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INVESTIGATION OF STREAM SEDIMENT LOADS RELATED TO PLACER MINING IN THE GOLDSTREAM CREEK BASIN, ALASKA
Preliminary TMDL Data Collection

by

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INTRODUCTION

The 1992 Clean Water Act (CWA) Section 303(d)(l)(A) and (B) requires states to submit a list of waters which persistently exceed the criteria and/or impairment of uses to the U.S. Environmental Protection Agency (EPA). The list for Alaska placer mining was submitted to the EPA by the Alaska Department of Environmental Conservation (ADEC) on April 1, 1992. The list included 12 streams in four basins. 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 is one which has persistently exceeded the criteria and/or exhibits 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 limitations (NPDES permit), 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.

ADEC and Alaska Department of Natural Resources, Division of Water (DOW) reviewed existing water quality data from the identified basins and recognized that additional information would be needed to make the required decisions. Existing information provided adequate data on overall water quality, but was not sufficient to determine the sources of sediment and define the effect of potential controls on water quality. This report covers the second year of data collection, concentrating on the Goldstream Creek drainage. The information provided will be used in developing the Goldstream Creek assessment report. The agencies undertook this project to:

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

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

3. Determine the degree of impact from each point source discharge and its influence on the water quality of Goldstream Creek, and

4. Estimate the contribution of sediment and turbidity from non-point sources to the Goldstream Creek drainage.

STUDY LOCATION

The lower limit of the study area was set at Goldstream Creek above Standard Creek Road. The entire drainage was studied above this site. The tributaries to Goldstream Creek(Pedro Creek, Gilmore Creek, and Fox Creek) comprise 30.7 mi^2 of the 246.1 mi^2 drainage in the study area. Table 1 lists the site locations along with the identifying number which corresponds to the site location on Figure 1.

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

Location	Site	Area (mi^2)
Pedro Cr[R]	1	14.2
Pedro Cr at Monument[R]	2	8.8
Gilmore Cr[R]	3	11.1
Fox Cr[R]	4	5.4
Goldstream Cr @ Fox[A]	5	48.7
Goldstream Cr @ Ballaine Rd	6	76.0
Goldstream Cr @ Sheep Cr Rd[A]	7	97.0
Goldstream Cr 3.0 miles above Nugget Cr	8 (7-7-93)	116
Goldstream Cr 1.2 miles above Nugget Cr	9 (8- 19-93)	121
Goldstream Cr @ Standard Cr Rd[A]	10	246

[R] = repetitive sampling site

[A] = automated sampling site

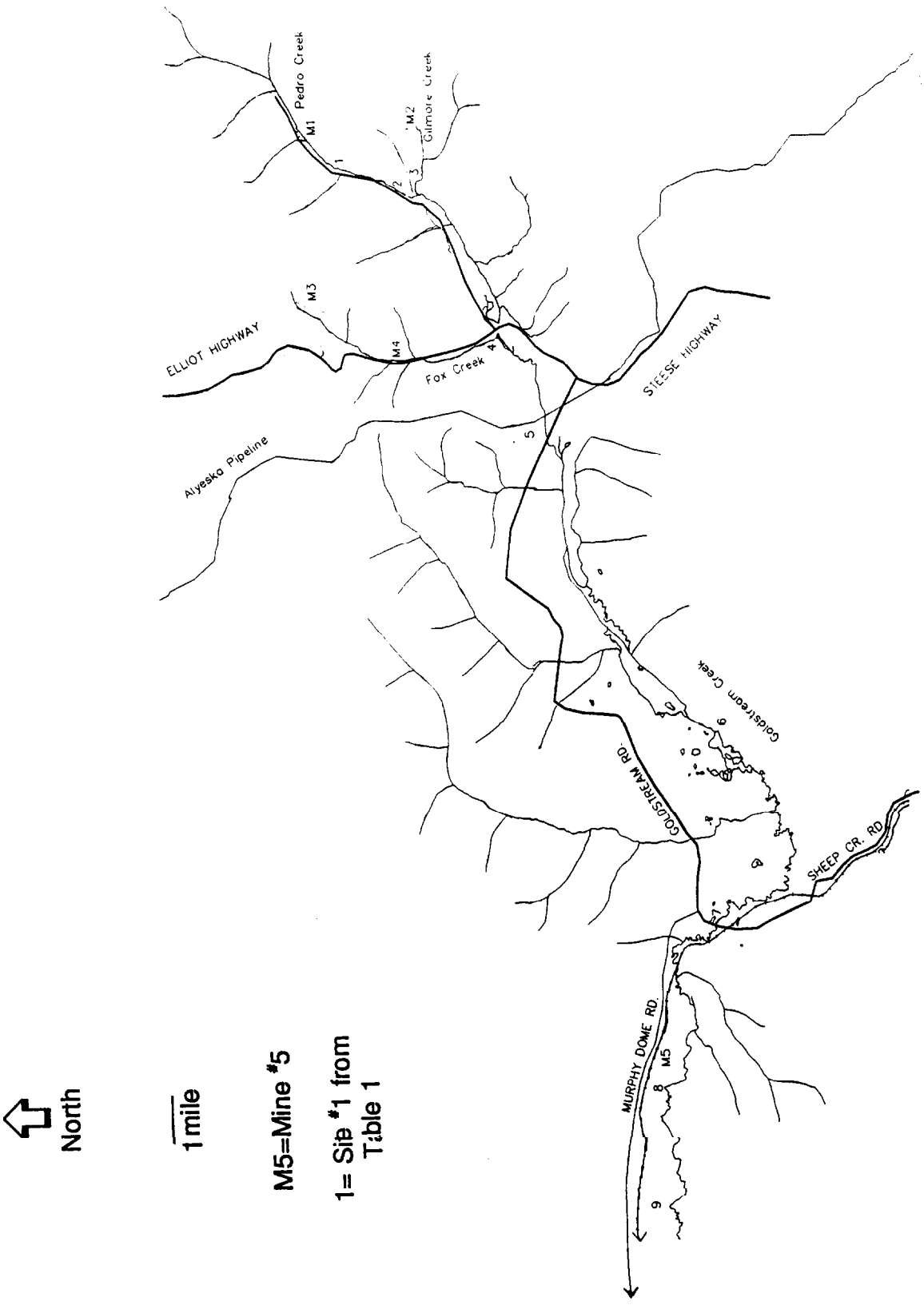


Figure 1: Site Locations

METHODS

Discharge

Stream velocities used in the calculation of discharge were measured with a Price pygmy meter, except at Standard Creek Road where a bridge crane and Price AA meter were used. 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 (Rantz and other, 1982).

A continuous stage recorder was installed at the Goldstream Creek at Fox and Goldstream Creek at Standard Creek Road sites. The small, battery operated devices can measure water levels from zero to ten feet in intervals of one-hundredth of a foot. The data are stored on EPROM microchips, which are then read by a computer.

Sediment

Samples for sediment analysis were obtained using a hand-held depth-integrating sampler and a churn splitter. Composite samples were collected from the churn splitter. Samples were collected at the upstream sites first, working downstream during the day on the July 7 and August 18 sampling trips.

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 cornposited 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 using USEPA methods 180.1 and 160.2, respectively.

RESULTS

Grab Samples

Appendix A lists the results of all the grab samples collected. Table 2 summarizes these results along the direction of flow. Table 2 also shows where the active mines are in relation to the sampling sites. The flows were similar during each of the sampling trips (Appendix A).

Table 2. Turbidity and stream total suspended solids (TSS) results from the grab samples collected during the two sampling trips.

Location	7 July				18 August			
	Turb (NTU)	TSS (mg/l)	Q (cfs)	Load (Ton/d)	Turb (NTU)	TSS (mg/l)	Q (cfs)	Load (Ton/d)
Pedro Cr (inactive mine)	1.2	0.93	8.61	0.02	0.90	2.13	6.96	0.04
Gilmore Cr (active mine)	8.7	7.33	8.41	0.17	6.1	10.8	6.24	0.18
Fox Cr (active mine)	18	12.2	2.86	0.09	40	54.2	2.04	0.30
Goldstream Cr @ Fox	5.2	4.68	24.0	0.30	6.3	12.1	18.8	0.61
Goldstream Cr @ Ballaine Rd	4.5	0.63	n/m		5.4	1.90	n/m	
Goldstream Cr @ Sheep Cr Rd Active mine	6.6	3.90	34.7	0.36	7.5	3.05	29.3	0.24
Goldstream Cr above Nugget Cr	9.9	9.98	34.5	0.93	5.0	1.68	29.0	0.13
Goldstream Cr @ Standard Cr Rd	6.0	9.63	90.5	2.35	3.6	10.7	75.8	2.19

n/m = not measured

Automated sites

The results from the three automated sites are found in Appendix A. The appendix contains the daily average turbidity and TSS for all sites, and discharge and daily load for the Goldstream Creek at Fox and Goldstream Creek at Standard Creek Road sites.

The results are summarized in Table 3 for the period of July 24 through September 10 because all the automated equipment was operated during this period of time. The number of samples reported in the table refers to the number of days sediment samples were collected.

Table 3. The results from the automated samplers for the period of July 24 through September 10. The number of samples refers to the total number of sediment samples collected.

Site	Turbidity median (NTU)	Turbidity mean (NTU)	Average Discharge (cfs)	Average Load (Tons/day)	Number of Samples
Goldstream Cr at Fox	7.3	8.5	22.8	1.32	151
Goldstream Cr at Sheep Cr Rd	3.8	4.9			61
Goldstream Cr at Standard Cr Rd	3.2	3.9	73.9'	2.58	122

'Stream gage failure resulted in only 39 days of record

One high-flow event occurred during the period of September 19-21. This event was the result of a large storm event that measured 1.22 inches over September 18 and 19 in Engineer Creek Basin. Engineer Creek is a small tributary that enters Goldstream Creek just south of the Fox site. The precipitation gage is located approximately one mile south of the Fox site. This precipitation event was followed one to two days later by significant increases in the turbidity and total suspended solids at all automated and grab sample sites.

DISCUSSION

Three different methods were used in the sample design: continuous daily automated samples cornposited every six hours, two separate one-day sampling trips, and a series of grab samples collected throughout the summer. This sample design provides opportunities to evaluate inputs to the system from non-point sources, point sources, and storm events.

Turbidity and TSS values vary rapidly depending on flow conditions, duration and type of mining activity, and location of precipitation events. Goldstream Creek at Sheep Creek Road was sampled by both a grab sample and a cornposited sample on July 29. The cornposited sample had a turbidity and TSS of 5.1 NTU and 13.9 mg/l respectively, much higher than the grab sample from late in the day (7:35pm) that was only 1.4 NTU and 4.84 mg/l. Because the cornposited sample is an average of four samples collected at six hour intervals, at some time earlier in the day the turbidity and TSS must have been much higher than the average measured (because the grab sample at the end of the day was significantly lower than the average). This demonstrates that the processes that control the amount and movement of sediment in the system are quick to respond to changing conditions.

Non-point source influences

Non-point source influences can be isolated in various reaches of Goldstream Creek and consists of two types: sources from non-mined areas and sources from previously mined but not active areas. The best area to evaluate non-mining disturbed influences is downstream from the Ballaine Road sample point to the Sheep Creek Road sample point.

Beaver dams at the Ballaine Road site reduced the stream flow to velocities too low to measure. This provides a natural retention pond that would allow most of the suspended sediments to settle out. The increase in TSS below this site is due to natural stream processes (erosion and transport) and non-mining related activities, such as road construction on Sheep Creek Road.

For the two one-day sampling trips (July and August), the TSS averaged 8.4 mg/l at the Goldstream Creek Fox site upstream of the beaver pond, and was reduced to an average of 1.3 mg/l at the Ballaine Road site. At the Sheep Creek Road site the average TSS for the two sample sets had increased 2.2 mg/l to 3.5 mg/l, or an increase due to background processes of approximately 0.4 mg/l per mile of stream reach. Although sediment in streams is usually expressed as mg/l per basin area, this report uses mg/l per mile of stream reach because the point sources of turbidity being studied are along the streams. It is possible to have a high TSS and turbidity input from a small basin area because of active mining along a segment of stream reach.

The Pedro Creek area has one mine that was not active through most of the summer and provides a means to evaluate how disturbed areas will influence the non-point source sediment load. The TSS on the two day sample sets averaged 1.5 mg/l or 0.3 mg/l per mile of stream reach, actually less than Goldstream Creek between Ballaine and Sheep Creek Road sites. Although the influence of the disturbed area is being averaged over stream reaches that differ in morphology, the results suggests that disturbed areas are not significant sources of TSS during non-flood conditions.

Point source influences

There were three areas that were influenced by active mining, Gilmore Creek, Fox Creek, and Goldstream Creek between Sheep Creek Road and Nugget Creek. The influence from active mining can be seen in Table 4. Table 4 should be used for relative comparisons only because the sample times from all the sites do not coincide. The loading in the system

Table 4. The results from all sites (automated and grab) through 18 September. Includes spring break-up results.

Site	n	Dates (1993)	Turbidity median (NTU)	Turbidity mean (NTU)	Average TSS (mg/l)
Fox Cr	52	6/2-9/19	19.0	38.4	51.2
Gilmore Cr	54	6/2-9/19	4.7	8.5	47.4
Pedro Cr	58	6/2-9/15	0.90	1.1	3.6
Goldstream Cr @ Fox	151	4/27-9/24	8.0	12.9	61.1
Goldstream Cr @ Sheep Cr Rd	82	5/27-9/22	3.7	4.8	14.2
Goldstream Cr @ Standard Cr Rd	122	5/12-9/10	4.1	6.2	37.5

is very dependent on short time segments, and if one site is sampled in a high loading event and another is not, the results could be skewed. To reduce any skewness in the data set, a large number of samples were averaged over the summer to allow a relative evaluation. Even taking into account the time dependency of the system, the average TSS

for both Fox and Gilmore Creeks is elevated in comparison to Pedro Creek and the Goldstream Creek reach between the Ballaine and Sheep Creek Road sites. The reasons for the lower values at both these sites was discussed above. Both Fox and Gilmore Creeks are approximately three miles long and produce 17 and 16 mg/l per mile of stream reach respectively.

Load evaluations can be made using the two single-day sample trips where both grab samples and flow measurements were taken at each site. Tables 5 and 6 provide the load, discharge, and basin area in actual amounts and percentage of total for both the entire Goldstream Creek drainage basin above Standard Creek Road and upper Goldstream Creek at the Fox site for the July and August sample trips respectively.

The beaver ponds in the system act as sediment retention basins and remove a significant portion of the TSS (and therefore load) midway through the basin, and loads downstream don't necessarily reflect this loss of sediment. The effectiveness of the beaver ponds in removing sediment is apparent in Table 5 as the load decreases from 0.30 tons per day at the Fox Goldstream Creek site to 0.05 tons per day at the Ballaine Road. The load at Ballaine Road is estimated by assuming the flow is mid-way between the measured Fox and Sheep Creek Road flows. This provides a method to estimate load at the Ballaine Road site.

Table 5: The load, discharge and basin area for the July single day sample trip. The basin area percentage refers to the basin area of the site divided by the area of Goldstream Creek above the Fox and Standard Creek Road sites. Basin load is in tons per day per square mile of drainage basin. Load at Ballaine is calculated by estimating Goldstream Creek flow.

Site	Load		Basin area	Discharge		load per area
	tons/day	%	%	cfs	%	
Fox Cr	0.09	4	6	2.86	3	0.006
Gilmore Cr	0.17	7	2	8.41	9	0.031
Pedro Cr	0.02	1	5	8.61	10	0.002
Goldstream Cr @ Fox	0.30	13	20	24.0	27	0.006
Goldstream Cr @ Ballaine	0.05	3	31	29.4	32	0.001
Goldstream Cr @ 'Sheep Cr Rd	0.36	16	39	34.7	38	0.004
Goldstream Cr above Nugget Cr	0.93	40	47	34.5	38	0.008
Goldstream Cr @ Standard Cr Rd	2.35	100	100	90.5	100	0.010

Upper Goldstream only Site	Load		Basin area	Discharge	
	tons/day	%	%	cfs	%
Fox Cr	0.09	30	29	2.86	12
Gilmore Cr	0.17	54	11	8.41	35
Pedro Cr	0.02	8	23	8.61	36
Goldstream Cr @ Fox	0.30	100	100	24.0	100

Below the Ballaine Road site to the Sheep Creek Road site non-point source processes add approximately 0.31 tons per day to the load, or about half the amount of load that is

Table 6: The load, discharge and basin area for the August single day sample trip. The basin area percentage refers to the basin area of the site divided by the area of Goldstream Creek above the Fox and Standard Creek Road sites. Basin load is in tons per day per square mile of drainage basin. Load at Ballaine is calculated by estimating Goldstream Creek flow.

Site	Load		Basin area	Discharge		load per area
	tons/day	%	%	cfs	%	
Fox Cr	0.30	14	6	2.04	3	0.021
Gilmore Cr	0.18	8	2	6.24	9	0.033
Pedro Cr	0.04	2	5	6.96	10	0.004
Goldstream Cr @ Fox	0.61	28	20	18.8	27	0.013
Goldstream Cr @ Ballaine	0.12	6	31	24.1	32	0.002
Goldstream Cr @ Sheep Cr Rd	0.24	11	39	29.3	38	0.002
Goldstream Cr above Nugget Cr	0.13	6	47	29.0	38	0.001
Goldstream Cr @ Standard Cr Rd	2.19	100	100	75.8	100	0.009

Upper Goldstream only Site	Load		Basin area	Discharge	
	tons/day	%	%	cfs	%
Fox Cr	0.30	49	29	2.04	11
Gilmore Cr	0.18	30	11	6.24	33
Pedro Cr	0.04	7	23	6.96	37
Goldstream Cr @ Fox	0.61	100	100	18.8	100

added in the reach containing the active mine. Table 6 shows similar results for the August sampling trip with the exception of the reach below the Sheep Creek Road site. This reach had a significant decrease in load from 0.24 to 0.13 tons per day. The variation in total load

in the downstream Goldstream Creek from the reach containing the active mine can be substantial depending on the mining activity being done.

In the upper Goldstream Creek section (to the Fox Goldstream site) most of the sediment load did come from stream reaches with active mining. As can be seen in the second part of Tables 5 and 6, Fox and Gilmore Creeks contribute approximately 40 percent of the daily load. Most of this load is lost (80%) by the Goldstream Creek Ballaine Road site.

Sudden events: breakup and storms

Most sediment load transported by the streams occurred over short periods of time, either due to storm events or during breakup conditions. The Goldstream Creek at Fox site was installed early in the season to identify effects of breakup on sediment load. Large sediment loads are produced during breakup because ice conditions in the stream channel cause flows to erode unconsolidated sediment from the banks of the creeks. The ice in the channel forces water to flow where it doesn't normally. The flows are high, with the ice increasing the stream stage reaching sediment not readily available for transport during normal and low flow conditions. The flows and sediment loads at the Goldstream Creek **Fox** site (Appendix A) display this response to the high spring melt flows. Values for sediment load are very high until after May 20 when both the flows and TSS values are similar to the summer values. Although this is a natural process, some sediment load is related to the mined areas where working the stream bed changes the sediment availability.

One storm event of significance was recorded at the Fox and Sheep Creek Road sites during September 19-21. This event is the result of approximately 1.22 inches of rain over a two day period (September 18 and 19). The sediment load increase was seen at all stations (Standard Creek Road site was not sampled during the storm event). Table 7 shows the median TSS for all samples collected at the sites this summer (excluding the storm event) and the TSS for September 19-22.

Table 7. The median TSS for ail samples to September 18, and actual TSS for September 19, 20, 21, and 22. All values in mg/l total suspended solids.

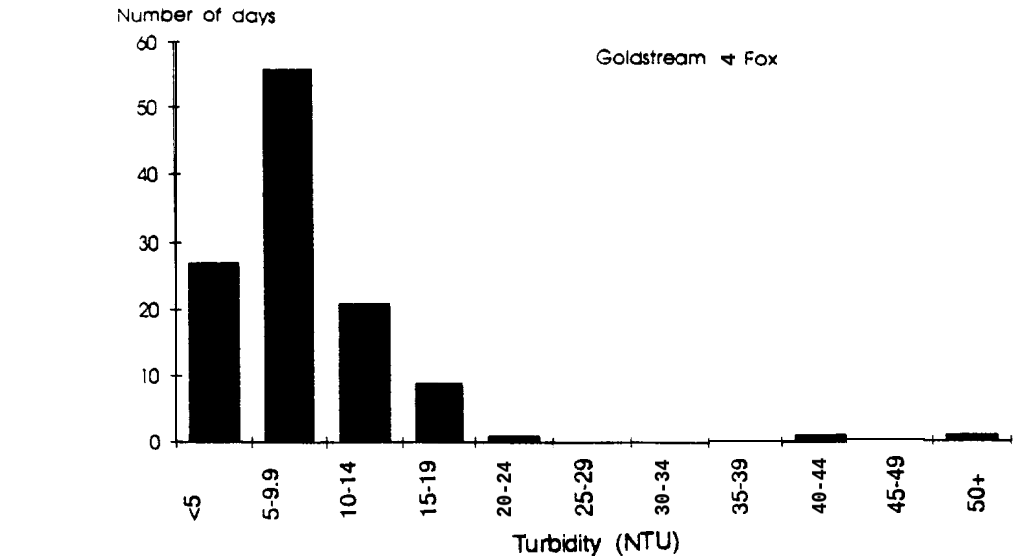
Site	median	n	Sept. 19	20	21	22
Fox Cr	30.0	52	328			
Gilmore Cr	11.4	54	850			
Goldstream Cr @ Fox	19.9	151	230	450	94.2	55.3
Goldstream Cr @ Sheep Cr Rd	8.3	82	41.3	936	2080	1800

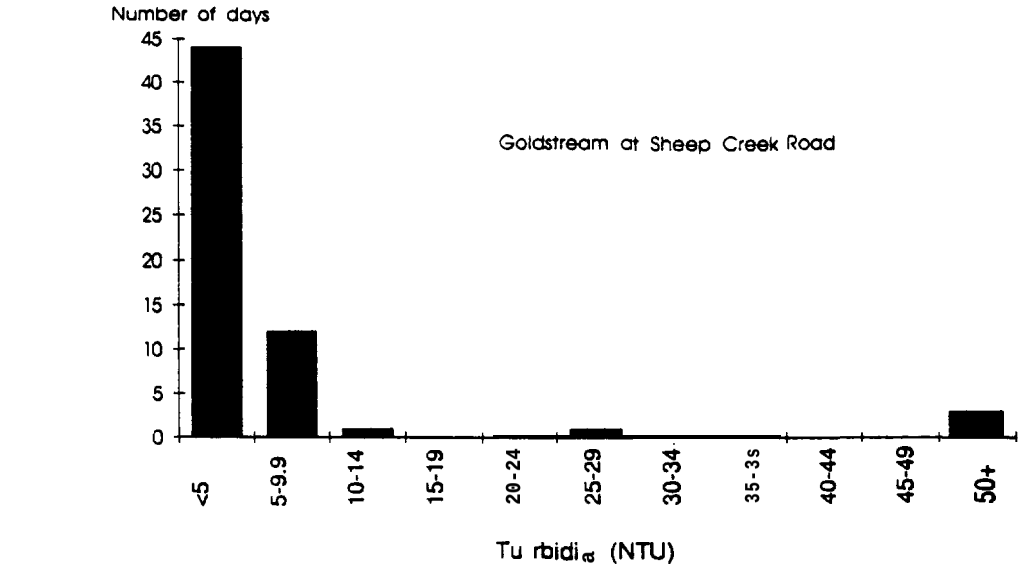
The storm values were the largest recorded values (post break-up) and were orders of magnitude greater than the median values for the summer. The upstream sub-basins (Fox and Gilmore) were grab sampled on the last day of the storm event, and the Fox and Sheep Creek Road sites were sampled with the automated samplers. The storm derived sediment is transported through the system (as far as the Sheep Creek Road site) in three days. The Fox

site peaks on the second day of increase and the Sheep Creek Road site peaks on the third day.

When examining the record for the Fox site, the sediment load is generally less than five tons per day except for the storm event. Discounting the May results because of breakup effects, for the three days following the September storm (September 19, 20, and 21), the load totaled 130.2 tons or 41 percent of the total 318.9 tons for the summer (June through September 24).

Just as the majority of the load is transported over a short time period, the high turbidity levels occur in similar short time intervals. Figure 3 shows the frequency distributions for the turbidity data collected from the three automated sites from July 24 through September 10. The turbidity range with the most number of days at all sites (except the Fox site which was influenced by two active mines) was less than five NTU.





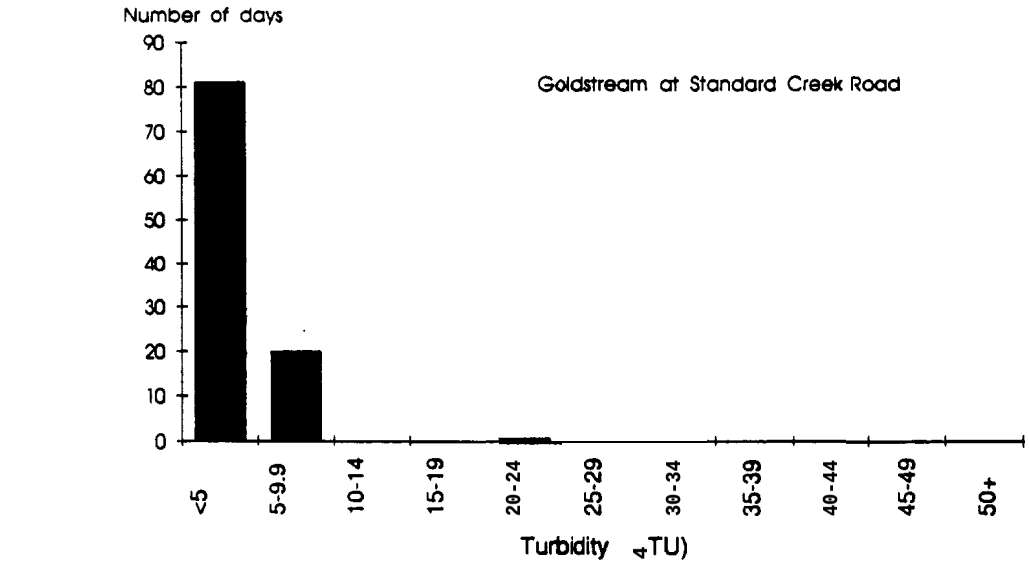


Figure 2: Turbidity Frequency Distributions

SUMMARY

This project included two single-day grab-sample trips where all sites were sampled, three automated sediment sample sites, and three grab sample sites. 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 disturbed but with no active mining contribute approximately the same sediment for transport as un-mined reaches of Goldstream Creek, 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). Initial break-up causes large flows and sediment loads within the upper Goldstream Creek drainage; and

3. Active mines in the lower basin contributed approximately the same sediment load as was input from natural processes.

REFERENCES

Rantz, S.E., and others. 1982. Measurement and Computation of Stream flow: Volume 1. Measurement of Stage and Discharge, US Geological Survey Water-Supply Paper 2175, 284pp.

APPENDIX A

1993 TMDL Data

ISCO's at Goldstream @ Fox, Goldstream @ Standard Creek Rd. and Goldstream @ Sheep Creek Rd (for second half of summer).
Grabs taken at all other sites. Pressure transducers at Goldstream @ Fox & Goldstream @ Standard Creek Road
No flow measured at Goldstream at Ballaine Rd, beavers have built dams and restricted flow.
Samples with time recorded are grab samples, all others are taken with ISCO, every 6 hours, one composite sample per day.
Flow is estimated at Goldstream below May on 18 August -- and therefore sediment load is estimated as well.

TMDL Daytl:	Date	Time	Turbidity (NTU)	TSS (mg/L)	Q (cfs)	sed load (tons/day)
Pedro Cr	7-Jut-93	907	1.2	0.93	8.61	0.02
Gilmore Cr above Pedro Cr	7-Jul-93	935	a.7	7.33	8.41	0.17
Fox Cr	7-Jul-93	1000	18	12.2	2.86	0.09
Goldstream @ Fox	7-Jul-93	1035	5.2	4.68	24.0	0.30
Goldsbeam at Ballaine Road	7-Jul-93	1115	4.5	0.63	29.40	0.05
Goldsbeam at Sheep Cr Road	7-Jul-93	1135	6.6	3.90	34.7	0.36
Goldstream below May	7-Jul-93	1245	9.9	9.98	34.5	0.93
Lower Goldstream Cr	7-Jul-93	1515	6.0	9.63	90.5	2.35

TMDL Day #2:	Date	Time	Turbidity (NTU)	TSS (mg/L)	Q (cfs)	sed load (tons/day)
Pedro Cr	19-Aug-93	815	0.90	2.13	6.96	0.04
Gilmore Cr above Pedro Cr	18-Aug-93	830	6.1	10.8	6.24	0.18
Fox Cr	18-Aug-93	849	40	54.2	2.04	0.30
Goldstream @ Fox	18-Aug-93	914	6.3	12.1	18.8	0.61
Goldstream @ Ballaine Road	18-Aug-93	930	5.4	1.90	24.10	0.12
Goldstream at Sheep Cr Road	18-Aug-93	955	7.5	3.05	29.3	0.24
Goldstream below May (note: flow is estimated)	18-Aug-93	1145	5.0	1.68	29.0	0.13
Lower Goldstream Cr	18-Aug-93	1330	3.6	10.7	75.8	2.19

site id	date	time	turbidity (NTU)	tss (mg/L)	Q (cfs)	sed load (tons/day)
Goldsbeam Cr at Sheep Cr Road	27-May-93	not noted	3.7	4.51		
Goldstream Cr at Sheep Cr Road	28-May-93	1915	3.5	7.30		
Goldstream Cr at Sheep Cr Road	29-May-93	1505	3.1	3.87		
Goldstream Cr at Sheep Cr Road	30-May-93	1819	3.0	2.77		
Goldstream Cr at Sheep Cr Road	3-Jun-93	1750	2.3	2.51		
Goldstream Cr at Sheep Cr Road	6-Jun-93	1200	2.3	3.43		
Goldstream Cr at Sheep Cr Road	14-Jun-93	1830	2.2	1.60		
Goldstream Cr at Sheep Cr Road	15-Jun-93	1825	3.4	3.46		
Goldstream Cr at Sheep Cr Road	18-Jun-93	1730	12	25.7		
Goldstream Cr at Sheep Cr Road	21-Jun-93	1715	6.2	6.10		
Goldstream Cr at Sheep Cr Road	22-Jun-93	1835	1.7	4.65		
Goldstream Cr at Sheep Cr Road	23-Jun-93	1540	3.4	3.98		
Goldstream Cr at Sheep Cr Road	24-Jun-93	1710	3.5	19.4		
Goldstream Cr at Sheep Cr Road	2-Jul-93	1510	3.4	4.60		
Goldstream Cr at Sheep Cr Road	6-Jul-93	1410	5.4	3.35		
Goldstream Cr at Sheep Cr Road	7-Jul-93	1135	6.6	3.90		
Goldstream Cr at Sheep Cr Road	7-Jul-93	1135	6.6	2.35		
Goldstream Cr at Sheep Cr Road	19-Jul-93	1817	2.9	5.12		
Goldstream Cr at Sheep Cr Road	21 Jul-93	1810	2.6	5.67		
Goldstream Cr at Sheep Cr Road	22-Jul-93	1607	2.2	10.5		
Goldsbeam Cr at Sheep Cr Road	29-Jul-93	1935	1.4	4.84		

site id	date	time	turbidity (NTU)	tss (me/L)	Q (cfs)	sed load (tons/day)
Goldstream Cr at Sheep Cr Road	24-Jul-93		3.1	13.4		
Goldstream Cr at Sheep Cr Road	25-Jul-93		4.5	10.0		
Goldstream Cr at Sheep Cr Road	26-Jul-93		3.8	8.17		
Goldstream Cr at Sheep Cr Road	27-Jul-93		2.8	6.38		
Goldsbeam Cr at Sheep Cr Road	28-Jul-93		12	67.4		
Goldstream Cr at Sheep Cr Road	29-Jul-93		5.1	13.9		
Goldstream Cr at Sheep Cr Road	30-Jul-93		3.6	7.96		
Goldstream Cr at Sheep Cr Road	31-Jul-93		2.7	7.38		
Goldsbeam Cr at Sheep Cr Road	1 -Aug-93		3.2	5.09		
Goldsbeam Cr at Sheep Cr Road	2-Aug-93		27	99.5		
Goldstream Cr at Sheep Cr Road	3-Aug-93		7.9	21.3		
Goldsteam Cr at Sheep Cr Road	4-Aug-93		3.4	7.21		
Goldstream Cr at Sheep Cr Road	5-Aug-93		3.3	6.83		
Goldstream Cr at Sheep Cr Road	6-Aug-93		3.6	a.74		

Goldstream Cr at Sheep Cr Road	7-Aug-93	4.1	29.4
Goldstream Cr at Sheep Cr Road	8-Aug-93	4.6	15.8
Goldstream Cr at Sheep Cr Road	9-Aug-93	3.8	7.60
Goldsteam Cr at Sheep Cr Road	10-Aug-93	2.9	7.60
Goldstream Cr at Sheep Cr Road	11-Aug-93	3.4	5.43
Goldstream Cr at Sheep Cr Road	12-Aug-93	3.9	4.85
Goldstream Cr at Sheep Cr Road	13-Aug-93	3.6	7.31
Goldstream Cr at Sheep Cr Road	14-Aug-93	6.3	6.57
Goldstream Cr at Sheep Cr Road	15-Aug-93	9.0	7.23
Goldstream Cr at Sheep Cr Road	16-Aug-93	3.1	7.33
Goldstream Cr at Sheep Cr Road	17-Aug-93	4.0	4.29
Goldstream Cr at Sheep Cr Road	18-Aug-93	8.7	6.26
Goldstream Cr at Sheep Cr Road	19-Aug-93	3.6	3.99
Goldstream Cr at Sheep Cr Road	20-Aug-93	6.1	5.36
Goldstream Cr at Sheep Cr Road	21-Aug-93	6.9	25.8
Goldstream Cr at Sheep Cr Road	22-Aug-93	4.1	6.79
Goldstream Cr at Sheep Cr Road	23-Aug-93	3.0	7.14
Goldstream Cr at Sheep Cr Road	24-Aug-93	2.8	21.3
Goldsbeam Cr at Sheep Cr Road	25-Aug-93	3.7	6.92
Goldstream Cr at Sheep Cr Road	26-Aug-93	3.7	5.14
Goldstream Cr at Sheep Cr Road	27-Aug-93	4.7	11.9
Goldstream Cr at sheep Cr Road	28-Aug-93	2.5	7.94
Goldsbeam Cr at Sheep Cr Road	29-Aug-93	2.6	4.95
Goldstream Cr at Sheep Cr Road	30-Aug-93	4.1	8.35
Goldstream Cr at Sheep Cr Road	31-Aug-93	3.5	3.80
Goldstream Cr at Sheep Cr Road	1-Sep-93	4.5	20.2
Goldstream Cr at Sheep Cr Road	2-Sep-93	6.4	4.78
Goldstream Cr at Sheep Cr Road	3-Sep-93	6.9	14.1
Goldstream Cr at Sheep Cr Road	4-Sep-93	5.0	31.4
Goldsbeam Cr at sheep Cr Road	5-Sep-93	3.9	43.3
Goldstream Cr at Sheep Cr Road	6-Sep-93	3.7	29.8
Goldstream Cr at Sheep Cr Road	7-Sep-93	3.5	9.55
Goldsbeam Cr at Sheep Cr Road	8-Sep-93	3.0	6.53
Goldstream Cr at Sheep Cr Road	S-sap-93	6.2	11.0
Goldstream Cr at Sheep Cr Road	10-Sep-93	4.0	8.72
Goldstream Cr at Sheep Cr Road	11-Sep-93	3.4	11.7
Goldstream Cr at Sheep Cr Road	12-Sep-93	3.6	12.3
Goldstream Cr at Sheep Cr Road	13-Sep-93	0.0	23.8
Goldstream Cr at Sheep Cr Road	14-Sep-93	3.7	12.9
Goldstream Cr at Sheep Cr Road	15-Sep-93	3.6	10.7
Goldstream Cr at Sheep Cr Road	16-Sep-93	3.1	8.68
Goldstream Cr at Sheep Cr Road	17-Sep-93	3.2	13.6
Goldstream Cr at Sheep Cr Road	18-Sep-93	6.2	21.5
Goldsbeam Cr at Sheep Cr Road	19-Sep-93	7.3	41.3
Goldsbeam Cr at Sheep Cr Road	20-Sep-93	so	938
Goldstream Cr at Sheep Cr Road	21-Sep-93	150	2060
Goldstream Cr at Sheep Cr Road	22-Sep-93	150	1800

site id	date	time	turbidity (NTU)	tss (mg/L)	0 (cfs)	sad load (tons/day)
Goldstream Cr at Standard Creek Road	12-May-93		25	247		
Goldstream Cr at Standard Creek Road	13-May-93		26	239	473	304.88
Goldstream Cr at Standard Creek Road	14-May-93		25	249	471	316.87
Goldstream Cr at Standard Creek Road	15-May-93		29	269	497	359.99
Goldstraam Cr at Standard Creek Road	16-May-93		28	261	496	349.53
Goldstream Cr at Standard Creak Road	17-May-93		21	231	464	288.88
Goldstream Cr at Standard Creek Road	1 a-May-93		19	198	428	228.55
Goldstream Cr at Standard Creek Road	19-May-93		20	187	367	165.65
Goldstream Cr at Standard Creek Road	20-May-93		20	158	311	132.50
Goldstream Cr at Standard Creek Road	21 -May-93		17	100	274	74.27
Goldstream Cr at Standard Creek Road	22-May-93		13	78.0	245	51.52
Goldstream Cr at Standard Creak Road	23-May-93		14	73.6	217	43.12
Goldstream Cr at Standard Creek Road	24-May-93		12	73.5	198	39.27
Goldstream Cr at Standard Creek Road	25-May-93		10	58.5	188	29.63
Goldstream Cr at Standard Creek Road	26-May-93		9.6	60.8	179	29.40
Goldstream Cr at Standard Creek Road	27-May-93		9.4	65.8	171	30.32
Goldstream Cr at Standard Creek Road	28-May-93		8.9	60.4	165	26.87
Goldstream Cr at Standard Creek Road	29-May-93		9.9	62.9	157	26.87
Goldstream Cr at Standard Creek Road	30-May-93		9.7	54.0	150	21.89
Goldstream Cr at Standard Creek Road	31 -May-93		9.5	57.4	144	22.21
Goldstream Cr at Standard Creek Road	1 Jun-93		4.7	23.5	138	8.76
Goldstream Cr at Standard Creek Road	2-Jun-93		4.3	22.6	133	8.16

Goldstream Cr at Standard Creek Road	3-Jun-93	3.0	25.6	128	8.85
Goldstream Cr at Standard Creek Road	4-Jun-93	3.1	17.7	124	5.93
Goldstream Cr at Standard Creek Road	5-Jun-93	4.1	19.1	122	6.29
Goldstream Cr at Standard Creek Road	6-Jun-93	4.9	21.9	120	7.10
Goldstream Cr at Standard Creek Road	7-Jun-93	2.2	21.3	121	6.97
Goldstream Cr at Standard Creek Road	8-Jun-93	3.9	17.8	119	5.71
Goldstream Cr at Standard Creek Road	9-Jun-93	1.4	18.5	118	5.87
Goldstream Cr at Standard Creek Road	10-Jun-93	2.8	17.9	115	5.54
Goldstream Cr at Standard Creek Road	11-Jun-93	2.9	21.7	113	6.63
Goldstream Cr at Standard Creak Road	12-Jun-93	5.7	19.4	115	5.99
Goldstream Cr at Standard Creek Road	13-Jun-93	5.7	16.9	112	5.10
Goldstream Cr at Standard Creek Road	14-Jun-93	3.2	24.1	109	7.10
Goldstream Cr at Standard Creek Road	15-Jun-93	6.2	21.3	107	6.13
Goldstream Cr at Standard Creek Road	16-Jun-93	2.7	24.4	118	7.78
Goldstream Cr at Standard Creek Road	17-Jun-93	4.8	41.6	123	13.80
Goldstream Cr at Standard Creek Road	18-Jun-93	4.5	34.4	117	10.85
Goldstream Cr at Standard Creek Road	19-Jun-93	5.4	31.1	126	10.53
Goldstream Cr at Standard Creek Road	20-Jun-93	6.1	39.5	149	15.93
Goldstream Cr at Standard Creek Road	21-Jun-93	7.8	37.0	144	14.39
Goldstream Cr at Standard Creak Road	22-Jun-93	7.3	35.8	139	13.47
Goldstream Cr at Standard Creek Road	23-Jun-93	6.8	29.2	128	10.05
Goldstream Cr at Standard Creek Road	24-Jun-93	7.2	11.8	122	3.89
Goldstream Cr at Standard Creek Road	25-Jun-93	3.1	17.2	121	5.62
Goldstream Cr at Standard Creek Road	26-Jun-93	5.9	27.2	120	8.78
Goldstream Cr at Standard Creek Road	27-Jun-93	2.0	14.5	116	4.54
Goldstream Cr at Standard Creek Road	28-Jun-93	4.4	18.8	112	5.68
Goldstream Cr at Standard Creek Road	29-Jun-93	4.6	21.4	108	6.25
Goldstream Cr at Standard Creek Road	30-Jun-93	4.9	22.1	104	6.21
Goldstream Cr at Standard Creek Road	1-Jul-93	6.7	28.7	99.9	7.73
Goldstream Cr at Standard Creek Road	2-Jul-93	3.6	21.6	98.6	5.73
Goldstream Cr at Standard Creek Road	3-Jul-93	4.6	33.1	96.3	8.60
Goldstream Cr at Standard Creek Road	4-Jul-93	3.7	18.2	94.9	4.65
Goldstream Cr at Standard Creek Road	5-Jul-93	4.1	16.5	93.4	4.15
Goldstream Cr at Standard Creek Road	6-Jul-93	6.7	22.3	91.4	5.51
Goldstream Cr at Standard Creek Road	7-Jul-93	4.3	19.9	90.5	4.86
Goldstream Cr at Standard Creek Road	8-Jul-93	4.2	16.8	90.7	4.11
Goldstream Cr at Standard Creek Road	9-Jul-93	4.0	15.4	89.8	3.73
Goldstream Cr at Standard Creek Road	10-Jul-93	4.6	14.7	88.7	3.52
Goldstream Cr at Standard Creek Road	11-Jul-93	3.7	15.8	86.7	3.70
Goldstream Cr at Standard Creek Road	12-Jul-93	4.0	15.6	65.1	3.58
Goldstream Cr at Standard Creek Road	13-Jul-93	4.0	13.8	84.0	3.13
Goldstream Cr at Standard Creek Road	14-Jul-93	3.4	18.0	82.2	3.99
Goldstream Cr at Standard Creek Road	15-Jul-93	3.8	16.1	80.8	3.52
Goldstream Cr at Standard Creek Road	16-Jul-93	5.8	17.3	79.6	3.71
Goldstream Cr at Standard Creek Road	17-Jul-93	3.6	17.0	78.8	3.61
Goldstream Cr at Standard Creek Road	18-Jul-93	2.8	11.9	77.6	2.48
Goldstream Cr at Standard Creek Road	19-Jul-93	4.6	18.7	77.3	3.48
Goldstream Cr at Standard Creek Road	20-Jul-93	1.5	11.7	77.3	2.44
Goldstream Cr at Standard Creek Road	21-Jul-93	2.7	12.2	77.4	2.55
Goldstream Cr at Standard Creek Road	22-Jul-93	1.8	6.05	76.6	1.25
Goldstream Cr at Standard Creek Road	23-Jul-93	4.1	11.5	76.7	2.38
Goldstream Cr at Standard Creek Road	24-Jul-93	1.8	3.49	76.7	0.72
Goldstream Cr at Standard Creek Road	25-Jul-93	2.0	11.8	78.0	2.48
Goldstream Cr at Standard Creek Road	26-Jul-93	2.1	7.63	78.0	1.58
Goldstream Cr at Standard Creek Road	27-Jul-93	1.6	5.53	77.8	1.16
Goldstream Cr at Standard Creek Road	28-Jul-93	1.9	7.63	77.4	1.57
Goldstream Cr at Standard Creek Road	29-Jul-93	2.9	6.82	76.0	1.40
Goldstream Cr at Standard Creek Road	30-Jul-93	2.4	6.07	75.5	1.24
Goldstream Cr at Standard Creek Road	31-Jul-93	3.0	8.18	74.1	1.64
Goldstream Cr at Standard Creek Road	1-Aug-93	2.8	4.36	72.9	0.86
Goldstream Cr at Standard Creek Road	2-Aug-93	2.1	8.24	72.6	1.22
Goldstream Cr at Standard Creek Road	3-Aug-93	2.5	3.57	73.7	0.71
Goldstream Cr at Standard Creek Road	4-Aug-93	2.4	4.00	77.0	0.83
Goldstream Cr at Standard Creek Road	5-Aug-93	2.4	7.95	74.8	1.61
Goldstream Cr at Standard Creek Road	6-Aug-93	2.3	6.89	79.6	1.48
Goldstream Cr at Standard Creek Road	7-Aug-93	2.6	7.63	84.5	1.74
Goldstream Cr at Standard Creek Road	8-Aug-93	2.8	6.47	85.3	1.49
Goldstream Cr at Standard Creek Road	9-Aug-93	4.4	7.87	88.2	1.87
Goldstream Cr at Standard Creek Road	10-Aug-93	3.2	6.11	86.0	1.42
Goldstream Cr at Standard Creek Road	11-Aug-93	3.7	5.49	83.3	1.23
Goldstream Cr at Standard Creek Road	12-Aug-93	3.4	7.57	81.2	1.66
Goldstream Cr at Standard Creek Road	13-Aug-93	3.4	7.78	80.3	1.68
Goldstream Cr at Standard Creek Road	14-Aug-93	3.8	9.46	79.6	2.03

Goldstream Cr at Standard Creak Road	15-Aug-93	3.3	5.37	78.5	1.14
Goldstream Cr at Standard Creak Road	16-Aug-93	3.9	8.04	77.6	1.68
Goldstream Cr at Standard Creak Road	17-Aug-93	4.8	10.2	76.6	2.12
Goldstream Cr at Standard Creek Road	18-Aug-93	3.6	10.7	75.8	2.20
Goldstream Cr at Standard Creek Road	19-Aug-93	3.2	6.74	75.8	1.38
Goldstream Cr at Standard Creek Road	20-Aug-93	3.0	7.91	74.8	1.59
Goldstream Cr at Standard Creek Road	21-Aug-93	2.6	9.90	75.2	2.01
Goldstream Cr at Standard Creek Road	22-Aug-93	3.2	10.5	79.4	2.26
Goldstream Cr at Standard Creek Road	23-Aug-93	4.1	16.3	84.9	3.74
Goldstream Cr at Standard Creek Road	24-Aug-93	3.6	12.6	88.5	3.00
Goldstream Cr at Standard Creek Road	25-Aug-93	5.4	18.5	87.6	4.37
Goldstream Cr at Standard Creek Road	26-Aug-93	5.2	26.3	85.3	6.05
Goldstream Cr at Standard Creek Road	27-Aug-93	23	112	82.8	25.01
Goldstream Cr at Standard Creek Road	28-Aug-93	4.6	28.2	80.5	6.11
Goldstream Cr at Standard Creek Road	29-Aug-93	2.8	9.02	79.1	1.93
Goldstream Cr at Standard Creek Road	30-Aug-93	2.5	10.4	78.4	2.19
Goldstream Cr at Standard Creek Road	31-Aug-93	3.1	10.3	80.8	2.24
Goldstream Cr at Standard Creek Road	1-Sep-93	2.9	11.9		
Goldstream Cr at Standard Creek Road	2-Sep-93	3.9	19.6		
Goldstream Cr at Standard Creek Road	3-Sep-93	6.9	48.4		
Goldstream Cr at Standard Creek Road	4-Sep-93	8.2	43.6		
Goldstream Cr at Standard Creek Road	5-Sep-93	5.7	30.7		
Goldstream Cr at Standard Creek Road	6-Sep-93	5.2	24.2		
Goldstream Cr at Standard Creek Road	7-Sep-93	4.8	19.3		
Goldstream Cr at Standard Creek Road	8-Sep-93	3.1	14.3		
Goldstream Cr at Standard Creek Road	9-Sep-93	5.0	13.6		
Goldstream Cr at Standard Creek Road	10-Sep-93	2.8	10.9		

site id	date	time	turbidity (NTU)	tss (mg/L)	Q (cfs)	sed load (tons/day)
Goldstream Cr @ Fox	27-Apr-93		30	349		
Goldstream Cr @ Fox	28-Apr-93		22	161		
Goldstream Cr @ Fox	29-Apr-93		36	354		
Goldstream Cr @ Fox	30-Apr-93		47	576		
Goldstream Cr @ Fox	1-May-93		50	602		
Goldstream Cr @ Fox	2-May-93		44	523		
Goldstream Cr @ Fox	3-May-93		29	215		
Goldstream Cr @ Fox	4-May-93		26	163		
Goldstream Cr @ Fox	5-May-93		19	132		
Goldstream Cr @ Fox	6-May-93		21	114		
Goldstream Cr @ Fox	7-May-93		40	576	73.7	114.42
Goldstream Cr @ Fox	8-May-93		60	224	72.5	43.75
Goldstream Cr @ Fox	9-May-93		26	151	72.0	29.31
Goldstream Cr @ Fox	10-May-93		46	302	61.9	50.48
Goldstream Cr @ Fox	11-May-93		39	192	59.3	30.63
Goldstream Cr @ Fox	12-May-93		50	236	59.4	37.78
Goldstream Cr @ Fox	13-May-93		85	220	61.9	36.81
Goldstream Cr @ Fox	14-May-93		21	53.8	68.4	9.92
Goldstream Cr @ Fox	15-May-93		39	184	65.3	32.38
Goldstream Cr @ Fox	16-May-93		50	29.2	61.7	4.86
Goldstream Cr @ Fox	17-May-93		60	290	60.7	47.42
Goldstream Cr @ Fox	18-May-93		15	309	55.5	46.19
Goldstream Cr @ Fox	19-May-93		8.2	75.9	51.9	10.63
Goldstream Cr @ Fox	20-May-93		empty	empty	49.5	#VALUE!
Goldstream Cr @ Fox	21-May-93		9.2	56.2	46.7	7.07
Goldstream Cr @ Fox	22-May-93		6.1	31.3	44.4	3.75
Goldstream Cr @ Fox	23-May-93		4.1	34.7	43.8	4.10
Goldstream Cr @ Fox	24-May-93		4.7	28.0	41.8	3.16
Goldstream Cr @ Fox	25-May-93		3.7	25.9	40.9	2.86
Goldstream Cr @ Fox	26-May-93		4.1	20.5	39.1	2.16
Goldstream Cr @ Fox	27-May-93		5.3	25.7	39.4	2.73
Goldstream Cr @ Fox	28-May-93		empty	empty	37.7	#VALUE!
Goldstream Cr @ Fox	29-May-93		3.9	24.5	36.8	2.43
Goldstream Cr @ Fox	30-May-93		6.4	27.0	34.8	2.53
Goldstream Cr @ Fox	31-May-93		15	69.4	35.3	6.61
Goldstream Cr @ Fox	1 Jun-93		6.3	26.7	34.9	2.51
Goldstream Cr @ Fox	2-Jun-93		4.9	19.9	32.9	1.77
Goldstream Cr @ Fox	3-Jun-93		4.5	25.2	32.5	2.21
Goldstream Cr @ Fox	4-Jun-93		3.7	15.4	32.5	1.35
Goldstream Cr @ Fox	5-Jun-93		4.0	27.1	31.5	2.30
Goldstream Cr @ Fox	6 Jun-93		10	28.4	32.6	2.50
Goldstream Cr @ Fox	7-Jun-93		8.9	19.1	32.7	1.68

Goldstream Cr @ Fox	8-Jun-93	6.6	19.4	31.5	1.65
Goldstream Cr @ Fox	9-Jun-93	9.2	19.2	32.1	1.66
Goldstream Cr @ Fox	10-Jun-93	12	38.2	30.8	3.17
Goldstream Cr @ Fox	11-Jun-93	6.2	18.5	29.1	1.45
Goldstream Cr @ Fox	12-Jun-93	6.5	15.8	28.5	1.22
Goldstream Cr @ Fox	13-Jun-93	6.0	55.3	28.4	4.23
Goldstream Cr @ Fox	14-Jun-93	4.9	59.6	27.7	4.45
Goldstream Cr @ Fox	15-Jun-93	6.2	19.9	27.0	1.45
Goldstream Cr @ Fox	16-Jun-93	15	18.9	31 .o	1.58
Goldstream Cr @ Fox	17-Jun-93	9.8	11.8	33.1	1.06
Goldstream Cr @ Fox	18-Jun-93	11	64.9	33.9	5.94
Goldstream Cr @ Fox	19-Jun-93	18	72.2	38.0	7.40
Goldstraam Cr @ Fox	20-Jun-93	14	59.2	39.8	6.35
Goldstream Cr @ Fox	21-Jun-93	7.0	25.2	35.3	2.40
Goldstream Cr @ Fox	22-Jun-93	11	24.0	32.7	2.12
Goldstream Cr @ Fox	23-Jun-93	11	22.7	30.6	1.87
Goldstream Cr @ Fox	24-Jun-93	24	35.7	29.6	2.85
Goldstream Cr @ Fox	25-Jun-93	7.2	18.2	27.6	1.35
Goldstraam Cr @ Fox	26-Jun-93	11	20.9	26.6	1.50
Goldstream Cr @ Fox	27-Jun-93	8.0	17.3	26.6	1.24
Goldstream Cr @ Fox	28-Jun-93	5.5	17.8	24.7	1.18
Goldstream Cr @ Fox	29-Jun-93	8.2	20.0	24.7	1.33
Goldstream Cr @ Fox	30-Jun-93	5.1	19.1	23.4	1.21
Goldstream Cr @ Fox	1-Jul-93	7.1	17.6	23.7	1.12
Goldstream Cr @ Fox	2-Jul-93	8.1	18.1	25.4	1.24
Goldstream Cr @ Fox	3-Jul-93	14	22.7	24.0	1.47
Goldstream Cr @ Fox	4-Jul-93	5.0	12.9	23.0	0.80
Goldstream Cr @ Fox	5-Jul-93	9.0	18.1	21.4	1.05
Goldstream Cr @ Fox	6-Jul-93	7.0	17.3	21.4	1 .00
Goldstream Cr @ Fox	7-Jul-93	4.8	15.2	24.0	0.99
Goldstream Cr @ Fox	8-Jul-93	7.3	14.7	22.7	0.90
Goldstream Cr @ Fox	9-Jul-93	6.5	12.2	21.4	0.70
Goldstream Cr @ Fox	10-Jul-93	6.8	8.44	21.8	0.50
Goldstream Cr @ Fox	11 Jul-93	5.6	10.6	20.4	0.58
Goldstraam Cr @ Fox	12-Jul-93	5.9	10.8	19.4	0.56
Goldstream Cr @ Fox	13-Jul-93	4.7	11.4	19.1	0.58
Goldstream Cr @ Fox	14-Jul-93	4.4	12.1	17.4	0.57
Goldstream Cr @ Fox	15-Jul-93	6.4	14.9	15.9	0.64
Goldstream Cr @ Fox	16-Jul-93	6.9	13.5	15.2	0.55
Goldstream Cr @ Fox	17-Jul-93	9.8	20.2	15.8	0.86
Goldstream Cr @ Fox	18-Jul-93	13	18.9	17.3	0.88
Goldstream Cr @ Fox	19-Jul-93	7.4	16.2	15.6	0.68
Goldstream Cr @ Fox	20-Jul-93	18	25.0	16.7	1.13
Goldstream Cr @ Fox	21-Jul-93	5.9	13.7	18.0	0.67
Goldstream Cr @ Fox	22-Jul-93	7.2	20.0	17.7	0.95
Goldstream Cr @ Fox	23-Jul-93	18	33.9	17.6	1.60
Goldstream Cr @ Fox	24-Jul-93	13	34.5	17.1	1.59
Goldstream Cr @ Fox	25-Jul-93	8.7	16.0	16.7	0.72
Goldstream Cr @ Fox	26-Jul-93	12	16.9	17.8	0.81
Goldstraam Cr @ Fox	27-Jul-93	14	20.3	18.7	1.03
Goldstream Cr @ Fox	28-Jul-93	5.1	11.0	16.7	0.49
Goldstream Cr @ Fox	29-Jul-93	4.5	10.9	16.7	0.49
Goldstream Cr @ Fox	30-Jul-93	12	14.1	16.7	0.63
Goldstream Cr @ Fox	31-Jul-93	5.0	7.54	15.2	0.31
Goldstream Cr @ Fox	1 -Aug-93	7.3	13.5	15.7	0.57
Goldstream Cr @ Fox	2-Aug-93	12	13.1	15.7	0.56
Goldstream Cr @ Fox	3Aug-93	20	54.2	17.4	2.53
Goldstream Cr @ Fox	4-Aug-93	7.3	9.58	17.4	0.45
Goldstream Cr @ Fox	5-Aug-93	7.6	14.9	20.5	0.82
Goldstream Cr @ Fox	6-Aug-93	18	60.4	30.1	4.91
Goldstream Cr @ Fox	7-Aug-93	15	67.5	31.9	5.81
Goldstream Cr @ Fox	8-Aug-93	8.5	20.7	28.8	1.61
Goldstream Cr @ Fox	9-Aug-93	7.6	18.4	26.3	1.30
Goldstream Cr @ Fox	10-Aug-93	11	21.5	24.4	1.41
Goldstream Cr @ Fox	11 -Aug-93	5.4	10.3	23.8	0.66
Goldstream Cr @ Fox	12-Aug-93	5.8	8.65	20.8	0.49
Goldstream Cr @ Fox	13-Aug-93	4.9	11.0	20.8	0.62
Goldstraam Cr @ Fox	14-Aug-93	6.0	11.7	20.3	0.64
Goldstream Cr @ Fox	15-Aug-93	18	15.9	19.9	0.85
Goldstream Cr @ Fox	16-Aug-93	13	22.2	19.4	1.16
Goldstream Cr @ Fox	17-Aug-93	9.1	22.9	18.0	1.11
Goldstream Cr @ Fox	18-Aug-93	6.3	12.1	18.8	0.61
Goldstream Cr @ Fox	19-Aug-93	19	29.6	17.5	1.40

Goldstream Cr @ Fox	20-Aug-93	6.6	11.5	16.8	0.52
Goldstream Cr @ Fox	21-Aug-93	7.9	20.4	21.4	1.18
Goldstream Cr @ Fox	22-Aug-93	8.1	19.7	26.0	1.38
Goldstream Cr @ Fox	23-Aug-93	6.7	17.9	25.6	1.24
Goldstream Cr @ Fox	24-Aug-93	4.8	10.6	23.4	0.67
Goldstream Cr @ Fox	25-Aug-93	8.5	13.1	22.1	0.78
Goldstream Cr @ Fox	26-Aug-93	5.5	12.1	21.4	0.70
Goldstream Cr @ Fox	27-Aug-93	3.6	7.82	20.8	0.44
Goldstream Cr @ Fox	28-Aug-93	2.9	7.01	21.2	0.40
Goldstream Cr @ Fox	29-Aug-93	13	13.9	21.2	0.79
Goldstream Cr @ Fox	30-Aug-93	3.3	9.21	22.1	0.55
Goldstream Cr @ Fox	31-Aug-93	6.9	17.0	25.1	1.15
Goldstream Cr @ Fox	1-Sep-93	12	45.3	30.7	3.75
Goldstream Cr @ Fox	2-Sep-93	17	64.0	37.9	6.53
Goldstream Cr @ Fox	3-Sep-93	6.2	38.4	36.1	3.73
Goldstream Cr @ Fox	4-Sep-93	4.8	20.9	33.5	1.89
Goldstream Cr @ Fox	5-Sep-93	6.3	19.0	31.8	1.63
Goldstream Cr @ Fox	6-Sep-93	3.7	13.9	29.7	1.11
Goldstream Cr @ Fox	7-Sep-93	5.1	13.3	29.0	1.04
Goldstream Cr @ Fox	8-Sep-93	3.4	9.88	27.1	0.72
Goldstream Cr @ Fox	9-Sep-93	2.6	8.10	26.3	0.58
Goldstream Cr @ Fox	10-Sep-93	2.7	9.01	26.3	0.64
Goldstream Cr @ Fox	11-Sep-93	4.0	8.78	26.0	0.61
Goldstream Cr @ Fox	12-Sep-93	3.8	7.72	26.0	0.54
Goldstream Cr @ Fox	13-Sep-93	3.6	9.04	26.6	0.65
Goldstream Cr @ Fox	14-Sep-93	3.1	10.9	26.6	0.78
Goldstream Cr @ Fox	15-Sep-93	3.2	11.9	27.2	0.88
Goldstream Cr @ Fox	16-Sep-93	7.9	19.6	30.0	1.59
Goldstream Cr @ Fox	17-Sep-93	17	76.1	39.5	8.11
Goldstream Cr @ Fox	18-Sep-93	6.3	23.0	34.7	2.16
Goldstream Cr @ Fox	19-Sep-93	45	230	46.1	28.53
Goldstream Cr @ Fox	20-Sep-93	55	460	72.5	87.93
Goldstream Cr @ Fox	21-Sep-93	14	94.2	54.1	13.75
Goldstream Cr @ Fox	22-Sep-93	9.7	55.3	46.8	6.98
Goldstream Cr @ Fox	23-Sep-93	11	48.2	41.9	5.44
Goldstream Cr @ Fox	24-Sep-93	4.4	27.4	39.5	2.91
					318.86

site id	date	time	turbidity (NTU)	tss (me/L)	Q (cfs)	sed load (tons/day)
Fox Cr	2-Jun-93	1026	3.1	32.7		
Fox Cr	3-Jun-93	1827	85	117		
Fox Cr	3-Jun-93	1931	9.3	34.7		
Fox Cr	5-Jun-93	1520	29	25.6		
Fox Cr	7-Jun-93	2230	140	168		
Fox Cr	10-Jun-93	1950	130	131		
Fox Cr	14-Jun-93	2212	28	28.9		
Fox Cr	16-Jun-93	1650	32	27.3		
Fox Cr	1%Jun-93	1946	60	79.5		
Fox Cr	20-Jun-93	1920	22	42.3		
Fox Cr	21-Jun-93	958	12	13.4		
Fox Cr	22-Jun-93	1956	17	8.86		
Fox Cr	23-Jun-93	2055	21	28.7		
Fox Cr	24-Jun-93	1304	400	310		
Fox Cr	29-Jun-93	1810	25	13.4		
Fox Cr	30-Jun-93	1850	19	8.32		
Fox Cr	4-Jul-93	2042	13	10.0		
Fox Cr	5-Jul-93	1933	26	18.7		
Fox Cr	6-Jul-93	2110	20	28.8		
Fox Cr	7-Jul-93	1000	18	12.2		
Fox Cr	9-Jul-93	1839	7.0	12.0		
Fox Cr	10-Jul-93	1637	8.1	13.2		
Fox Cr	11-Jul-93	1642	7.3	14.5		
Fox Cr	13-Jul-93	1427	11	18.1		
Fox Cr	14-Jul-93	941	6.1	14.5		
Fox Cr	15-Jul-93	1448	12	19.2		
Fox Cr	18-Jul-93	1310	130	127		
Fox Cr	19-Jul-93	942	20	50.6		
Fox Cr	21-Jul-93	942	6.0	14.0		
Fox Cr	21-Jul-93	2050	12	24.8		
Fox Cr	22-Jul-93	630	40	73.5		
Fox Cr	23-Jul-93	1227	27	48.4		

Fox Cr	X-Jut-93	1915	30	51.3
Fox Cr	26-Jul-93	2048	19	33.3
Fox Cr	27-Jul-93	2030	60	78.9
Fox Cr	28-Jul-93	1040	10	21.7
Fox Cr	29-Jul-93	1829	15	34.0
Fox Cr	4-Aug-93	2140	15	28.7
Fox Cr	5-Aug-93	1000	15	34.6
Fox Cr	6-Aug-93	2208	23	58.7
Fox Cr	8-Aug-93	1729	12	30.8
Fox Cr	9-Aug-93	1343	17	44.4
Fox Cr	12-Aug-93	2132	150	175
Fox Cr	13-Aug-93	1405	8.4	25.4
Fox Cr	16-Aug-93	1828	9.3	21.6
Fox Cr	18-Aug-93	849	41	54.2
Fox Cr	22-Aug-93	2243	33	48.5
Fox Cr	23-Aug-93	1945	18	30.0
Fox Cr	2-Sep-93	813	60	190
Fox Cr	3-Sep-93	1445	18	50.2
Fox Cr	5-Sep-93	2156	9.4	28.5
Fox Cr	19-Sep-93	1902	64	328

site id	date	time	turbidity (NW)	tss (mg/L)	Q (cfs)	sed load (tons/day)
Gilmore Cr above Pedro Cr	2-Jun-93	1032	23	21.0		
Gilmore Cr above Pedro Cr	3-Jun-93	1925	1.8	4.44		
Gilmore Cr above Pedro Cr	5-Jun-93	1512	2.5	6.51		
Gilmore Cr above Pedro Cr	6-Jun-93	1941	2.9	13.6		
Gilmore Cr above Pedro Cr	7-Jun-93	2235	2.3	7.68		
Gilmore Cr above Pedro Cr	8-Jun-93	915	2.1	8.63		
Gilmore Cr above Pedro Cr	13-Jun-93	2215	2.4	7.39		
Gilmore Cr above Pedro Cr	14-Jun-93	2217	1.8	187		
Gilmore Cr above Pedro Cr	16-Jun-93	2122	1.5	4.49		
Gilmore Cr above Pedro Cr	16-Jun-93	1640	6.5	26.4		
Gilmore Cr above Pedro Cr	19-Jun-93	1954	21	198		
Gilmore Cr above Pedro Cr	20-Jun-93	1927	4.6	23.0		
Gilmore Cr above Pedro Cr	21-Jun-93	1004	7.7	25.8		
Gilmore Cr above Pedro Cr	22-Jun-93	1950	3.5	7.09		
Gilmore Cr above Pedro Cr	23-Jun-93	2042	2.9	5.22		
Gilmore Cr above Pedro Cr	24-Jun-93	1257	3.5	10.8		
Gilmore Cr above Pedro Cr	29-Jun-93	1815	7.2	7.08		
Gilmore Cr above Pedro Cr	30-Jun-93	1840	8.5	6.14		
Gilmore Cr above Pedro Cr	4-Jul-93	2050	8.4	5.45		
Gilmore Cr above Pedro Cr	5-Jul-93	1940	5.8	3.47		
Gilmore Cr above Pedro Cr	6-Jul-93	2117	6.5	5.65		
Gilmore Cr above Pedro Cr	7-Jul-93	935	8.7	7.33		
Gilmore Cr above Pedro Cr	9-Jul-93	1830	12	12.2		
Gilmore Cr above Pedro Cr	10-Jul-93	1630	8.0	12.0		
Gilmore Cr above Pedro Cr	11-Jul-93	1632	4.7	8.00		
Gilmore Cr above Pedro Cr	12-Jul-93	945	4.7	8.04		
Gilmore Cr above Pedro Cr	13-Jul-93	1419	7.1	7.33		
Gilmore Cr above Pedro Cr	14-Jul-93	946	3.3	13.9		
Gilmore Cr above Pedro Cr	15-Jul-93	1440	11	10.1		
Gilmore Cr above Pedro Cr	16-Jul-93	1817	2.9	9.55		
Gilmore Cr above Pedro Cr	18-Jul-93	1300	3.2	7.46		
Gilmore Cr above Pedro Cr	19-Jul-93	948	2.9	6.11		
Gilmore Cr above Pedro Cr	21-Jul-93	2010	2.6	11.4		
Gilmore Cr above Pedro Cr	22-Jul-93	635	3.5	8.04		
Gilmore Cr above Pedro Cr	23-Jul-93	1239	4.3	9.72		
Gilmore Cr above Pedro Cr	25-Jul-93	1922	1.3	7.19		
Gilmore Cr above Pedro Cr	26-Jul-93	2056	7.3	34.9		
Gilmore Cr above Pedro Cr	27-Jul-93	2035	2.0	11.5		
Gilmore Cr above Pedro Cr	28-Jul-93	1045	3.4	11.4		
Gilmore Cr above Pedro Cr	29-Jul-93	1829	2.7	30.3		
Gilmore Cr above Pedro Cr	4-Aug-93	2130	18	33.6		
Gilmore Cr above Pedro Cr	5-Aug-93	1007	16	59.0		
Gilmore Cr above Pedro Cr	6-Aug-93	2152	33	293		
Gilmore Cr above Pedro Cr	8-Aug-93	1720	10	33.7		
Gilmore Cr above Pedro Cr	Q-Aug-93	1336	11	53.0		
Gilmore Cr above Pedro Cr	12-Aug-93	2132	1.8	15.6		
Gilmore Cr above Pedro Cr	13-Aug-93	1415	3.9	19.5		
Gilmore Cr above Pedro Cr	18-Aug-93	830	6.1	10.8		

Gilmore Cr above Pedro Cr	22-Aug-93	2235	15	130	
Gilmore Cr above Pedro Cr	23-Aug-93	1935	55	434	
Gilmore Cr above Pedro Cr	2-Sep-93	618	37	385	
Gilmore Cr above Pedro Cr	3-Sep-93	1425	15	177	
Gilmore Cr above Pedro Cr	5-Sep-93	2150	5.6	55.0	
Gilmore Cr above Pedro Cr	19-Sep-93	1650	85	850	

site id	date	time	turbidity (NTU)	tss (mg/L)	Q (cfs)	sed load (tons/day)
Perdro Cr above Gilmore Cr	2-Jun-93	1034	0.80	7.25		
Perdro Cr above Gilmore Cr	3-Jun-93	1927	1.0	5.20		
Perdro Cr above Gilrnore Cr	5-Jun-93	1515	0.85	10.5		
Perdro Cr above Gilmore Cr	6-Jun-93	1943	0.80	6.67		
Perdro Cr above Gilmore Cr	7-Jun-93	2238	1.0	1.20		
Perdro Cr above Gilmore Cr	8-Jun-93	920	1.10	1.98		
Perdro Cr above Gilmore Cr	10-Jun-93	1943	0.60	2.18		
Perdro Cr above Gilmore Cr	14-Jun-93	2220	0.80	1.00		
Perdro Cr above Gilmore Cr	16-Jun-93	1645	1.0	1.60		
Perdro Cr above Gilmore Cr	19-Jun-93	1957	1.3	2.15		
Perdro Cr above Gilmore Cr	20-Jun-93	1930	1.4	6.09		
Perdro Cr above Gilmore Cr	21-Jun-93	1006	1.1	6.14		
Perdro Cr above Gilmore Cr	22-Jun-93	1952	1.3	1.18		
Perdro Cr above Gilmore Cr	23-Jun-93	2044	1.0	1.35		
Perdro Cr above Gilmore Cr	24-Jun-93	1259	1.2	1.73		
Perdro Cr above Gilmore Cr	29-Jun-93	1820	1.2	1.12		
Perdro Cr above Gilmore Cr	30-Jun-93	1 a45	2.2	0.85		
Perdro Cr above Gilmore Cr	4-Jul-93	2055	1.2	1.76		
Perdro Cr above Gilmore Cr	5-Jul-93	1945	1.0	1.49		
Perdro Cr above Gilmore Cr	7-Jul-93	907	1.2	0.93		
Perdro Cr above Gilmore Cr	7-Jul-93	2121	1.4	1.67		
Perdro Cr above Gilmore Cr	9-Jul-93	1833	0.50	0.22		
Perdro Cr above Gilmore Cr	10-Jul-93	1627	0.65	2.70		
Perdro Cr above Gilmore Cr	12-Jul-93	947	1.20	2.20		
Perdro Cr above Gilmore Cr	13-Jul-93	1421	0.95	1.01		
Perdro Cr above Gilmore Cr	14-Jul-93	948	0.65	3.49		
Perdro Cr above Gilmore Cr	15-Jul-93	1443	0.75	1.09		
Perdro Cr above Gilmore Cr	16-Jul-93	1822	0.52	0.88		
Perdro Cr above Gilrnore Cr	18-Jul-93	1304	0.75	2.36		
Perdro Cr above Gilmore Cr	19-Jul-93	951	0.90	0.80		
Perdro Cr above Gilmore Cr	20-Jul-93	1635	0.90	0.49		
Perdro Cr above Gilmore Cr	21-Jul-93	2015	0.50	2.23		
Perdro Cr above Gilmore Cr	22-Jul-93	640	0.55	1 .a4		
Perdro Cr above Gilmore Cr	22-Jul-93	1900	0.80	I.91		
Perdro Cr above Gilmore Cr	23-Jul-93	1240	0.90	4.37		
Perdro Cr above Gilmore Cr	25-Jul-93	1925	0.65	4.18		
Perdro Cr above Gilmore Cr	26-Jul-93	2056	0.75	4.65		
Perdro Cr above Gilnwre Cr	27-Jul-93	2040	0.60	2.83		
Perdro Cr above Gilmore Cr	28-Jul-93	1049	0.90	1.44		
Perdro Cr above Gilnwre Cr	29-Jul-93	1022	0.84	1.43		
Perdro Cr above Gilmore Cr	4-Aug-93	2135	1.1	4.13		
Perdro Cr above Gilmore Cr	5-Aug-93	1010	1.2	2.97		
Perdro Cr above Gilmore Cr	6-Aug-93	2158	2.1	12.6		
Perdro Cr above Gilrnore Cr	8-Aug-93	1723	1.3	4.26		
Perdro Cr above Gilmore Cr	9-Aug-93	1820	0.65	3.01		
Perdro Cr above Gilmore Cr	12-Aug-93	2120	0.80	3.10		
Perdro Cr above Gilmore Cr	15-Aug-93	1418	0.80	3.49		
Perdro Cr above Gilmore Cr	18-Aug-93	815	0.90	2.13		
Perdro Cr above Gilmore Cr	1 S-Aug-93	1338	0.80	I.77		
Perdro Cr above Gilnwre Cr	20-Aug-93	1415	0.75	2.47		
Perdro Cr above Gilmore Cr	22-Aug-93	2237	1.2	4.25		
Perdro Cr above Gilmore Cr	23-Aug-93	1940	0.85	3.35		
Perdro Cr above Gilmore Cr	26-Aug-93	2020	1.70	1.99		
Perdro Cr above Gilmore Cr	2-Sep-93	821	0.80	10.7		
Perdro Cr above Gilmore Cr	3-Sep-93	1430	0.85	6.14		
Perdro Cr above Gilmore Cr	5-Sep-93	2151	1.0	3.6		
Perdro Cr above Gilmore Cr	14-Sep-93	1855	5.9	35.7		
Perdro Cr above Gilmore Cr	15-Sep-93	1750	0.90	1.33		

site id	data	time	turbidity (NTU)	tss (mg/L)	Q (cfs)	sed load (tons/day)
Pedro Cr at Monument	3-Jun-93	1920	1.5	4.71		
Pedro Cr at Monument	16-Jun-93	1630	1.0	1.39		
Pedro Cr at Monument	17-Jun-93	1330	1.9	3.74		
Pedro Cr at Monument	21-Jun-93	1010	1.8	5.96		
Pedro Cr at Monument	22-Jun-93	1945	1.3	1.76		
Pedro Cr at Monument	30-Jun-93	1630	1.4	1.59		
Pedro Cr at Monument	22-Jul-93	2327	0.50	4.70		
Pedro Cr at Monument	19-Sep-93	1642	4.7	32.3		