug-92	0.55	0.75	18.8	0.04
Birch Cr ab Fish Cr	18-Aug-92	0.80	1.03	18.4	0.05
Birch Cr ab Fish Cr	19-Aug-92	2.1	2.25	19.0	0.12
Birch Cr ab Fish Cr	20-Aug-92	1.1	2.00	16.6	0.09
Birch Cr ab Fish Cr	21-Aug-92	0.75	1.74	17.3	0.08
Birch Cr ab Fish Cr	22-Aug-92	0.65	0.75	17.0	0.03
Birch Cr ab Fish Cr	23-Aug-92	2.4	4.25	16.8	0.19
Birch Cr ab Fish Cr	24-Aug-92	3.1	3.59	15.3	0.15
Birch Cr ab Fish Cr	25-Aug-92	0.75	1.58	16.5	0.07
Birch Cr ab Fish Cr	26-Aug-92	0.85	1.28	16.1	0.06
Birch Cr ab Fish Cr	27-Aug-92	1.2	1.52	16.7	0.07
Birch Cr ab Fish Cr	28-Aug-92	5.4	6.34	19.0	0.33
Birch Cr ab Fish Cr	29-Aug-92	19	16.8	18.0	0.81
Birch Cr ab Fish Cr	30-Aug-92	23	20.8	18.7	1.05
Birch Cr ab Fish Cr	31-Aug-92	29	24.8	19.1	1.28
Birch Cr ab Fish Cr	01-Sep-92	3.8	4.71	19.7	0.25
Birch Cr ab Fish Cr	02-Sep-92	1.4	1.74	20.7	0.10
Birch Cr ab Fish Cr	03-Sep-92	2.8	6.08	23.2	0.38
Birch Cr ab Fish Cr	04-Sep-92	20	22.7	24.4	1.49
Birch Cr ab Fish Cr	05-Sep-92	25	52.2	25.2	3.55
Birch Cr ab Fish Cr	06-Sep-92	8.8	23.0	24.6	1.53
Birch Cr ab Fish Cr	07-Sep-92	20	26.0	24.1	1.69
Birch Cr ab Fish Cr	08-Sep-92	23	29.5	22.8	1.82
Birch Cr ab Fish Cr	09-Sep-92	11	20.6	22.2	1.23
Birch Cr ab Fish Cr	10-Sep-92	25	38.2	22.2	2.29
		18	23.9	21.8	1.41
Gold Dust Cr	24-Jun-92	280	26.7		
Gold Dust Cr	25-Jun-92	450	47.6		
Gold Dust Cr	26-Jun-92	1210	112		
Gold Dust Cr	27-Jun-92	45	90.9		
Gold Dust Cr	28-Jun-92	45	43.0		
Gold Dust Cr	29-Jun-92	20	21.5		
Gold Dust Cr	30-Jun-92	13	14.0		
Gold Dust Cr	01-Jul-92	10	10.1		
Gold Dust Cr	02-Jul-92	11	11.1		
Gold Dust Cr	03-Jul-92	6.6	7.60		
Gold Dust Cr	04-Jul-92	7.2	4.76		
Gold Dust Cr	05-Jul-92				
Gold Dust Cr	06-Jul-92			6.48	
Gold Dust Cr	07-Jul-92	6.2	12.8	6.55	0.23
Gold Dust Cr	08-Jul-92	10	18.9	5.59	0.28
Gold Dust Cr	09-Jul-92	9.9	19.7	6.05	0.32

Site	Date	Turb (NTU)	TSS (mg/L)	Discharge (cfs)	Load (tons/day)
Gold Dust Cr	10-Jul-92	5.1	11.0	4.82	0.14
Gold Dust Cr	11-Jul-92	4.0	7.98	6.10	0.13
Gold Dust Cr	12-Jul-92	6.1	16.5	12.8	0.57
Gold Dust Cr	13-Jul-92	3.8	6.82	10.2	0.19
Gold Dust Cr	14-Jul-92	2.4	3.14	8.01	0.07
Gold Dust Cr	15-Jul-92	2.6	4.12	6.43	0.07
Gold Dust Cr	16-Jul-92	1.2	2.67	5.37	0.04
Gold Dust Cr	17-Jul-92	2.1	2.31	4.50	0.03
Gold Dust Cr	18-Jul-92	1.8	2.77	4.03	0.03
Gold Dust Cr	19-Jul-92	2.5	6.30	4.26	0.07
Gold Dust Cr	20-Jul-92	2.3	2.86	6.01	0.05
Gold Dust Cr	21-Jul-92	1.7	2.87	5.79	0.04
Gold Dust Cr	22-Jul-92	1.6	2.61	5.81	0.04
Gold Dust Cr	23-Jul-92	1.8	2.47	5.14	0.03
Gold Dust Cr	24-Jul-92	2.0	4.29	4.58	0.05
Gold Dust Cr	25-Jul-92	3.1	13.2	8.06	0.29
Gold Dust Cr	26-Jul-92	2.9	8.84	9.62	0.23
Gold Dust Cr	27-Jul-92	15	117	24.3	7.63
Gold Dust Cr	28-Jul-92	3.7	24.1	18.2	1.18
Gold Dust Cr	29-Jul-92	9.0	85.1	22.9	5.26
Gold Dust Cr	30-Jul-92	20	273	58.4	43.0
Gold Dust Cr	31-Jul-92	4.5	50.7	36.1	4.93
Gold Dust Cr	01-Aug-92	5.4	20.7	25.7	1.43
Gold Dust Cr	02-Aug-92	3.2	13.9	19.8	0.75
Gold Dust Cr	03-Aug-92	1.9	10.2	15.7	0.43
Gold Dust Cr	04-Aug-92	2.8	6.70	13.1	0.24
Gold Dust Cr	05-Aug-92	2.8	5.64	10.5	0.16
Gold Dust Cr	06-Aug-92	1.7	3.86	8.65	0.09
Gold Dust Cr	07-Aug-92	1.7	3.27	7.38	0.06
Gold Dust Cr	08-Aug-92	2.3	2.47	6.74	0.04
Gold Dust Cr	09-Aug-92	1.7	2.50	6.48	0.04
Gold Dust Cr	10-Aug-92	1.8	2.73	5.55	0.04
Gold Dust Cr	11-Aug-92	2.1	4.44	4.73	0.06
Gold Dust Cr	12-Aug-92	1.4	2.93	4.26	0.03
Gold Dust Cr	13-Aug-92	1.4	7.28	4.26	0.08
Gold Dust Cr	14-Aug-92	1.5	2.98	3.89	0.03
Gold Dust Cr	15-Aug-92	1.1	1.79	3.16	0.02
Gold Dust Cr	16-Aug-92	2.6	24.9	2.96	0.20
Gold Dust Cr	17-Aug-92	1.5	3.79	2.96	0.03
Gold Dust Cr	18-Aug-92	0.95	1.62	3.14	0.01
Gold Dust Cr	19-Aug-92	1.1	1.30	2.36	0.01
Gold Dust Cr	20-Aug-92	1.3	1.66	2.17	0.01
Gold Dust Cr	21-Aug-92	1.2	1.88	1.99	0.01
Gold Dust Cr	22-Aug-92	1.3	1.53	1.99	0.01
Gold Dust Cr	23-Aug-92	1.2	2.00	1.82	0.01
Gold Dust Cr	24-Aug-92	1.2	1.85	1.65	0.01
Gold Dust Cr	25-Aug-92	2.3	13.4	1.39	0.05
Gold Dust Cr	26-Aug-92	5.2	22.9	1.71	0.11
Gold Dust Cr	27-Aug-92	1.0	1.46	3.06	0.01
Gold Dust Cr	28-Aug-92	0.90	1.35	3.16	0.01

Site	Date	Turb (NTU)	TSS (mg/L)	Discharge (cfs)	Load (tons/day)
Gold Dust Cr	29-Aug-92	0.70	1.46	3.97	0.02
Gold Dust Cr	30-Aug-92	2.4	6.99	4.38	0.08
Gold Dust Cr	31-Aug-92	1.5	31.3	4.73	0.40
Gold Dust Cr	01-Sep-92	1.0	1.12	5.21	0.02
Gold Dust Cr	02-Sep-92	1.8	4.97	5.71	0.08
Gold Dust Cr	03-Sep-92	1.5	1.60	5.71	0.02
Gold Dust Cr	04-Sep-92	1.4	4.37	5.72	0.07
Gold Dust Cr	05-Sep-92	1.5	4.40	5.22	0.06
Gold Dust Cr	06-Sep-92	0.65	2.50	4.74	0.03
Gold Dust Cr	07-Sep-92	2.2	5.41	4.03	0.06
Gold Dust Cr	08-Sep-92	1.6	3.72	3.67	0.04
Gold Dust Cr	09-Sep-92	1.3	1.15	3.37	0.01
Ptarmigan Cr ab Eagle Cr	15-Jun-92	2.4	31.8		
Ptarmigan Cr ab Eagle Cr	16-Jun-92	1.6	10.2		
Ptarmigan Cr ab Eagle Cr	17-Jun-92	1.0	3.93		
Ptarmigan Cr ab Eagle Cr	18-Jun-92	1.1	1.58		
Ptarmigan Cr ab Eagle Cr	19-Jun-92	1.2	1.56		
Ptarmigan Cr ab Eagle Cr	20-Jun-92	0.95	1.78		
Ptarmigan Cr ab Eagle Cr	21-Jun-92	0.75	1.69		
Ptarmigan Cr ab Eagle Cr	22-Jun-92	0.65	0.45		
Ptarmigan Cr ab Eagle Cr	23-Jun-92	0.70	0.92		
Ptarmigan Cr ab Eagle Cr	24-Jun-92	0.80	1.16		
Ptarmigan Cr ab Eagle Cr	25-Jun-92	0.75	1.15		
Ptarmigan Cr ab Eagle Cr	26-Jun-92	0.70	0.69		
Ptarmigan Cr ab Eagle Cr	27-Jun-92	0.65	0.80		
Ptarmigan Cr ab Eagle Cr	28-Jun-92	0.70	1.02		
Ptarmigan Cr ab Eagle Cr	29-Jun-92	0.70	1.24		
Ptarmigan Cr ab Eagle Cr	30-Jun-92	0.55	1.14		
Ptarmigan Cr ab Eagle Cr	01-Jul-92	0.60	0.68		
Ptarmigan Cr ab Eagle Cr	02-Jul-92	0.50	0.79		
Ptarmigan Cr ab Eagle Cr	03-Jul-92	0.55	0.22		
Ptarmigan Cr ab Eagle Cr	04-Jul-92	0.50	0.22		
Ptarmigan Cr ab Eagle Cr	05-Jul-92	0.45	0.11		
Ptarmigan Cr ab Eagle Cr	06-Jul-92	0.55	0.10		
Ptarmigan Cr ab Eagle Cr	07-Jul-92				
Ptarmigan Cr ab Eagle Cr	08-Jul-92				
Ptarmigan Cr ab Eagle Cr	09-Jul-92				
Ptarmigan Cr ab Eagle Cr	10-Jul-92				
Ptarmigan Cr ab Eagle Cr	11-Jul-92				
Ptarmigan Cr ab Eagle Cr	12-Jul-92				
Ptarmigan Cr ab Eagle Cr	13-Jul-92				
Ptarmigan Cr ab Eagle Cr	14-Jul-92				
Ptarmigan Cr ab Eagle Cr	15-Jul-92				
Ptarmigan Cr ab Eagle Cr	16-Jul-92			6.76	
Ptarmigan Cr ab Eagle Cr	17-Jul-92	0.75	4.10	6.00	0.008
Ptarmigan Cr ab Eagle Cr	18-Jul-92	0.65	0.57	6.02	0.001
Ptarmigan Cr ab Eagle Cr	19-Jul-92	0.60	0.58	5.97	0.001
Ptarmigan Cr ab Eagle Cr	20-Jul 92	1.2	1.16	6.26	0.004
Ptarmigan Cr ab Eagle Cr	21-Jul-92	0.65	2.41	6.09	0.004

Site	Date	Turb (NTU)	TSS (mg/L)	Discharge (cfs)	Load (tons/day)
Ptarmigan Cr ab Eagle Cr	22-Jul-92	1.0	1.12	6.33	0.003
Ptarmigan Cr ab Eagle Cr	23-Jul-92	0.90	1.55	5.94	0.004
Ptarmigan Cr ab Eagle Cr	24-Jul-92	0.80	0.92	5.71	0.002
Ptarmigan Cr ab Eagle Cr	25-Jul-92	0.55	1.49	5.68	0.002
Ptarmigan Cr ab Eagle Cr	26-Jul-92	1.1	1.38	6.05	0.004
Ptarmigan Cr ab Eagle Cr	27-Jul-92	0.60	1.45	6.17	0.002
Ptarmigan Cr ab Eagle Cr	28-Jul-92	1.0	1.49	6.90	0.004
Ptarmigan Cr ab Eagle Cr	29-Jul-92	1.2	1.67	13.1	0.005
Ptarmigan Cr ab Eagle Cr	30-Jul-92			49.9	
Ptarmigan Cr ab Eagle Cr	31-Jul-92			21.6	
Ptarmigan Cr ab Eagle Cr	01-Aug-92			14.4	
Ptarmigan Cr ab Eagle Cr	02-Aug-92			11.4	
Ptarmigan Cr ab Eagle Cr	03-Aug-92			10.4	
Ptarmigan Cr ab Eagle Cr	04-Aug-92			9.10	
Ptarmigan Cr ab Eagle Cr	05-Aug-92			8.29	
Ptarmigan Cr ab Eagle Cr	06-Aug-92			8.52	
Ptarmigan Cr ab Eagle Cr	07-Aug-92			8.67	
Ptarmigan Cr ab Eagle Cr	08-Aug-92			7.94	
Ptarmigan Cr ab Eagle Cr	09-Aug-92			7.58	
Ptarmigan Cr ab Eagle Cr	10-Aug-92			6.87	
Ptarmigan Cr ab Eagle Cr	11-Aug-92			6.83	
Ptarmigan Cr ab Eagle Cr	12-Aug-92	0.65	0.94	6.39	0.002
Ptarmigan Cr ab Eagle Cr	13-Aug-92	0.55	1.03	6.31	0.002
Ptarmigan Cr ab Eagle Cr	14-Aug-92	0.80	1.05	6.33	0.002
Ptarmigan Cr ab Eagle Cr	15-Aug-92	1.3	4.68	6.17	0.016
Ptarmigan Cr ab Eagle Cr	16-Aug-92	0.90	1.14	6.11	0.003
Ptarmigan Cr ab Eagle Cr	17-Aug-92	0.80	0.91	6.14	0.002
Ptarmigan Cr ab Eagle Cr	18-Aug-92	0.75	0.69	6.19	0.001
Ptarmigan Cr ab Eagle Cr	19-Aug-92	0.43	0.57	6.12	0.001
Ptarmigan Cr ab Eagle Cr	20-Aug-92	0.75	0.91	6.00	0.002
Ptarmigan Cr ab Eagle Cr	21-Aug-92	0.60	0.57	5.90	0.001
Ptarmigan Cr ab Eagle Cr	22-Aug-92	0.70	0.88	5.91	0.002
Ptarmigan Cr ab Eagle Cr	23-Aug-92			5.80	
Ptarmigan Cr ab Eagle Cr	24-Aug-92			5.69	
Ptarmigan Cr ab Eagle Cr	25-Aug-92			5.64	
Ptarmigan Cr ab Eagle Cr	26-Aug-92			5.74	
Ptarmigan Cr ab Eagle Cr	27-Aug-92			6.29	
Ptarmigan Cr ab Eagle Cr	28-Aug-92			6.22	
Ptarmigan Cr ab Eagle Cr	29-Aug-92			6.24	
Ptarmigan Cr ab Eagle Cr	30-Aug-92			6.18	
Ptarmigan Cr ab Eagle Cr	31-Aug-92			6.37	
Ptarmigan Cr ab Eagle Cr	01-Sep-92			6.75	
Ptarmigan Cr ab Eagle Cr	02-Sep-92			7.42	
Ptarmigan Cr ab Eagle Cr	03-Sep-92	0.55	0.70	7.95	0.001
Ptarmigan Cr ab Eagle Cr	04-Sep-92	0.70	0.31	8.08	0.001
Ptarmigan Cr ab Eagle Cr	05-Sep-92	0.75	0.46	7.88	0.001
Ptarmigan Cr ab Eagle Cr	06-Sep-92	0.75	0.46	7.58	0.001
Ptarmigan Cr ab Eagle Cr	07-Sep-92	0.50	0.23	7.37	0.000
Ptarmigan Cr ab Eagle Cr	08-Sep-92	0.50	0.10	7.24	0.000
Ptarmigan Cr ab Eagle Cr	09-Sep-92	0.55	1.05	7.16	0.002

Site	Date	Turb (NTU)	TSS (mg/L)	Discharge (cfs)	Load (tons/day)
Ptarmigan Cr ab Eagle Cr	10-Sep-92	0.50	0.10	7.01	0.000
Eagle Cr ab Ptarmigan Cr	15-Jun-92	500	1260		
Eagle Cr ab Ptarmigan Cr	16-Jun-92	1400	4850		
Eagle Cr ab Ptarmigan Cr	17-Jun-92	1800	6750		
Eagle Cr ab Ptarmigan Cr	18-Jun-92	1400	6040		
Eagle Cr ab Ptarmigan Cr	19-Jun-92	700	2590		
Eagle Cr ab Ptarmigan Cr	20-Jun-92	650	2350		
Eagle Cr ab Ptarmigan Cr	21-Jun-92	700	2960		
Eagle Cr ab Ptarmigan Cr	22-Jun-92	450	1950		
Eagle Cr ab Ptarmigan Cr	23-Jun-92	330	1450		
Eagle Cr ab Ptarmigan Cr	24-Jun-92	220	803		
Eagle Cr ab Ptarmigan Cr	25-Jun-92	32	1200		
Eagle Cr ab Ptarmigan Cr	26-Jun-92	600	2600		
Eagle Cr ab Ptarmigan Cr	27-Jun-92	210	837		
Eagle Cr ab Ptarmigan Cr	28-Jun-92	120	531		
Eagle Cr ab Ptarmigan Cr	29-Jun-92	65	378		
Eagle Cr ab Ptarmigan Cr	30-Jun-92	50	292		
Eagle Cr ab Ptarmigan Cr	01-Jul-92	70	359		
Eagle Cr ab Ptarmigan Cr	02-Jul-92	50	208		
Eagle Cr ab Ptarmigan Cr	03-Jul-92	37	170		
Eagle Cr ab Ptarmigan Cr	04-Jul-92	31	139		
Eagle Cr ab Ptarmigan Cr	05-Jul-92	21	85.8		
Eagle Cr ab Ptarmigan Cr	06-Jul-92	22	78.4	5.13	1.09
Eagle Cr ab Ptarmigan Cr	07-Jul-92	2.4	10.2	5.50	0.15
Eagle Cr ab Ptarmigan Cr	08-Jul-92	2.3	10.7	6.30	0.18
Eagle Cr ab Ptarmigan Cr	09-Jul-92	3.0	8.74	5.48	0.13
Eagle Cr ab Ptarmigan Cr	10-Jul-92	8.4	28.5	5.43	0.42
Eagle Cr ab Ptarmigan Cr	11-Jul-92	18	48.2	5.55	0.72
Eagle Cr ab Ptarmigan Cr	12-Jul-92	3.3	11.6	5.65	0.18
Eagle Cr ab Ptarmigan Cr	13-Jul-92	2.1	13.5	5.02	0.18
Eagle Cr ab Ptarmigan Cr	14-Jul-92	2.0	9.66	4.67	0.12
Eagle Cr ab Ptarmigan Cr	15-Jul-92	2.4	25.2	4.11	0.28
Eagle Cr ab Ptarmigan Cr	16-Jul-92	2.2	21.0	4.51	0.25
Eagle Cr ab Ptarmigan Cr	17-Jul-92	8.8	52.0	4.51	0.63
Eagle Cr ab Ptarmigan Cr	18-Jul-92	10	33.5	4.52	0.41
Eagle Cr ab Ptarmigan Cr	19-Jul-92	65	190	7.82	4.01
Eagle Cr ab Ptarmigan Cr	20-Jul-92	310	612	18.7	30.9
Eagle Cr ab Ptarmigan Cr	21-Jul-92	330	395	13.4	14.3
Eagle Cr ab Ptarmigan Cr	22-Jul-92	170	196	10.8	5.72
Eagle Cr ab Ptarmigan Cr	23-Jul-92	50	72.3	9.28	1.81
Eagle Cr ab Ptarmigan Cr	24-Jul-92	32	56.0	8.43	1.27
Eagle Cr ab Ptarmigan Cr	25-Jul-92	8.7	13.9	8.71	0.33
Eagle Cr ab Ptarmigan Cr	26-Jul-92	13	30.3	9.44	0.77
Eagle Cr ab Ptarmigan Cr	27-Jul-92	100	254	19.4	13.3
Eagle Cr ab Ptarmigan Cr	28-Jul-92	65	98.6	19.9	5.31
Eagle Cr ab Ptarmigan Cr	29-Jul-92	200	573	22.8	35.2
Eagle Cr ab Ptarmigan Cr	30-Jul-92	1000	3610	42.6	414
Eagle Cr ab Ptarmigan Cr	31-Jul-92	130	408	26.5	29.1
Eagle Cr ab Ptarmigan Cr	01-Aug-92	50	114	20.3	6.22

Site	Date	Turb (NTU)	TSS (mg/L)	Discharge (cfs)	Load (tons/day)
Eagle Cr ab Ptarmigan Cr	02-Aug-92	22	44.3	16.7	2.00
Eagle Cr ab Ptarmigan Cr	03-Aug-92	17	31.8	14.0	1.20
Eagle Cr ab Ptarmigan Cr	04-Aug-92	18	36.0	12.4	1.20
Eagle Cr ab Ptarmigan Cr	05-Aug-92	12	28.5	12.2	0.94
Eagle Cr ab Ptarmigan Cr	06-Aug-92	12	53.1	11.9	1.70
Eagle Cr ab Ptarmigan Cr	07-Aug-92	9.1	27.8	10.9	0.82
Eagle Cr ab Ptarmigan Cr	08-Aug-92	12	43.1	10.2	1.19
Eagle Cr ab Ptarmigan Cr	09-Aug-92	8.0	15.0	9.97	0.40
Eagle Cr ab Ptarmigan Cr	10-Aug-92	6.8	15.2	9.24	0.38
Eagle Cr ab Ptarmigan Cr	11-Aug-92	5.9	12.4	8.85	0.30
Eagle Cr ab Ptarmigan Cr	12-Aug-92	3.6	11.0	8.62	0.26
Eagle Cr ab Ptarmigan Cr	13-Aug-92	3.8	8.08	8.29	0.18
Eagle Cr ab Ptarmigan Cr	14-Aug-92	6.4	21.4	8.34	0.48
Eagle Cr ab Ptarmigan Cr	15-Aug-92	3.0	6.04	7.89	0.13
Eagle Cr ab Ptarmigan Cr	16-Aug-92	2.0	3.21	8.00	0.07
Eagle Cr ab Ptarmigan Cr	17-Aug-92	2.8	6.60	8.04	0.14
Eagle Cr ab Ptarmigan Cr	18-Aug-92	2.3	5.80	7.84	0.12
Eagle Cr ab Ptarmigan Cr	19-Aug-92	2.8	8.45	6.60	0.15
Eagle Cr ab Ptarmigan Cr	20-Aug-92	2.0	4.90	7.32	0.10
Eagle Cr ab Ptarmigan Cr	21-Aug-92	2.1	4.60	7.25	0.09
Eagle Cr ab Ptarmigan Cr	22-Aug-92	1.5	3.21	7.17	0.06
Eagle Cr ab Ptarmigan Cr	23-Aug-92	3.1	7.00	5.90	0.11
Eagle Cr ab Ptarmigan Cr	24-Aug-92	1.5	4.12	6.54	0.07
Eagle Cr ab Ptarmigan Cr	25-Aug-92	1.9	2.99	6.36	0.05
Eagle Cr ab Ptarmigan Cr	26-Aug-92	1.9	5.99	6.71	0.11
Eagle Cr ab Ptarmigan Cr	27-Aug-92	4.0	6.73	6.92	0.13
Eagle Cr ab Ptarmigan Cr	28-Aug-92	2.4	2.97	6.19	0.05
Eagle Cr ab Ptarmigan Cr	29-Aug-92	1.5	2.98	6.10	0.05
Eagle Cr ab Ptarmigan Cr	30-Aug-92	2.3	3.51	6.53	0.06
Eagle Cr ab Ptarmigan Cr	31-Aug-92	2.5	5.08	6.86	0.09
Eagle Cr ab Ptarmigan Cr	01-Sep-92	2.6	4.36	7.17	0.08
Eagle Cr ab Ptarmigan Cr	02-Sep-92	4.1	16.2	8.02	0.35
Eagle Cr ab Ptarmigan Cr	03-Sep-92	1.4	12.1	8.41	0.28
Eagle Cr ab Ptarmigan Cr	04-Sep-92	9.6	23.6	8.90	0.57
Eagle Cr ab Ptarmigan Cr	05-Sep-92	3.1	11.8	9.44	0.30
Eagle Cr ab Ptarmigan Cr	06-Sep-92	1.6	6.73	9.18	0.17
Eagle Cr ab Ptarmigan Cr	07-Sep-92	2.0	15.9	8.31	0.36
Eagle Cr ab Ptarmigan Cr	08-Sep-92	4.0	14.9	8.06	0.32
Eagle Cr ab Ptarmigan Cr	09-Sep-92	2.5	10.3	7.86	0.22
Eagle Cr be Cripple Cr	24-Jun-92	23	23.4		
Eagle Cr be Cripple Cr	25-Jun-92	40	72.1		
Eagle Cr be Cripple Cr	26-Jun-92	75	123		
Eagle Cr be Cripple Cr	27-Jun-92	60	40.7		
Eagle Cr be Cripple Cr	28-Jun-92	28	14.9		
Eagle Cr be Cripple Cr	29-Jun-92	22	10.4		
Eagle Cr be Cripple Cr	30-Jun-92	18	5.12		
Eagle Cr be Cripple Cr	01-Jul-92	13	4.88		
Eagle Cr be Cripple Cr	02-Jul-92	11	4.66		
Eagle Cr be Cripple Cr	03-Jul-92	8.2	4.56		

Site	Date	Turb (NTU)	TSS (mg/L)	Discharge (cfs)	Load (tons/day)
Eagle Cr be Cripple Cr	04-Jul-92	6.4	55.1		
Eagle Cr be Cripple Cr	05-Jul-92	6.5	3.76		
Eagle Cr be Cripple Cr	06-Jul-92				
Eagle Cr be Cripple Cr	07-Jul-92	2.6	4.78	2.76	0.04
Eagle Cr be Cripple Cr	08-Jul-92	2.9	5.00	2.97	0.04
Eagle Cr be Cripple Cr	09-Jul-92	2.2	4.42	2.82	0.03
Eagle Cr be Cripple Cr	10-Jul-92	2.9	6.06	2.90	0.05
Eagle Cr be Cripple Cr	11-Jul-92	1.9	5.06	2.80	0.04
Eagle Cr be Cripple Cr	12-Jul-92	1.5	6.50	2.73	0.05
Eagle Cr be Cripple Cr	13-Jul-92	2.3	6.03	2.57	0.04
Eagle Cr be Cripple Cr	14-Jul-92	1.9	3.95	2.70	0.03
Eagle Cr be Cripple Cr	15-Jul-92	2.0	3.51	2.63	0.02
Eagle Cr be Cripple Cr	16-Jul-92	2.6	3.89	2.33	0.02
Eagle Cr be Cripple Cr	17-Jul-92	2.7	4.04	2.40	0.03
Eagle Cr be Cripple Cr	18-Jul-92	2.4	5.43	2.10	0.03
Eagle Cr be Cripple Cr	19-Jul-92	95	476	4.23	5.43
Eagle Cr be Cripple Cr	20-Jul-92	38	843	9.15	20.8
Eagle Cr be Cripple Cr	21-Jul-92	19	113	5.83	1.78
Eagle Cr be Cripple Cr	22-Jul-92	3.7	17.2	4.83	0.22
Eagle Cr be Cripple Cr	23-Jul-92	3.4	7.18	4.10	0.08
Eagle Cr be Cripple Cr	24-Jul-92	3.7	5.92	3.87	0.06
Eagle Cr be Cripple Cr	25-Jul-92	5.5	6.08	4.04	0.07
Eagle Cr be Cripple Cr	26-Jul-92	11	13.4	4.56	0.17
Eagle Cr be Cripple Cr	27-Jul-92	90	180	12.3	5.96
Eagle Cr be Cripple Cr	28-Jul-92	15	55.8	11.6	1.74
Eagle Cr be Cripple Cr	29-Jul-92	32	392	17.2	18.2
Eagle Cr be Cripple Cr	30-Jul-92	110	368	31.2	30.9
Eagle Cr be Cripple Cr	31-Jul-92	45	23.0	14.8	0.92
Eagle Cr be Cripple Cr	01-Aug-92	39	18.6	10.5	0.53
Eagle Cr be Cripple Cr	02-Aug-92	13	7.13	8.23	0.16
Eagle Cr be Cripple Cr	03-Aug-92	24	11.3	6.87	0.21
Eagle Cr be Cripple Cr	04-Aug-92	18	9.28	6.39	0.16
Eagle Cr be Cripple Cr	05-Aug-92	16	10.5	5.76	0.16
Eagle Cr be Cripple Cr	06-Aug-92	15	8.59	5.15	0.12
Eagle Cr be Cripple Cr	07-Aug-92	15	6.70	4.84	0.09
Eagle Cr be Cripple Cr	08-Aug-92	13	5.06	4.54	0.06
Eagle Cr be Cripple Cr	09-Aug-92	4.6	15.1	4.62	0.19
Eagle Cr be Cripple Cr	10-Aug-92	5.4	7.81	4.33	0.09
Eagle Cr be Cripple Cr	11-Aug-92	2.6	2.57	4.55	0.03
Eagle Cr be Cripple Cr	12-Aug-92	3.6	2.58	4.52	0.03
Eagle Cr be Cripple Cr	13-Aug-92	2.6	2.44	4.29	0.03
Eagle Cr be Cripple Cr	14-Aug-92	2.1	1.33	4.18	0.01
Eagle Cr be Cripple Cr	15-Aug-92	1.2	1.35	4.04	0.01
Eagle Cr be Cripple Cr	16-Aug-92	1.2	1.02	4.04	0.01
Eagle Cr be Cripple Cr	17-Aug-92	1.2	1.59	3.92	0.02
Eagle Cr be Cripple Cr	18-Aug-92	1.3	1.61	3.74	0.02
Eagle Cr be Cripple Cr	19-Aug-92	1.2	0.93	3.55	0.01
Eagle Cr be Cripple Cr	20-Aug-92	1.3	2.86	3.50	0.03
Eagle Cr be Cripple Cr	21-Aug-92	1.3	1.31	3.54	0.01
Eagle Cr be Cripple Cr	22-Aug-92	1.4	1.29	3.46	0.01

Site	Date	Turb (NTU)	TSS (mg/L)	Discharge (cfs)	Load (tons/day)
Eagle Cr be Cripple Cr	23-Aug-92	0.85	1.36	3.39	0.01
Eagle Cr be Cripple Cr	24-Aug-92	1.6	1.18	3.39	0.01
Eagle Cr be Cripple Cr	25-Aug-92	1.2	1.28	3.32	0.01
Eagle Cr be Cripple Cr	26-Aug-92	1.9	1.67	3.25	0.01
Eagle Cr be Cripple Cr	27-Aug-92	2.7	3.55	3.24	0.03
Eagle Cr be Cripple Cr	28-Aug-92	1.4	0.94	3.24	0.01
Eagle Cr be Cripple Cr	29-Aug-92	0.90	1.29	3.22	0.01
Eagle Cr be Cripple Cr	30-Aug-92	0.85	3.18	3.23	0.03
Eagle Cr be Cripple Cr	31-Aug-92	1.5	12.1	3.38	0.11
Eagle Cr be Cripple Cr	01-Sep-92	1.4	2.38	3.52	0.02
Eagle Cr be Cripple Cr	02-Sep-92	4.6	42.9	4.04	0.47
Eagle Cr be Cripple Cr	03-Sep-92	4.3	4.26	4.52	0.05
Eagle Cr be Cripple Cr	04-Sep-92	3.9	3.62	4.63	0.05
Eagle Cr be Cripple Cr	05-Sep-92	3.1	5.24	4.59	0.06
Miller Fork	15-Jun-92	1.1	1.52		
Miller Fork	16-Jun-92	0.95	0.51		
Miller Fork	17-Jun-92	1.8	2.20		
Miller Fork	18-Jun-92				
Miller Fork	19-Jun-92				
Miller Fork	20-Jun-92				
Miller Fork	21-Jun-92				
Miller Fork	22-Jun-92				
Miller Fork	23-Jun-92				
Miller Fork	24-Jun-92	1.7	5.39		
Miller Fork	25-Jun-92	1.1	3.40		
Miller Fork	26-Jun-92	0.55	1.31		
Miller Fork	27-Jun-92	0.65	1.39		
Miller Fork	28-Jun-92	0.60	1.27		
Miller Fork	29-Jun-92	0.45	0.77		
Miller Fork	30-Jun-92	0.40	0.89		
Miller Fork	01-Jul-92	0.45	0.25		
Miller Fork	02-Jul-92	0.55	0.25		
Miller Fork	03-Jul-92	0.45	0.38		
Miller Fork	04-Jul-92	0.41	0.37		
Miller Fork	05-Jul-92	0.45	0.90		
Miller Fork	06-Jul-92	0.50	0.51	2.11	0.003
Miller Fork	07-Jul-92	0.45	0.37	2.15	0.002
Miller Fork	08-Jul-92			2.11	
Miller Fork	09-Jul-92			1.95	
Miller Fork	10-Jul-92			1.89	
Miller Fork	11-Jul-92			1.98	
Miller Fork	12-Jul-92			1.85	
Miller Fork	13-Jul-92			1.78	
Miller Fork	14-Jul-92			1.68	
Miller Fork	15-Jul-92			1.57	
Miller Fork	16-Jul-92			1.51	
Miller Fork	17-Jul-92	0.75	1.04	1.52	0.004
Miller Fork	18-Jul-92	0.70	1.29	1.47	0.005
Miller Fork	19-Jul-92	1.3	5.51	1.96	0.029

Site	Date	Turb (NTU)	TSS (mg/L)	Discharge (cfs)	Load (tons/day)
Miller Fork	20-Jul-92	(65	0.77	3.92	0.008
Miller Fork	21-Jul-92	0.85	0.89	2.96	0.007
Miller Fork	22-Jul-92	0.60	0.77	2.59	0.005
Miller Fork	23-Jul-92	0.95	0.38	2.18	0.002
Miller Fork	24-Jul-92	0.90	0.63	2.35	0.004
Miller Fork	25-Jul-92	0.80	0.51	2.55	0.004
Miller Fork	26-Jul-92	0.85	2.27	3.21	0.020
Miller Fork	27-Jul-92	0.50	1.39	6.66	0.025
Miller Fork	28-Jul-92	2.0	15.2	6.81	0.280
Miller Fork	29-Jul-92	1.2	7.50	11.0	0.222
Miller Fork	30-Jul-92	1.0	2.55	19.3	0.133
Miller Fork	31-Jul-92	0.65	1.01	10.6	0.029
Miller Fork	01-Aug-92	0.45	0.38	7.26	0.007
Miller Fork	02-Aug-92	0.45	0.65	6.13	0.011
Miller Fork	03-Aug-92	0.85	0.38	5.46	0.006
Miller Fork	04-Aug-92	0.70	1.38	4.81	0.018
Miller Fork	05-Aug-92	0.60	0.38	3.95	0.004
Miller Fork	06-Aug-92	3.2	2.41	3.63	0.024
Miller Fork	07-Aug-92	0.95	0.65	3.30	0.006
Miller Fork	08-Aug-92	0.65	0.10	3.11	0.001
Miller Fork	09-Aug-92	1.0	0.90	3.00	0.007
Miller Fork	10-Aug-92			2.87	
Miller Fork	11-Aug-92			2.73	
Miller Fork	12-Aug-92	1.3	7.87	2.56	0.054
Miller Fork	13-Aug-92	0.70	2.60	2.40	0.017
Miller Fork	14-Aug-92	0.50	1.29	2.40	0.008
Miller Fork	15-Aug-92	0.85	1.97	2.34	0.012
Miller Fork	16-Aug-92	0.95	1.99	2.29	0.012
Miller Fork	17-Aug-92	1.7	4.20	2.17	0.025
Miller Fork	18-Aug-92	0.80	0.26	2.06	0.001
Miller Fork	19-Aug-92	0.60	0.42	1.96	0.002
Miller Fork	20-Aug-92	0.45	0.79	1.94	0.004
Miller Fork	21-Aug-92	1.2	1.03	1.89	0.005
Miller Fork	22-Aug-92	0.85	0.91	1.88	0.005
Miller Fork	23-Aug-92	1.0	1.28	1.84	0.006
Miller Fork	24-Aug-92	1.7	1.29	1.78	0.006
Miller Fork	25-Aug-92	1.5	6.92	1.73	0.032
Miller Fork	26-Aug-92	0.60	0.92	1.68	0.004
Miller Fork	27-Aug-92	1.5	10.8	1.68	0.049
Miller Fork	28-Aug-92	0.70	0.78	1.68	0.004
Miller Fork	29-Aug-92	0.90	2.08	1.68	0.009
Miller Fork	30-Aug-92	1.3	2.47	1.68	0.011
Miller Fork	31-Aug-92	21	390	1.68	1.77
Miller Fork	01-Sep-92	0.60	0.66	1.84	0.003
Miller Fork	02-Sep-92	0.80	2.70	2.49	0.018
Miller Fork	03-Sep-92	1.2	1.45	2.83	0.011
Miller Fork	04-Sep-92	0.60	1.87	2.95	0.015
Miller Fork	05-Sep-92	0.95	0.92	2.86	0.007
Miller Fork	06-Sep-92	1.3	2.35	2.81	0.018
Miller Fork	07-Sep-92	0.70	1.07	2.57	0.007

Site	Date	Turb (NTU)	TSS (mg/L)	Discharge (cfs)	Load (tons/day)
Miller Fork	08-Sep-92	1.0	4.05	2.40	0.026
Miller Fork	09-Sep-92	0.70	0.80	2.29	0.005
Miller Fork	10-Sep-92	1.4	2.21	2.12	0.013

Appendix C

Monitoring Methods:

Discharge

Velocities used to calculate discharge in most cases were measured with a Price Pygmy meter. At sites with bridges and when wading the stream was not possible, velocities were measured from the bridge using a Price AA meter suspended from a crane. Velocities were measured at six-tenths depth, with sufficient number of sections such that no one section contained over ten percent of the fotal flow. Where depth was greater that 2.5 feet, velocities were measured at two-tenths and eight-tenths of the depth from the surface. The average of the two readings were interpreted as the mean velocity. Discharges were calculated using the standard midpoint method (USDOI, 1981) from at least twenty velocity measurements taken across the stream cross section.

Gage locations were chosen based on having a history of previous monitoring and on proximity to bridges for high flow measurements. The sites were situated sufficiently downstream of any mining or tributary so that the stream was so that the stream was well mixed at the sampling site. At each location the specific site was chosen by looking for a cross section that would provide the most change in stage for change in stream discharge and the least turbulence around the staff gage. Staff gage water surface levels were recorded whenever agency personnel were in the vicinity. Continuous water surface levels were recorded with Omnidata DP320 Stream Stage Recorders. The DP320 is a small, battery operated device with a submersible pressure transducer which measures and records water levels between 0 to ten feet to the nearest hundredth of a foot. Water level data are stored in a solid state memory called a data storage module. At all sites the water level recorders monitored water levels at 30 minute intervals.

Rating curves are developed for each site by taking at least four discharge measurements at different water levels throughout the season. The rating curves are then used to estimate discharge from the observed or recorded water levels.

Water quality analyses are performed in the ADM&WM lab located on the University of Alaska, Fairbanks campus.

Procedures prescribed in the EPA publication no. EPA-600/ 4-79-020, "Methods for Chemical Analyses of Water and Wastes," were followed whenever possible (EPA, 1983). Other sources of methods were the USGS "Techniques of Water-Resources Investigations, Book 5, Chapter A1;" the AOHA-AWWA-WPCF "Standard Methods for the Examination of Water and Wastewater, Sixteenth Edition;" and procedures outlined in the user manuals of certain instrumentation (Skougstad et al., 1979; APHA, 1985). The lab is a participant in EPA analytical quality assurance studies, and has participated in the USGS Standard Reference Water Sample Quality Assurance program since 1980. For all analyses calibrations were performed using in-house analytical standards and blanks,

and were monitored and verified by running previously analyzed Standard Reference Water Samples along with the water samples collected for this study.

Turbidity and Total Suspended Solids

Samples for these analyses were collected from automated samples or by grab methods in well-mixed reaches at sampling sites. When automated samplers were employed, the intake hose for the sampler was installed at a well- mixed location in the stream at middepth with the intake nozzle pointing upstream. The automated samplers were programmed to composite into one bottle four samples taken six hours apart each day.

Most turbidity determinations were done in the lab because the lab served as a receiving point for samples coming in from more than one collecting agency, and because some of the more turbid samples required several serial dilutions to bring their turbidity down to readable levels. Since 1987 the instrument used was a Turner Design Model 40 laboratory turbidimeter.

TSS samples were filtered through prewashed, dried and weighed glass fiber filters, according to EPA specifications. The size of the aliquot was dependent upon the amount of material suspended, but ranged from 25 ml to a liter. Sediment yield was calculated by multiplying the seasonal average sediment load by the actual days monitored and dividing by drainage area.

The median is that value which divides a series so that one half or more of the observations are equal to or greater than it and one half or more of the observations are equal to or less than it (Croxden, Cowden, and Klein, 1987). Because values such as turbidities can be no smaller than zero but have no real upper limit, infrequent, extreme events such as floods can produce large turbidity values which distort the mean or average value. The median may better represent the normally observed turbidity value and indicates the extent to which the average is affected by extreme events.

The data are published annually as a Public Data File by the Alaska Division of Geological and Geophysical Surveys and include the 24 hour average turbidity, total suspended solids and stream discharge for each day as well as seasonal and monthly averages.

APPENDIX D

Specific Locations of Sampling Sites

Site Name	Full Name	MTRS Description
Miller Fork	Miller Fork of Eagle Creek	100 yards above confluence of Mastodon Fork of Eagle in NE 1\4 Sec. 11,T7N, R11E, FM.
Eagle Cr bw Cripple Cr	Eagle Creek below Cripple Creek	1/4 mile below the confluence of Eagle Creek SE 1\4 Sec. 10 T7N, R11E, FM.
Eagle ab Ptarmigan Cr	Eagle Creek above	1/4 mile above confluence of Ptarmigan Creek and Eagle Creek NE 1\4 Sec 17 T7N, R11E, FM.
Ptarmigan Cr	Ptarmigan Creek above Eagle Creek	1/4 mile upstream of the Steese Highway Bridge in SW 1\4 Sec, 9 T7N, R11E, FM.
Birch ab Gold Dust	Eagle Birch Creek above Gold Dust Creek	approximately 1/2 mile above the confluence of Birch and Gold Dust Creeks in SW 1\4 Sec, 18 T7N, R11E, FM.
Birch Cr ab Fish Cr	Birch above Fish Creek	approximately 100 yards upstream of the confluence of Birch and Fish Creeks in NE 1\4 Sec. 19 T7N, R11E, FM.
Birch Cr ab Butte Cr	Birch Creek above Butte Creek	1/4 mile upstream of the confluence of Birch and Butte Creeks.
Birch ab 12mile Cr	Birch Creek above Twelvemile Creek	1/4 mile above confluence in SW 1/4, NW 1/4, Sec. 33, T7N, R10E, FM.
Birch at Bridge	Birch Creek at Steese Highway Bridge	200 ft. above bridge on left bank in SE1/4, Sec 11, T10N, R16E, FM.