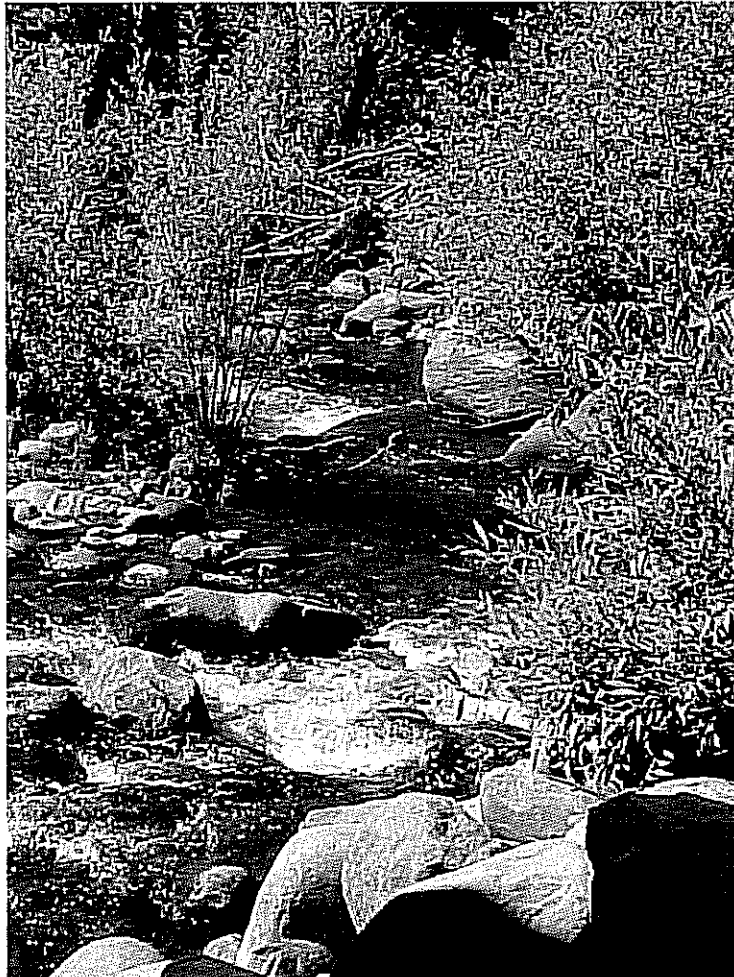


COW CREEK WATER QUALITY STUDY

2001-2003



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CA Regional Water Quality Control Board,
Central Valley Region

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I. INTRODUCTION AND BACKGROUND

The 275,000 acre Cow Creek watershed located in eastern Shasta County is a major, undamed tributary to the Sacramento River. Land use and ownership is evenly divided between commercial forestland, irrigated and non-irrigated rangeland, and small rural property owners. The watershed has significant anadromous fish resources (salmon and steelhead), resident cold water fish species, and substantial recreational use. Three of the five principal subwatersheds are currently 303(d) listed for elevated fecal coliform levels (Oak Run, Clover, and South Cow Creek).

During 2001, 2002, and 2003, staff of the RWQCB conducted water quality sampling at sites throughout the Cow Creek watershed. Most samples were taken during the months of April through September, and the frequency of sampling varied depending on available time and funding (no outside grant funding was provided for conduct of this work).

The purpose of this investigation was as follows:

- assess existing water quality in Cow Creek and provide a basis for comparison with past and future studies
- evaluate to what extent existing water quality may be limiting aquatic resources and other identified beneficial uses
- evaluate the appropriateness of the 303(d) listing
- provide input to the Cow Creek Watershed Assessment, and provide information to assist in tracking future changes in water quality and watershed condition

II. STUDY METHODS AND QUALITY ASSURANCE PLAN

A total of 16 sampling locations were monitored during the three year study period. These stations are shown in Figure 1 and described in Table 1. Photos of the sample sites are shown in Figure 2.

Monitored parameters and constituents included flow, temperature, dissolved oxygen, conductivity, pH, turbidity, fecal coliform and E. coli bacteria, and aquatic macroinvertebrates. A description of the monitoring protocols is as follows:

Flow

Continuous, real time flow data for Cow Creek is available from the USGS gage site (# 11374000) located on lower Cow Creek upstream of the Sacramento River confluence. In addition, RWQCB staff measured flow in the field using a Swiffer current velocity meter together with channel cross section measurements. Flow measurements taken in this manner were only possible during low or moderate stream flow conditions.

Temperature

During the April through September period, water temperatures at the 16 sampling locations were continuously recorded using Onset temperature loggers. Loggers were placed in sites with continuous flow and in shaded areas to prevent sun interference. Data from the recorders was periodically downloaded and transferred to Excel spreadsheets. Recorders were occasionally lost due to vandalism.

or malfunction, and these were replaced. Water temperature was also recorded with an YSI field meter concurrent with the weekly or monthly water quality sampling at the 16 stations.

Dissolved Oxygen, pH, and Conductivity

Measurements of dissolved oxygen, pH, and conductivity were taken using an YSI 556 Multi-Probe Field Meter. Dissolved oxygen readings were periodically checked with a Hach Dissolved Oxygen Kit using the modified Winkler method of analysis. Generally, checks were made at least twice in a sample day.

Turbidity

Measurements were taken using a Hach 2100 portable field turbidity unit. The unit was calibrated quarterly with current standards and checked with portable standards the day prior to sampling.

Fecal Coliform and E-coli Bacteria

Water samples were taken to Basic Laboratory in prepared 130 ml sample containers for analysis of total and fecal coliform bacteria using the 15 tube analysis. In addition, analysis for E-coli concentrations were performed by Basic Laboratory and by the RWQCB staff (at their office laboratory) using the Colilert quanti-tray method of analysis. Due to QA concerns, the RWQCB E-coli data is included in this report for information purposes only.

Macroinvertebrate Survey

Macroinvertebrate collection and sample analysis was performed following the California Stream Bioassessment Procedure protocol developed by the CA Dept. of Fish and Game. Sample collection was by RWQCB staff who had previously received one day, on-site field training by the DFG. The preserved samples were delivered to the DFG Aquatic Bioassessment Laboratory in Chico for analysis.

Other information pertinent to quality assurance is as follows:

- water samples were held in ice cooled chests during field collection and were delivered to Basic Laboratory on the same day as sampling
- no duplicates or field blanks were used in this study
- all field and laboratory data were checked by the RWQCB project manager and any unusual results were noted and rechecked

III. RESULTS AND DISCUSSION

1. FLOW

Results

Table 2 shows average monthly flow in mainstem Cow Creek at the USGS Millville gage site for the three year study period. Table 3 shows measured flow at individual sample sites recorded by RWQCB staff periodically through the study period.

Discussion

Average monthly flows in 2001-2003 at the USGS gage site can be compared to similar data collected at this site over the period 1950 to 1998 (as reported in the Cow Creek Watershed Assessment, Nov. 2001). The historic data record for flow at this site reported that monthly averages varied from 38 cfs in August to 1,780 cfs in January. During the first two years of this study period, flows in August (and in July and Sept.) were substantially less than the long term average. In 2003, August flows were greater than the long term average.

Flows measured in the field at individual sample sites (Table 3) provide a relative comparison of total flow in each of the five sub-watersheds during the summer season (i.e. June through Sept.). In general, flows in North Cow, Old Cow, and South Cow are similar, with Old Cow typically having the highest flow. Flow in Oak Run Creek is substantially less, and the Lower Oak Run station was dry from June through Oct. in each of the study years. Table 3 also provides information on the relatively low flows occurring at the lower watershed stations during the summer season. For example, on 20 Aug 2003 (a day when the mainstem flow coincidentally equaled the long term August average of 38 cfs), tributary flows were 4 cfs in lower North Cow, 0 in lower Oak Run, 3 cfs in lower Clover, 17 cfs in lower Old Cow, and 20 cfs in lower South Cow.

2. TEMPERATURE

Results

Table 4 summarizes the large quantity of temperature data collected during 2001-2003. Data at each station are summarized in terms of absolute daily maximum, maximum 7-day average, maximum 24 hour temperature fluctuation, number of 7-day averages exceeding 66 degrees F, and number of days where maximum temperatures exceeded 75 degrees F. In an attempt to more closely examine possible temperature impacts to different life stages of anadromous and resident fish, data are also summarized by season (i.e. spring, summer, fall, winter). Daily temperature recordings for each of the sample stations throughout the study period are available from the RWQCB.

Discussion

Determining temperature impacts on aquatic species, particularly cold water fish species, is difficult and complex. No attempt will be made at a detailed assessment and explanation of temperature effects in Cow Creek based on the data collected during this study. However, temperature data from this study will be a useful contribution to the larger body of knowledge on temperature in Cow Creek which is currently being gathered and assessed. A more comprehensive, longer term data record is needed for stations throughout the watershed, together with a comparison of that database with known information on salmonid distribution (in Cow Cr) and the temperature requirements of various life stages.

It can be said that temperature data from this study supports previous findings that seasonal water temperatures in the mid and lower part of the watershed are not supportive of cold water species. For purposes of consideration of impaired waterbody listing (i.e. 303d listing), EPA is

currently recommending using the criteria of summer stream temperatures where the maximum 7-day average temperature exceeds 65 degrees F. This criteria is to be used in combination with other factors including the natural temperature characteristics (or capabilities) of the waterbody and information on population trends of cold water species. Using the 7-day average, 65 F criteria, Table 4 shows that all of the 'upper' watershed sites were colder than the recommended criteria (upper Old Cow is marginal). All of the 'middle' watershed sites were either marginally or substantially in excess of the 65 F criteria (i.e. warmer), and all of the 'lower' watershed sites were substantially in excess of the criteria. This is not to say that a 303(d) listing is merited based on the temperature data. Again, more data is needed (particularly in the spring for assessing implications for salmon/steelhead survival), and this must be considered along with the natural temperature regime which would be present in Cow Creek outside the influence of any land or water management activities.

3. BACTERIA

Results

Results of fecal coliform bacteria sampling are shown in Table 5. During 2002, a switch was made from fecal coliform analysis to e-coli analysis in anticipation that the RWQCB Basin Plan Objective for bacteria would be changed to e-coli concentration. That change is still under review and consideration. Table 6 presents the e-coli data collected in 2002 and 2003.

Discussion

Three of the five principal Cow Creek watershed tributaries are currently 303(d) listed for fecal coliform bacteria concentrations (i.e. Oak Run, Clover, and South Cow Creeks). The water quality objective for protection of contact recreation is 200 MPN (monthly average) and 400 MPN (maximum). Since sampling frequency was insufficient to compare results to the monthly average objective, the focus here is on maximum values.

During 2001 and 2002, 165 samples from throughout the watershed were analyzed for fecal coliform bacteria. Of those, 19 exceeded the 400 MPN objective. With the exception of 3 samples from North Cow Creek, all of the exceedences were from Oak Run, Clover or South Cow Creeks.

The e-coli data (Table 6) can be compared to recommended water quality criteria for protection of contact recreation (no adopted Basin Plan objective as yet). Of the 136 samples analyzed in 2002 and 2003 for e-coli, 24 samples exceeded the recommended criteria of 235 MPN. Of those 24, 9 occurred in tributaries not currently 303(d) listed for bacteria (3 in North Cow, 5 in Old Cow, and 1 in the mainstem).

Sampling occurred from April through September over the three year period. There was no obvious seasonal trend in coliform bacteria concentrations (i.e. high levels were found during the early, middle, and late summer season).

4. OTHER WATER QUALITY PARAMETERS

Results

Results of field measurements of dissolved oxygen, conductivity, pH, and turbidity are shown in Appendix A.

Discussion

Each of the above parameters were in the 'normal' range, and generally were not at levels which would represent a potential threat to aquatic life or other beneficial uses in Cow Creek.

Dissolved oxygen readings were mostly taken in mid-day which would be the time period of maximum concentration. Given the relatively high level of weed and algae growth (particularly in the lower watershed) during the summer season, it is expected that there may be a significant 24 hour fluctuation of DO concentration (high in the day, low at night) at some stations during the summer season. Some of the recordings did approach levels which might be considered stressful for aquatic life (5 mg/l or less). Future dissolved oxygen monitoring should include a better assessment of daily fluctuation, particularly in the lower watershed reaches.

[Conductivity is an approximate measure of the salinity or level of dissolved substances in the water. As expected, conductivity increased from the upper watershed stations to the lower stations (typically increasing by a level of two or three fold). Overall, conductivity did not exceed 300 micro mhos, even at the lower watershed stations.]

Turbidity levels were low, as would be expected during the low flow, summer season. pH ranged from 7 to 9.

5. MACROINVERTEBRATES

Results

A summary of selected metrics for evaluating benthic macroinvertebrates is shown in Table 7. Complete records of the macroinvertebrate data and analysis are available from the RWQCB.

Discussion

Five metrics were selected for comparison of macroinvertebrate populations at the individual sample stations:

- Taxonomic Richness – A measure of the total number of different species found
- EPT Index – The % of mayflies, stoneflies, and caddisflies (clean water species) relative to other insect families found
- Shannon Diversity Index – A measure of the diversity of the insect community (i.e. number of different species relative to the number of individuals)
- % Intolerant Taxa - % of species found which are considered intolerant of pollution conditions

- % Tolerant Taxa - % of species found which are considered to be tolerant of pollution conditions

Generally, one would expect stronger, more robust metrics for the upper watershed stations relative to the lower stations (i.e. water quality at the upper watershed stations is colder and cleaner relative to the lower stations). This relationship is particularly evident for North Cow and Clover Creeks, and moderately so for South Cow Creek. In Old Cow and Oak Run Creeks, insect populations at the lower stations were equally robust (or more so) than populations found at the middle and upper stations. The mainstem site compared somewhat favorably with middle and upper sites in the tributaries. These kinds of comparisons between sites are only valid when similar habitat and substrates are sampled, so comparisons must be made with caution.

The macroinvertebrate data is perhaps most valuable for comparisons of long term trends at individual sites, and less valuable for making comparisons between sites.

IV. SUMMARY

During the period May, 2001 through August, 2003, RWQCB staff conducted a water quality study in the Cow Creek watershed. A total of 15 stations were established throughout the five principal Cow Creek tributaries and one on the mainstem. Temperature recorders were placed at all stations. Water samples were analyzed for fecal coliform bacteria and e-coli, and field measurements were made for dissolved oxygen, pH, conductivity, and turbidity. Macroinvertebrates were sampled at all stations in June, 2003.

Flow

Data from the USGS gaging station on lower Cow Creek showed that flows during the 2001 and 2002 were lower than the historic average (1950-1998). The 2003 flows were normal relative to the historic average. Measurements made by RWQCB staff provided a comparison of flow in the individual tributaries through the summer season.

Temperature

Consistent with previous studies, temperature data indicates that the lower and middle reaches of the five Cow Creek tributaries would not be supportive of cold water species through the summer season. Additional temperature data is needed to better determine Cow Creek temperature regime for all seasons of the year within each of the major tributaries.

Bacteria

Both fecal coliform and e-coli concentrations periodically exceeded standards and criteria for protection of contact recreation. Most exceedences were generally in the three tributaries which are currently listed as impaired (i.e. Oak Run, Clover, and South Cow), however there were some exceedences in the other two tributaries (North Cow and Old Cow).

Other Parameters

Dissolved oxygen, pH, conductivity, and turbidity were all within 'normal' ranges. Further monitoring of dissolved oxygen is merited to assess the extent of diurnal variation, particularly in the lower watershed.

Macroinvertebrates

Five individual metrics were selected to assess macroinvertebrate community dynamics. In North Cow, Clover, and South Cow Creeks, metrics indicated a more degraded community from the upper watershed sites to the lower, while Old Cow Creek showed similar community metrics for all of the sites. Oak Run Creek samples indicated a more robust community at the lower site relative to the upper site. Comparison of sites is influenced by available habitat and substrate, and cannot be viewed as strictly an indication of water quality condition.

FIGURES

Figure 1 --Cow Creek Water Quality Monitoring Stations

1. Main Cow Creek Stem
2. Lower North Cow Creek
3. Middle North cow Creek
4. Upper North Cow Creek
5. Lower Oak Run Creek
6. Middle Oak Run Creek
7. Upper Oak Run Creek
8. Lower Clover Creek
9. Upper Clover Creek
10. Lower Old Cow Creek
11. Middle Old Cow Creek
12. Upper Old Cow Creek
13. Old Cow/South Cow Creek
14. Lower South Cow Creek
15. Middle South Cow Creek
16. Upper South Cow Creek

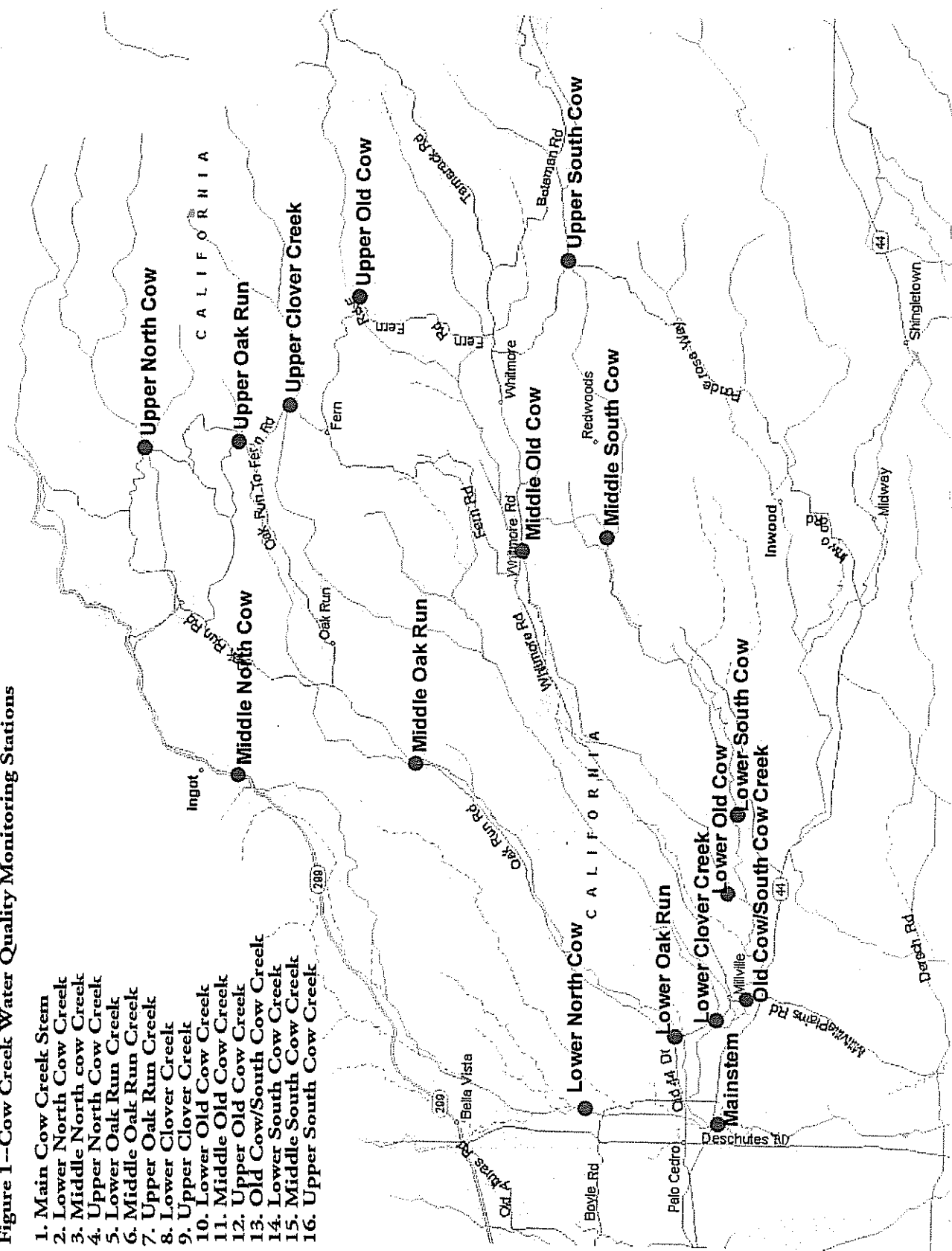
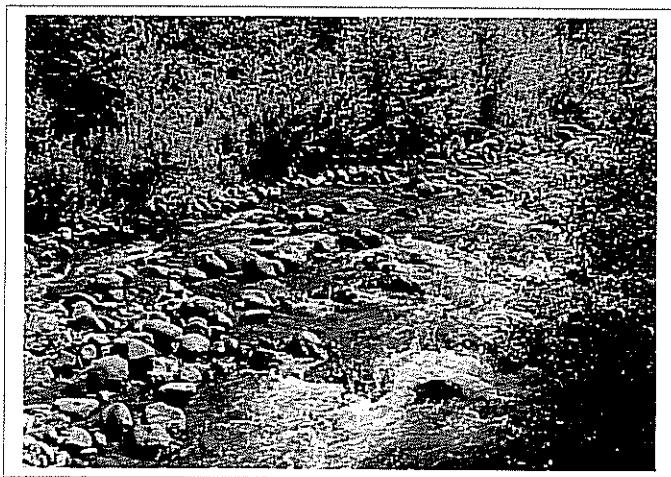


FIGURE 2- WATER QUALITY SAMPLING STATIONS

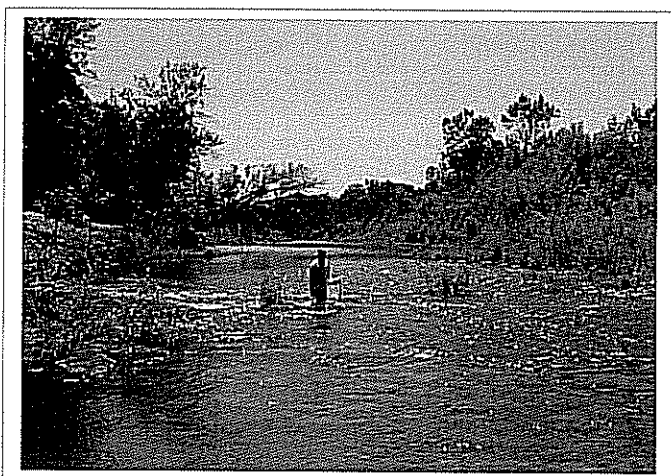
Upper North Cow



Middle North Cow



Lower North Cow



Upper Oak Run

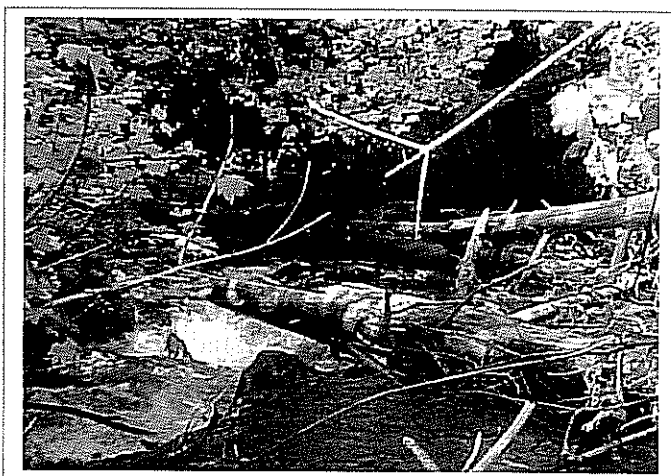


FIGURE 2- WATER QUALITY SAMPLING STATIONS

Middle Oak Run

Lower Oak Run



Upper Clover

Lower Clover

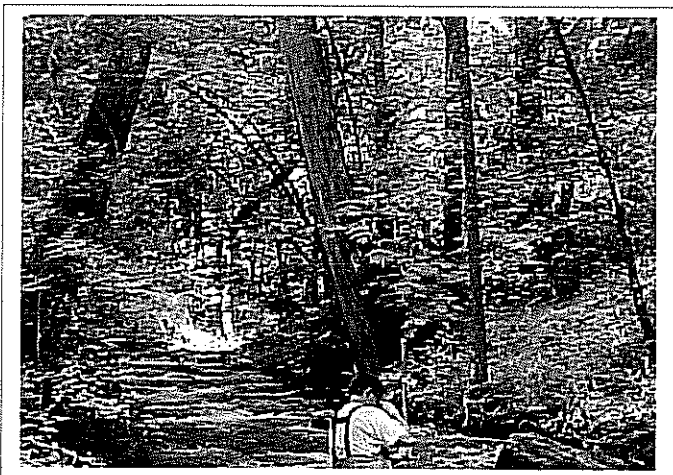
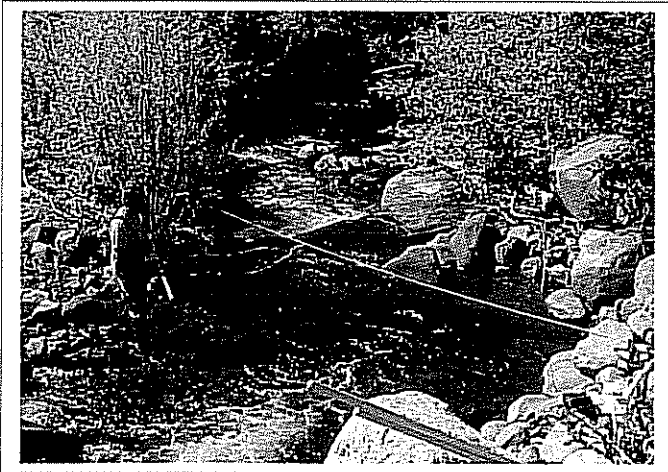
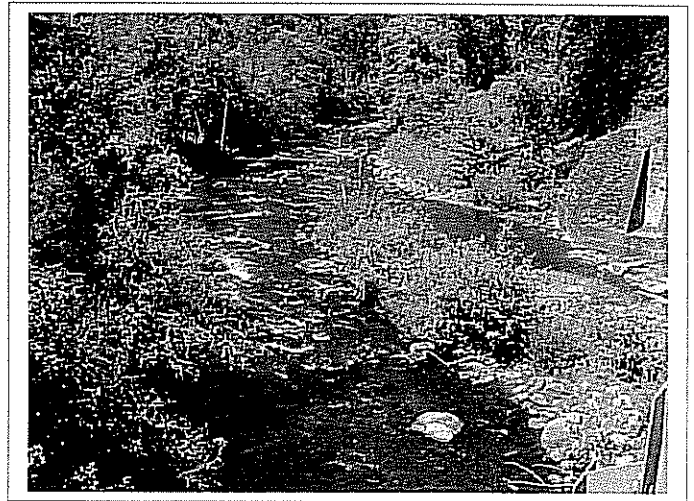


FIGURE 2- WATER QUALITY SAMPLING STATIONS

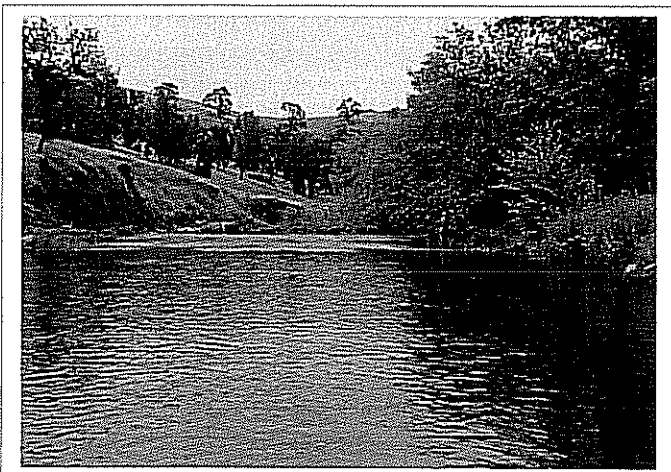
Upper Old Cow



Middle Old Cow



Lower Old Cow



Mainstem

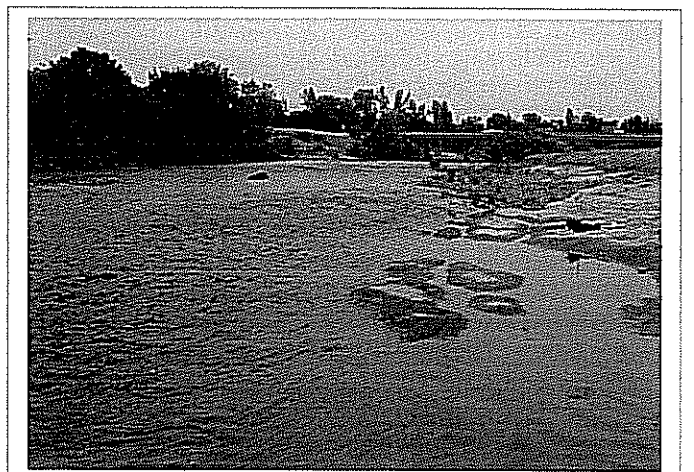
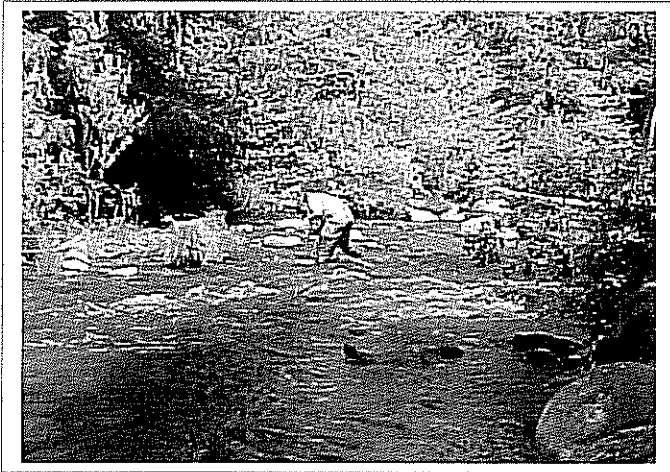
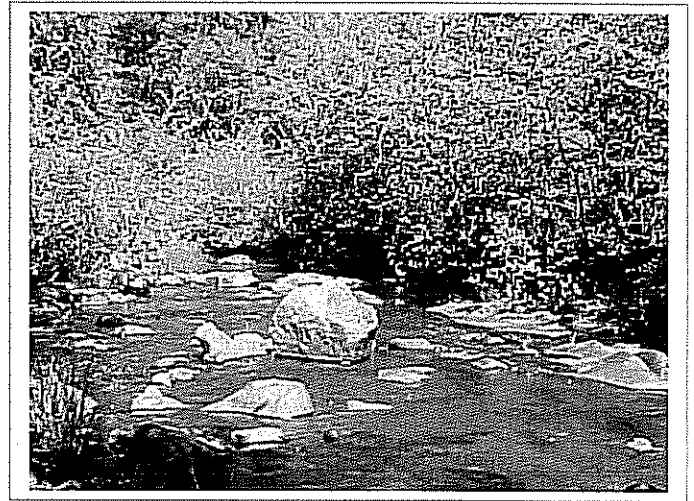


FIGURE 2- WATER QUALITY SAMPLING STATIONS

Upper South Cow



Middle South Cow



Lower South Cow



Lower Old Cow/South Cow



TABLES

Table 1: Cow Creek Water Quality Station Name and Location

<u>Name</u>	<u>Station ID</u> (UNC)	<u>Location Description</u>	<u>Date Sampled</u>	<u>GPS</u>
Upper North Cow	(UNC)	Phillips Rd bridge near Buzzard Roost	2003	N40 44' 56.09"; W121 56' 34.53"
Middle North Cow	(MNC)	Hwy 299 in Ingot	2001, 02, 03	N40 44' 37.41"; W122 3' 53.87"
Lower North Cow	(LNC)	near Swede Crk Rd/Old 44	2001, 02, 03	N40 33' 48.73"; W122 13' 34.18"
Upper Oak Run	(UOR)	Phillips Rd bridge near Oak Run to Fern Rd	2003	N40 42' 49.70"; W121 56' 40.64"
Middle Oak Run	(MOR)	Oak Run Rd 2 miles south of Oak Run to Fern Rd	2001, 02, 03	N40 39' 22.64"; W122 4' 25.08"
Lower Oak Run	(LOR)	Bridge at Old 44 Dr. near Winding Way	2001, 02, 03	N40 34' 0.15" W122 11' 26.19"
Upper Clover	(UCC)	Oak Run to Fern Rd, ½ mile north of Clover Crk	2001, 02, 03	N40 42' 8.50"; W122 55' 6.65"
Lower Clover	(LCC)	Old 44, ½ mile west of Whitmore Rd	2001, 02, 03	N40 33' 12.01"; W122 10' 58.54"
Upper Old Cow	(UOC)	Bridge on Fern Rd	2003	N40 40' 47.99"; W121 52' 13.4"
Middle Old Cow	(MOC)	Bridge on Whitmore Rd	2001, 02, 03	N40 37' 24.34"; W121 58' 51.73"
Lower Old Cow	(LOC)	JS Ranch	2003	N40 33' 38.00"; W122 5' 51.88"
Lower Old/South Cow	(O/S)	¼ mile north of Hwy 44 on Old 44 Dr.	2001, 02, 03	N40 32' 44.05"; W122 10' 27.42"
Upper South Cow	(USC)	Bridge on Ponderosa Way	2001, 02, 03	N40 36' 25.28"; W121 51' 12.50"
Middle South Cow	(MSC)	PG&E, South Cow Creek Rd	2003	N40 33' 3.95"; W122 4' 37.52"
Lower South Cow	(LSC)	Dr. Farrell's, ¼ mile north of So Cow Crk Rd	2001, 02, 03	N40 33' 2.28"; W122 4' 38.10"
Mainstem	(Main)	Hwy 44 bridge, 1/3 mile east of Deschutes Rd	2001, 02, 03	N40 33' 45.11"; W122 13' 36.64"

Table 2: Monthly Average Flow at U.S.G.S. Millville Gage 2001-2003

2001

	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
#11374000	645	1091	696	325	136	36	19	12	18	32	513	2530

2002

	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
#11374000	1405	1090	725	483	301	94	25	15	16	22	92	2046

2003

	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
#11374000	2194	914	1128	1225	1022	209	69	51	38			

Table 3: Cow Creek Flow - RWQCB Field Measurement

	2002									
	5/29/2002	6/19/2002	7/2/2002	7/18/2002	7/30/2002	10/31/2002				
Middle North Cow	51	24	16	11	11	6	8			
Lower North Cow	63	17	7	4	4	3	9			
Middle Oak Run	8	4	1	1	1	2	2			
Lower Oak Run	6	1	0	0	0	0	0			
Upper Clover Creek	26	21	13	13	16	16	4			
Lower Clover Creek	25	7	4	1	2	2	2			
Middle Old Cow	71	31	19	16	15	15	5			
Upper South Cow	47	20	18	20	14	14	12			
Lower South Cow	44	24	14	10	10	10	15			
Lower Old/South Cow	109	35	28	15	15	14	24			
Mainstem	270	43	37	20	20	17	35			

	2003										
	6/11/2003	7/10/2003	7/17/2003	7/22/2003	7/25/2003	7/29/2003	8/7/2003	8/12/2003	8/20/2003	8/22/2003	9/8/2003
Upper North Cow	44		17			14			10		
Middle North Cow	69		17			7			13		
Lower North Cow	58		6			4			4		
Upper Oak Run	12		8			7			7		
Middle Oak Run	7		1			2			2		
Lower Oak Run	6										
Upper Clover	31		19			9			8		
Lower Clover	30		5			3			3		
Upper Old Cow	13		15			13			14		
Middle Old Cow	70		38			22			33		
Lower Old Cow	57										
Upper South Cow	56		27			24			16		
Middle South Cow	5		4			5			4		
Lower South Cow	70		18			22			20		
Lower Old/South Cow	172		37			36			37		
Mainstem	244	75	45	51	62	31	56	43	38	37	34

Table 4: Cow Creek Temperature Data 2001, 2002, 2003

Station	Year	Jun-Jul-Aug		Sep-Oct-Nov		Dec-Jan-Feb		Mar-Apr-May		Jun-Jul-Aug		Sep-Oct-Nov		Dec-Jan-Feb		Mar-Apr-May		Absolute Number of Days max >75F	Number of 7-day Average >66F	Max winter (Dec-Feb) Diel Fluctuation	Max summer (Jul-Sept) Diel Fluctuation	Days
		Absolute Daily MAX Water Temp Summer	Absolute Daily MAX Water Temp Fall	Absolute Daily MAX Water Temp Winter	Absolute Daily MAX Water Temp Spring	Absolute Daily MAX Water Temp Summer	Absolute Daily MAX Water Temp Fall	Absolute Daily MAX Water Temp Winter	Absolute Daily MAX Water Temp Spring	MAX 7-day Average Water Temp Summer	MAX 7-day Average Water Temp Fall	MAX 7-day Average Water Temp Winter	MAX 7-day Average Water Temp Spring	MAX 7-day Average Water Temp Summer	MAX 7-day Average Water Temp Fall	MAX 7-day Average Water Temp Winter	MAX 7-day Average Water Temp Spring					
Upper North Cow	2003	71.17	66.79	No Data	60.68	No Data	No Data	No Data	No Data	68.53	60.68	No Data	No Data	No Data	No Data	No Data	No Data	29	75	No Data	16.02	100
Middle North Cow	2003	85.58	77.54	No Data	69.06	No Data	No Data	No Data	No Data	76.42	69.06	No Data	No Data	No Data	No Data	No Data	No Data	10	75	No Data	17.54	113
Lower North Cow	2003	98.17	89.11	No Data	78.62	No Data	No Data	No Data	No Data	86.34	78.62	No Data	No Data	No Data	No Data	No Data	No Data	76	114	No Data	19.79	159
Upper Oak Run	2003	81.63	59.07	No Data	55.44	No Data	No Data	No Data	No Data	57.27	55.44	No Data	No Data	No Data	No Data	No Data	No Data	0	0	No Data	6.69	149
Middle Oak Run	2003	86.42	77.67	No Data	72.67	No Data	No Data	No Data	No Data	80.72	72.67	No Data	No Data	No Data	No Data	No Data	No Data	25	98	No Data	12.07	150
Lower Oak Run	2003	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data
Upper Clover Creek	2003	56.92	57.48	No Data	54.98	No Data	No Data	No Data	No Data	54.70	54.98	No Data	No Data	No Data	No Data	No Data	No Data	0	0	No Data	5.01	106
Lower Clover Creek	2003	93.93	76.25	No Data	83.76	No Data	No Data	No Data	No Data	83.76	70.05	No Data	No Data	No Data	No Data	No Data	No Data	56	83	No Data	15.55	123
Upper Old Cow	2003	69.76	61.63	No Data	59.08	No Data	No Data	No Data	No Data	63.61	59.08	No Data	No Data	No Data	No Data	No Data	No Data	0	0	No Data	10.88	113
Middle Old Cow	2003	79.02	72.55	No Data	65.25	No Data	No Data	No Data	No Data	70.33	65.25	No Data	No Data	No Data	No Data	No Data	No Data	31	31	No Data	15.85	149
Lower Old Cow	2003	89.64	0.00	No Data	0.00	No Data	No Data	No Data	No Data	81.03	0.00	No Data	No Data	No Data	No Data	No Data	No Data	75	75	No Data	16.20	100
Upper South Cow	2003	66.55	61.35	No Data	57.43	No Data	No Data	No Data	No Data	61.47	57.43	No Data	No Data	No Data	No Data	No Data	No Data	0	0	No Data	10.12	113
Middle South Cow	2003	76.94	69.36	No Data	65.04	No Data	No Data	No Data	No Data	70.46	65.04	No Data	No Data	No Data	No Data	No Data	No Data	23	23	No Data	11.36	81
Lower South Cow	2003	89.43	79.46	No Data	71.63	No Data	No Data	No Data	No Data	79.59	71.63	No Data	No Data	No Data	No Data	No Data	No Data	80	80	No Data	18.54	112
Lower Old/South Cow	2003	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	n	n	No Data	No Data	No Data
Mainstem	2003	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data
Middle North Cow	2002	74.3	no data	no data	67.1	no data	no data	no data	75.6	67.1	no data	no data	no data	no data	no data	no data	no data	3	3	no data	66.3	61
Lower North Cow	2002	no data	no data	no data	no data	no data	no data	no data	85.1	no data	no data	no data	no data	no data	no data	no data	no data	6	6	no data	68.3	62
Upper Clover Creek	2002	60.55	no data	no data	57.57	no data	no data	no data	60.55	57.57	no data	no data	no data	no data	no data	no data	no data	0	0	no data	5.02	76
Lower Clover Creek	2002	89.9	73.3	no data	81	no data	72.3	no data	82.8	81	72.3	no data	no data	no data	no data	no data	no data	84	111	no data	14.9	198
Middle Old Cow	2002	78.69	65.4	no data	60.4	no data	60.4	no data	79.32	64.9	60.4	no data	no data	no data	no data	no data	no data	0	0	no data	12.6	169
Upper South Cow	2002	66.6	61.3	no data	58.3	no data	58.3	no data	61.6	62.7	58.3	no data	no data	no data	no data	no data	no data	0	0	no data	11.5	198
Lower South Cow	2002	89.9	78.6	no data	73.6	no data	73.6	no data	79	80.8	73.6	no data	no data	no data	no data	no data	no data	124	124	no data	18.3	249
Lower Old/South Cow	2002	88.98	no data	no data	81.56	no data	81.56	no data	96.16	81.56	no data	no data	no data	no data	no data	no data	no data	62	62	no data	40.96	76
Mainstem	2002	94.2	86.1	no data	85.6	no data	79.6	no data	84.8	85.6	79.6	no data	no data	no data	no data	no data	no data	140	140	no data	15.8	231
Middle North Cow	2001	83.8	77.1	no data	73.6	no data	66.9	no data	78.9	73.6	66.9	no data	no data	no data	no data	no data	no data	99	99	no data	18.5	111
Lower North Cow	2001	99.2	no data	no data	88.7	no data	no data	no data	98.1	88.7	no data	no data	no data	no data	no data	no data	no data	51	51	no data	19	51
Middle Oak Run	2001	84	82	no data	75.9	no data	72.2	no data	no data	75.9	72.2	no data	no data	no data	no data	no data	no data	28	28	no data	15.7	28
Lower Oak Run	2001	94.4	no data	no data	84	no data	no data	no data	81.8	84	no data	no data	no data	no data	no data	no data	no data	79	79	no data	22.8	79
Upper Clover Creek	2001	63.7	60.6	no data	59.2	no data	56.7	no data	no data	59.2	56.7	no data	no data	no data	no data	no data	no data	0	0	no data	7.2	97
Lower Clover Creek	2001	88	no data	no data	79	no data	no data	no data	84.3	79	no data	no data	no data	no data	no data	no data	no data	0	0	no data	13.4	52
Middle Old Cow	2001	76.3	74.5	no data	68.7	no data	65.9	no data	no data	68.7	65.9	no data	no data	no data	no data	no data	no data	18	18	no data	14.7	28
Upper South Cow	2001	63.5	62.1	no data	57	no data	57	no data	no data	59.1	57	no data	no data	no data	no data	no data	no data	0	0	no data	9	28
Lower South Cow	2001	87.8	no data	no data	79.1	no data	no data	no data	85.7	79.1	no data	no data	no data	no data	no data	no data	no data	76	76	no data	18.5	76
Lower Old/South Cow	2001	92.2	no data	no data	81.7	no data	no data	no data	91.9	81.7	no data	no data	no data	no data	no data	no data	no data	78	78	no data	27	78
Mainstem	2001	88.7	no data	no data	77.3	no data	no data	no data	88.7	77.3	no data	no data	no data	no data	no data	no data	no data	28	28	no data	no data	28

Absolute Daily Max Water Temp = Highest maximum temp.
 Max 7-day Average Water Temp = Average the day & 6 previous days Mean values, then find the highest temp.
 Number of 7-day average >66F = Number of days that the 7-day average is over 66 degrees Fahrenheit.
 Diel Fluctuation = (Maximum daily temp) - (Minimum daily temp)

Summer = June, July, Aug
 Fall = Sept, Oct, Nov
 Winter = Dec, Jan, Feb
 Spring = Mar, Apr, May

Table 5: Fecal Coliform Bacteria

2001

<i>SITE</i>	<i>5/22/01</i>	<i>6/5/01</i>	<i>6/11/01</i>	<i>8/28/01</i>	<i>9/4/01</i>	<i>9/11/01</i>	<i>9/18/01</i>	<i>9/25/01</i>
<i>Middle North Cow</i>	162	900	300	110	80	170	240	>1600
<i>Lower North Cow</i>	22	110	80					
<i>Middle Oak Run</i>	10	430	80	50	170	80	80	1600
<i>Lower Oak Run</i>	1600	240	>1600					
<i>Upper Clover Creek</i>	13	70	30	13	13	22	80	>1600
<i>Lower Clover Creek</i>	40	500	170					
<i>Middle Old Cow</i>	65	23	23	240	240	90	130	170
<i>Upper South Cow</i>	95	13	6	30	50	2	30	
<i>Lower South Cow</i>		300	300					
<i>Lower Old/South Cow</i>	600	110	130					
<i>Mainstem</i>	163	50	30					

2002

<i>SITE</i>	<i>4/2/02</i>	<i>4/10/02</i>	<i>4/18/02</i>	<i>4/25/02</i>	<i>5/2/02</i>	<i>5/9/02</i>	<i>5/15/02</i>
<i>Middle North Cow</i>	9	300	23	22	8	14	84
<i>Lower North Cow</i>	30	1600	30	13	30	33	170
<i>Middle Oak Run</i>	110	1600	300	300	170	130	170
<i>Lower Oak Run</i>	170	900	170	350	900	600	500
<i>Upper Clover Creek</i>	2	9	50	<2	13	4	30
<i>Lower Clover Creek</i>	220	>1600	110	1600	500	300	900
<i>Middle Old Cow</i>	11	13	13	4	2	17	4
<i>Upper South Cow</i>	2	17	11	<2	<2	2	11
<i>Lower South Cow</i>	170	130	17	50	170	300	1600
<i>Lower Old/South Cow</i>	130	90	110	130	110	50	110
<i>Mainstem</i>	21	300	30	140	110	23	246

RWQCB Basin Plan Water Quality Objective for Contact Recreation

Monthly Average: 200

Maximum: 400

Table 6: E-coli Bacteria

2002

<i>SITE</i>	5/23/02	5/28/02	6/4/02	6/12/02	6/19/02	6/27/02
<i>Middle North Cow</i>	17	32	190	440		
<i>Lower North Cow</i>	6	20	7		19	21
<i>Middle Oak Run</i>	32	71	650	200		
<i>Lower Oak Run</i>	120	411	310		84	1050
<i>Upper Clover Creek</i>	4	12	6	34	68	
<i>Lower Clover Creek</i>	60	40	1200		54	770
<i>Middle Old Cow</i>	42	65	53	80	435	
<i>Upper South Cow</i>	3	15	24	16	6	
<i>Lower South Cow</i>	290	218	154		123	
<i>Lower Old/South Cow</i>	66	119	26		50	53
<i>Mainstem</i>	51	57	65		31	22

2003

<i>SITE</i>	6/18/03	7/10/03	7/16/03	7/23/03	8/8/03	8/14/03	8/20/03
<i>Upper North Cow</i>			23	17	5	11	13
<i>Middle North Cow</i>			12	55	8	33	12
<i>Lower North Cow</i>		461	40	44	48	17	27
<i>Upper Oak Run</i>			96	172	73	272	152
<i>Middle Oak Run</i>			75	56	58	74	25
<i>Lower Oak Run</i>		66		228	613	179	61
<i>Upper Clover Creek</i>		11	15	13	57	28	16
<i>Lower Clover Creek</i>		816	61	166	326	74	326
<i>Upper Old Cow</i>		141	365	22	16	59	14
<i>Middle Old Cow</i>		92	435	148	308	261	124
<i>Lower Old Cow</i>	816						
<i>Upper South Cow</i>		11	4	14	3	5	11
<i>Middle South Cow</i>			387		345	148	119
<i>Lower South Cow</i>		61	161	308		48	135
<i>Lower Old/South Cow</i>		121	56	69	548	17	20
<i>Mainstem</i>	345	161	206	77	62	16	33

Water Quality Criteria for Protection of Contact Recreation

Monthly Mean: 126

Maximum: 235

Table 7:

SUMMARY OF SELECTED MACROINVERTEBRATE METRICS

June-03								
	North Cow Creek			Oak Run Creek			Clover Creek	
	Upper	Middle	Lower	Upper	Middle	Lower	Upper	Lower
<i>Taxonomic Richness</i>	26	20	10	10	26	17	37	9
<i>EPT Index (%)</i>	78	41	32	21	50	70	64	24
<i>Shannon Diversity</i>	2.0	1.8	1.2	0.9	2.3	1.6	2.7	1.0
<i>Percent Intolerant Taxa</i>	38	20	3	9	8	22	37	5
<i>Percent Tolerant Taxa</i>	2	0	1	0	1	1	2	0

June-03								
	Old Cow Creek			South Cow Creek			Old/South	Cow Creek
	Upper	Middle	Lower	Upper	Middle	Lower	Cow Creek	Main
<i>Taxonomic Richness</i>	29	31	31	36	35	22	19	22
<i>EPT Index (%)</i>	51	50	66	77	56	51	35	51
<i>Shannon Diversity</i>	2.1	2.4	2.2	2.3	2.8	1.7	1.5	1.7
<i>Percent Intolerant Taxa</i>	16	21	47	29	38	15	10	15
<i>Percent Tolerant Taxa</i>	2	1	2	0	2	1	0	1

APPENDIX

A

APPENDIX A -COW CREEK WATER QUALITY DATA 2001-2003

Cow Creek 2001-2002											RWQCB		Basic Lab	
Date	Time	Station	Temp (C)	Temp (F)	DO	Cond	pH	Turbidity	tot	E.Coli	tot	fec	E.Coli	
5/22/2001	9:33	Middle North Cow	15.8	60.4	9.4	113	7.8	1.6	1733	47	350/1600	23/300		
5/22/2001	13:45	Middle Oak Run	26.3	79.3	8.6	154	8.5	1.8	>2400	1986	900/1600	7/13		
5/22/2001	10:31	Upper Clover Creek	11.2	52.2	9.9	96	7.9	0.8	56	2	300/140	2/23		
5/22/2001	11:09	Middle Old Cow	13.4	56.0	9.4	86	8.0	0.5	155	7	130/900	80/50		
5/22/2001	11:37	Upper South Cow	17.9	64.3	8.8	96	8.1	1.4	921	29	500/220	80/110		
5/22/2001	12:04	Lower Old/South Cow	24.8	76.6	9.0	136	8.4	1.4	>2400	39	1600/300	900/300		
5/22/2001	12:23	Lower Clover Creek	26.3	79.3	9.7	138	8.6	1.9	>2400	285	170/280	30/50		
5/22/2001	12:41	Lower Oak Run	24.5	76.1	8.5	212	8.1	1.1	>2400	613	1600/1600	1600/1600		
5/22/2001	13:13	Lower North Cow	25.9	78.6	8.8	144	8.2	0.9	>2400	11	240/130	13/30		
5/22/2001	14:25	Mainstem	28.7	83.7	9.9	141	8.8	1.0	>2400	9	1600/300	25/300		
5/29/2001	9:16	Middle North Cow	15.1	59.2	9.4	135	6.9		>2400	153				
5/29/2001	10:44	Middle Oak Run	19.8	67.7	8.6	149	7.4		>2400	649				
5/29/2001	10:20	Upper Clover Creek	10.1	50.1	10.2	62	7.0		365	127				
5/29/2001	10:44	Middle Old Cow	15.6	60.0	9.2	100	7.3		1986	115				
5/29/2001	11:06	Upper South Cow	12.6	54.7	9.6	92	7.2		26	4				
5/29/2001	12:19	Lower Old/South Cow	22.8	73.1	9.4	148	7.7		>2400	47				
5/29/2001	12:31	Lower Clover Creek	24.1	75.4	9.8	146	8.0		>2400	816				
5/29/2001	12:42	Lower Oak Run	22.8	73.1	9.3	207	7.8		>2400	1986				
5/29/2001	12:58	Lower North Cow	23.2	73.8	8.6	161	7.7		>2400	2				
5/29/2001	12:02	Mainstem	24.2	75.5	9.5	155	7.9		>2400	4				
6/5/2001	9:05	Middle North Cow	16.2	61.1	7.1	154	8.1	1.9			>1600	900		
6/5/2001	9:35	Middle Oak Run	20.3	68.5	8.5	162	8.2	1.9			1700	130		
6/5/2001	10:00	Upper Clover Creek	10.1	50.2	9.4	63	8.2	1.5			1600	70		
6/5/2001	10:25	Middle Old Cow	14.7	58.4	9.3	104	8.2	2.5			500	23		
6/5/2001	10:45	Upper South Cow	12.3	54.1	9.5	96	8.2	1.3			110	13		
6/5/2001	11:40	Middle South Cow	20.4	68.8	10.0	137	8.8	1.3			>1600	300		
6/5/2001	12:25	Lower Old/South Cow	23.3	73.9	9.3	157	8.8	2.9			300	110		
6/5/2001	12:35	Lower Clover Creek	24.0	75.3	9.7	166	8.7	1.4			500	500		
6/5/2001	12:45	Lower Oak Run	24.0	75.1	7.1	202	8.7	2.4			24000	24000		
6/5/2001	12:55	Lower North Cow	23.5	74.3	8.1	178	8.6	1.0			110	110		
6/5/2001	12:00	Mainstem	24.1	75.3	11.1	165	8.9	0.8			70	50		
6/11/2001	10:10	Middle North Cow	17.3	63.1	9.3	154	8.1	1.7			900	300		
6/11/2001	11:10	Middle Oak Run	22.0	71.6	8.9	146	8.0	1.5			300	80		
6/11/2001	11:45	Upper Clover Creek	11.4	52.4	9.8	65	8.3	2.2			280	30		
6/11/2001	12:20	Middle Old Cow	17.6	63.7	8.8	108	8.4	2.6			500	23		
6/11/2001	12:55	Upper South Cow	13.7	56.7	9.2	98	8.4	0.8			500	6		
6/11/2001	14:30	Middle South Cow	22.2	71.9	9.6	147	9.1	2.4			1600	300		
6/11/2001	15:05	Lower Old/South Cow	24.1	75.3	9.8	172	9.1	1.2			900	130		
6/11/2001	15:25	Lower Clover Creek	25.0	77.1	11.1	173	9.2	1.8			300	170		
6/11/2001	15:40	Lower Oak Run	25.1	77.3	14.6	189	9.4	2.4			>1600	>1600		
6/11/2001	15:55	Lower North Cow	24.8	76.7	10.1	186	9.0	4.0			130	80		
6/11/2001	14:00	Mainstem	25.1	77.2	17.0	170	8.7	1.0			100	30		

Cow Creek 2001-2002											RWQGB		Basic Lab	
Date	Time	Station	Temp (C)	Temp (F)	DO	Cond	pH	Turbidity	tot	E Coll	tot	fec	E Coll	
6/19/2001	9:13	Middle North Cow	17.7	63.8	6.7	173	7.6	0.9	>2400	313				
6/19/2001	9:45	Middle Oak Run	22.2	72.0	7.5	145	8.0	1.0	>2400	128				
6/19/2001	10:14	Upper Clover Creek	12.0	53.6	9.5	66	7.7	1.6	517	228				
6/19/2001	10:58	Middle Old Cow	17.9	64.2	8.5	111	8.1	2.3	>2400	61				
6/19/2001	11:34	Upper South Cow	14.7	58.5	8.7	101	8.1	4.1	548	31				
6/19/2001	12:30	Middle South Cow	23.6	74.5	9.7	152	9.0	2.1	>2400	106				
6/19/2001	13:31	Lower Old/South Cow	26.9	80.4	10.3	168	9.2	1.4	>2400	27				
6/19/2001	13:52	Lower Clover Creek	28.1	82.5	9.1	175	9.2	4.5	>2400	36				
6/19/2001	14:20	Lower Oak Run	25.9	78.7	7.5	173	9.8	1.5	>2400	3				
6/19/2001	14:49	Lower North Cow	28.2	82.7	6.9	199	9.0	1.0	>2400	0				
6/19/2001	13:01	Mainstem	26.4	79.4	5.9	179	8.4	1.2	>2400	17				
6/26/2001	6:04	Middle North Cow	16.9	62.4	7.9	166	7.6		>2400	194				
6/26/2001	6:38	Middle Oak Run	20.3	68.5	7.3	204	7.7		>2400	73				
6/26/2001	7:26	Upper Clover Creek	11.2	52.1	9.7	68	7.8		549	260				
6/26/2001	7:49	Middle Old Cow	15.3	59.6	9.1	109	7.8		>2400	93				
6/26/2001	8:20	Upper South Cow	12.6	54.6	9.3	101	7.8		272	40				
6/26/2001	9:03	Middle South Cow							>2400	84				
6/26/2001	10:00	Lower Old/South Cow	20.9	69.7	8.5	174	8.1		>2400	15				
6/26/2001	10:12	Lower Clover Creek	21.2	70.2	9.0	183	8.0		>2400	55				
6/26/2001	10:20	Lower Oak Run	22.0	71.6	11.6	153	8.9		>2400	93				
6/26/2001	10:30	Lower North Cow	21.8	71.2	7.7	202	8.4		>2400	26				
6/26/2001	9:36	Mainstem							>2400	34				
7/3/2001	6:41	Middle North Cow	19.7	67.4	7.6	176	6.7	1.8	>2400					
7/3/2001	7:11	Middle Oak Run	23.7	74.6	6.8	158	7.3	1.9	>2400					
7/3/2001	7:42	Upper Clover Creek	13.2	55.7	9.2	69	7.1	1.4	378					
7/3/2001	8:04	Middle Old Cow	17.8	64.1	8.6	113	7.3	3.9	>2400					
7/3/2001	8:28	Upper South Cow	14.0	57.2	9.0	103	7.3	0.9	304					
7/3/2001	9:15	Middle South Cow							>2400					
7/3/2001	10:06	Lower Old/South Cow	25.5	77.9	8.3	170	8.2	1.2	>2400					
7/3/2001	10:16	Lower Clover Creek						5.2	>2400					
7/3/2001	10:38	Lower Oak Run	25.8	78.4	6.6	259	8.1	1.7	>2400					
7/3/2001	10:48	Lower North Cow	26.5	79.7	6.1	201	8.1	1.2	>2400					
7/3/2001	9:41	Mainstem	26.4	79.6	4.6	180	7.9	3.5	>2400					
7/10/2001	7:50	Middle North Cow	20.2	68.3	7.8	178	8.1	1.8	>2400					
7/10/2001	8:24	Middle Oak Run	23.6	74.5	6.8	165	8.2	2.0	>2400					
7/10/2001	8:54	Upper Clover Creek	13.5	56.2	8.8	71	8.3	1.6	575					
7/10/2001	9:15	Middle Old Cow	17.9	64.2	8.6	115	8.2	3.6	>2400					
7/10/2001	9:40	Upper South Cow	14.8	58.6	8.7	104	8.3	1.5	1414					
7/10/2001	13:30	Middle South Cow	26.0	78.9	9.9	156	9.2	1.5	>2400					
7/10/2001	11:35	Lower Old/South Cow						1.3	>2400					
7/10/2001	11:46	Lower Clover Creek						1.2	>2400					
7/10/2001	11:57	Lower Oak Run	26.6	80.0		213	9.5	1.6	>2400					

Cow Creek 2001-2002												
Date	Time	Station	Temp (C)	Temp (F)	DO	Cond	pH	Turbidity	RWGB tot	E.Coli	Basic Lab fec	E.Coli
7/10/2001	12:17	Lower North Cow							>2400			
7/10/2001	11:09	Mainstem	27.0	80.5	5.6	186	8.3	1.7	>2400			
7/17/2001	7:43	Middle North Cow	17.5	63.6	8.4	169	8.3	2.5	961	132		
7/17/2001	8:10	Middle Oak Run	21.5	70.6	7.3	171	8.4	0.9	>2400	68		
7/17/2001	8:37	Upper Clover Creek	11.7	53.0	9.5	90	8.5	1.5	260	27		
7/17/2001	9:01	Middle Old Cow	16.4	61.4	9.1	114	8.4	3.0	>2400	80		
7/17/2001	9:25	Upper South Cow	13.0	55.4	9.4	103	8.4	0.8	549	55		
7/17/2001	10:20	Middle South Cow	20.8	69.4	9.4	155	8.6	1.6	>2400	457		
7/17/2001	11:11	Lower Old/South Cow	24.0	75.3	9.9	177	8.8	0.7	961	40		
7/17/2001	11:25	Lower Clover Creek	24.9	76.8	9.8	170	9.0	1.0	961	35		
7/17/2001	11:30	Lower Oak Run	25.3	77.5	9.8	182	9.7	1.2	>2400	78		
7/17/2001	11:45	Lower North Cow	23.6	74.4	7.6	214	8.7	1.3	>2400	89		
7/17/2001	10:45	Mainstem	23.9	75.1	5.8	186	8.5	1.1	>2400	82		
7/24/2001	6:49	Middle North Cow	18.9	66.0	7.8	178	8.5	2.8	>2400	194		
7/24/2001	7:18	Middle Oak Run	21.9	71.4	6.8	175	8.4	1.4	>2400	61		
7/24/2001	7:45	Upper Clover Creek	12.2	54.0	9.5	70	8.6	1.8	461	15		
7/24/2001	8:11	Middle Old Cow	17.2	62.9	8.6	116	8.4	3.2	>2400	16		
7/24/2001	8:45	Upper South Cow	13.7	56.7	8.9	104	8.4	1.2	488	19		
7/24/2001	14:39	Middle South Cow	28.5	83.4	9.7	154	9.2	1.1				
7/24/2001	14:57	Lower Old/South Cow	30.5	86.9	11.0	179	9.3	0.9				
7/24/2001	15:05	Lower Clover Creek	31.9	89.4	10.1	150	9.5	1.1				
7/24/2001	15:13	Lower Oak Run	29.9	85.8	12.9	170	9.9	2.1				
7/24/2001	15:28	Lower North Cow	27.7	81.9	9.6	220	9.1	0.9				
7/24/2001	15:46	Mainstem	32.7	90.9	11.0	184	9.3	1.1				
7/31/2001	6:48	Middle North Cow	18.1	64.5	6.0	184	6.8		>2400	47		
7/31/2001	7:09	Middle Oak Run	22.5	72.4	7.0	172	7.6		>2400	21		
7/31/2001	7:29	Upper Clover Creek	12.3	54.1	9.6	72	7.9		>2400	40		
7/31/2001	7:46	Middle Old Cow	16.7	62.0	8.9	117	7.9		103	272		
7/31/2001	8:03	Upper South Cow	13.0	55.5	9.4	104	8.1		435	20		
7/31/2001	8:44	Middle South Cow	20.6	69.1	7.9	162	8.1		>2400	107		
7/31/2001	8:57	Lower Old/South Cow	22.9	73.3	7.2	182	8.1		>2400	54		
7/31/2001	9:05	Lower Clover Creek	22.7	72.8	6.6	173	8.1		>2400	14		
7/31/2001	9:12	Lower Oak Run	23.1	73.6	3.6	165	8.8		>2400	36		
7/31/2001	9:24	Lower North Cow	23.2	73.7	5.3	225	8.4		>2400	51		
7/31/2001	9:39	Mainstem	24.6	76.3	7.3	189	8.4		>2400	13		
8/7/2001	6:50	Middle North Cow	17.7	63.9	8.0	176	8.9	0.9	>2400	50		
8/7/2001	7:17	Middle Oak Run	21.2	70.1	6.5	207	8.7	0.7	>2400	19		
8/7/2001	7:48	Upper Clover Creek	12.6	54.7	9.1	73	8.8	1.1	579	39		
8/7/2001	8:13	Middle Old Cow	16.9	62.4	8.9	117	8.7	2.6	>2400	29		
8/7/2001	8:39	Upper South Cow	13.0	55.4	9.1	105	8.6	1.2	687	25		
8/7/2001	9:34	Middle South Cow	21.0	69.8	8.6	164	8.6	1.1	>2400	44		
8/7/2001	9:52	Lower Old/South Cow	23.2	73.8	7.6	199	8.6	0.8	>2400	11		
8/7/2001	10:07	Lower Clover Creek	23.4	74.0	4.0	172	8.7	0.9	>2400	55		
8/7/2001	10:17	Lower Oak Run	23.6	74.4	4.0	182	9.6	2.9	>2400	1		

Cow Creek 2001-2002											RWQGB		Basic Lab	
Date	Time	Station	Temp (C)	Temp (F)	DO	Cond	pH	Turbidity	tot	E.Coli	tot	fec	E.Coli	
8/7/2001	10:34	Lower North Cow	23.4	74.1	4.3	229	8.7	1.2	>2400	26				
8/7/2001	10:51	Mainstem	25.8	78.5	7.6	196	8.8	1.5	>2400	22				
8/14/2001	6:58	Middle North Cow	16.4	61.5	8.3	168	8.5		>2400	33				
8/14/2001	7:58	Middle Oak Run	19.8	67.7	6.7	243	8.4		>2400	2				
8/14/2001	8:07	Upper Clover Creek	11.9	53.3	9.6	74	8.7		1046	34				
8/14/2001	8:18	Middle Old Cow	15.9	60.6	9.1	119	8.5		>2400	38				
8/14/2001	9:01	Upper South Cow	12.4	54.4	9.5	105	8.5		1120	25				
8/14/2001	10:35	Middle South Cow	21.7	71.0	9.4	160	8.9		>2400	33				
8/14/2001	10:54	Lower Old/South Cow	23.5	74.3	9.6	198	9.0		>2400	10				
8/14/2001	11:11	Lower Clover Creek	22.8	73.1	10.3	157	9.1		>2400	131				
8/14/2001	11:31	Lower North Cow	22.7	72.8	6.7	232	9.1		>2400	25				
8/14/2001	11:54	Mainstem	26.1	78.9	9.6	196	8.7		1986	28				
8/21/2001	9:04	Middle North Cow	16.9	62.4	7.4	176	9.1	1.3	>2400	67				
8/21/2001	9:31	Middle Oak Run	20.9	69.6	7.8	209	8.9	0.7	>2400	16				
8/21/2001	10:00	Upper Clover Creek	12.1	53.8	9.5	74	8.9	1.1	649	21				
8/21/2001	10:27	Middle Old Cow	16.7	62.1	9.1	118	8.8	1.7	>2400	53				
8/21/2001	11:15	Upper South Cow	13.4	56.0	9.6	105	8.9	0.8	1120	16				
8/21/2001	12:15	Middle South Cow	22.2	72.0	9.7	157	9.2	0.9	>2400	45				
8/21/2001	12:50	Lower Old/South Cow	24.6	76.2	10.5	196	9.4	0.6	>2400	8				
8/21/2001	13:26	Lower North Cow	23.0	73.3	8.1	235	8.9	0.9	>2400	2				
8/21/2001	14:00	Mainstem	27.6	81.7	9.0	193	9.4	0.8	>2400	5				
8/28/2001	6:17	Middle North Cow	19.2	66.6	7.7	189	8.2	0.7			>1600	110		
8/28/2001	6:37	Middle Oak Run	22.0	71.7	7.2	177	8.4	1.3			1600	50		
8/28/2001	6:57	Upper Clover Creek	13.2	55.8	9.3	77	8.7	2.4			220	13		
8/28/2001	7:15	Middle Old Cow	16.7	62.1	8.9	120	8.6	0.9			>1600	240		
8/28/2001	7:35	Upper South Cow	14.1	57.3	9.1	108	8.7	0.9			50	30		
9/1/2001	6:03	Middle South Cow	20.9	69.5	7.0	169	8.3	1.4			>2400	19		
9/1/2001	6:20	Lower Old/South Cow	22.9	73.3	5.9	203	8.7	0.7			>2400	27		
9/1/2001	6:47	Lower North Cow	23.4	74.0	5.3	242	8.6	1.4			>2400	4		
9/1/2001	7:06	Mainstem	23.8	74.9	5.5	208	8.7	0.8			>2400	11		
9/4/2001	6:09	Middle North Cow	16.5	61.8	8.1	192	8.5	1.5			500	80		
9/4/2001	6:31	Middle Oak Run	20.2	68.3	8.0	198	8.6	9.0			>1600	170		
9/4/2001	6:49	Upper Clover Creek	12.6	54.7	9.4	77	8.9	1.6			500	13		
9/4/2001	7:09	Middle Old Cow	16.3	61.3	9.0	122	8.7	2.0			>1600	240		
9/4/2001	7:29	Upper South Cow	12.4	54.3	9.7	107	8.8	0.9			500	50		
9/8/2001	8:16	Middle South Cow	17.4	63.3	8.5	168	9.2	2.0			>2400	179		
9/8/2001	8:30	Lower Old/South Cow	19.7	67.5	7.2	205	9.1	0.8			248	133		
9/8/2001	8:50	Lower North Cow	19.6	67.3	6.5	245	9.0	1.5			276	143		
9/8/2001	9:10	Mainstem	20.8	69.4	7.8	212	9.1	2.3			214	122		

Cow Creek 2001-2002										RWQGB		Basic Lab	
Date	Time	Station	Temp (C)	Temp (F)	DO	Cond	pH	Turbidity	tot	E. coli	tot	fec	E. coli
9/11/2001	6:35	Middle North Cow						2.7			500	170	
9/11/2001	7:00	Middle Oak Run						1.5			1600	80	
9/11/2001	7:30	Upper Clover Creek						1.3			240	22	
9/11/2001	7:50	Middle Old Cow						1.6			1600	90	
9/11/2001	8:06	Upper South Cow						0.9			240	2	
9/15/2001	7:40	Middle South Cow						1.4			>2400	25	
9/15/2001	7:00	Lower Old/South Cow						2.0			>2400	32	
9/15/2001	7:20	Lower North Cow						1.2			>2400	61	
9/15/2001	6:25	Mainstem						1.7			>2400	866	
9/18/2001	6:30	Middle North Cow						1.5			1600	240	
9/18/2001	6:50	Middle Oak Run						1.3			>1600	80	
9/18/2001	7:07	Upper Clover Creek						1.5			300	80	
9/18/2001	7:25	Middle Old Cow						2.2			>1600	130	
9/18/2001	7:40	Upper South Cow						0.9			1600	30	
9/21/2001	6:55	Middle South Cow						1.4			>2400	249	
9/21/2001	7:15	Lower Old/South Cow						1.2			>2400	21	
9/21/2001	7:30	Lower North Cow						1.4			>2400	35	
9/21/2001	7:45	Mainstem						1.0			>2400	17	
9/29/2001	8:29	Middle North Cow						1.7			>2400	179	
9/29/2001	8:56	Middle Oak Run						9.0			387	188	
9/29/2001	9:17	Upper Clover Creek						1.4			365	68	
9/29/2001	9:37	Middle Old Cow						2.0			687	135	
9/29/2001	9:57	Upper South Cow						3.6			1046	43	
9/25/2001	7:37	Middle South Cow						1.4			1600	170	
9/25/2001	7:57	Lower Old/South Cow						2.0			>1600	1600	
9/25/2001	7:15	Lower North Cow						1.6			>1600	>1600	
9/25/2001	6:57	Mainstem						4.4			>1600	>1600	
4/2/2002	8:26	Middle North Cow									>1600	9	
4/3/2002	8:42	Middle Oak Run									1600	110	
4/2/2002	8:59	Upper Clover Creek									300	2	
4/2/2002	9:11	Middle Old Cow									>1600	11	
4/2/2002	9:32	Upper South Cow									900	2	
4/2/2002	10:20	Middle South Cow									1600	170	
4/2/2002	10:30	Lower Old/South Cow									430	130	
4/2/2002	10:34	Lower Clover Creek									1600	220	
4/2/2002	10:37	Lower Oak Run									>1600	170	
4/2/2002	10:44	Lower North Cow									1600	30	
4/2/2002	10:55	Mainstem									900	21	

Cow Creek 2001-2002										RWQCB		Basic Lab	
Date	Time	Station	Temp (C)	Temp (F)	DO	Cond	pH	Turbidity	tot	E:Coll	tot	fec	E:Coll
4/10/2002	10:30	Middle North Cow									1600	300	
4/10/2002	11:00	Middle Oak Run									>1600	1600	
4/10/2002	11:30	Upper Clover Creek									900	9	
4/10/2002	11:50	Middle Old Cow									1600	13	
4/10/2002	12:25	Upper South Cow									>1600	17	
4/10/2002	13:15	Middle South Cow									1600	130	
4/10/2002	13:25	Lower Old/South Cow									>1600	90	
4/10/2002	13:35	Lower Clover Creek									>1600	>1600	
4/10/2002	13:40	Lower Oak Run									900	900	
4/10/2002	13:50	Lower North Cow									1600	1600	
4/10/2002	14:20	Mainstem									1600	300	
4/18/2002	12:25	Middle North Cow									1600	23	
4/18/2002	12:45	Middle Oak Run									>1600	300	
4/18/2002	13:15	Upper Clover Creek									>1600	50	
4/18/2002	13:35	Middle Old Cow									500	13	
4/18/2002	13:55	Upper South Cow									1600	11	
4/18/2002	14:35	Middle South Cow									500	17	
4/18/2002	14:50	Lower Old/South Cow									>1600	110	
4/18/2002	15:00	Lower Clover Creek									>1600	110	
4/18/2002	15:10	Lower Oak Run									>1600	170	
4/18/2002	15:25	Lower North Cow									900	30	
4/18/2002	15:40	Mainstem									>1600	30	
4/25/2002	11:30	Middle North Cow									>1600	22	
4/25/2002	11:50	Middle Oak Run									>1600	300	
4/25/2002	12:15	Upper Clover Creek									500	<2	
4/25/2002	12:30	Middle Old Cow									500	4	
4/25/2002	12:55	Upper South Cow									300	<2	
4/25/2002	13:30	Middle South Cow									>1600	50	
4/25/2002	13:45	Lower Old/South Cow									>1600	130	
4/25/2002	13:55	Lower Clover Creek									>1600	1600	
4/25/2002	14:00	Lower Oak Run									1600	350	
4/25/2002	14:10	Lower North Cow									170	13	
4/25/2002	14:25	Mainstem									>1600	140	
5/2/2002	11:35	Middle North Cow									>1600	8	
5/2/2002	12:00	Middle Oak Run									>1600	170	
5/2/2002	12:25	Upper Clover Creek									900	13	
5/2/2002	12:40	Middle Old Cow									900	2	
5/2/2002	13:05	Upper South Cow									900	<2	
5/2/2002	13:50	Middle South Cow									>1600	170	
5/2/2002	14:10	Lower Old/South Cow									1600	110	
5/2/2002	14:20	Lower Clover Creek									>1600	500	
5/2/2002	14:25	Lower Oak Run									>1600	900	

Cow Creek 2001-2002										RWQCB		Basic Lab	
Date	Time	Station	Temp (C)	Temp (F)	DO	Cond	pH	Turbidity	tot	E:Coll	tot	tec	E:Coll
5/2/2002	14:40	Lower North Cow							900		900	30	
5/2/2002	14:50	Mainstem							900		110		
5/9/2002	11:45	Middle North Cow							1600		14		
5/9/2002	12:05	Middle Oak Run							1600		130		
5/9/2002	12:25	Upper Clover Creek							170		4		
5/9/2002	12:45	Middle Old Cow							170		17		
5/9/2002	13:05	Upper South Cow							500		2		
5/9/2002	13:50	Middle South Cow							1600		300		
5/9/2002	14:05	Lower Old/South Cow							>1600		50		
5/9/2002	14:10	Lower Clover Creek							>1600		300		
5/9/2002	14:20	Lower Oak Run							300		600		
5/9/2002	14:30	Lower North Cow							170		33		
5/9/2002	14:40	Mainstem							900		23		
5/15/2002	11:55	Middle North Cow							>1600		84		
5/15/2002	12:20	Middle Oak Run							>1600		170		
5/15/2002	12:40	Upper Clover Creek							900		30		
5/15/2002	12:55	Middle Old Cow							23		4		
5/15/2002	13:10	Upper South Cow							130		11		
5/15/2002	14:25	Middle South Cow							>1600		1600		
5/15/2002	14:40	Lower Old/South Cow							1600		110		
5/15/2002	14:50	Lower Clover Creek							1600		900		
5/15/2002	15:00	Lower Oak Run							900		500		
5/15/2002	15:05	Lower North Cow							900		170		
5/15/2002	15:20	Mainstem							500		246		
5/22/2002	12:45	Middle North Cow											
5/22/2002	13:05	Middle Oak Run											
5/22/2002	13:30	Upper Clover Creek											
5/22/2002	13:45	Middle Old Cow											
5/22/2002	14:05	Upper South Cow											
5/22/2002	14:50	Middle South Cow											
5/22/2002	15:25	Lower Old/South Cow											
5/22/2002	15:35	Lower Clover Creek											
5/22/2002	15:45	Lower Oak Run											
5/22/2002	15:55	Lower North Cow											
5/22/2002	16:05	Mainstem											
5/23/2002	12:45	Middle North Cow							1410		17		
5/23/2002	13:05	Middle Oak Run							1730		32		
5/23/2002	13:30	Upper Clover Creek							670		4		
5/23/2002	13:45	Middle Old Cow							440		42		
5/23/2002	14:05	Upper South Cow							440		3		
5/23/2002	14:50	Middle South Cow							>2400		290		
5/23/2002	15:25	Lower Old/South Cow							980		66		
5/23/2002	15:35	Lower Clover Creek							1990		60		
5/23/2002	15:45	Lower Oak Run							>2400		12		

Cow Creek 2001-2002													
Date	Time	Station	Temp (C)	Temp (F)	DO	Cond	pH	Turbidity	RWQCB tot	E.Coli	Basic Lab tot fec	E.Coli	
5/23/2002	15:55	Lower North Cow									870	6	
5/23/2002	16:05	Mainstem									690	51	
5/28/2002	11:00	Middle North Cow	16.0	60.7		76	6.4		326	31	1046	32	
5/28/2002	11:25	Middle Oak Run	19.4	66.9		90	7.7		261	42	>2400	71	
5/28/2002	11:45	Upper Clover Creek	10.2	50.3		38	7.8		44	10	162	12	
5/28/2002	12:05	Middle Old Cow	15.1	59.2		56	8.0		96	16	2400	65	
5/28/2002	12:30	Upper South Cow	12.0	53.7		47	8.5		71	15	1203	15	
5/28/2002	14:05	Middle South Cow	21.0	69.8		83	8.2		1300	365	>2400	218	
5/28/2002	14:20	Lower Old/South Cow	21.0	69.7		93	8.4		1120	195	>2400	119	
5/28/2002	14:30	Lower Clover Creek	22.4	72.3		89	8.5		1553	104	2400	40	
5/28/2002	14:40	Lower Oak Run	27.9	82.2		149	9.1		1553	206	>2400	411	
5/28/2002	14:50	Lower North Cow	24.8	76.7		116	8.8		>2400	29	1733	20	
5/28/2002	15:05	Mainstem	24.2	75.6		106	8.6		1733	145	1414	57	
6/4/2002	11:30	Middle North Cow	17.7	63.8	6.9	106	7.6	1.7	980	111	>2400	190	
6/4/2002	12:20	Middle Oak Run	20.8	69.4	6.9	110	8.3	2.3	>2400	479	1990	650	
6/4/2002	12:55	Upper Clover Creek	11.6	52.9	5.3	50	8.2	1.6	178	22	330	6	
6/4/2002	13:15	Middle Old Cow	18.7	65.6	7.1	85	8.2	2.4	727	30	1410	53	
6/4/2002	13:40	Upper South Cow	14.8	58.6	6.9	67	8.2	1.3	770	35	1050	24	
6/4/2002	14:45	Middle South Cow	24.5	76.1	5.2	118	8.6	2.0	>2400	154	>2400	154	
6/4/2002	15:35	Lower Old/South Cow	24.7	76.4	5.1	126	8.9	3.8	2419	56	>2400	26	
6/4/2002	15:45	Lower Clover Creek	25.4	77.6	5.1	124	8.5	2.5	>2400	602	>2400	1200	
6/4/2002	16:00	Lower Oak Run	30.9	87.6	7.5	190	9.7	1.7	1986	122	>2400	310	
6/4/2002	16:10	Lower North Cow	28.6	83.5	5.8	162	9.1	1.2	>2400	11	1990	7	
6/4/2002	16:20	Mainstem	27.6	81.6	5.6	143	8.8	1.2	1733	57	>2400	65	
6/12/2002	8:00	Middle North Cow	14.3	57.7	6.8	100	8.2	1.2			>2400	440	
6/12/2002	8:30	Middle Oak Run	18.3	65.0	7.3	106	7.9	2.6			>2400	200	
6/12/2002	8:55	Upper Clover Creek	9.4	48.9	8.6	46	7.8	1.8			>2400	34	
6/12/2002	9:15	Middle Old Cow	14.1	57.3	8.4	79	7.8	2.5			1730	80	
6/12/2002	9:30	Upper South Cow	10.8	51.4	8.9	64	7.8	0.9			650	16	
6/14/2002	9:15	Middle South Cow	18.9	66.1	8.1	118	7.9	2.0			>2400	727	
6/14/2002	9:35	Lower Old/South Cow	22.3	72.1	7.6	131	7.9	1.7			>2400	111	
6/14/2002	9:45	Lower Clover Creek	22.9	73.2	7.2	121	8.0	1.6			>2400	345	
6/14/2002	10:05	Lower Oak Run	23.4	74.1	6.9	167	8.4	1.4			>2400	55	
6/14/2002	10:20	Lower North Cow	22.9	73.2	6.0	164	8.0	1.0			>2400	24	
6/14/2002	10:50	Mainstem	24.1	75.3	7.3	145	8.0	1.2			>2400	59	
6/19/2002	8:55	Middle North Cow	16.9	62.4	7.8	119	7.7	1.6			>2400	344	
6/19/2002	9:35	Middle Oak Run	20.6	69.1	7.7	113	8.0	1.5			>2400	68	
6/19/2002	10:15	Upper Clover Creek	10.7	51.3	9.3	49	8.0	1.9			>2400	68	
6/19/2002	11:00	Middle Old Cow	17.2	62.9	7.8	89	8.1	4.1			>2400	435	
6/19/2002	11:40	Upper South Cow	14.1	57.3	8.6	76	7.9	1.1			1410	6	
6/19/2002	14:35	Middle South Cow	26.1	78.9	7.5	140	8.3	1.8			>2400	123	
6/19/2002	14:50	Lower Old/South Cow	26.8	80.3	7.1	163	8.2	1.4			>2400	50	
6/19/2002	15:10	Lower Clover Creek	27.7	81.8	7°	136	8.3	1.7			>2400	54	
6/19/2002	15:20	Lower Oak Run	31.6	88.9		199	8.8	1.6			>2400	84	

Cow Creek 2001-2002													
Date	Time	Station	Temp (C)	Temp (F)	DO	Cond	pH	Turbidity	RWQCB tot E.Coli	Basic Lab tot fec E.Coli			
6/19/2002	15:35	Lower North Cow	27.6	81.6	8.4	183	8.6	1.8		1990			
6/19/2002	16:20	Mainstem	28.8	83.9	8.3	173	8.5	1.1		>2400			
6/27/2002	12:05	Middle North Cow	22.3	72.1	7.4	122	7.7	1.0					
6/27/2002	12:20	Middle Oak Run	22.5	72.5	7.4	115	8.4	1.7					
6/27/2002	13:10	Upper Clover Creek	13.5	56.2	8.4	47	7.9	2.2					
6/27/2002	13:30	Middle Old Cow	22.5	72.5	6.8	93	8.1	3.0					
6/27/2002	14:10	Upper South Cow	17.6	63.7	7.7	76	8.2	0.9					
6/27/2002	15:10	Middle South Cow	28.6	83.6	6.9	140	8.7	2.6					
6/27/2002	15:25	Lower Old/South Cow	27.5	81.5	7.1	202	8.9	1.4		>2400			
6/27/2002	15:35	Lower Clover Creek	30.5	87.0	7.3	131	8.4	2.4		>2400			
6/27/2002	15:45	Lower Oak Run	28.3	83.0	5.4	175	8.7	1.5		>2400			
6/27/2002	16:00	Lower North Cow	30.2	86.4	5.5	184	9.0	1.6		>2400			
6/27/2002	16:20	Mainstem	31.7	89.0	8.2	166	9.2	1.0	>2400	25			
7/3/2002	12:45	Middle North Cow	22.7	72.8	5.0	128	7.7	2.2					
7/3/2002	13:10	Middle Oak Run	27.0	80.5	6.0	144	8.6	1.4					
7/3/2002	13:40	Upper Clover Creek	13.6	56.5	7.8	98	8.5	2.0					
7/3/2002	14:05	Middle Old Cow	22.9	73.2	6.3	100	8.3	3.3					
7/3/2002	14:25	Upper South Cow	17.6	63.6	6.8	77	8.3	1.1					
7/3/2002	15:40	Middle South Cow	28.5	83.4	6.7	140	8.9	1.3					
7/3/2002	16:20	Lower Old/South Cow	30.0	86.0	6.3	169	8.9	1.4					
7/3/2002	16:30	Lower Clover Creek	31.8	89.2	6.3	141	8.6	1.6					
7/3/2002	16:45	Lower Oak Run	27.3	81.1	6.4	178	8.5	1.4					
7/3/2002	16:55	Lower North Cow	30.6	87.0	6.9	195	9.0	1.6					
7/3/2002	17:10	Mainstem	30.9	87.6	5.5	171	9.1	1.8					
7/10/2002	13:00	Middle North Cow	25.3	77.5		144	8.7	1.5					
7/10/2002	13:30	Middle Oak Run	27.9	82.3		115	8.8	1.6					
7/10/2002	13:55	Upper Clover Creek	15.2	59.4		50	8.4	2.6					
7/10/2002	14:15	Middle Old Cow	25.3	77.5		109	8.5	3.8					
7/10/2002	14:35	Upper South Cow	19.0	66.2		81	8.5	1.9					
7/10/2002	15:15	Middle South Cow	30.7	87.3		162	9.0	1.9					
7/10/2002	15:35	Lower Old/South Cow	32.3	90.2		179	9.0	1.5					
7/10/2002	15:50	Lower Clover Creek	34.4	93.9		143	9.0	1.4					
7/10/2002	16:00	Lower Oak Run	28.2	82.8		179	9.0	1.7					
7/10/2002	16:15	Lower North Cow	30.1	86.1		198	8.9	1.2					
7/10/2002	16:30	Mainstem	33.6	92.6		183	9.2	1.6					
7/18/2002	12:15	Middle North Cow	22.3	72.1		154	8.7	1.9					
7/18/2002	13:30	Middle Oak Run	25.7	78.2		123	8.9	1.0					
7/18/2002	14:15	Upper Clover Creek	13.7	56.6		48	8.0	1.8					
7/18/2002	15:00	Middle Old Cow	22.4	72.4		103	8.4	2.8					
7/18/2002	15:50	Upper South Cow	17.3	63.1		81	8.3	0.9					
7/19/2002	14:30	Middle South Cow	28.0	82.3		150	9.0	2.1					
7/19/2002	13:35	Lower Old/South Cow	29.0	84.1		180	8.9	1.3					
7/19/2002	13:20	Lower Clover Creek	27.0	80.5		154	8.5	3.0					
7/19/2002	13:10	Lower Oak Run	26.2	79.2		186	9.2	3.3					

Cow Creek 2001-2002											RW/CGB		Basic Lab	
Date	Time	Station	Temp (C)	Temp (F)	DO	Cond	pH	Turbidity	tot	E:Goli	tot	fec	E:Goli	
8/15/2002	12:20	Lower North Cow	26.3	79.3	8.5	232	8.0	2.0	>2400	727				
8/15/2002	6:30	Mainstem	26.3	79.4	4.5	201	7.9	1.4	>2400	816				
10/17/2002	9:20	Middle North Cow	9.9	49.8	9.0	123	9.0	1.2	>2400	345				
10/17/2002	9:55	Middle Oak Run	12.7	54.9	10.5	98	8.2	1.0	>2400	308				
10/17/2002	10:40	Upper Clover Creek	8.2	46.8	11.0	42	7.6	1.5						
10/17/2002	11:00	Middle Old Cow	10.0	50.0	10.0	75	7.6	2.3						
10/17/2002	11:30	Upper South Cow	7.8	46.1	11.0	63	7.6	1.4						
10/17/2002	13:00	Middle South Cow	13.8	56.9	8.0	107	8.1	3.3						
10/17/2002	14:00	Lower Old/South Cow	15.6	60.0	10.0	137	8.4	1.2						
10/17/2002	14:15	Lower Clover Creek	14.1	57.3	9.0	124	8.5	1.6						
10/17/2002		Lower Oak Run		Land										
10/17/2002	14:35	Lower North Cow	15.8	60.4	9.0	165	8.3	1.2						
10/17/2002	15:00	Mainstem	17.0	62.6	10.0	192	8.0	1.3						
6/18/2003		Lower Old Cow							>2400	816				
6/18/2003		Lower Old Cow							>2400	345				
6/18/2003		Mainstem							>2400	308				
6/18/2003		Mainstem												
7/10/2003		Upper North Cow							2500	51				
7/10/2003		Middle North Cow							2500	199				
7/10/2003		Lower North Cow							2500	461				
7/10/2003		Upper Oak Run							2500	260				
7/10/2003		Middle Oak Run							2500	68				
7/10/2003		Lower Oak Run							2500	66				
7/10/2003		Upper Clover Creek							189	11				
7/10/2003		Lower Clover Creek							>2400	816				
7/10/2003		Upper Old Cow							921	141				
7/10/2003		Middle Old Cow							236	92				
7/10/2003		Upper South Cow							158	11				
7/10/2003		Lower South Cow							2500	61				
7/10/2003		Lower Old/South Cow							2500	121				
7/10/2003		Mainstem							2500	161				
7/16/2003	12:50	Upper North Cow	67.0					1.0	344	23				
7/16/2003	13:30	Middle North Cow	76.0					0.8	2500	12				
7/16/2003	8:40	Lower North Cow	77.0					1.3	2500	40				
7/16/2003	11:30	Upper Oak Run	55.0					3.8	2500	96				
7/16/2003	12:25	Middle Oak Run	78.0					1.5	2500	75				
7/16/2003	8:58	Lower Oak Run	76.0					1.8	2500	>2400				
7/16/2003	12:00	Upper Clover Creek	54.0					1.5	59	15				
7/16/2003	10:25	Lower Clover Creek	77.0					1.2	2500	61				
7/16/2003	16:20	Upper Old Cow	67.0					1.1	1986	365				
7/16/2003	10:50	Middle Old Cow	65.0					2.0	2500	435				
7/16/2003	16:45	Upper South Cow	64.0					0.8	236	4				
7/16/2003	15:25	Middle South Cow	70.0					1.7	2500	387				
7/16/2003	10:02	Lower South Cow	71.0					2.0	2500	161				

Cow Creek 2001-2002											RWQCB		Basic Lab	
Date	Time	Station	Temp (C)	Temp (F)	DO	Cond	pH	Turbidity	tot	E.Coli	tot	fec	E.Coli	
7/16/2003	9:05	Lower Old/South Cow		76.0					2500	56				
7/16/2003	9:30	Mainstem		78.0				1.3	2500	206				
7/23/2003	13:30	Upper North Cow	22.7	72.8	8.6	185	7.6	0.9	1414	17				
7/23/2003	13:55	Middle North Cow	28.2	82.7	8.5	151	8.5	1.0	2500	55				
7/23/2003	9:55	Lower North Cow	29.1	84.3	6.5	186	7.6	1.2	2500	44				
7/23/2003	13:10	Upper Oak Run	15.2	59.4	10.7	58	7.4	4.1	2500	172				
7/23/2003	14:30	Middle Oak Run	30.1	86.2	9.0	127	8.3	1.8	2500	56				
7/23/2003	9:30	Lower Oak Run	29.1	84.4	6.5	175	7.5	2.2	2500	228				
7/23/2003	13:00	Upper Clover Creek	14.9	58.8	10.3	47	6.4	1.2	199	13				
7/23/2003	9:20	Lower Clover Creek	28.1	67.0	8.5	122	7.0	2.0	2500	166				
7/23/2003	12:40	Upper Old Cow	19.5	67.0	9.4	82	7.6	1.2	1986	22				
7/23/2003	12:15	Middle Old Cow	22.4	72.4	10.8	90	7.5	1.8	2500	148				
7/23/2003		Lower Old Cow		32.0										
7/23/2003	11:45	Upper South Cow	16.8	62.3	9.5	73	6.1	0.9	326	14				
7/23/2003		Middle South Cow		32.0										
7/23/2003	10:40	Lower South Cow	25.6	78.1	9.3	130	6.7	1.5	2500	308				
7/23/2003	9:00	Lower Old/South Cow	27.9	82.3	8.0	140	6.8	1.2	2500	69				
7/23/2003	8:15	Mainstem	29.0	84.2	7.2	146	7.2	1.3	2500	77				
7/29/2003		Upper North Cow						1.2						
7/29/2003		Middle North Cow						0.9						
7/29/2003		Middle Oak Run						2.1						
7/29/2003		Lower Oak Run												
7/29/2003		Upper Clover Creek						1.4						
7/29/2003		Lower Clover Creek												
7/29/2003		Upper Old Cow						1.3						
7/29/2003		Middle Old Cow						1.9						
7/29/2003		Lower Old Cow												
7/29/2003		Upper South Cow						3.1						
7/29/2003	14:42	Middle South Cow	21.4	70.5	8.1	103	7.0	1.7						
7/29/2003		Lower South Cow						2.3						
7/29/2003		Mainstem						1.3						
8/8/2003		Upper North Cow							866	5				
8/8/2003		Middle North Cow							1986	8				
8/8/2003		Lower North Cow							2500	48				
8/8/2003		Upper Oak Run							980	73				
8/8/2003		Middle Oak Run							2500	58				
8/8/2003		Lower Oak Run							2500	613				
8/8/2003		Upper Clover Creek							185	57				
8/8/2003		Lower Clover Creek							2500	326				
8/8/2003		Upper Old Cow							132	16				
8/8/2003		Middle Old Cow							1733	308				
8/8/2003		Upper South Cow							80	3				
8/8/2003		Middle South Cow												
8/8/2003		Lower South Cow							2500	345				

Cow Creek 2001-2002											RWQGB		Basic Lab	
Date	Time	Station	Temp (C)	Temp (F)	DO	Cond	pH	Turbidity	tot	E. coli	tot	fec	E. coli	
8/8/2003		Lower Old/South Cow							2500	548				
8/8/2003		Mainstem							2500	62				
8/14/2003		Upper North Cow							435	11				
8/14/2003		Middle North Cow							2419	33				
8/14/2003		Lower North Cow							2500	17				
8/14/2003		Upper Oak Run							2500	272				
8/14/2003		Middle Oak Run							2419	74				
8/14/2003		Lower Oak Run							2500	179				
8/14/2003		Upper Clover Creek							172	28				
8/14/2003		Lower Clover Creek							2500	74				
8/14/2003		Upper Old Cow							308	59				
8/14/2003		Middle Old Cow							980	261				
8/14/2003		Lower Old Cow												
8/14/2003		Upper South Cow							112	5				
8/14/2003		Middle South Cow							2500	148				
8/14/2003		Lower South Cow							2419	48				
8/14/2003		Lower Old/South Cow							2419	17				
8/14/2003		Mainstem							2419	16				
8/20/2003	10:30	Upper North Cow	15.1	59.2	9.3	69	7.5	0.7	579	13				
8/20/2003	9:40	Middle North Cow	17.1	62.8	9.1	144	6.6	1.0	687	12				
8/20/2003	10:40	Lower North Cow	23.8	74.9	6.9	195	7.8	2.2	2500	27				
8/20/2003	12:15	Upper Oak Run	13.1	55.5	9.5	60	5.0	4.0	1553	152				
8/20/2003	11:20	Middle Oak Run	22.5	72.4	8.6	122	8.4	1.9	2500	25				
8/20/2003		Lower Oak Run						0.7	1414	61				
8/20/2003		Upper Clover Creek	13.4	56.0	9.4	51	5.5	1.5	74	16				
8/20/2003	10:20	Lower Clover Creek	22.3	72.2	7.9	120	7.2	2.2	2500	326				
8/20/2003	13:30	Upper Old Cow	16.4	61.5	9.0	79	7.6	1.5	365	14				
8/20/2003	15:30	Middle Old Cow	22.3	72.2	8.1	101	7.8	2.7	1046	124				
8/20/2003		Lower Old Cow												
8/20/2003	14:30	Upper South Cow	15.3	59.5	9.2	79	5.3	0.7	71	11				
8/20/2003		Middle South Cow	20.6	69.1	7.8	108	7.3	1.8	2500	119				
8/20/2003	11:50	Lower South Cow	20.9	69.6	9.7	124	6.7	1.2	2419	135				
8/20/2003	10:00	Lower Old/South Cow	21.6	70.8	8.0	135	7.4	1.1	2419	20				
8/20/2003	9:00	Mainstem	22.7	72.8	7.4	144	6.9	2.7	2419	33				