#34

From: Gene Davis
To: Emanuel, Melenee
Date: 6/30/04 4:22PM
Subject: more RB5 data for 2004 303(d) update

Melenee,
Please find attached two data files that have pesticide data collected (mostly) by Central Valley Regional Board staff for the Sacramento and Feather Rivers and selected tributaries.

I checked with Joe and we have identified two more potential data sources here at RB5. I am checking into these and will let you know what I find.
-Gene

Electronic

#36

From: Gene Davis
To: Emanuel, Melenee
Date: 6/30/04 3:48PM
Subject: Fwd: Re: urgent-- Qs for RWQCB5 data assembly

Melenee,
Attached is one (of two that I promised you) data files. The second file (Sacramento and Feather River watershed monitoring data) is 'in the works', and I will send it to you as soon as I get it from our staff.

I will check with Joe, but I don't think there will be any more data coming from us.
-Gene

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>>> Melenee Emanuel 06/30/04 11:41AM >>>
Hi Gene
Send the data to me please. Dennis sent me the URL to the Upper Feather River Rpt. I'm still waiting for one appendices from that report. The contents of one of the appendices was loaded twice... so I think I'm missing the channel profiles App:D? Is this the end of the data that R5 is sending...or do you anticipate sending more?

Melenee

Melenee Emanuel
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>>> Gene Davis 06/30/04 11:29AM >>>
Melenee,
Joe forwarded your request to me. I haven't seen this report, so I'm not sure we even have a copy. However, the correct web address for the report source is http://www.feather-river-crm.org. You should be able to access the report through this link (via the "Monitoring Program" button on their homepage).

In addition, I am working with staff here to compile data from recent Delta and Sacramento/Feather Rivers monitoring that we did. Should we send this data to you? Should we also send this data to Peter Kozelka (or to anyone else)?

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>>> Melenee Emanuel 06/28/04 02:28PM >>>
Hi Joe

Peter sent your data to me. I am collecting data building the administrative record for the 2004 303(d) list. I'm having difficults connecting to the following link http://www.featherrivercrm.org to obtain the 1999-2003 Water Quality Monitoring Report for the Upper Feather River. Could you email me the report?

Thanks

Melenee

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>>> <Kozelka.Peter@epamail.epa.gov> 06/17/04 10:34AM >>>

----- Forwarded by Peter Kozelka/R9/USEPA/US on 06/17/2004 10:34 AM -----

Dennis Heiman <HEIMAND@rb5r.swrcb.ca.gov> 06/16/2004 02:12 PM

To: Peter Kozelka/R9/USEPA/US@EPA
cc: Joe Karkoski <KarkosJ@rb5s.swrcb.ca.gov>
Subject: Re: urgent-- Qs for RWQCB5 data assembly

Peter - In response to your recent email, I'm forwarding some files with water quality information for the Pit (the data collected as part of the SWAMP program). A similar report (1999-2003 Watershed Monitoring Report for Upper Feather River) exists on www.featherrivercrm.org, if you don't already have that.

I'm also including our water quality data spread sheet for Cow Cr (RWQCB monitoring from 2000-2003).

I'm in the process of compiling a compendium of recent and ongoing monitoring in each of the individual watershed areas of the north Sacramento River watershed. It might alert you to some additional data

that you were not aware of. I'll include appropriate contacts for the watershed data information. Hope to have it out before I leave (July 10) for three weeks of vacation. FYI, the Sacramento River Watershed Program is also compiling a Compendium of watershed monitoring and it will be presented to their Monitoring and Toxics Subcommittee on July 15 and, when approved, available to the public on www.sacriver.org.

(See attached file: Pit River Report 1.ddh.doc)(See attached file: Pitthydrolab.xls)(See attached file: Cow Main Data Table.xls)

#36

From: Gene Davis
To: Emanuel, Melenee
Date: 7/1/04 8:59AM
Subject: Re: QAQC

Melenee~
Please find attached a draft report that includes the Sacramento urban creek data I sent you yesterday. This report also has the QAQC sample results and discussion. I will check into the QAQC for the Sacramento and Feather River data I also sent you yesterday and will ask for similar data from the one (possibly two) other data sources I am pursuing.
-Gene

>>> Melenee Emanuel 07/01/04 07:57AM >>>
Hi Gene

I have not looked at the data that you sent. You probably send the QA information, but just in case you have not send QAPPs and/or QAQC data please do so.

Thanks

Melenee

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Electronic

All individual fish measurements
June 03 sampling event;
Summary Table

PG&E fish sampling, analysis by Cal. F&G Lab 5-7
↳ 48 PCB congeners

North Fork Feather River Fish Tissue Sampling, 2002-2003, Poe Project (Poe Reservoir and Big Bend Dam Reservoir below Poe Powerhouse)

n=16

Site	ID	Date Collected	CDFG Batch	Date Delivered	Fish Species	Fork Length	Total Length	Tissue Analysis (PCB's - ppb)	Tissue Analysis Hg - ppm)
Poe Reservoir									
Upstream	POSKR1	11/21/2002	L-497-02	11/22/2002	Sacramento Sucker	367	375	6.35	NA
	POSKR2	11/21/2002	L-497-02	11/22/2002	Sacramento Sucker	435	451	10.7	NA
	POSKR3	11/21/2002	L-497-02	11/22/2002	Sacramento Sucker	376	392	6.96	NA
	POSKR4	11/21/2002	L-497-02	11/22/2002	Sacramento Sucker	420	443	6.37	NA
	POSKR5	11/21/2002	L-497-02	11/22/2002	Sacramento Sucker	411	432	6.96	NA
	POSKR6	11/21/2002	L-497-02	11/22/2002	Sacramento Sucker	418	433	6.86	NA
							Mean =	**7.37**	
	PORBT1	11/21/2002	L-512-02	12/9/2002	Rainbow Trout	408	415	NA	0.07
	POSPM1	11/21/2002	L-512-02	12/9/2002	Sacramento Pikemin	396	428	NA	0.33
	POSPM2	11/21/2002	L-512-02	12/9/2002	Sacramento Pikemin	376	408	NA	0.19
							Mean =		**0.26**
	POSMB1	6/16/2003	PR # 1	6/23/2003	Smallmouth Bass	203	210	1.94	0.09
	POSMB2	6/16/2003	PR # 2	6/23/2003	Smallmouth Bass	217	225	1.94	0.11
	POSMB3	6/16/2003	PR # 3	6/23/2003	Smallmouth Bass	223	235	1.94	0.12
	POSMB4	6/16/2003	PR # 4	6/23/2003	Smallmouth Bass	221	230	1.31	0.13
	POSMB5	6/16/2003	PR # 5	6/23/2003	Smallmouth Bass	253	262	1.31	0.12
	POSMB6	6/17/2003	PR # 6	6/23/2003	Smallmouth Bass	220	230	1.31	0.09
	POSMB7	6/17/2003	PR # 7	6/23/2003	Smallmouth Bass	215	224	NA	0.11
	POSMB8	6/17/2003	PR # 8	6/23/2003	Smallmouth Bass	220	235	NA	0.11
	POSMB9	6/17/2003	PR # 9	6/23/2003	Smallmouth Bass	284	300	NA	0.27
							Mean =	**1.69**	**0.13**

Fish Tissue Sites & QAQC

[1] = SMB Composite of PR-1, PR-2, and PR-3

[2] = SMB Composite of PR-4, PR-5, and PR-6

	Date Collected	CDFG Batch	Date Delivered	Fish Species	Fork Length	Total Length	Tissue Analysis (PCB's - ppb)	Tissue Analysis Hg - ppm)
Below Poe Powerhouse (Big Bend)								
downstream	PPSKR1	12/4/2002	L-512-02	12/9/2002	Sacramento Sucker	450	468	4.57	NA
	PPSKR2	12/4/2002	L-512-02	12/9/2002	Sacramento Sucker	427	449	10.00	NA
	PPSKR3	12/4/2002	L-512-02	12/9/2002	Sacramento Sucker	415	425	4.61	NA
	PPSKR4	12/4/2002	L-512-02	12/9/2002	Sacramento Sucker	358	374	0.65	NA
	PPSKR5	12/4/2002	L-512-02	12/9/2002	Sacramento Sucker	342	350	1.03	NA
	PPSKR6	12/4/2002	L-512-02	12/9/2002	Sacramento Sucker	331	346	1.19	NA
							Mean =	**3.68**	
	PPRBT1	12/4/2002	L-512-02	12/9/2002	Rainbow Trout	269	285	NA	0.03
	PPRT1	6/19/2003	PPH # 27	6/23/2003	Rainbow Trout	390	410	NA	0.04
							Mean =		**0.035**
	PPSPM1	12/5/2002	L-512-02	12/9/2002	Sacramento Pikemin	425	459	NA	~~0.22~~
	PPPM1	6/19/2003	PPH # 4	6/23/2003	Sacramento Pikemin	470	508	NA	0.84

QAQC Dup collected from FERC # 2105 Not confirmed

Poe (FERC # 2107) 5-7

North Fork Feather River Fish Tissue Sampling, 2002-2003, Poe Project (Poe Reservoir and Big Bend Dam Reservoir below Poe Powerhouse)

Site	ID	Date Collected	CDFG Batch	Date Delivered	Fish Species	Fork Length	Total Length	Tissue Analysis	Tissue Analysis
	PPPM2	6/19/2003	PPH # 5	6/23/2003	Sacramento Pikemin	518	550	NA	0.57
	PPPM3	6/19/2003	PPH # 6	6/23/2003	Sacramento Pikemin	460	490	NA	0.33
	PPPM4	6/19/2003	PPH # 7	6/23/2003	Sacramento Pikemin	492	524	NA	0.98
	PPPM5	6/19/2003	PPH # 8	6/23/2003	Sacramento Pikemin	540	560	NA	0.80
	PPPM6	6/19/2003	PPH # 9	6/23/2003	Sacramento Pikemin	418	450	NA	0.35
	PPPM7	6/19/2003	PPH # 10	6/23/2003	Sacramento Pikemin	490	524	NA	0.50
							Mean =		**0.57**
	PPSMB1	6/17/2003	PPH # 1	6/23/2003	Smallmouth Bass	290	300	2.67	0.32
	PPSMB2	6/17/2003	PPH # 2	6/23/2003	Smallmouth Bass	316	328	2.67	0.20
	PPSMB3	6/19/2003	PPH # 19	6/23/2003	Smallmouth Bass	278	295	2.67	0.16
	PPSMB4	6/19/2003	PPH # 20	6/23/2003	Smallmouth Bass	280	294	1.05	0.13
	PPSMB5	6/19/2003	PPH # 21	6/23/2003	Smallmouth Bass	270	278	1.05	0.17
	PPSMB6	6/19/2003	PPH # 22	6/23/2003	Smallmouth Bass	240	247	1.05	0.11
	PPSMB7	6/19/2003	PPH # 23	6/23/2003	Smallmouth Bass	255	265	NA	0.15
	PPSMB9	6/19/2003	PPH # 25	6/23/2003	Smallmouth Bass	235	240	NA	0.15
	PPSMB10	6/19/2003	PPH # 26	6/23/2003	Smallmouth Bass	270	282	NA	0.15
							Mean =	**1.86**	**0.17**
	PPSB1	6/17/2003	PPH # 3	6/23/2003	Spotted Bass[a]	333	361	4.77	0.22
	PPSB2	6/19/2003	PPH # 12	6/23/2003	Spotted Bass	326	349	4.77	0.29
	PPSB3	6/19/2003	PPH # 13	6/23/2003	Spotted Bass	305	332	4.77	0.40
	PPSB4	6/19/2003	PPH # 14	6/23/2003	Spotted Bass	360	380	4.10	0.46
	PPSB5	6/19/2003	PPH # 15	6/23/2003	Spotted Bass	318	339	4.10	0.30
	PPSB6	6/19/2003	PPH # 16	6/23/2003	Spotted Bass	298	312	4.10	0.19
	PPSB7	6/19/2003	PPH # 17	6/23/2003	Spotted Bass	378	400	NA	0.65
	PPSB8	6/19/2003	PPH # 18	6/23/2003	Spotted Bass	320	340	NA	0.29
	PPSB10	6/19/2003	PPH # 28	6/23/2003	Spotted Bass	350	365	NA	0.19
							Mean =	**4.44**	**0.33**

[1] = SMB Composite of PPH-1, PPH-2, and PPH-19

[2] = SMB Composite of PPH-20, PPH-21, and PPH-22

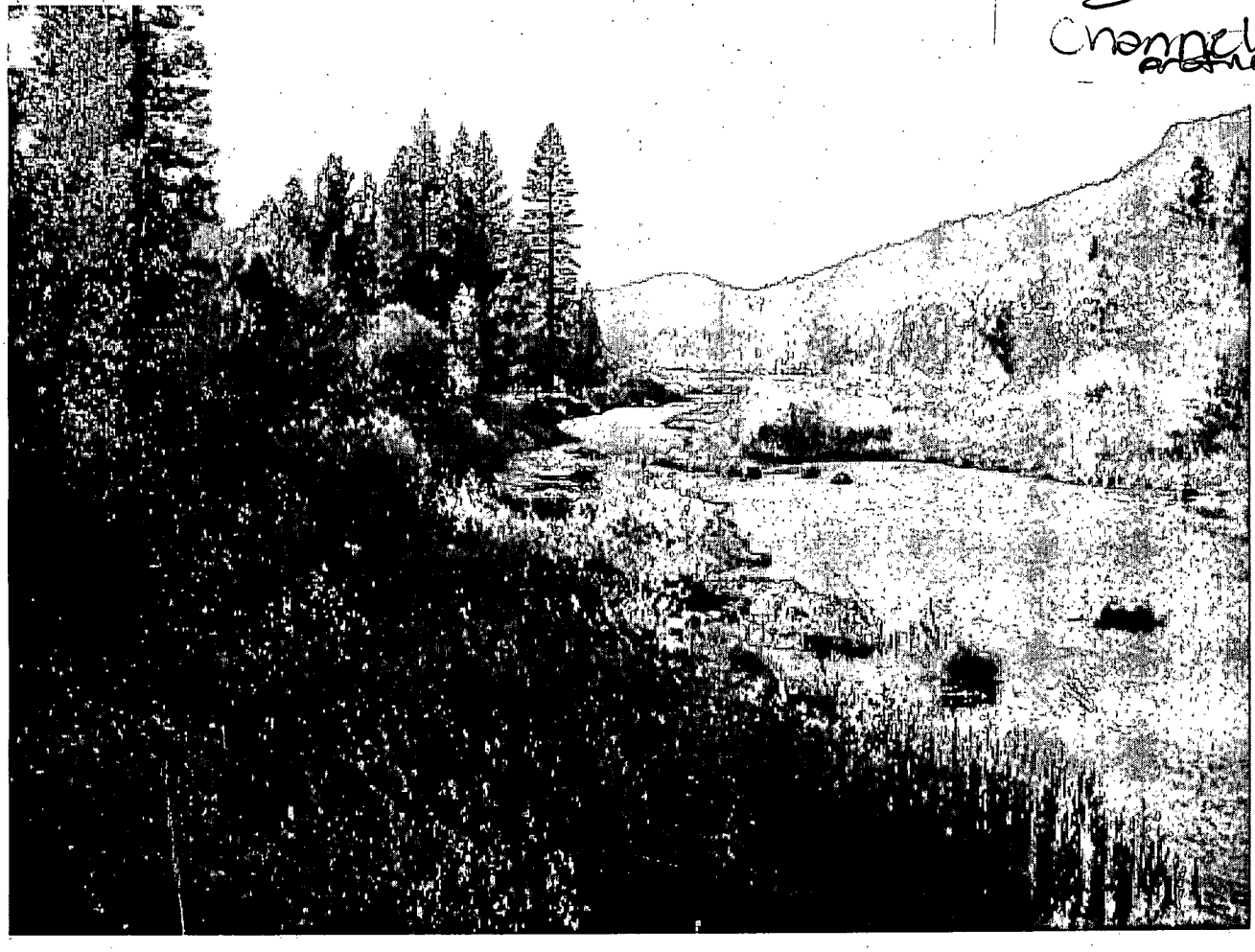
[3] = SPB Composite of PPH-3, PPH-12, and PPH-13

[4] = SPB Composite of PPH-14, PPH-15, and PPH-16

#360
Upper Feather Rvr.
F40

Feather River Coordinated Resource Management
Watershed Monitoring Program
SWRCB Agreement # 00-115-150-0
With Plumas Corporation
(October 1, 2000 – December 30, 2003)
Final Report

Missing Appendix E Channel



Prepared by Plumas Corporation
Quincy, CA
2/2004

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EXECUTIVE SUMMARY

This report presents watershed monitoring data from numerous sites in the Feather River watershed collected by members of the Feather River Coordinated Resource Management Group since 1999. The data presented in this report are meant to be baseline data to which future monitoring efforts can be compared, in order to track trends in the watershed, and possibly see if restoration efforts have a significant effect on watershed function. Precipitation varied from 56% to 111% of normal during the monitoring period. Physical stream characteristics, flow regime, water quality and biota were monitored. This report summarizes a copious amount of data, however, these data will prove most useful in the future when they can be referenced for comparisons. The questions we are attempting to answer are long-term questions on a large scale, and we have found it most beneficial for our purposes, at this time, to look at this large landscape scale as a sum of the parts. The sources of the data need to be kept in mind, as well as the fact that these are small sample sites within a large landscape.

The Feather River watershed includes 3,222 square miles of land base that drains west from the Great Basin Escarpment of the northern Sierra Nevada and southern Cascade mountains into the Sacramento River. Annual precipitation ranges less than 12" to more than 70".

The long term objectives of the watershed monitoring program are to:

- Continuously monitor changes in water temperature over time as a key parameter in assessing changes in watershed condition. A significant reduction in summer water temperatures over time is indicative of improving watershed condition.
- Continuously monitor changes in surface water flow over time as a key parameter in assessing changes in watershed condition. A significant increase in summer base flow and reduced peak flow are indicative of improving watershed condition.
- Continuously monitor changes in turbidity over time as a parameter in assessing watershed condition changes. An overall long-term decrease in turbidity is indicative of improving watershed condition.
- Monitor bedload and suspended sediment at various flows to gain a greater understanding of watershed function.
- Monitor physical and biological changes in Monitoring Reaches, as an indicator of upstream conditions:

  Channel morphology, including channel cross sections, channel entrenchment and gradient, channel bed material sampling, large woody debris, (LWD), and pool tail fines. Transect data includes bank stability, shade, width/depth ratio, stream shore water depth, and bank angle. Bankfull will be estimated based on known procedures and field indicators.

  Water chemistry, including water, air temperature and turbidity.

  Habitat, including spatial distribution of fast and slow water via longitudinal gradient (i.e. pool and riffle orientation), pools (size, depth and number), pool tail substrate (% fines), shading, and stream bank stability (i.e. vegetation cover).

  Aquatic fauna, including macroinvertebrates, including analysis of population numbers and species diversity.

  Aerial and ground photographs to provide visual documentation of in-stream and upland changes in vegetation and channel structure, and to support other monitoring results.

There are four main stream systems covered under this monitoring program: Indian and Spanish Creeks (which together make the East Branch North Fork Feather River (EBNFFR)), the North Fork Feather, and the Middle Fork Feather, using two main types of monitoring sites: Monitoring Reaches (MR) and Continuous Recording Stations (CRS).

The most significant findings of the monitoring include:

Geomorphic:

- No sites showed a clear improving or declining trend in geomorphic parameters from 1999 to 2003.

Temperature:

- Indian Cr at Flournoy Bridge and Sulphur Creek showed some increases in temperatures despite higher flows.
- Wolf Cr at Main Street in Greenville generally showed a temperature improvement even with declining flows; some of which could be due to the beaver dam downstream of the site, (which is increasing depth at the sensor) and ever-improving riparian vegetation.
- As far as tributaries into Indian Cr, Lights has a worse temperature condition than Wolf, and both were generally worse than Red Clover @ Drum.
- Spanish Cr was generally in better temperature condition than Indian Cr in 2001 and 2003.
- All but six monitoring sites had temperatures regimes that were not conducive to coldwater fisheries.

Water Quality:

- The Middle Fork Feather River at Beckwourth goes dry in most dry years, and was high in turbidity, total suspended solids, total dissolved solids, alkalinity, EC, and metals.
- Depending on which water quality objective level is used for aluminum, several sites did not meet the objective.
- Lights Creek did not meet Basin Plan objectives for copper.
- Manganese levels were higher than Basin Plan Objectives at numerous sites.
- Rock, Indian above Flournoy, and Spanish above Indian had some of the highest total coliform in both 2001 and 2003.
- Sulphur Creek, Greenhorn Creek, and Lights Creek had some of the highest fecal coliform in both years.
- Turbidity monitoring through American Valley showed a general increase in turbidity from the upstream to the downstream sites.

Aquatic Biota:

- No salmonids were detected at Wolf, Lights, and Last Chance Creeks.
- The general trend of increasing fish biomass from 2001 to 2003 is probably a reflection of the increased flow between those years.
- The general decline in macroinvertebrate indices is probably a reflection of declining flows from 1999 to 2001.
- At Butt Cr, in 2003, suckers appeared.

Flow:

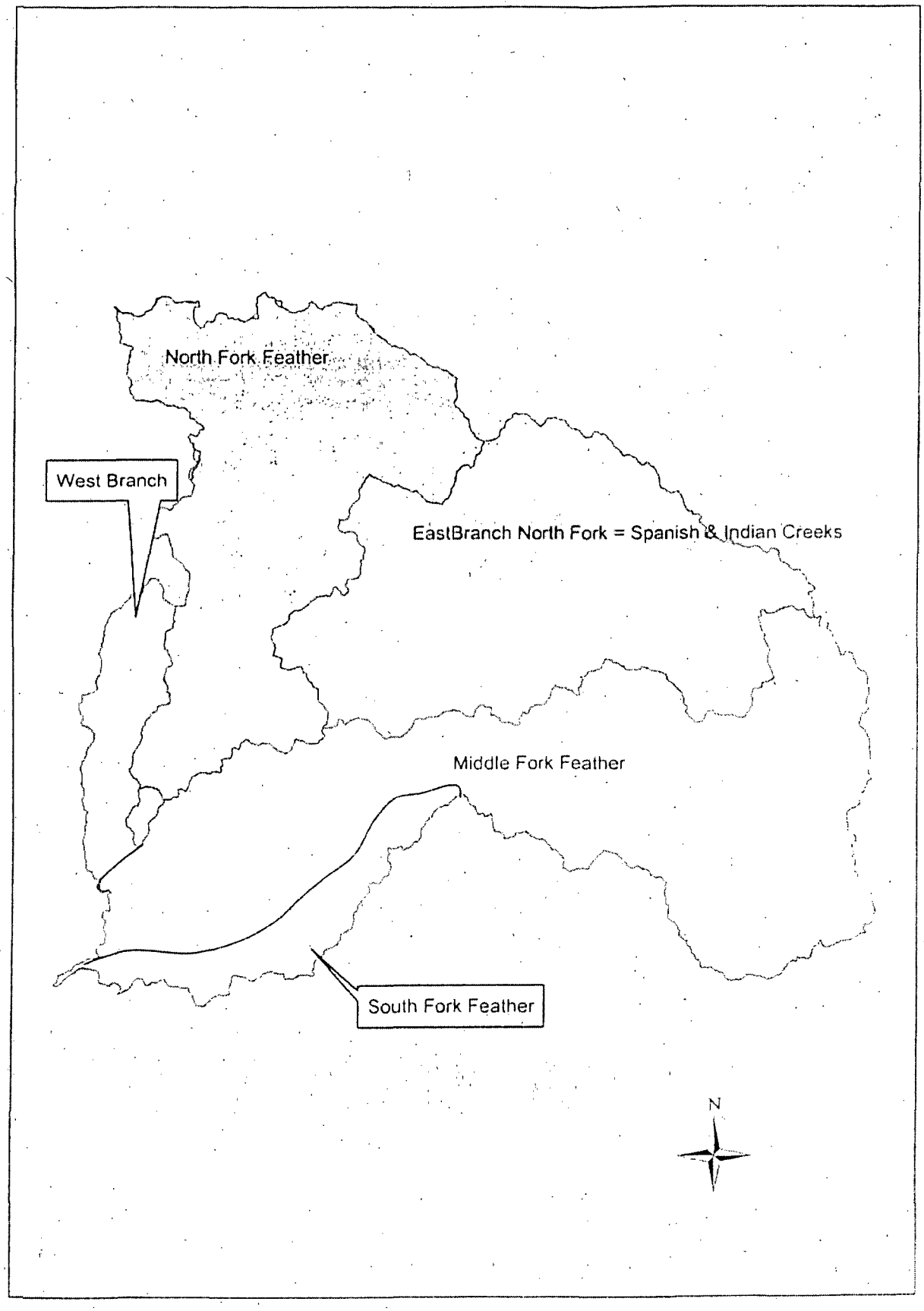
- Despite increasing precipitation from 2001 to 2003, Lights Cr showed a steady decline in the 7-day average minimum flow.

Recommendations for future monitoring include:

- Five year or moderate event monitoring at the alluvial sites.
- Ten year or major event monitoring at the non-alluvial sites.
- Use macroinvertebrate monitoring to trigger further water quality monitoring.
- Continue to maintain and calibrate all Continuous Recording Stations.
- Continue intensive monitoring in watersheds with expected restoration work.

(See Table 14 at the end of the report.)

Figure 1. Major watersheds in the upper Feather.



CHAPTER I

INTRODUCTION

Watershed Overview

The Feather River watershed includes 3,222 square miles of land base that drains west from the Great Basin Escarpment of the northern Sierra Nevada and southern Cascade mountains into the Sacramento River. The Feather River is unique in that the North and Middle Forks bisect the crest of the Sierra. Elevations range from 2,250 to over 10,000 feet. Annual precipitation ranges from less than 12" on the eastside, to more than 70" on the western slopes. Vegetation ranges from sage and eastside pine in the east, to mixed conifer and deciduous forests in the west.

Water produced from the Feather River provides over 4,000 MW of hydroelectric power, and represents a significant component of the State Water Project, annually providing 3.2 million acre-feet for urban, industrial, and agricultural consumers downstream. This monitoring report covers a portion of the upper Feather River watershed: from the North Fork headwater areas down to the confluence of the North Fork Feather with the East Branch North Fork Feather; all of the East Branch North Fork Feather River; and from the Middle Fork headwater areas down to Nelson Point (see Figure 1).

National Forest lands cover a significant part of the upper Feather River watershed. Public, as well as private forestlands, contribute to a timber-based local economy in the upper Feather. Cattle ranching is another important economic activity, and is conducted primarily in active or terraced floodplains on both public and private land. There is also light industry in the area, and roughly 25,000 residents. The upper Feather River watershed also provides habitat to numerous species that are federally Endangered or Threatened, as well as other species of special concern.

The Feather River has been impacted by 140 years of intense human use, including mining, grazing, timber harvesting, railroads and roads. Wildfires have also had an impact on the watershed. Intense use and natural processes have led to a watershed-wide problem of channel entrenchment. Five-hundred square miles of alluvial systems in the headwaters areas are particularly impacted by entrenchment. Functionally, this has led to higher peak winter flows, and lower summer flows, which, in turn affects water quality, aquatic and riparian habitats, productivity of adjacent lands, and downstream beneficial uses.

Monitoring Program Objectives

The long term objectives of the program are to:

- Continuously monitor changes in water temperature over time as a key parameter in assessing changes in watershed condition. A significant reduction in summer water temperatures over time is indicative of improving watershed condition.
- Continuously monitor changes in surface water flow over time as a key parameter in assessing changes in watershed condition. A significant increase in summer base flow and reduced peak flow are indicative of improving watershed condition.
- Continuously monitor changes in turbidity over time as a parameter in assessing watershed condition changes. An overall long-term decrease in turbidity is indicative of improving watershed condition.

- Monitor bedload and suspended sediment at various flows to gain a greater understanding of watershed function.
- Monitor physical and biological changes in reference reaches, as an indicator of upstream conditions:

  Channel morphology, including channel cross sections, channel entrenchment and gradient, channel bed material sampling, large woody debris, (LWD), and pool tail fines. Transect data includes bank stability, shade, width/depth ratio, stream shore water depth, and bank angle. Bankfull will be estimated based on known procedures and field indicators.

  Water chemistry, including water, air temperature and turbidity.

  Habitat, including spatial distribution of fast and slow water via longitudinal gradient (i.e. pool and riffle orientation), pools (size, depth and number), pool tail substrate (% fines), shading, and stream bank stability (i.e. vegetation cover).

  Aquatic fauna, including Macro-invertebrates, including analysis of population numbers and species diversity in comparison to Sierra Nevada reference sites.

  Aerial and ground photographs to provide visual documentation of in-stream and upland changes in vegetation and channel structure, and to support other monitoring results.

The results of this monitoring program are also expected to help the FR-CRM assess the long-term trends in watershed condition in response to natural and management changes, and restoration projects, and provide useful information to help prioritize limited restoration funding to areas of greatest need.

Monitoring Program Description

There are four main stream systems covered under this monitoring program: Indian and Spanish Creeks (which together make the East Branch North Fork Feather River (EBNFFR)), the North Fork Feather, and the Middle Fork Feather. Most of the monitoring effort is concentrated in the Indian Creek watershed because of its highly degraded upper watershed condition, and high potential for restoration with many square miles of alluvial valleys. Site location follows a nested approach.

There are two main types of monitoring sites funded by this grant: Monitoring Reaches (MR) and continuous recording stations (CRS). The following schema and Figure 2 show the locations of these monitoring sites (as well as some others). Photos of each site are in Appendix G. Watershed monitoring in the Feather River watershed, is also conducted by other CRM agencies, which contributes to the CRM's database. Those primary partners are the Plumas and Lassen National Forests, and the Calif. Dept. of Water Resources (DWR).

The monitoring sites are nested within sub-watersheds as follows:

North Fork Feather River watershed

NFFR @ acw East Branch (MR)
- Butt Cr (MR)
- Goodrich Cr (MR) (discontinued)

NFFR @ Domingo Springs (MR)
- East Branch mouth (MR)
  - Spanish mouth (MR)
  - Spanish Cr acw Greenhorn (MR)
    - Greenhorn Cr mouth (MR)
  - Spanish @ Gansner (CRS)
    - Rock Cr mouth (MR)
  - Indian Cr @ Indian Falls
    - Wolf Cr @ Park (MR)
    - Wolf Cr @ Main St Bridge (CRS)

Lights Cr (MR & CRS)
Indian @ T-ville (MR & CRS)
Indian @ Flournoy (MR & CRS)
Indian @ DWR weir (abv Red Clover) (MR & CRS)
Red Clover @ Chase Bridge (MR)
Red Clover Cr @ Drum (MR)
RC @ Notson (CRS)
Last Chance Cr @ Murdock (MR)
LC @ Doyle x-ing (CRS & DWR weather)
McClellan Cr (DWR)
Little Stoney Cr (DWR)
Willow Cr (DWR)
LC @ Alkali Flat low water x-ing (DWR)
Ferris Cr (DWR)
LC @ Bird-Jordan Neck (staff gage & DWR)

Middle Fork Feather River watershed

Nelson Cr (MR)
MFFR @ Sloat (staff gage)
Jamison Cr (MR)
Sulphur Cr @ Clio (MR & CRS)
Boulder Cr (staff gage)
Barry Cr (staff gage)
Sulphur @ Lower Loop Bridge (staff gage)
Sulphur @ Upper Loop Bridge (staff gage)
MFFR @ Beckwourth (MR)

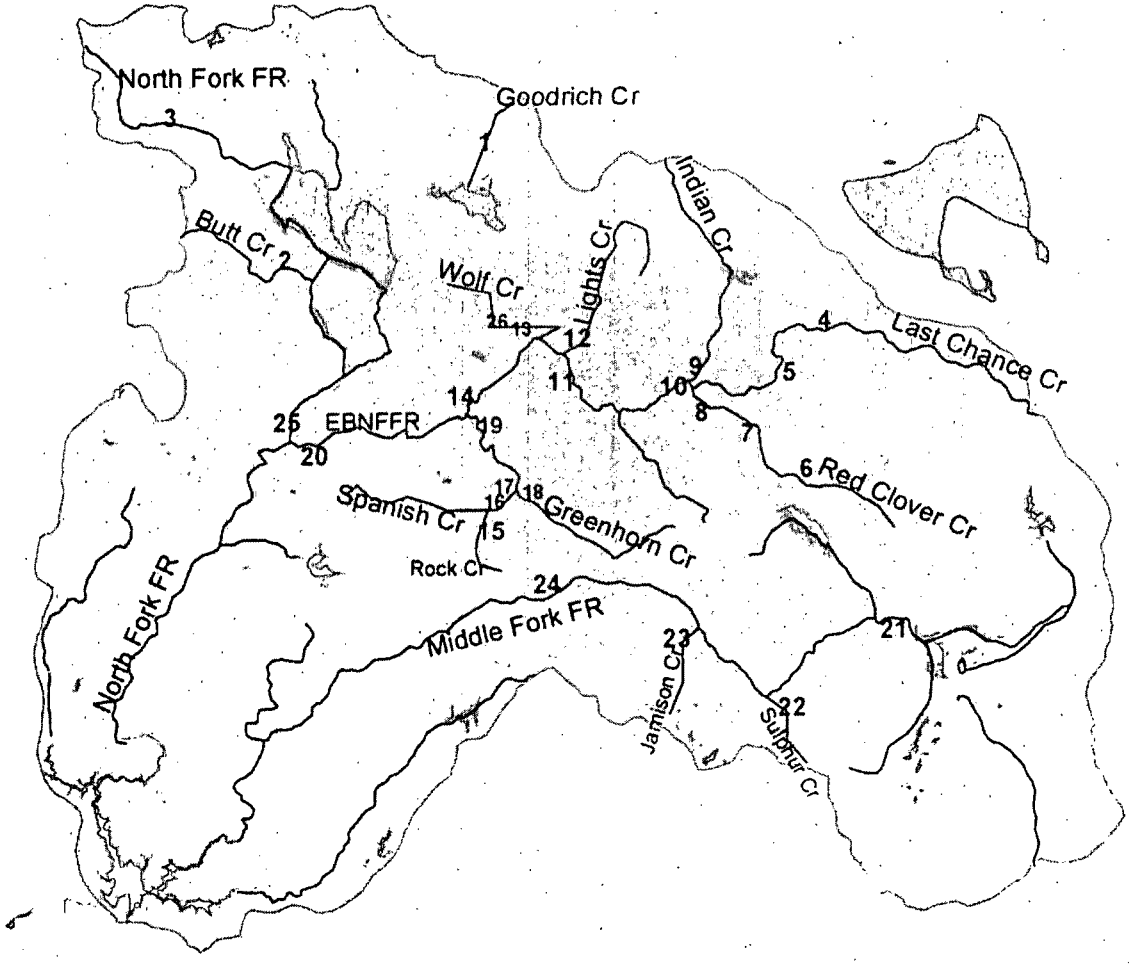
The types of data collected at each location are as follows. Data are presented in the Results and Significant Findings chapter. For a more detailed discussion of the objective and method of each measurement, please refer to the 319(h) final report and QAP in Appendix A.

Monitoring Reaches (MR):
Monitoring Reaches are typically 1000-feet reaches located at the bottom of a subwatershed in a depositional reach. They are based on the USFS Region Five Stream Condition Inventory model (SCI), with some modifications and additions. Measurements that are taken are expected to reflect the condition of the watershed above the Monitoring Reach. Caveats with that assumption are: 1) if there is a lot of disturbance at the monitoring reach location, measurements may be more a reflection of changes in that reach rather than watershed-wide changes; and 2) SCI sites were developed for watersheds of 5,000-10,000 acres, whereas the FR-CRM Monitoring Reach sites encompass larger watershed areas. However, the CRM's philosophy of project design has always been to assess a number of metrics, rather than relying on one single method of analysis. The CRM's monitoring program follows this same philosophy.

The FR-CRM's location of Monitoring Reaches (as well as Continuous Recording Stations) is complementary to the Plumas and Lassen National Forest SCI monitoring locations, and are typically on private lands that are not accessible to the Forest Service. A true assessment of any of these watersheds based on Monitoring Reach data should look at upstream Forest Service SCI sites, as well as the CRM sites. Monitoring Reach surveying has been conducted on a biennial basis, and, with a one-year grant extension, was conducted twice under this grant. It should also be noted that care is taken to conduct the survey at each site within approximately the same two weeks each year. It should also be noted that all of the CRM sites are monitored within the same year. This differs from the Forest Service approach of staggering site monitoring, so that a few are monitored each year, so that each site is monitored once every five years. The CRM approach of all sites within the same year allows for a more valid comparison between sites.

Figure 2.

Upper Feather River Watershed Monitoring Locations



1. Goodrich Cr
2. Butt Cr
3. NFFR abv Lake Almanor
4. Last Chance Cr @ Doyle Crossing (CRS)
5. Last Chance Cr blw Murdock Crossing
6. Red Clover Cr blw Chase Bridge
7. Red Clover Cr at Notson Bridge (CRS)
8. Red Clover Cr blw Drum Bridge
9. Indian Cr abv Red Clover (DWR weir)
10. Indian Cr blw Red Clover (Flournoy)
11. Indian Cr at Taylorsville
12. Lights Cr
13. Wolf Cr near Town Park
14. Indian Cr abv Spanish Cr
15. Rock Cr
16. Spanish Cr at Hwy 70 (Gansner Park)
17. Spanish Cr abv Greenhorn
18. Greenhorn Cr
19. Spanish Cr abv Indian
20. East Branch North Fork Feather abv NFFR
21. Middle Fork Feather @ Beckwourth
22. Sulphur Cr
23. Jamison Cr
24. Middle Fork Feather abv Nelson Cr
25. North Fork Feather
26. Wolf Cr @ Main St Bridge

CHAPTER II

RESULTS AND SIGNIFICANT FINDINGS

The data presented in this report are considered as baseline data to which continued monitoring can be compared in order to determine trends in watershed function and whether or not the CRM's restoration efforts are making significant measurable improvements on a watershed scale. The reader and any users of these data are cautioned against using any one year of data out of context. Table 1 shows the precipitation range over which these data were collected.

Table 1. Precipitation averages

Water Year (10/1-9/30)	Percent of Historic Average annual precip for all Feather River Basin from CDEC	Water Year (7/1-6/30)	Total annual precip (inches) near Indian Cr in Genesee (Wilcox data)
		1996	54.55
		1997	58.9
1998	144%	1998	60.70
1999	99%	1999	47.8
2000	101%	2000	43.65
2001	56%	2001	23.6
2002	77%	2002	33.6
2003	111%	2003	49.6
			46.55 = Avg

Geomorphology and Habitat

Table 2 displays annual summary data for selected geomorphic and habitat parameters at 19 Monitoring Reaches. The full summary data are displayed for each monitoring site in Appendix B. Raw data are available at the Plumas Corporation Office. Plotted permanent cross-sections are displayed in Appendix C. Plotted pebble counts are in Appendix D. Plotted channel profiles are in Appendix E.

Table 2. Summary of Geomorphic and Habitat Parameters at all Monitoring Reaches

Map #	Location	Year	average BF width (ft)	average BF depth (ft)	Average W/D	Average entrench-ment	Average percent fines	Pool:riffle ratio	Pebble count D_{50} (mm)
	Alluvial Channels								
1	Goodrich	1999	24.5	1.2	21	19.7	16%	2	
		2001	20.5	0.9	22	25.7	3	3.5	
2	Butt (CRM)	1999	38.3	1.9	21	1.9	14	1.3	
		2001	47.7	1.9	21	3.1	10	1.4	29.5
		2003	52.8	2.2	24	3.2	12	0.9	27
13	Wolf	1999	25.7	1.5	17	2	64	1.1	
		2001	31.7	1.5	22	2.7	22	1.8	15.5
		2003	24.1	1.4	18	2.3	26	1.7	18.5
12	Lights	1999	48.1	1.8	27	1.2	63	2.1	
		2001	32.8	1.5	24	2	15	7.2	18
		2003	33.4	1.3	27	2.1	38	4.7	16.5
5	Last Chance	1999	37.4	1.4	26	1.9	55	4.2	
		2001	36.6	1.3	30	2	18	7.3	18
		2003	32.7	1.4	24	2.5	25	9	21
10	Indian blw Red Clover	1999	78	1.8	48	1.7	37	1.7	
	(abv Flournoy Bridge)	2001	83.5	2	43	2.7	6	1.8	30
		2003	79.7	2	40	2.2	23	1.6	27
11	Indian blw Tville Bridge	1999	102.4	1.9	53	2.5	35	3.8	
		2001	102.4	1.6	64	4.3	2	3.6	35
		2003	121.4	2.2	55	2.9	12	4.9	36
18	Greenhorn	1999	36.9	1.6	24	1.5	31	1.3	
		2001	38.4	1.4	30	1.4	33	2.3	17.5
		2003	39.2	1.4	30	1.4	6	3.1	22
17	Spanish abv Greenhorn	1999	57.8	1.7	34	1.6	20	1.9	
		2001	70.8	2.2	32	1.5	17	3.6	11
		2003	75.8	2.3	33	1.4	14	3.2	16.5
21	MF Feather @ Beckwourth	1999	34.8	1.3	27	2.6	82	11.5	
		2001	43.5	1.4	31	2.5	35	13.7	5
		2003	49.1	1.6	30	2.3	58.3	8.8	15
22	Sulphur	1999	43.9	1.3	35	2.2	40	1	
		2001	39.2	1.2	34	2.8	10	0.9	30
		2003	42.9	1.3	33	3.1	19	1.1	40
6	Red Clover@Chase Bridge	1995	52	1.4	37	1.9	20	1.1	15
		2003	65	1.7	40	1.6	40	1.8	22
	Depositional/ non-alluvial Channels								
15	Rock	1999	45.8	1.5	31	1.3	24	0.6	
		2001	50.5	2	27	1.6	5	0.6	33
		2003	51.1	2.2	24	1.7	10	0.6	38
19	Spanish abv Indian	1999	75.5	2.2	35	1.5	37	2.7	
		2001	94.2	2.6	38	1.5	10	2.7	29
		2003	88.7	2.9	30	1.5	12	2.6	28.5
	Non-alluvial channels								
3	NF Feather abv Almanor	1999	53.1	2.1	26	2.3	16	0.5	
		2001	55.5	1.9	30	2.2	14	0.9	
		2003	63.7	2.5	27	2	16	0.6	
25	NF Feather abv	1999	63.8	1.2	56	1.3	9	0.2	
	East Branch	2001	63.4	1.3	51	1.2	3	0.8	55
		2003	66.7	1.2	56	1.2	no data	0.1	30
20	East Branch NF Feather	1999	119.4	2.8	46	1.6	10	2.4	
		2001	122.3	2.6	48	1.7	12	1.9	102
		2003	133	3.3	41	1.6	12	2.1	74
8	Red Clover @ Drum	1999	53.2	2.1	26	2.1	9	0.4	
		2001	60.6	2.2	29	2.4	4	0.2	
14	Indian abv Spanish	1999	112.3	2.2	55	1.4	13	2.1	
		2001	109.2	2.4	46	1.5	7	1.1	102
		2003	115	2.2	52	1.5	21	1.7	104
23	Jamison	1999	39.9	1.7	24	1.4	8	0.2	
		2001	40.9	1.7	25	1.2	3	0.2	34
		2003	41.6	1.5	28	1.2	11	0.2	32
24	MF Feather abv Nelson	1999	92.8	2.3	42	1.6	15	1.2	
		2001	83.7	2.1	46	1.5	9	1.1	93
		2003	92.3	2.5	38	1.6	7	1.2	74

Notes:
Avg BF width, BF depth, W:D, and Entrenchment calculated by averaging 3 permanent cross-sections and 5 random transects.
More detailed description of parameters in Appendices A & B.

While the three years of data presented in Table 2 are considered as baseline data, an attempt was made to see if there was significant change at any location. Change was arbitrarily considered to be a 20% difference from one year to the next, or a steady trend in one direction for all three years.

No sites showed a clear improving or declining trend from 1999 to 2003. This is not surprising, considering the lack of major bedload moving events during this period. However, there were more changes in parameters at the alluvial sites than the non-alluvial sites. This is also to be expected since SCI is recommended for alluvial sites.

Width to depth ratio remained the same at all but six sites between the three years. The sites that exhibited change did not show a clear trend, except Greenhorn Cr, which showed a nearly steady increase in width to depth ratio (a declining trend).

Entrenchment decreased (shown by an *increase* in the entrenchment ratio number) at every site where there was a change between 1999 and 2001. Entrenchment increased only at two sites (Indian blw Red Clover and blw Tville Bridge) between 2001 and 2003.

Percent fines decreased at every site where there was a change between 1999 and 2001, and mostly increased from 2001 to 2003.

Pool to riffle ratios showed changes at most sites. Most changes were ambiguous, except for a steady increase in pools at Last Chance and Greenhorn Creeks. An important point to note, however, is that pools were defined differently by the survey crew in 1999 than the other years. Erroneously, 1999 was based more on the observer's definition of what a pool looks like. Following the protocol in 2001 and 2003, pools were defined as a section of channel where the max depth is twice as deep as the pooltail crest depth. The change in definition accounts for the increase in pool numbers at some sites.

Pebble counts between 2001 and 2003 were analyzed in greater detail than the other parameters in Table 2. A full discussion of that analysis, including particle size distribution graphs, is presented in Appendix D. To summarize the discussion, most reaches showed an improving trend, as would be expected with the increased flow, and three showed a declining trend: Greenhorn, NFFR abv Almanor, and NFFR abv EBNFFR. Full bedload pavement and subpavement samples were collected in 1999. Those samples are currently being analyzed by DWR.

Permanent Cross-sections

Six of the permanent cross-sections were analyzed in greater detail, and there were no discernable changes in the six analyzed cross-sections. That full analysis is in Appendix C. The full analysis included a calculation of cross-sectional area, which is not included in Table 2. Some of the variability found in the data is presumed to be due more to subjective field bankfull determinations than actual channel changes.

Channel Profile

Appendix E displays three years of channel profiles for each Monitoring Reach. As expected, with relatively normal to low flows in this reporting period, there was not significant change in channel profile at any site. Max pool depths are included on some of the graphs. Although a change in pool depth (as so many indicators of change) would have to be looked at in context of other parameters, pool infilling could indicate a new upstream source of sediment. Pool deepening could indicate a degradation cycle. Again, it should be remembered that pools were defined differently by the survey crew in 1999 than the other years (which accounts for some of the increase in pool numbers at some sites). Also, some water surface elevation points were obviously in error

(showing water flowing uphill). Without being able to go back and re-survey at this juncture, points that appeared erroneous were simply edited out. All of the raw survey data are available at the Plumas Corporation office.

Water Quality

Tables 3a-8 display temperature and other water quality data. Table 9 displays water quality objectives and criteria for comparison. A discussion of each table follows.

Water Temperature

Table 3a and 3b display summer water temperature data, collected at the Monitoring Reaches (every other year with Hobotemp dataloggers) and Continuous Recording Stations (continuously with Campbell CR10X data loggers). Table 3a is listed by station. Table 3b displays the same data, listed by year.

Definitions of headings in Tables 3a and 3b:
Absolute daily MAX water temp = The highest 1 hour-long temperature that was recorded during the sampling period
MAX 7-day avg of daily avg = A running 7-day average was calculated throughout the sampling period. This column displays the highest of those seven-day averages.
 # 7-day averages >66F = This column displays the number of running seven day averages that were greater than 66 degrees Farenheit. The importance of this parameter is biological, in that if the water is an average temperature greater than 66F for seven days, it is probably not conducive to a coldwater fishery.
 # days with max >75F = This column displays the number of days that had an absolute 1-hour long temperature greater than 75F. The importance of this parameter is also biological, in that if the water is even has a short-term maximum greater than 75 degrees Farenheit, then it is probably not conducive to a coldwater fishery.
Max summer diurnal fluctuation = This column shows the greatest fluctuation in temperature in a 24-hour period during the sampling period.
Data days – This column shows the dates of the sampling period, and is important to note in comparisons between years. Unfortunately, some stations in 2003 have incomplete data.

Table 3a. Summer water temperatures for all sites (CRS & MR) Listed by Site

Map #	station	year	Absolute Max daily water temp	Max 7-day avg of daily avg t	# 7-day averages >66F	# days with max >75F	Max summer diurnal fluctuation F	data days
3	NF Feather abv Almanor	2001	64	55	0	0	12	6/14-9/10
		2003*	59*	53*	0*	0*	14*	6/15/-8/15
1	Goodrich	2001	73	69	25	0	12	6/14-9/10
2	Butt (CRM)	2001	71	61	0	0	19	6/14-9/10
		2003	71	61	0	0	17	6/15-9/7
25	F Feather abv East Bran	2003	69	58	0	0	8	6/10-9/6
4	Last Chance @Doyle Crossing	2000	85	73	57	71	58	continuous
		2001	88	73	67	102	63	continuous
		2002	89	73	54	88	60	continuous
		2003	90	74	56	85	61	continuous
5	Last Chance@SCI	2001	82	72	64	59	22	6/8-9/2
		2003*	80*	72*	28*	26*	20*	6/14-7/31
7	Red Clover @ Notson	2000	79	67	6	18	53	continuous
		2001	79	68	22	40	55	continuous
		2002	80	70	46	47	54	continuous
		2003	81	71	23	28	53	continuous
8	Red Clover @ Drum	2001	87	63	0	0	33	6/8-9/4
		2003	70	66	0	0	10	6/13-8/14
9	Indian abv Red Clover (DWR weir)	2000	68	63	0	0	41	continuous
		2001	74	67	5	0	45	continuous
		2002	69	64	0	0	40	continuous
		2003	71	66	0	0	41	continuous
10	Indian blw Red Clover (@ Flournoy)	2000	73	66	0	0	45	continuous
		2001	79	69	41	27	50	continuous
		2002	69	64	0	0	40	continuous
		2003	78	69	13	3	45	continuous
12	Lights	2000	84	75	79	62	51	continuous
		2001	87	75	110	103	57	continuous
		2002	88	78	97	96	56	continuous
		2003	88	80	80	65	50	continuous
13	Wolf @SCI	2001	79	70	65	28	19	6/4-9/4
26	Wolf @ Main	2000	84	70	43	69	59	continuous
		2001	78	69	53	19	47	continuous
		2002	70	66	0	0	40	continuous
		2003	72	69	13	0	38	continuous
14	Indian abv Spanish	2001	80	73	78	40	13	6/9-9/5
		2003*	80*	74*	22*	13*	10*	/10-6/29; 7/17-9/6
15	Rock	2001	77	69	30	6	15	6/9-9/5
		2003	75	68	14	1	15	6/7-9/3
18	Greenhorn mouth	2001	77	72	61	2	10	6/12-9/6
		2003	76	71	20	4	17	6/16-9/6
16	Spanish @ Gansner	2003	80	71	20	14	49	continuous
17	Spanish abv Greenhorn	2001	77	68	12	12	19	6/12-9/6
		2003*	70*	62*	0*	0*	16*	6/10-7/15
19	Spanish abv Indian	2001	77	73	78	19	11	6/9-9/3
		2003*	78*	71*	16*	5*	10*	/10-6/30; 7/17-9/6
20	East Branch NF Feather	2001	78	74	83	24	8	6/10-9/6
		2003*	81*	74*	27*	13*	11*	6/10-7/31
21	NF Feather @ Beckwourt	2003*	81*	73*	51*	32*	22*	)/7-6/30; 7/17-9/3
22	Sulphur	2001	80	67	18	32	26	6/7-9/3
		2003	83	69	16	38	28	6/7-9/3
23	Jamison	2001	72	63	0	0	17	6/7-9/3
		2003	71	63	0	0	12	6/7-9/3
24	MF Feather abv Nelson	2001	77	73	78	10	9	6/7-9/3
		2003*	66*	60*	0*	0*	8*	6/7-6/25

*Note data days; comparisons between years would not be valid due to incomplete data.

Table 3b. Summer water temperatures for all sites (CRS & MR) Listed by Year

Fig2 Map #	station	year	Absolute MAX daily Max water temp	MAX 7-da avg of daily avg	# 7-day averages >66F	# days with max greater than 75F	max summer (Jul-Sep) diurnal fluctuation	data days
4	Last Chance @Doyle	2000	85	73	57	71	58	continuous
9	Indian abv Red Clover	2000	68	63	0	0	41	continuous
10	Indian @Flournoy	2000	73	66	0	0	45	continuous
7	Red Clover @ Notsor	2000	79	67	6	18	53	continuous
12	Lights	2000	84	75	79	62	51	continuous
26	Wolf @ Main	2000	84	70	43	69	59	continuous
3	F Feather abv Alman	2001	64	55	0	0	12	6/14-9/10
2	Butt (CRM)	2001	71	61	0	0	19	6/14-9/10
1	Goodrich	2001	73	69	25	0	12	6/14-9/10
4	Last Chance @Doyle	2001	88	73	67	102	63	continuous
5	Last Chance@SCI	2001	82	72	64	59	22	6/8-9/2
7	Red Clover @ Notsor	2001	79	68	22	40	55	continuous
8	Red Clover @ Drum	2001	87	63	0	0	33	6/8-9/4
9	Indian abv Red Clover	2001	74	67	5	0	45	continuous
10	Indian @Flournoy	2001	79	69	41	27	50	continuous
12	Lights	2001	87	75	110	103	57	continuous
26	Wolf @ Main	2001	78	69	53	19	47	continuous
13	Wolf @Mon Reach	2001	79	70	65	28	19	6/4-9/4
14	Indian abv Spanish	2001	80	73	78	40	13	6/9-9/5
15	Rock	2001	77	69	30	6	15	6/9-9/5
18	Greenhorn mouth	2001	77	72	61	2	10	6/12-9/6
17	panish abv Greenhor	2001	77	68	12	12	19	6/12-9/6
19	Spanish abv Indian	2001	77	73	78	19	11	6/9-9/3
20	ast Branch NF Feath	2001	78	74	83	24	8	6/10-9/6
22	Sulphur	2001	80	67	18	32	26	6/7-9/3
23	Jamison	2001	72	63	0	0	17	6/7-9/3
24	MF Feather abv Nelso	2001	77	73	78	10	9	6/7-9/3
4	Last Chance @Doyle	2002	89	73	54	88	60	continuous
7	Red Clover @ Notsor	2002	80	70	46	47	54	continuous
9	Indian abv Red Clover	2002	69	64	0	0	40	continuous
10	Indian @Flournoy	2002	69	64	0	0	40	continuous
12	Lights	2002	88	78	97	96	56	continuous
26	Wolf @ Main	2002	70	66	0	0	40	continuous
3	F Feather abv Alman	2003*	59*	53*	0*	0*	14*	6/15/-8/15
2	Butt (CRM)	2003	71	61	0	0	17	6/15-9/7
25	Feather abv East Bra	2003	69	58	0	0	8	6/10-9/6
4	Last Chance @Doyle	2003	90	74	56	85	61	continuous
5	Last Chance@SCI	2003*	80*	72*	28*	26*	20*	6/14-7/31
7	Red Clover @ Notsor	2003	81	71	23	28	53	continuous
8	Red Clover @ Drum	2003	70	66	0	0	10	6/13-8/14
9	Indian abv Red Clover	2003	71	66	0	0	41	continuous
10	Indian @Flournoy	2003	78	69	13	3	45	continuous
12	Lights	2003	88	80	80	65	50	continuous
26	Wolf @ Main	2003	72	69	13	0	38	continuous
14	Indian abv Spanish	2003*	80*	74*	22*	13*	10*	10-6/29; 7/17-9/6
15	Rock	2003	75	68	14	1	15	6/7-9/3
18	Greenhorn mouth	2003	76	71	20	4	17	6/16-9/6
16	Spanish @ Gansner	2003	80	71	20	14	49	continuous
17	panish abv Greenhor	2003*	70*	62*	0*	0*	16*	6/10-7/15
19	Spanish abv Indian	2003*	78*	71*	16*	5*	10*	10-6/30; 7/17-9/6
20	ast Branch NF Feath	2003*	81*	74*	27*	13*	11*	6/10-7/31
21	Feather @ Beckwou	2003*	81*	73*	51*	32*	22*	/7-6/30; 7/17-9/3
22	Sulphur	2003	83	69	16	38	28	6/7-9/3
23	Jamison	2003	71	63	0	0	12	6/7-9/3
24	MF Feather abv Nelso	2003*	66*	60*	0*	0*	8*	6/7-6/25

*Note data days. Comparisons between years would not be valid due to incomplete data.

When analyzing water temperature data, it is important to keep in mind the precipitation (Table 1), streamflow (Tables 13a&b) and air temperature conditions for the year. (Between the summers of 2001, 2002 and 2003, air temperatures were highest in 2001.) Based on these conditions, between 2001 and 2003, one would expect to see improvement trends in water temperatures. Most of the sample locations display this trend, or an ambiguous combination of trends in the different parameters. In analyzing the data, improvements or degradation of temperature conditions that counter the precip, flow, and air temp, are most noteworthy:

- Indian Cr at Flournoy Bridge primarily followed the flow trends, except from 2002 to 2003, which showed an increase in temperatures despite the higher flows. (However, this station needs to be checked for accuracy.)
- Sulphur Cr (from 2001 to 2003) showed an increase in temperatures despite higher flows.
- Wolf Cr at Main Street in Greenville generally showed a temperature improvement even with declining flows; some of which could be due to the beaver dam downstream of the site, (which is increasing depth at the sensor) and ever-improving riparian vegetation.

Red Clover at Notson showed a steady increase in max daily and 7-day avg temperatures from 2000-03, with ambiguous changes in the other parameters. Last Chance at Doyle showed a steady increase in daily max temps, but ambiguous changes in the other parameters. The ambiguous results in many parameters made it difficult to rank the different stations by temperature impairment.

Another interesting way to look at the temperature data is to follow temperatures down a watercourse in any particular year. The same data from Table 3a is displayed in Table 3b by year, again roughly organized by watershed. The most noteworthy trends are:

- As far as tributaries into Indian Cr, Lights has a worse temperature condition than Wolf, and both were generally worse than Red Clover @ Drum.
- Spanish Cr was generally in better temperature condition than Indian Cr in 2001 and 2003.
- Because of many differing beneficial uses, no hard and fast water temperature objectives have been set for the Feather River. However, if one were to set objectives of a seven-day average no greater than 66F, and an absolute max no greater than 75F, (both of which are conducive to trout production) then most monitoring sites do not meet these objectives. The six sites that do, or nearly, meet these objectives are: NFFR abv Lake Almanor, Butt Cr, NFFR abv the East Branch, Red Clover @ Drum, Indian abv Red Clover, and Jamison Creek. Wolf at Main and Indian at Flournoy sometimes do, and sometimes do not, meet them.

Other trends include:

- Wolf Creek showed a slight warming of water from the Main Street Bridge site to the Monitoring Reach in 2001, a distance of approximately one mile, most of which was a CRM project area in 1989. The restoration work (as well as a drought) has helped vegetation become established in this stretch of Wolf Cr.
- Indian Cr above Red Clover (@ DWR weir) to Flournoy Bridge (less than one mile), increased in temperature every year except 2002, when both sites were approx. equal. Although, surprisingly, temperatures in Red Clover at Drum in 2001 and 2003 do not appear to be a significant source of this warming.
- As expected in this narrow canyon reach, Red Clover Cr cooled between Notson Br and Drum Br in 2001 and 2003 (except for daily max in 2001).
- Last Chance Creek cooled from Doyle Crossing to Murdock crossing in 2001, which was the only year of valid data.
- Spanish Cr improved in temperature conditions from Gansner Park to the mouth in 2003, but, surprisingly, generally warmed between Spanish abv Greenhorn and the mouth of Spanish in 2001.

Unfortunately, due to lost data, etc., a similar comparison is not possible for the confluence of the East Branch and the North Fork.

Due to bridge modifications, and subsequent installation changes, Indian Cr at Taylorsville has been out of the water in the summer months. We plan to modify this station as soon as funds are available. Also, much of the 2003 temperature data is incomplete due to prolonged spring run-off, and a rapid drop in stage in mid-summer, when some Hobotemps were re-positioned; unfortunately, many were not.

Table 4. Upper Feather River Water Quality Data

Fig2 Map #	Station Name	Date	Time pst	Temp C	Temp. F	D.O. ppm	pH field	EC(field) (umhos/cm)	EC (lab) (umhos/cm)	Alkalinity RBLab (mg/L)	Turbidity RBLab NTU	TSS mg/L	TDS mg/L
3	NF Feather ab Lake Almanor	6/19/01	1330	18.5	65.3	8.8	7.8	70	73	38	0.4	<1.0	72
	NF Feather ab Lake Almanor	8/6/01	1450	20	68	8	7.4	78	83	46	3.8		
	NF Feather ab Lake Almanor	9/10/03	640	9.2	48.6	9.8	7.5	72	74		0.7		
1	Goodrich C	6/21/01	1225	26.1	78.98	7.6	8.3	119	121	67	3.5	4	81
2	Butt C	6/19/01	1420	20.1	68.18	8.4	8.1	127	129	70	0.5	<1.0	90
	Butt C	8/9/01	1100	12.5	54.5	8.1	8.3	160	112	68	0.6		
	Butt C	9/10/03	740	9.7	49.5	9.1	7.3	125	125		1.4		
25	NF Feather R ab EBNFFR	6/20/01	1420	20.6	69.08	8.4	8.3	133	136	69	0.9	2	79
	NF Feather R ab EBNFFR	9/11/03	645	16.0	60.8	8.7	7.9	136	137		0.5		
5	Last Chance @ Murdock	6/21/01	720	16.3	61.34	5.8	8	227	170	88	5.4	14	100
	Last Chance @ Murdock	8/8/01	1100	25	77	8.7	8.3	154	138	81	13		
	Last Chance @ Murdock	9/10/03	1050	14.1	57.4	8.1	8.1	163	160		1.2		
8	Red Clover abv Indian	6/21/01	825	15	59	8.9	8.2	163	185	94	0.5	2	117
	Red Clover abv Indian	8/13/01	1200	21.4	70.52	8.1	8.8	171	150	88	1.2		
	Red Clover abv Indian	9/10/03	1200	12.1	53.8	9.3	8.3	178	177		2.2		
10	Indian C @ Flournoy Br	6/21/01	900	18.1	64.58	8.5	7.4	163	165	82	1.3	1	102
	Indian C @ Flournoy Br	9/24/01	1100	17	62.6	9.5	7.8	174	173	87	1.1		
	Indian C @ Flournoy Br	9/10/03	1230	13.5	56.3	9.6	7.9	128	128		2.2		
11	Indian C @ Taylorsville	6/21/01	940	21.1	69.98	7.9	7.4	150	152	73	1	4	92
	Indian C @ Taylorsville	8/14/01	800	22.4	72.32	7.3	7.3	150	139	75	0.8		
	Indian C @ Taylorsville	9/10/03	1300	17.1	62.8	8.7	7.3	143	140		0.9		
12	Lights	6/19/01	1550	26.9	80.42	7.7	8	161	163	82	4	13	106
	Lights	8/9/01	1500	32.9	91.22	8.5	8.8	255	229	126	24		
	Lights	9/10/03	920	16.1	61.0	7.9	7.9	158	156		2.1		
13	Wolf C MR	6/19/01	1500	25.9	78.62	7.9	8.1	158	161	76	1.2	1	82
	Wolf C MR	8/8/01	1600	27.7	81.86	7.8	8.1	162	145	84	1.9		
	Wolf C MR	9/10/03	835	14.3	57.7	8.1	7.9	145	144		1.5		
14	Indian C ab Spanish C	6/21/01	1010	22	71.6	8.3	8	239	241	108	1.9	3	140
	Indian C AB Spanish C	9/10/03	1330	16.5	61.7	9.1	8.1	215	212		2.1		
15	Rock C	6/20/01	1115	18.1	64.58	9.3	8.3	116	119	61	0.3	<1.0	75
	Rock C	8/10/01	730	17.5	63.5	8.7	8	150	132	70	0.7		
	Rock C	9/9/03	1315	15.8	60.4	10.1	8.3	118	117		0.8		
18	Greenhorn C A Mouth	6/20/01	1200	21	69.8	8.4	7.6	188	189	90	1.5	4	123
	Greenhorn C A Mouth	8/7/01	1400	21.8	71.24	7.3	7.5	190	168	98	1.7		
	Greenhorn C A Mouth	9/9/03	1210	18.4	65.1	8.3	7.3	181	178	in	1.4		
17	Spanish C ab Greenhorn C	6/20/01	1220	20.4	68.72	8.7	7.3	149	150	68	1.4	3	98
	Spanish C ab Greenhorn C	8/8/01	700	16	60.8	6.3	6.8	156	141	77	2		
	Spanish C AB Greenhorn C	9/9/03	1245	17.3	63.1	8.2	7.3	154	143		2		
19	Spanish C ab Indian C	6/20/01	1330	23.5	74.3	8.7	8.3	171	172	84	0.9	<1.0	108
	Spanish C AB Indian C	9/11/03	800	14.8	58.6	8.7	8.1	176	175		0.9		
20	EBNF Feather ab NFFR	6/20/01	1450	23.7	74.66	8.4	8.3	237	238	107	0.8	2	134
	EBNF Feather ab NFFR	9/11/03	715	16.3	61.3	9.2	8.1	242	238		0.5		
21	MF Feather R @ Beckwourth	6/20/01	700	13.1	55.58	5.5	8	271	271	126	26	22	192
22	Sulphur C A Clio	6/20/01	740	12.5	54.5	9	7.8	179	182	91	2	5	118
	Sulphur C A Clio	8/7/01	800	14.7	58.46	8.5	7.6	201	178	100	2.5		
	Sulphur C A Clio	9/9/03	845	12.0	53.6	10.4	8.1	175	172	no	1.1		
23	Jamison C nr Two Rivers	6/20/01	810	12.3	54.14	9.2	7.8	112	115	58	0.3	<1.0	66
	Jamison C nr Two Rivers	8/7/01	1000	19.8	67.64	7.6	7.9	128	115	71	0.2		
	Jamison C nr Two Rivers	9/9/03	940	14.2	57.6	8.8	8.1	130	130		0.5		
24	MF Feather R ab Nelson C	6/20/01	910	20.4	68.72	8	8.1	140	142	70	1.1	<1.0	97
	MF Feather R ab Nelson C	9/9/03	1120	16.8	62.2	8.4	8.1	152	151		1.3		

Contextual Water Quality Parameters

Table 4 displays water quality data collected at each site twice in 2001and once in 2003. Between years, the timing of the sampling is a factor to consider. The data displayed in Table 4 is primarily contextual information in which to put the other water quality parameters. However turbidity, total suspended solids (TSS), and total dissolved solids (TDS) can tell us something between the sites, especially knowing that the samples were collected all within a relatively short time frame (TDS and TSS were only collected in June 2001). The Middle Fork Feather River at Beckwourth was the highest of all three of these parameters (as well as alkalinity and EC). This site has also gone dry later in the year for both sampling years, as it does in most dry years. Temperature, pH and DO cannot be compared due to the diurnal fluctuation of these parameters, and the different times of day at which they were collected. However, pH was within expected levels at all sites, while DO was low only at the Middle Fork at Beckwourth site.

Nutrients

Table 5 displays nutrient data. A comparison between years is mostly invalid due to several factors: 1) the different time of year the samples were collected; 2) the detection levels were different between years (detection levels were not reported with the 2001 data); and 3) nitrates and nitrites were analyzed together in 2001, and separately in 2003. One reason for the detection level difference was budgetary. A DWR contract lab analyzed the samples in 2001, at no cost to the SWAMP contract. However, the SWAMP contract covered the cost of analysis in 2003.

One would expect the 2003 nutrient levels to be higher since the samples were collected in September. However, 2003 was also a higher flow year, and the detection levels were higher. Nitrates and nitrites were not detected at any site in 2003. Total ammonia was not detected at any site in 2003, and only at Lights, Sulphur and MFFR at Beckwourth in 2001. The detection levels were the same for this analysis, showing a decrease in NH_3 from 2001 to 2003 at Lights and Sulphur, probably due to the higher flow year. Beckwourth was not sampled in 2003 due to a lack of continuous flow. Dissolved orthophosphate and total phosphorus decreased or remained the same, or was undetected at every site, except two. Dissolved orthophosphate increased on Indian Cr above Flournoy Bridge, near the mouth above Spanish Cr, and on Last Chance and Red Clover Creeks, and total phosphorus increased on Indian above Spanish. The increases were slight, and due to the timing, not comparable, but these trends are interesting to note, and may warrant continued monitoring.

Table 5. Upper Feather River Nutrients

Fig2 Map#	Station Name	Date	Time (PST)	Diss. NO2+NO3 (mg/L)	Total NH3 (mg/L)	Diss. Ortho.-PO4 (mg/L)	Total P (mg/L)
3	NF Feather ab Lake Almano	6/19/01	1330	<0.05	ND	0.03	0.05
	NF Feather ab Lake Almano	9/10/03	640	ND	ND	0.03	0.04
1	Goodrich C	6/21/01	1225	<0.05	ND	0.01	0.03
2	Butt C	6/19/01	1420	0.05	ND	0.01	0.04
	Butt C	9/10/03	740	ND	ND	<.01	<.02
25	NF Feather R ab EBNFFR	6/20/01	1420	0.05	ND	<0.01	0.06
	NF Feather R ab EBNFFR	9/11/03	645	ND	ND	<.01	<.02
5	Last Chance C @ Murdock	6/21/01	720	<0.05	ND	<0.01	0.04
	Last Chance C @ Murdock	9/10/03	1050	ND	ND	0.01	<.02
8	Red Clover C ab Indian	6/21/01	825	<0.05	ND	<0.01	0.03
	Red Clover C ab Indian	9/10/03	1200	ND	ND	0.01	0.03
10	Indian C AB Flournoy Br	6/21/01	900	<0.05	ND	0.01	0.04
	Indian C AB Flournoy Br	9/10/03	1230	ND	ND	0.02	0.03
11	Indian C @ Taylorsville	6/21/01	940	<0.05	ND	<0.01	0.01
	Indian C A Taylorsville	9/10/03	1300	ND	ND	<.01	<.02
12	Lights C A Mouth	6/19/01	1550	<0.05	0.1	0.03	0.08
	Lights C A Mouth	9/10/03	920	ND	ND	0.01	0.04
13	Wolf C MR	6/19/01	1500	<0.05	ND	0.02	0.05
	Wolf C MR	9/10/03	835	ND	ND	<.01	<.02
14	Indian C ab Spanish C	6/21/01	1010	<0.05	ND	0.02	0.02
	Indian C AB Spanish C	9/10/03	1330	ND	ND	0.03	0.04
15	Rock C NR Mouth	6/20/01	1115	0.05	ND	<0.01	<0.01
	Rock C NR Mouth	9/9/03	1315	ND	ND	<.01	<.02
18	Greenhorn C A Mouth	6/20/01	1200	<0.05	ND	<0.01	<0.01
	Greenhorn C A Mouth	9/9/03	1210	ND	ND	<.01	<.02
17	Spanish C ab Greenhorn C	6/20/01	1220	0.17	ND	0.02	0.04
	Spanish C AB Greenhorn C	9/9/03	1245	ND	ND	0.01	0.03
19	Spanish C ab Indian C	6/20/01	1330	0.05	ND	<0.01	<0.01
	Spanish C AB Indian C	9/11/03	800	ND	ND	<.01	<.02
20	EBNF Feather ab NFFR	6/20/01	1450	<0.05	ND	0.01	<0.01
	EBNF Feather ab NFFR	9/11/03	715	ND	ND	<.01	<.02
21	MF Feather R @ Beckwourth	6/20/01	700	0.11	0.2	0.01	0.81
22	Sulphur C A Clio	6/20/01	740	0.28	0.2	0.09	0.15
	Sulphur C A Clio	9/9/03	845	ND	ND	0.04	0.06
23	Jamison C nr Two Rivers	6/20/01	810	<0.05	ND	0.01	<0.01
	Jamison C nr Two Rivers	9/9/03	940	ND	ND	<.01	<.02
24	MF Feather R ab Nelson C	6/20/01	910	<0.05	ND	<0.01	0.13
	MF Feather R ab Nelson C	9/9/03	1120	ND	ND	<.01	<.02
	2003 detection limit			0.25 *(each)*	0.1	0.01	0.02

2003 Nitrate and nitrite measured separately
by Alpha Analytical, Inc (Sparks, NV)

ND = Not detected

If they had been analyzed together, perhaps they would've been able to detect?
So, dissolved NO2+NO3 isn't comparable between 2001 and 2003
Phosphate tests were analyzed by Sierra Environmental Monitoring (Reno, NV)

Metals

Table 6 displays total metal (not dissolved) analysis results. Here again, detection limits between 2001 and 2003 differed greatly.

- The Middle Fork at Beckwourth had high levels of many metals in 2001, but there was not enough water to sample that site in 2003.
- Aluminum was highest on the Middle Fork at Beckwourth, Last Chance Cr and Lights Cr in 2001. It was only detectable at Lights Cr in 2003, at a detection limit of 250 ppm. 15 of 20 sites were less than 250 ppm in 2001. Depending on which water quality objective level is used for aluminum, several sites did not meet the objective.
- Cadmium, copper, iron, lead, silver and zinc were highest in the Middle Fork at Beckwourth and Lights Cr in 2001. All were within water quality objectives, except copper at Lights Cr, and numerous sites for iron, depending on which objective level is used. None of those metals were detected in 2003, except for copper at Lights Cr and iron at numerous sites.
- Manganese levels were higher than Basin Plan Objectives at Lights, Sulphur, Last Chance, Indian above Spanish, and Middle Fork at Beckwourth in 2001, and, in 2003, at Lights, Sulphur, Indian above Spanish, Greenhorn, and Spanish above Greenhorn.
- Mercury was undetected in 2003 (at a detection limit of 200 ppb), and was highest at Wolf and Jamison Creeks in 2001, but within all water quality objectives.
- Arsenic was highest in 2001 and 2003 at the mouth of the East Branch, but within Basin Plan Objectives.
- Nickel was highest at three of the four sites in the Spanish Cr watershed in 2001. Selenium was highest at the East Branch North Fork and Sulphur Cr in 2001. At all sites, nickel and selenium were undetected in 2003, and were within water quality objectives in 2001.

Bacteria

Table 7 displays coliform analysis results. As described in the table, results between years at each site are not comparable because of the different methods used.

For total coliform, the eight highest sites in 2001 (in order) were Rock, Butt, Greenhorn, Indian above Flournoy, North Fork above Almanor, Spanish above Indian, and Indian above Taylorsville. In 2003, the eight highest sites were (order cannot be discerned from data) Rock, Indian above Flournoy, Spanish above Indian, Spanish above Greenhorn, Sulphur, Middle Fork at Nelson Pt, Wolf, and Lights. Only three of those sites (Rock, Indian above Flournoy, and Spanish above Indian) are common to both years.

For fecal coliform, Middle Fork at Beckwourth, Goodrich, Sulphur, Greenhorn and Lights were the highest (in that order) in 2001. In 2003, Wolf, Lights, Sulphur, Greenhorn, and Spanish above Greenhorn were the highest. (Middle Fork at Beckwourth and Goodrich were not sampled in 2003). Sulphur, Greenhorn and Lights Creeks were high in both years. The high total coliform sites do not correspond to the high fecal coliform sites.

Minerals

Table 8 displays minerals analysis from 2001 samples. Minerals were not analyzed in 2003.

Table 6. Upper Feather River Total Metals

Fig 2 Map#	Station Name	Date	Time (PST)	Al µg/L	As µg/L	Cd µg/L	Cr (tot) µg/L	Cu µg/L	Fe µg/L	Pb µg/L	Mn µg/L	Hg ng/L	Ni µg/L	Se µg/L	Ag µg/L	Zn µg/L
3	NF Feather R ab Lake Almanor	6/19/01	1330	58.7	<0.003	<0.002	0.05	0.19	45.6	<0.019	2	0.67	0.02	<0.08	<0.003	0.14
1	Goodrich C	6/21/01	1225	296	0.191	0.006	0.99	0.77	323	0.062	15.7	0.68	0.12	0.15	<0.003	0.82
2	Butt C	6/19/01	1420	116	0.293	<0.002	0.34	0.39	113	<0.019	7.41	0.96	0.05	0.09	<0.003	0.3
25	NF Feather R ab EBNFFR	6/20/01	1420	53.4	0.885	0.006	0.16	0.37	93.6	0.029	38.6	0.57	0.15	0.14	<0.003	0.33
5	Last Chance @ Murdock	6/21/01	720	702	0.801	0.016	0.26	1.28	777	0.139	87.4	2.25	0.2	<0.08	<0.003	1.38
8	Red Clover C ab Indian	6/21/01	825	40.6	0.833	<0.002	0.06	0.3	38.2	<0.019	3.12	0.8	<0.01	<0.08	<0.003	0.15
10	Indian C @ Flournoy Br	6/21/01	900	20.6	0.722	<0.002	<0.02	0.43	345	<0.019	32.8	0.7	<0.01	<0.08	<0.003	0.1
11	Indian C @ Taylorsville	6/21/01	940	54.4	1.05	0.009	0.06	0.92	94.6	<0.019	22.3	0.51	<0.01	0.12	<0.003	0.24
12	Lights C	6/19/01	1550	620	1.81	0.027	0.35	10.4	955	0.306	118	1.82	0.23	0.18	0.01	2.24
13	Wolf C	6/19/01	1500	67.8	1.27	0.005	0.07	0.46	338	0.043	18.6	3.42	0.04	0.15	<0.003	0.46
14	Indian C ab Spanish C	6/21/01	1010	165	3.08	0.004	0.37	1.99	165	0.06	70.7	1.04	<0.01	0.19	<0.003	0.57
15	Rock C	6/20/01	1115	12.9	0.292	0.002	0.11	0.22	25.1	<0.019	2.08	0.95	2.98	0.08	<0.003	0.08
18	Greenhorn C	6/20/01	1200	58.4	0.824	<0.002	0.28	0.53	365	0.023	48.9	0.66	0.05	0.17	<0.003	0.34
17	Spanish C ab Greenhorn C	6/20/01	1220	77.9	0.321	0.004	0.33	0.43	258	0.024	47.7	1.55	3.42	<0.08	<0.003	0.43
19	Spanish C ab Indian C	6/20/01	1330	42.4	0.623	<0.002	0.28	0.5	149	0.022	17.2	1.99	1.12	<0.08	<0.003	0.24
20	East Branch NF Feather R ab NFFR	6/20/01	1450	38.3	5.71	0.003	0.27	1.02	70.9	0.02	24.2	1.56	0.79	0.26	<0.003	0.25
21	MF Feather R @ Beckwourth	6/20/01	700	2390	2.32	0.038	1.09	2.85	2640	0.961	58.3	2.16	0.65	0.22	0.008	5.06
22	Sulphur C	6/20/01	740	81.8	0.483	0.005	0.04	0.7	562	0.03	53.8	0.65	0.02	0.23	<0.003	0.53
23	Jamison C	6/20/01	810	37.8	0.683	0.011	0.23	0.34	36.9	0.121	1.23	3.03	<0.01	<0.08	<0.003	0.35
24	MF Feather R ab Nelson C	6/20/01	910	28.5	0.887	0.004	0.06	0.57	91.4	0.068	21.3	1.92	<0.01	0.12	<0.003	0.18
3	NF Feather R AB Lake Almanor	9/10/03	640	ND	ND	ND	ND	ND	ND	ND	ND	<200	ND	ND	ND	ND
2	Butt C	9/10/03	740	ND	ND	ND	ND	ND	ND	ND	6.9	<200	ND	ND	ND	ND
25	NF FR AB EBNF FR	9/11/03	645	ND	ND	ND	ND	ND	1100	ND	34	<200	ND	ND	ND	ND
5	Last Chance @ Murdock	9/10/03	1050	ND	ND	ND	ND	ND	ND	ND	40	<200	ND	ND	ND	ND
8	Red Clover C abv Indian	9/10/03	1200	ND	ND	ND	ND	ND	ND	ND	15	<200	ND	ND	ND	ND
10	Indian C AB Flournoy Br	9/10/03	1230	ND	ND	ND	ND	ND	510	ND	26	<200	ND	ND	ND	ND
11	Indian C A Taylorsville	9/10/03	1300	ND	ND	ND	ND	ND	ND	ND	24	<200	ND	ND	ND	ND
12	Lights C A Mouth	9/10/03	920	730	ND	ND	ND	12	810	ND	100	<200	ND	ND	ND	ND
13	Wolf C NR Greenville	9/10/03	835	ND	ND	ND	ND	ND	3200	ND	44	<200	ND	ND	ND	ND
14	Indian C AB Spanish C	9/10/03	1330	ND	ND	ND	ND	ND	600	ND	65	<200	ND	ND	ND	ND
15	Rock C NR Mouth	9/9/03	1315	ND	ND	ND	ND	ND	ND	ND	ND	<200	ND	ND	ND	ND
18	Greenhorn C A Mouth	9/9/03	1210	ND	ND	ND	ND	ND	740	ND	170	<200	ND	ND	ND	ND
17	Spanish C AB Greenhorn C	9/9/03	1245	ND	ND	ND	ND	ND	ND	ND	63	<200	ND	ND	ND	ND
19	Spanish C AB Indian C	9/11/03	800	ND	ND	ND	ND	ND	ND	ND	23	<200	ND	ND	ND	ND
20	EBNF FR AB NF FR	9/11/03	715	ND	8.3	ND	ND	ND	ND	ND	16	<200	ND	ND	ND	ND
22	Sulphur C A Clio	9/9/03	845	ND	ND	ND	ND	ND	700	ND	66	<200	ND	ND	ND	ND
23	Jamison C nr Two Rivers	9/9/03	940	ND	ND	ND	ND	ND	ND	ND	ND	<200	ND	ND	ND	ND
24	MFFeather R ab Nelson Cr	9/9/03	1120	ND	ND	ND	ND	ND	ND	ND	37	<200	ND	ND	ND	ND
	2003 detection limits			250	5	5	5	5	500	5	5	200	5	5	5	50

analyzed at Alpha Analytical (Sparks, NV)

ml/l = 0.001 liters = ppt

micrograms/l = 0.000 001 liters = ppm

ng/l = .000 000 001 liters = ppb

all 2003 metals analyzed by Alpha Analytical, Inc (Sparks, NV), except Hg, by Sierra Env. Monitoring, F.

Table 7. Upper Feather River Coliform

Fig 2 Map #	Station Name	Date	Time	Total Sample Size	Total Coliform: Sample Volume Filtered	Total Coliform: # of colonies	Total Coliform: # of colonies /100 ml	Fecal Coliform: Sample Volume Filtered	Fecal Coliform: # of colonies	Fecal Coliform: # of colonies /100 ml
3	NF Feather R ab Lake Almanor	6/19/01	1330	200	100	31	31	100	37	37
1	Goodrich C	6/21/01	1225	200	100	6	6	100	166	166
2	Butt C	6/19/01	1420	200	100	62	62	100	59	59
25	NF Feather R ab EBNFFR	6/20/01	1420	200	100	26	26	100	0	0
5	Last Chance @ Murdock	6/21/01	720	200	100	8	8	100	19	19
8	Red Clover abv Indian	6/21/01	825	200	100	21	21	100	1	1
10	Indian C @ Flournoy Br	6/21/01	900	200	100	48	48	100	56	56
11	Indian C @ Taylorsville	6/21/01	940	200	100	23	23	100	27	27
12	Lights C	6/19/01	1550	200	100	0*	0*	100	93	93
13	Wolf C	6/19/01	1500	200	100	12	12	100	50	50
14	Indian C ab Spanish C	6/21/01	1010	200	100	19	19	100	3	3
15	Rock C	6/20/01	1115	200	100	92	92	100	1	1
18	Greenhorn C	6/20/01	1200	200	100	49	49	100	148	148
17	Spanish C ab Greenhorn C	6/20/01	1220	200	100	5	5	100	44	44
19	Spanish C ab Indian C	6/20/01	1330	200	100	24	24	100	7	7
20	East Branch NF Feather R ab NFFR	6/20/01	1450	200	100	16	16	100	1	1
21	MF Feather R @ Beckwourth	6/20/01	700	200	100	**	**	50	302	604
22	Sulphur C	6/20/01	740	200	100	5	5	100	158	158
23	Jamison C	6/20/01	810	200	100	12	12	100	1	1
24	MF Feather R ab Nelson C	6/20/01	910	200	100	19	19	100	0	0
	Blank			200	100	0	0	100	0	0

* = Solid growth on plate, but no total colonies

** = Solid growth (may have inhibited total colonies)

				MPN/100ml	MPN/100ml
3	NF Feather R AB Lake Almanor	9/10/03	640	110	110
2	Butt C	9/10/03	740	30	30
25	NF FR AB EBNF FR	9/11/03	645	500	4
5	Last Chance @ Murdock	9/10/03	1050	280	80
8	Red Clover abv Indian	9/10/03	1200	170	4
10	Indian C AB Flournoy Br	9/10/03	1230	>=1600	280
11	Indian C A Taylorsville	9/10/03	1300	50	23
12	Lights C A Mouth	9/10/03	920	>=1600	>=1600
13	Wolf C NR Greenville	9/10/03	835	>=1600	>=1600
14	Indian C AB Spanish C	9/10/03	1330	900	23
15	Rock C NR Mouth	9/9/03	1315	>=1600	<2
18	Greenhorn C A Mouth	9/9/03	1210	500	300
17	Spanish C AB Greenhorn C	9/9/03	1245	>=1600	300
19	Spanish C AB Indian C	9/11/03	800	>=1600	26
20	EBNF FR AB NF FR	9/11/03	715	80	13
22	Sulphur C A Clio	9/9/03	845	>=1600	900
23	Jamison C nr Two Rivers	9/9/03	940	60	<2
24	MFFeather abv Nelson	9/9/03	1120	>=1600	<2

methods comment: 2001 data is not that comparable to 2003 data because they used different methods. 2003 at Henrici used 15 tube fermentation, and no filtering. Without filtering, you would expect the number of colonies to be greater. Also, with the tube, the number of colonies is "most probable number", and is a statistical number based on the number of gas bubbles rising from the tube.

Table 8. UPPER FEATHER RIVER MINERALS

Station Name	Date	Time (PST)	Diss Ca (mg/L)	Diss Mg (mg/L)	Diss Na (mg/L)	Diss K (mg/L)	Diss SO4 (mg/L)	Diss Cl (mg/L)	Diss B (mg/L)	Diss Hardness as CaCO3 mg/L
NF Feather R ab Lake Almanor	6/19/01	1330	5	3	5	1.8	<1.0	<1.0	<0.1	25
Goodrich C	6/21/01	1225	13	5	3	0.6	<1.0	<1.0	<0.1	53
Butt C	6/19/01	1420	13	6	5	1.3	<1.0	<1.0	<0.1	57
NF Feather R ab EBNFFR	6/20/01	1420	13	6	5	1.2	5	<1.0	<0.1	57
Last Chance @ Murdock	6/21/01	720	17	5	10	2.7	<1.0	<1.0	<0.1	63
Red Clover abv Indian	6/21/01	825	18	7	8	2	3	1	<0.1	74
Indian C @ Flournoy Br	6/21/01	900	16	6	8	2.2	2	1	<0.1	65
Indian C @ Taylorsville	6/21/01	940	16	5	6	1.3	4	1	<0.1	61
Lights C	6/19/01	1550	17	5	8	1.6	5	<1.0	<0.1	63
Wolf C	6/19/01	1500	16	6	6	0.6	4	1	<0.1	65
Indian C ab Spanish C	6/21/01	1010	24	8	13	1.6	6	5	0.1	93
Rock C	6/20/01	1115	10	6	5	0.6	2	2	<0.1	50
Greenhorn C	6/20/01	1200	20	7	8	0.8	3	3	<0.1	79
Spanish C ab Greenhorn C	6/20/01	1220	13	7	6	1.1	3	3	<0.1	61
Spanish C ab Indian C	6/20/01	1330	17	7	7	0.7	3	2	<0.1	72
East Branch NF Feather R ab NF	6/20/01	1450	22	9	13	1.3	7	5	0.2	92
MF Feather R @ Beckwourth	6/20/01	700	24	8	20	4	3	7	0.1	93
Sulphur C	6/20/01	740	23	4	8	1.7	3	<1.0	<0.1	74
Jamison C	6/20/01	810	16	3	2	<0.5	2	<1.0	<0.1	52
MF Feather R ab Nelson C	6/20/01	910	17	4	6	1	3	1	<0.1	59

Table 9 Summary of water quality objectives and criteria (ug/L)

(revised 5/25/01)

Parameter	RWQCB	U.S. EPA or California DHS		Agricultural	USEPA California Toxics Rule Criteria for Freshwater Aquatic		USEPA National Toxics Rule Criteria for		USEPA National Ambient Water Quality Criteria	
		Primary	Secondary		Dissolved Continuous	Dissolved Maximum	Total Continuous	Total Maximum	Continuous Concentration	Maximum Concentration
Aluminum		1000	200	5000					87	750
Ammonia		500 [2]							4,15 [3]	24,1 [3, 7]
Arsenic	10 [4]	50 [16]		100	150	340	190	360	150 [4]	340 [4]
Boron				700						
Cadmium	0,22 [4]	5		10	2,2 [6]	4,3 [6]	1,1 [6]	3,9 [6]	2,2 [4, 6]	4,3 [4, 6]
Chloride			500.000	106.000						
Chromium		50 [8]		100 [9]	11 [10]	16 [10]	11	16	11 [10]	16 [10]
Conductivity			1.600	700						
Copper	5,6 [4]	1.300	1.000	200	9 [6]	13 [6]	12 [6]	18 [6]	9,0 [4, 6]	13 [4, 6]
Hardness										
Iron	300 [4]		300	5.000						1.000
Lead		15		5.000	2,5 [6]	65 [6]	3,2 [6]	82 [6]	2,5 [4, 6]	65 [4, 6]
Manganese	50 [4]		50	200						
Mercury		2				0,051 [15]	0,012	2,4	0,77 [12]	1,4 [4]
Nickel		100		200	52 [6]	470 [6]	160 [6]	1400 [6]	52 [4, 6]	470 [4, 6]
Nitrate (as N)		10.000								
pH [13]	6,5 - 8,5		6,5 - 8,5							6,5 - 9,0
Selenium		50		20	5 [12]	20 [12]	5	20	5 [12]	[12, 17]
Silver	10 [4]		100			3,4 [6]		4,1		3,4 [4, 6, 18]
Zinc	16 [4]		5.000	2.000	120 [6]	120 [6]	110	120	120 [4, 6]	120 [4, 6]

Footnotes:

1 From Food and Agriculture Organization of the United Nations, 1985, Water Quality for Agriculture

2 Taste and odor threshold

3 pH and temperature dependent; value shown based on ph 7.0 and temperature of 20 C

4 As dissolved

5 Million fibers per liter longer than 10 microns

6 Hardness dependent; value indicated is based on hardness of 100 mg/L as CaCO3

7 Based on pH of 7.0 and temperature of 20 C; maximum allowable concentration if salmonids present

8 Total chromium

9 Chromium (VI)

10 Criteria are for chromium (VI) as dissolved; criteria for chromium (III) as dissolved is hardness dependent

11 umhos/cm

12 As total recoverable

13 Standard pH units

14 Adjusted sodium adsorption ratio

15 For protection of human health from consumption of aquatic organisms

16 EPA adopted standard of 10 in January 2001; Pres. Bush halted implementation

17 Based on selenite and selenate fractions

18 Instantaneous maximum

Turbidity

Figures 3-6 display turbidity and flow measurements from the two continuous recording turbidimeters on Indian Cr at the Taylorsville Bridge, and on Spanish Cr at the Gansner Bridge for 2002and 2003. Changes in turbidity follow changes in flow fairly closely. The blip in turbidity at Spanish Creek in Oct. 2002 is probably due to tributary/road drainage construction activities just upstream of the sensor. Based on volunteer, staff, and subcontractor sampling efforts, regression curves were also plotted for TSS and turbidity for Indian and Spanish Creeks (Figures 7 and 8). Table 10 displays volunteer and staff turbidity monitoring at three locations along Greenhorn Cr and three locations along Spanish Creek, which shows, almost always, an increase in turbidity from the upstream sites to the downstream sites.

Turbidity monitoring has been funded under several funding sources. The primary source was Prop. 204 funding, with the expectation that the turbidity/TSS relationship, and round-the-clock event monitoring could help quantify the amount of sediment coming into Indian Valley from specific tributaries. These data were to be used to assist in channel restoration design efforts for Indian Cr. Large-scale restoration has not yet occurred on Indian Cr, but the data (including a rough quantification of sediment based on the turbidity vs TSS regression equation) were reported in the 204 final report, which is available on the CRM website at feather-river-crm.org. Those results are also briefly mentioned in the discussion by site.

The turbidity/TSS sampling in American Valley did not include depth-integrated sampling, however, the Indian Cr effort did. Neither effort included multiple cells across the channel, but locations on Indian Cr were determined in the 1980's by Mike Kossow and Craig Bolger of PG&E to be the most representative cell across the cross-section for average sediment load.

Figure 3. Average Daily Flow and Turbidity in Indian Creek at Taylorsville Water Year 2002

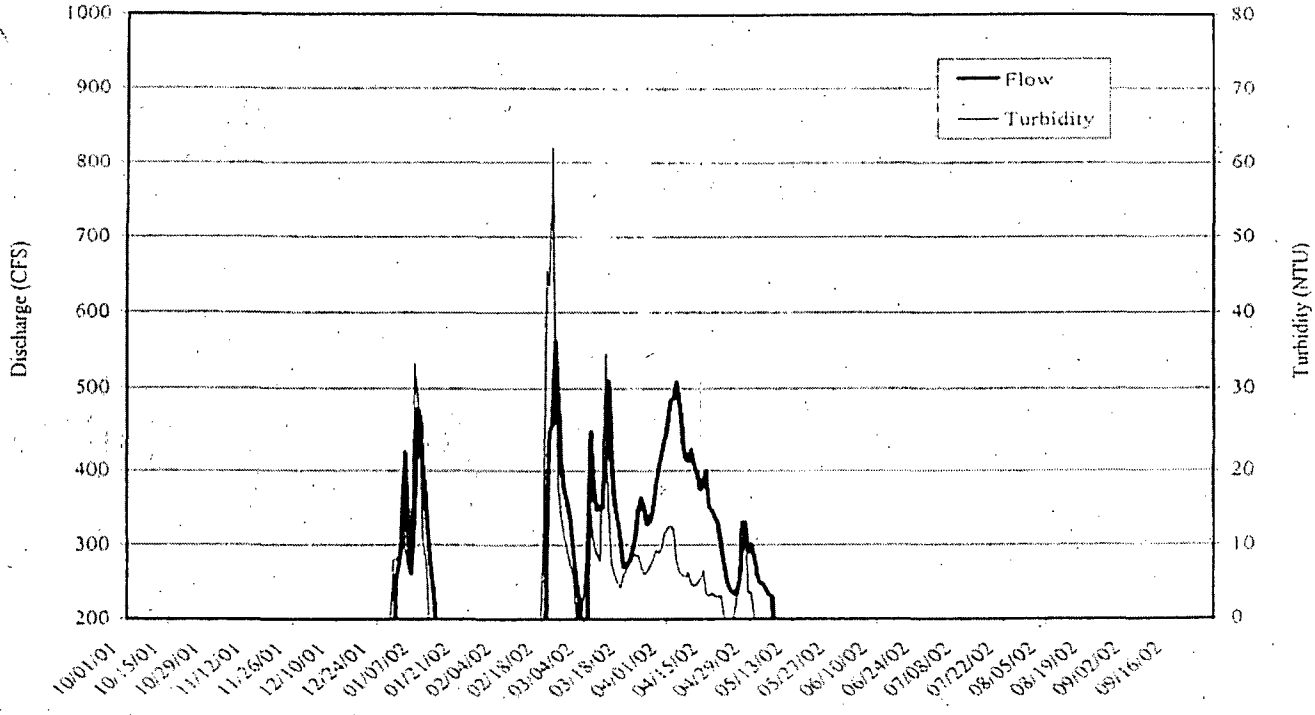


Figure 4. Average daily flow & Turbidity in Indian Creek at Taylorsville- Water Year 2003

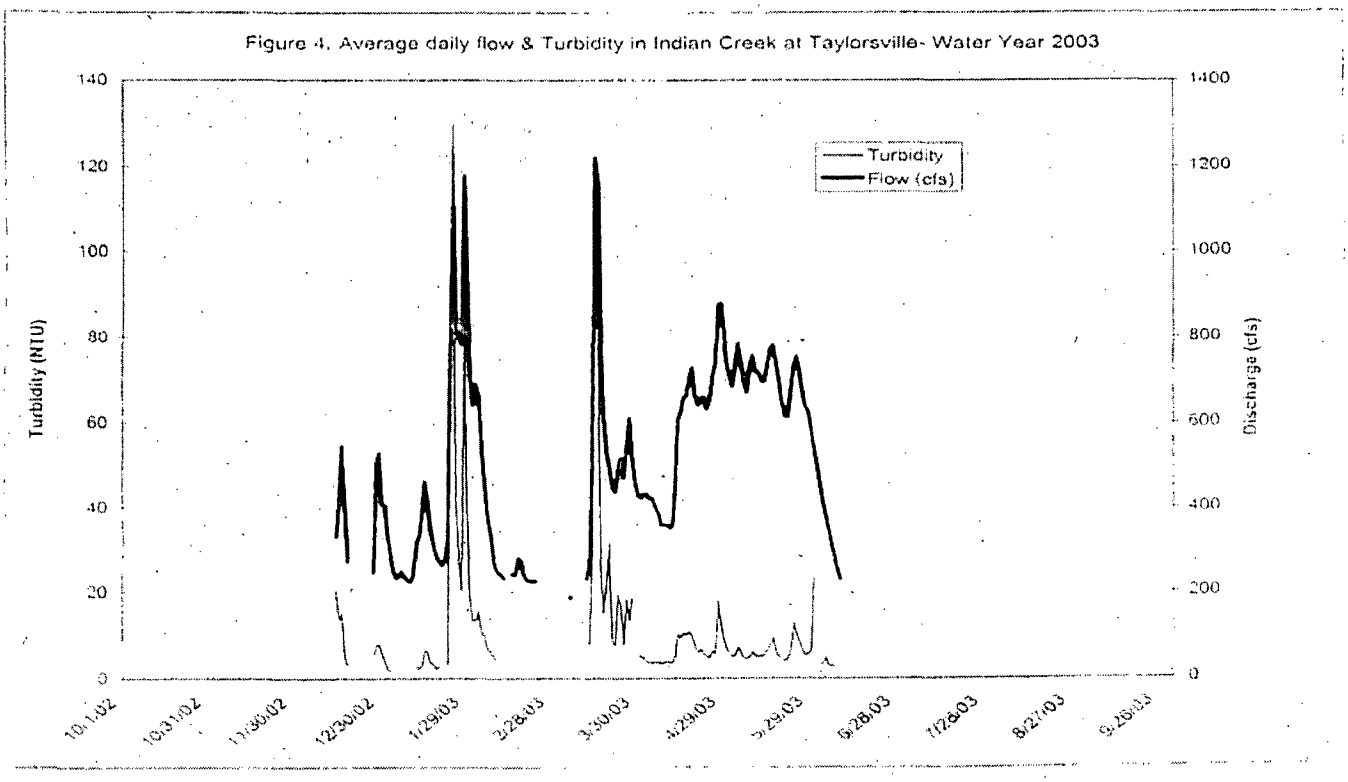


Figure 5. Average Daily Flow and Turbidity in Spanish Creek @ Highway 70 Bridge- Water Year 2002

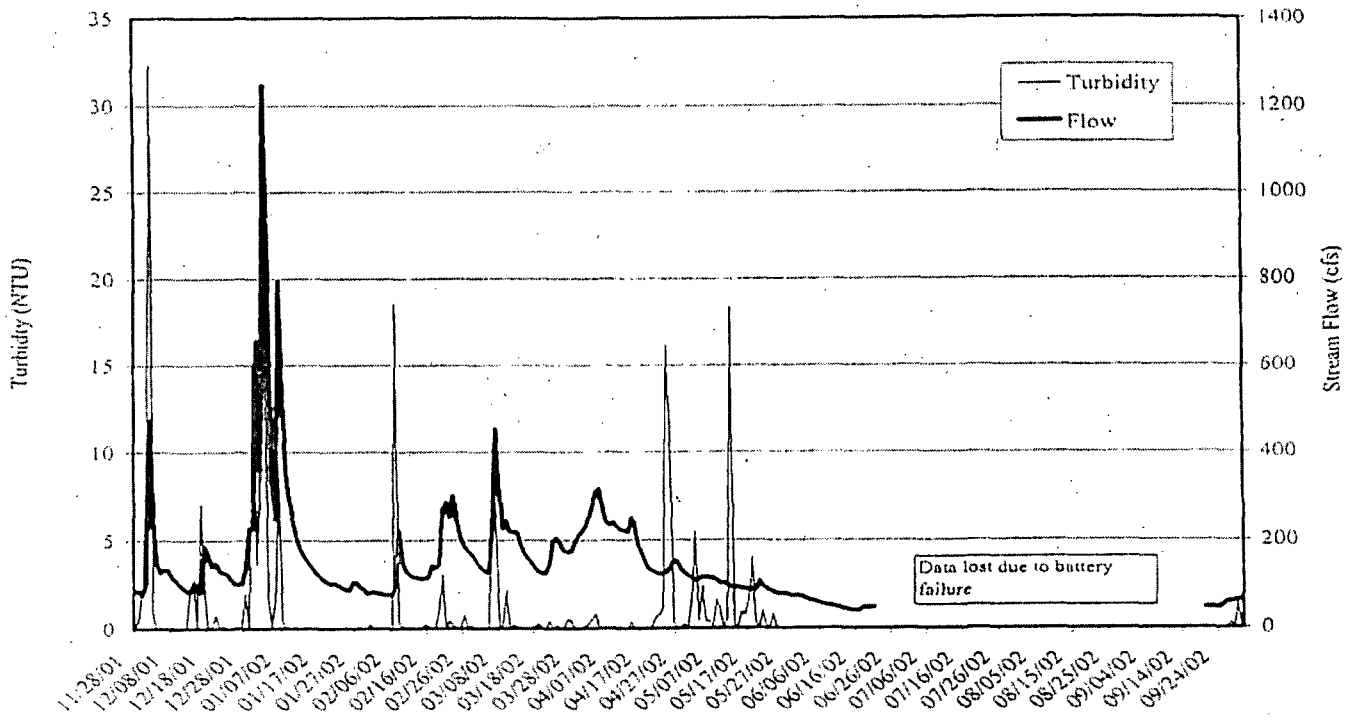


Figure 6. Average Daily Flow & Turbidity in Spanish Creek at Hwy 70 Bridge - Water Year 2003

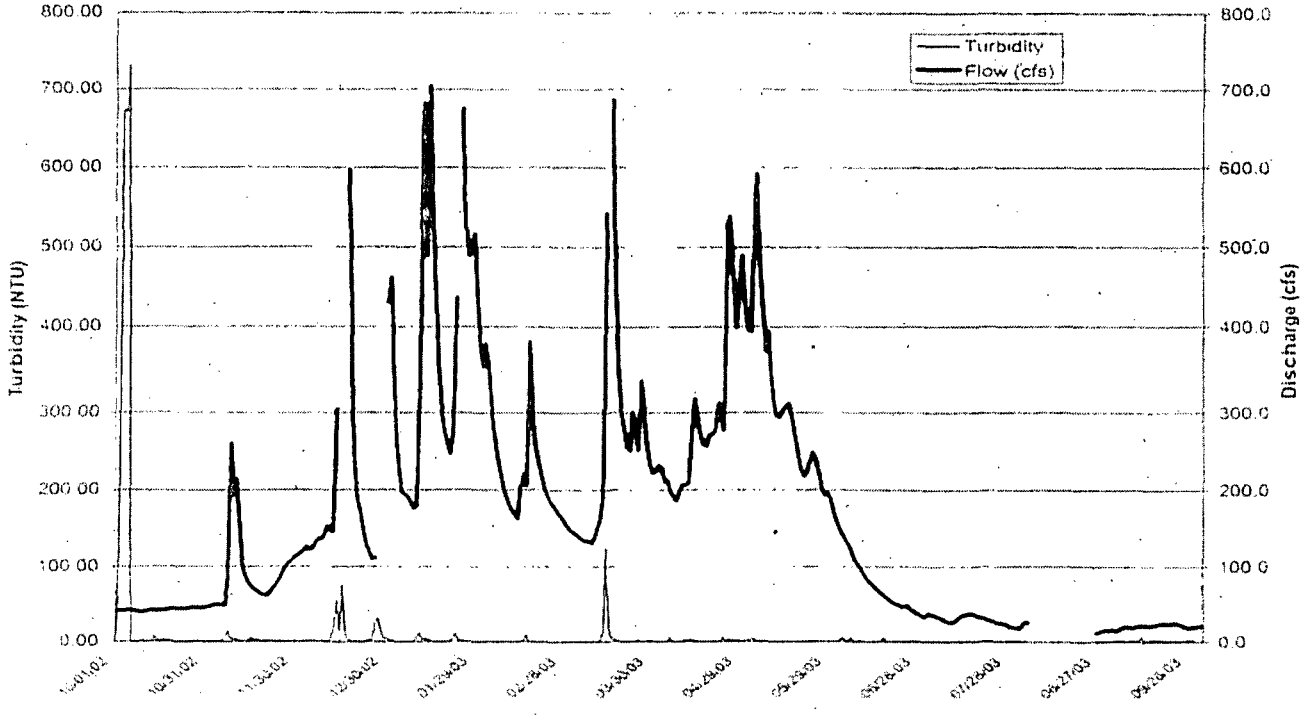


Figure 7. Regression Analysis of TSS versus Turbidity Indian Cr WY 2000

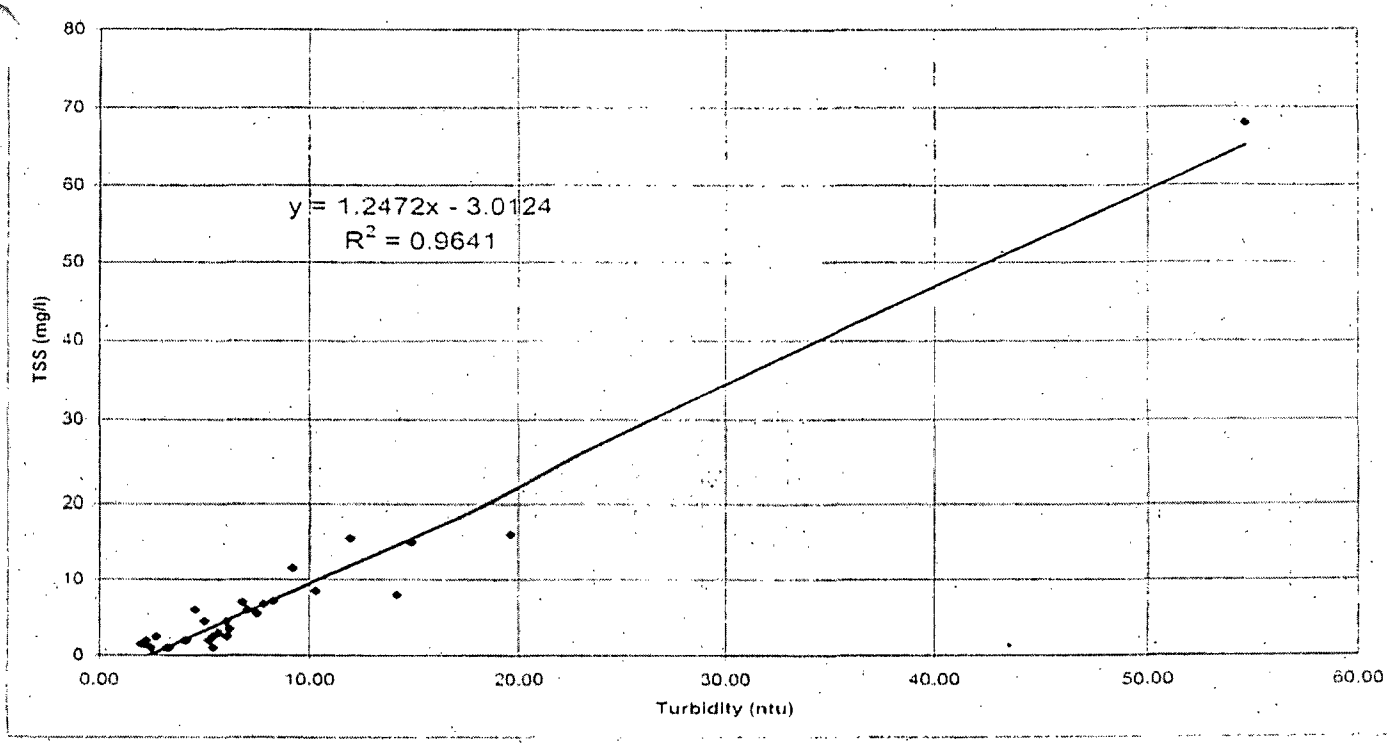


Figure 8. Regression Analysis of TSS vs. Turbidity Spanish and Greenhorn Creeks WY2003

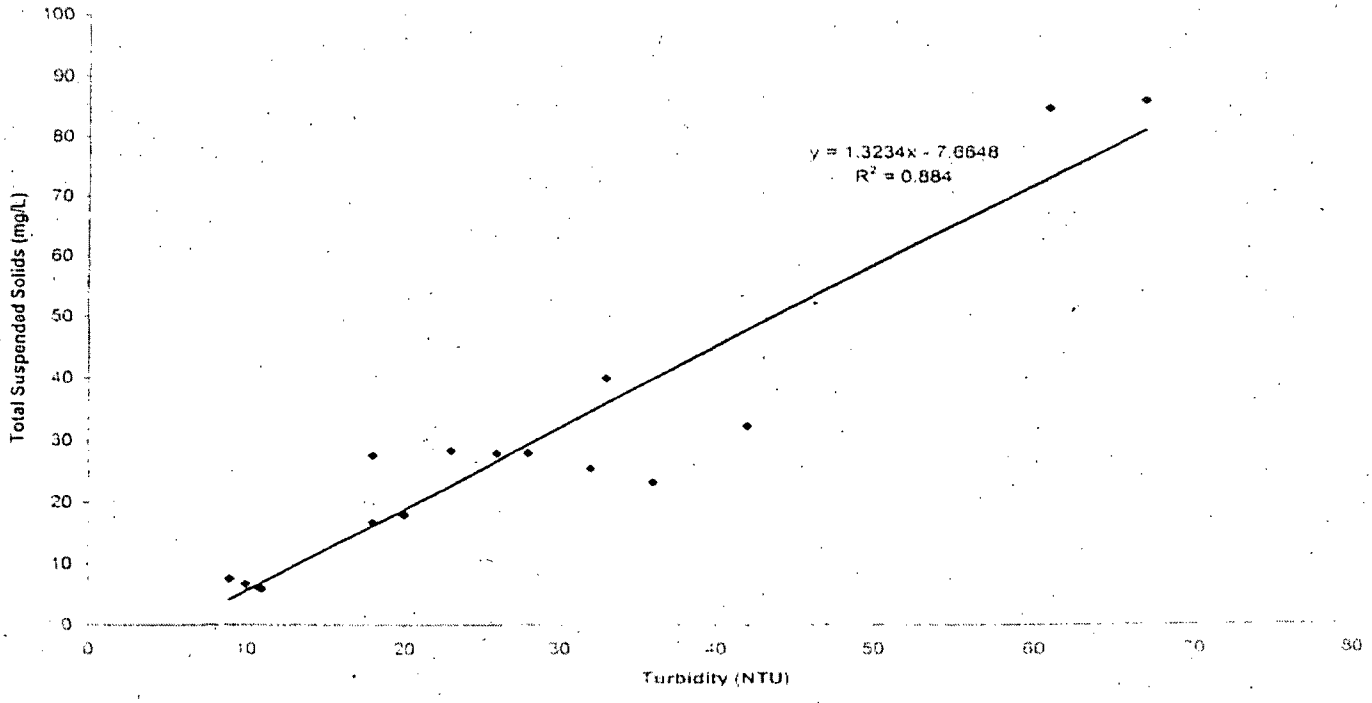


Table 10. Random American Valley (Spanish and Greenhorn Creeks) Turbidity Monitoring (Including Volunteer M

time is in international format

	date	Greenhorn @ gage abv Farnworth			Greenhorn at Labbe's		Greenhorn @ mouth		Spanish abv aggregate		Spanish @ hwy70 bridge			Spanish acw Greenhorn	
		time	gh	NTU's	time	ntu's	time	NTU's	time	NTU's	time	gh	NTU's	time	NTU's
											740		1.5		
	3/6/02	1640	0.66	10			1720	10	1705	12	1735		14	1720	21
	3/7/02	845	0.75	8			900	12	830	4	946		5	900	12
	3/7/02	1530	0.91	16			1540	17	1600	12	1610		14	1540	21
no storm	9/26/02	1100	0.2	0.6											
no storm	12/9/02	1300	0.28	0.8											
	12/13/02	1625	0.45	7			1640	8	1710	27	1610		21	1645	11
		1600	0.44	4											
	12/14/02	1040	0.73	24			1029	39	1005	45	1100		48	1026	111
	12/14/02	1519	0.64	10			1505	21	1610	19	1440		16	1500	59
		1600	0.68	10											
	12/15/02	1550	0.75	12			1537	15	1607	10	1510		6	1530	25
		1700	0.76	8											
	12/16/02	1001	1.27	23			950	64	927	59	1015		78	945	101
	12/16/02	1600	1.14	13			1600	56	1626	20	1535		40	1607	61
	12/17/02	943	0.75	8	900	13	932	17	959	7	905	2.8	11.5	928	23
	12/17/02	1620	0.7	5	1500	15	1632	9	1657	4	1615		4	1636	16
	12/18/02	1230	0.57	3											
	12/19/02	1630	0.5	3											
	12/27/02	1102	0.49	11			1049	20	1118	23	1133		28	1046	67
	12/27/02	1618	0.65	9			1632	33	1652	32	1603		42	1634	61
	12/28/02	1304	0.87	10			1318	18	1245	18	1335		26	1320	36
	12/28/02	1700	1.04	12											
	12/29/02	1640	0.82	4											
	12/30/02	1500	0.7	3											
	12/31/02	1600	0.84	3											
	1/10/03	1345	0.74	5											
no storm	1/16/03	1330	0.68	3											
	1/24/03	1402	0.99	6					1450	2					
	1/25/03										1629		1.5		
	3/14/03	1540	0.8	7			1516	4.82						1522	5.51
	3/15/03	1250	1.85	44.7			1129	140.5	1307	33.1	1110	above	57.2	1126	119.2
	3/15/03	1540	1.6	35											
	3/17/03	1300	0.94	6.7											
	3/23/03	1430	0.7	2											
	4/2/03	1400	0.7	1.2											
	4/12/03	1409	0.95	11			1346	10	1427	4	1255		4	1344	6
	4/24/03	1330	1.1	8											
	4/25/03	1700	1.12	7.7											
	4/28/03	1650	1.12	4.7											

Aquatic Biota

Fish Populations

Table 11 displays annual fish population summary data from electroshock surveys in the late summer of 2001 and 2003. An attempt was made both years to choose a sampling section that represented the overall habitat composition of the entire monitoring reach. However, crews were different between years, and the 2001 sampling areas were not noted. It should be noted that the difference in populations and fish size between years could be due more to a difference in sampling location than a difference in habitat conditions. The most noteworthy results are the fish data are:

- No salmonids were detected in either year at Wolf, Lights, and Last Chance Creeks.
- Looking at all the sites together, the general trend of increasing fish biomass from 2001 to 2003 is probably a reflection of the increased flow between those years.
- At Butt Cr, in 2003, salmonid lengths decreased, and suckers appeared.

Because of the large volume of water at some sites, fish have never been sampled, and Jamison Creek and Red Clover Cr at Drum Bridge were only sampled in 2001. At every site with salmonids, salmonid biomass increased from 2001 to 2003, along with an increase in non-salmonids at most sites. Little to no salmonids were present in 2001 in Indian Cr above Flournoy Bridge, and below the Taylorsville Bridge, but were well represented in 2003. While not shown in Table 11, fish lengths increased significantly for salmonids at Indian Cr above Flournoy Bridge and Sulphur Cr.

Table 11. Fish biomass in Monitoring Reaches

Fig 2 Map #	Reach	Year	Rainbow trout biomass ml/100 yds	Brown trout biomass ml/100yds	Non-salmonid biomass ml/100 yds
	Alluvial Channels				
2	Butt (CRM)	2001	1212	2008	1314
		2003	5266	783	8290**
13	Wolf	2001	0	0	670
		2003	0	0	250
12	Lights	2001	0	0	850
		2003	0	0	283
5	Last Chance	2001	0	0	1560
		2003	0	0	2000
10	Indian blw Red Clover (F	2001	10	0	18
		2003	2280	70	3929
11	Indian blwTaylorsville Bri	2001	0	0	930**
		2003	365	0	143**
18	Greenhorn	2001	233	47	173
		2003	269	426	917
17	Spanish abv Greenhorn	2001	4	31	1610
		2003	0	115	1121
22	Sulphur	2001	37	0	373
		2003	200	1416	821
	Depositional/ non-alluvial				
15	Rock *	2001	1414*	120*	1400*
		2003	851*	66*	418*
	non-alluvial channel summaries				
8	Red Clover abv Indian ([	2001	64	0	1470
23	Jamison	2001	1240	0	0
		2003	too much water		

** "non-descending catch - data not reliable
*data not comparable between years for Rock Cr:
2001 effort was 2 passes with 2 shockers; 2003 was 1 pass with 1 shocker

Macroinvertebrates

Table 12 displays selected macroinvertebrate metrics for 1999 and 2001. Analysis of macroinvertebrate samples collected in 2003 are not yet complete. As with other parameters, figures generated from macroinvertebrate analysis are primarily useful in trend monitoring.

Definitions of headings in Table 12:
Operational Taxonomic Units (OTU) = The number of taxa arrived at through a formula that considers the percentage of the sample that was identified in the lab. It is the total number of taxa from which EPT taxa and sediment intolerant taxa percentages were calculated.
%EPT taxa = This parameter was calculated for this report by taking the total number of Ephemeroptera, Plecoptera, and Trichoptera taxa provided by the Utah lab, and dividing it by the O.T.U.
Shannon Diversity Index = a commonly used macroinvertebrate index, which becomes primarily useful in trend analysis over time.
Percentage of Wisseman sediment intolerant taxa = This parameter was calculated for this report by taking the total number of Wisseman sediment intolerant taxa, and dividing it by the O.T.U.
Wisseman percentage of assemblage made up by tolerant taxa = an index provided by the National Aquatic Monitoring Center, (along with 53 other metrics).

The following discussion of improvements or declines only refers to changes greater than 10%. Any change less than 10% was considered to be no change. The most noteworthy results for macroinvertebrate analysis are:

- Goodrich Creek and North Fork Feather River above Lake Almanor were the only sites that showed a decline greater than 10% in all five metrics.
- The across the board declining trend in two metrics, and majority declining trend in other metrics, suggests that the difference could be due to the overall decrease in flow volume in 2001.
- The only site that shows more metrics improving than declining is Jamison Cr.

Other trends: Percentage of EPT taxa declined at 14 of the 19 sites. It did not improve at any site. The Wisseman percent of tolerant taxa increased (which is a declining trend) at 18 sites, and decreased (an improving trend) at one site. The other metrics were more ambiguous. The Shannon Diversity Index showed less than a 10% change at 12 of the sites. Total taxa (OTU) improved at five sites, declined at five sites, and showed less than a 10% change at eight sites. The percentage of sediment intolerant taxa increased (an improving trend) at four sites, decreased at 10 sites, and remained the same at four sites. No metric showed an improvement at a majority of sites.

Table 12. *Selected Macroinvertebrate Metrics in Monitoring Reaches*

Fig 2 Map #	Reach	Year	Operational Taxonomic Units	% EPT taxa	Shannon Diversity Index	Percentage of Wisseman sediment intolerant taxa	Wisseman % of assemblage made up by tolerant taxa
	Alluvial Channels						
1	Goodrich	1999	29	57	2.4	6	23
		2001	7	14	0.8	0	91
2	Butt (CRM)	1999	37	61	2.5	9	18
		2001	46	60	2.8	8	35
13	Wolf	1999	29	60	2.4	10	4
		2001	28	42	2.2	0	9
12	Lights	1999	27	74	2.6	5	7
		2001	27	45	2.4	5	8
5	Last Chance @ Murdock	1999	21	44	0.98	11	4
		2001	24	24	1.9	6	72
10	Indian blw Red Clover (Flournoy Bridge)	1999	33	67	2.3	8	9
		2001	37	55	2.2	7	11
11	*Indian blw Taylorsville Bri*	1999	36	62	2.4	4	2
		2001	36	50	2.7	6	15
18	Greenhorn	1999	40	62	2.7	3	4
		2001	41	52	2.6	5	27
17	Spanish abv Greenhorn	1999	35	60	2.3	6	3
		2001	32	53	2.3	10	9
2	MF Feather @ Beckwourt	1999	26	58	2.2	7	7
22	Sulphur	1999	30	62	2.6	12	5
		2001	31	59	2.5	5	36
	Depositional/ non-alluvial channels						
15	Rock	1999	36	54	2.8	3	9
		2001	44	45	2.4	3	56
19	Spanish abv Indian	1999	36	59	2.3	6	4
		2001	28	41	2.3	3	15
	non-alluvial channels						
3	NF Feather abv Almanor	1999	50	61	3.2	6	6
		2001	43	52	2.5	3	9
25	NF Feather abv East Bra	1999	43	52	2.9	6	9
		2001	46	52	3.2	6	13
20	East Branch NF Feather	1999	32	67	2.5	9	11
		2001	34	53	2.7	5	14
8	Red Clover abv Indian (L	1999	32	60	1.9	5	3
		2001	28	51	1.9	5	14
14	Indian abv Spanish	1999	28	66	2.4	2	20
		2001	21	49	1.9	0	12
23	Jamison	1999	29	60	2.4	0	1
		2001	36	61	2.7	3	4
24	MF Feather abv Nelson	1999	29	62	2.4	13	3
		2001	37	52	2.6	7	13

Flow

Flow data contribute to the CRM's understanding of how the major tributaries contribute to flows in the larger systems, such as Indian Creek (i.e. timing and volume). The two primary questions, regarding restoration, that the CRM is seeking to answer with the flow data are: 1) Are restoration projects contributing to a measurable increase (in the larger tributaries) of summer base flows? and 2) Are restoration projects contributing to a measurable attenuation of peak flows (in larger tributaries)?

There are a variety of ways to display and analyze the Continuous Recording flow data. Most of the flow data are presented in Appendix F, and are displayed in the context of precipitation data from Genesee that Jim Wilcox has been collecting since 1998. Other comparisons such as the flow's influence on water temperature, and between station comparisons were considered too exhaustive to include in this report.

In the body of this report, Tables 13a and 13b distill the flow data down to peaks and minimums. Table 13a is organized by year, and Table 13b by station. The tables display the maximum and minimum of running seven-day averages of daily flow, as well as the absolute max and min flow of any hour sampled throughout each year. Seven day averages were used to try and reduce the effects of flashy events, and because seven day averages are in common usage in temperature analysis. The difference between maximum and minimum flows (range) is displayed to try and reduce the effect of different precipitation amounts between years. An improvement in watershed function should be reflected in a smaller range, as well as higher minimum flows. The TAC concurred that concentrating on minimum flows as a primary indicator of improvement (rather than maximum flow attenuation) would help reduce the noise associated with stochastic precipitation events.

The most noteworthy result shown in Tables 13a and 13b is that despite increasing precipitation from 2001 to 2003, Lights Cr has shown a steady decline in the 7-day average minimum flow. Looking at the data in Tables 13a&b in the context of monthly flow and precipitation data (Appendix F), as expected, the 7-day average max, min and range generally follow monthly precipitation. However, one would expect the very minimum flow of the four-year period to be in 2001, the driest year, but the lowest 7-day average didn't show up at Flournoy, Lights and Doyle until 2002. Also, the highest maximum average daily flow was in Feb 2000 at all sites but just above and below Red Clover Creek (which may have been due to the influence of Antelope dam), but the highest precipitation year was 2003. The highest monthly precipitation was in December 2002; the lack of corresponding high flow was probably due to the unsaturated condition of the watershed at that time.

The 2003 bars also show one of the run-off patterns in this watershed. Peak monthly average flows were in April for Last Chance, Red Clover, and Indian Cr at Flournoy (just below Red Clover). For all the other sites it was in May. Last Chance and Red Clover are eastside, and melted a lot faster than the other subwatersheds. They are also in poor condition, without much functional floodplain area to absorb high flows (due to extensive gullying). They are also the highest priority watersheds for large-scale CRM restoration efforts. 2003 was an interesting year in general because of the high spring precipitation that produced relatively high flows into June.

On all the graphs with daily average flow and precipitation data, the flows generally peak with the precipitation, except at Flournoy Bridge in 2003. This station should be checked for accuracy.

Table 13 a. Summary of Flow Data from Permanent Stations Listed by Year

Fig 2 Map #	Station	Water Year	7-day Average Flow Max (CFS)	7-day Average Flow Min (CFS)	7-day Average Flow Range (CFS)	Hourly Average Statistics Maximum Discharge (CFS)	Hourly Average Statistics Minimum Discharge (CFS)	Hourly Average Statistics Mean Discharge (CFS)	Days without sensor error or obstructed flow	Total Data Days	Remarks
4	Last ChanceDoyle	2003	92	0.12	92	175	0.03	20.2	365	365	
7	Red Clover Notson	2003	287	3.22	283	473	1.07	54.4	365	365	
9	Indian abv Red Clvr	2003	239	12.7	227	272 OR	1.96	46.8	365	365	Some days affected by ice, not determined.
10	Indian blw Red Clvr	2003	701	24.7	677	1158	16.8	196	305	365	Sensor error in August 2003
11	Indian @ Tville	2003	909	225	683	1698	223	514	151	365	High flow period only
12	Lights	2003	290	0.00	290	630	0.00	76.3	346	365	Several days of zero flow (or near zero)
13	Wolf	2003	139	1.24	138	211	0.95	31.6	359	365	Beaver activity affects record
16	Spanish	2003	525	11.8	513	768	11.3	167	335	365	Beaver activity affects record
4	Last ChanceDoyle	2002	66.9	0.07	67	111	0.04	12.6	364	365	
7	Red Clover Notson	2002	38.9	2.80	36	59.3	2.43	7.93	209	209	Lost data due to vandalism
9	Indian abv Red Clvr	2002	126	4.08	122	160 OR	1.66	23.4	362	365	
10	Indian blw Red Clvr	2002	343	3.06	340	543	3.06	96.2	359	365	
11	Indian @ Tville	2002	471	248	223	623	222	348	89	89	High flow period only
12	Lights	2002	178	0.05	178	267	0.03	41.1	326	365	
13	Wolf	2002	94.7	1.10	94	116	1.08	12.9	222	365	
16	Spanish	2002	638	42.6	595	2194 OR	37.8	155	217	227	Installed November 2001, some data lost due to battery failure.
4	Last ChanceDoyle	2001	27.5	0.6	26.9	103	0.41	3.10	364	365	
7	Red Clover Notson	2001	66.1	2.5	63.6	101	2.13	11.5	365	365	
9	Indian abv Red Clvr	2001	16.7	3.82	12.9	28.3	3.50	8.84	365	365	
10	Indian blw Red Clvr	2001	174	3.46	170	236	0.20	56.4	365	365	
11	Indian @ Tville	2001	Not enough high flow days			555	255	314	14	15	High flow period only
12	Lights	2001	93.5	0.10	93.4	200	0.19	16.7	304	365	Some periods with zero flow
13	Wolf	2001	87.0	0.38	87	Beaver dam	---	---	322	365	Daily average estimated based on regression to Lights Creek
4	Last ChanceDoyle	2000	183.8	2.2	181.5	384	2.25	31.0	292	317	Installed 12/23/97, data missing due to installation upgrade
7	Red Clover Notson	2000	303.4	4.9	298.5	1354 OR	0.02	64.6	307	316	Installed 10/22/99, t data due to vandalism
9	Indian abv Red Clvr	2000	208.2	13.7	194.6	239 OR	12.9	51.0	331	331	Installed 11/04/99
10	Indian blw Red Clvr	2000	660.9	25.5	635.4	2103	21.2	161	331	331	Installed 11/05/99
11	Indian @ Tville	2000	1055.0	245.1	809.9	3387 OR	245	616	126	130	Installed 10/29/99, high flow period only
12	Lights	2000	437.6	1.5	436.1	2224 OR	1.18	87.6	278	277	Installed 12/28/99
13	Wolf	2000	249.0	0.7	248.2	935 OR	0.14	58.6	212	284	Installed 12/21/99

415	TRUE	
93	TRUE	
2047	TRUE	
867	TRUE	
3520	TRUE	
302	FALSE	
2774	TRUE	
149	FALSE	
415	FALSE	
93	TRUE	
2047	TRUE	
867	TRUE	
3520	TRUE	
302	TRUE	
2774	TRUE	
149	FALSE	
415		
93	FALSE	
2047	TRUE	
867	TRUE	
3520	TRUE	
2774	TRUE	
149	TRUE	
415	FALSE	
93	FALSE	
2047	okay	
867	TRUE	
3520	TRUE	
2774	TRUE	
149	FALSE	

[1]OR = For peak flows that are "over the rating", the discharge is calculated based on extrapolation of the existing rating table. No measurements are available that define the stage flow relationship during the peak flow event. Therefore, there is no estimate of the relative accuracy of these values.

13b. Summary of Annual Flow Data from Permanent Stations Listed by Station

Fig 2 Map #	Station	Water Year	7-day Average Flow Max (CFS)	7-day Average Flow Min (CFS)	7-day Average Flow Range (CFS)	Hourly Average Statistics Maximum Discharge (CFS)	Hourly Average Statistics Minimum Discharge (CFS)	Hourly Average Statistics Mean Discharge (CFS)	Days without sensor error or obstructed flow	Total Data Days	Remarks		
4	Last Chance Doyle	2000	183.8	2.2	181.5	384	2.25	31.0	292	317	Installed 12/23/97, data missing due to installation upgrade	3520	TRUE
	Last Chance Doyle	2001	27.5	0.6	26.9	103	0.41	3.10	364	365		3520	TRUE
	Last Chance Doyle	2002	66.9	0.07	67	111	0.04	12.6	364	365		3520	TRUE
	Last Chance Doyle	2003	92	0.12	92	175	0.03	20.2	365	365		3520	TRUE
7	Red Clover Notson	2000	303.4	4.9	298.5	1354 OR[1]	0.02	64.6	307	316	Installed 10/22/99, t data due to vandalism	149	FALSE
	Red Clover Notson	2001	66.1	2.5	63.6	101	2.13	11.5	365	365		149	TRUE
	Red Clover Notson	2002	38.9	2.80	36	59.3	2.43	7.93	209	209	Lost data due to vandalism	149	TRUE
	Red Clover Notson	2003	287	3.22	283	473	1.07	54.4	365	365		149	FALSE
9	Indian abv Red Clvr	2000	208.2	13.7	194.6	239 OR[1]	12.9	51.0	331	331	Installed 11/04/99	93	FALSE
	Indian abv Red Clvr	2001	16.7	3.82	12.9	28.3	3.50	8.84	365	365		93	TRUE
	Indian abv Red Clvr	2002	126	4.08	122	160 OR[1]	1.66	23.4	362	365		93	FALSE
	Indian abv Red Clvr	2003	239	12.7	227	272 OR[1]	1.96	46.8	365	365	Some days affected by ice, not determined.	93	FALSE
10	IndianblwRedClver	2000	660.9	25.5	635.4	2103	21.2	161	331	331	Installed 11/05/99	2047	okay
	IndianblwRedClver	2001	174	3.46	170	236	0.20	56.4	365	365		2047	TRUE
	IndianblwRedClver	2002	343	3.06	340	543	3.06	96.2	359	365		2047	TRUE
	IndianblwRedClver	2003	701	24.7	677	1158	16.8	196	305	365	Sensor error in August 2003	2047	TRUE
11	Indian @ Taylorsville	2000	1055.0	245.1	809.9	3387 OR[1]	245	616	126	130	Installed 10/29/99, high flow period only	2774	FALSE
	Indian @ Taylorsville	2001	Not enough high flow days			555	255	314	14	15	High flow period only	2774	TRUE
	Indian @ Taylorsville	2002	471	248	223	623	222	348	89	89	High flow period only	2774	TRUE
	Indian @ Taylorsville	2003	909	225	683	1698	223	514	151	365	High flow period only	2774	TRUE
12	Lights	2000	437.6	1.5	436.1	2224 OR[1]	1.18	87.6	278	277	Installed 12/28/99	867	FALSE
	Lights	2001	93.5	0.10	93.4	200	0.19	16.7	304	365	Some periods with zero flow	867	TRUE
	Lights	2002	178	0.05	178	267	0.03	41.1	326	365		867	TRUE
	Lights	2003	290	0.00	290	630	0.00	76.3	346	365	Several days of zero flow (or near zero)	867	TRUE
26	Wolf	2000	249.0	0.7	248.2	935 OR[1]	0.14	58.6	212	284	Installed 12/21/99	415	FALSE
	Wolf	2001	87.0	0.38	87	Beaver dam	---	---	322	365	Daily average estimated based on regression to Lights Creek	415	
	Wolf	2002	94.7	1.10	94	116	1.08	12.9	222	365		415	TRUE
	Wolf	2003	139	1.24	138	211	0.95	31.6	359	365	Beaver activity affects record	415	TRUE
16	Spanish	2002	638	42.6	595	2194 OR[1]	37.8	155	217	227	Installed November 2001, some data lost due to battery failure.	302	FALSE
	Spanish	2003	525	11.8	513	768	11.3	167	335	365	Beaver activity affects record	302	FALSE

[1]OR =

For peak flows that are "over the rating", the discharge is calculated based on extrapolation of the existing rating table. No measurements are available that define the stage flow relationship during the peak flow event. Therefore, there is no estimate of the relative accuracy of these values.

CHAPTER III

DISCUSSION OF INDIVIDUAL MONITORING SITES

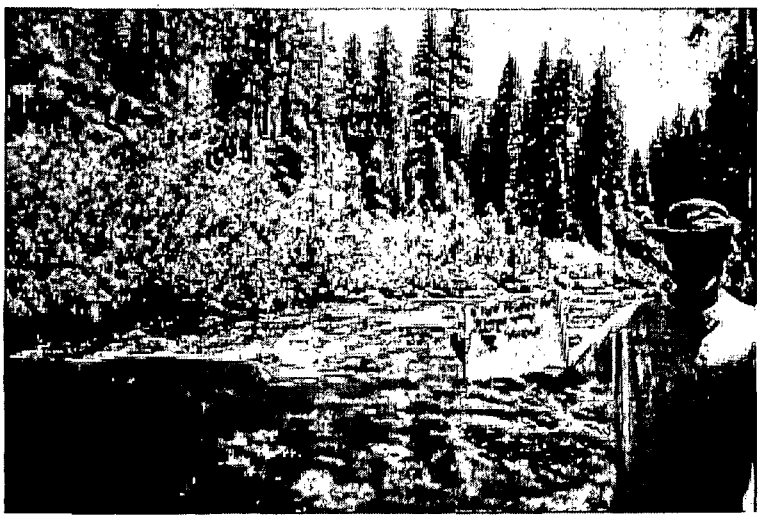
Figure 9. Goodrich Creek

Goodrich Creek was discontinued as a Monitoring Reach in 2001, due to further access denied by the owners. Geomorphic parameters showed a general improving trend from 1999 to 2001. Temperatures in Goodrich Creek were only measured in 2001, the worst water year. However, the max temp only reached 73F, and the max 7-day average was 69F. Temperatures were moderately conducive for trout production. We were never able to electroshock the reach. Nutrients were comparable to other sites, however, this site had the 2nd highest fecal coliform on 2001. This was one of the two sites that showed a clear decline from '99 to '01 in all five macroinvertebrate metrics displayed in Table 12.

Figure 10. Butt Creek

The geomorphic indicators showed an ambiguous mix of static, improving and declining trends. The channel slope appears to be increasing, but it is not known if that increase is actual or due to survey error. The crew leader stated that the site appeared the same each year of the survey. Water temperatures in Butt Cr are conducive to trout production, and this was reflected in the fish surveys, with the highest salmonid production of any site. Butt Cr was also the only site with riffle sculpin. However, several large suckers were present in the 2003 survey, while there were no suckers at all in the 2001 survey. Butt Cr didn't stand out in water quality except with the 4th highest Cr, and surprisingly, the 2nd highest total, and 6th highest fecal, coliform in 2001. Then in 2003, it had the lowest total coliform, and 7th highest fecal.

Figure 11. North Fork Feather River above Lake Almanor (@ Domingo Springs)



This site is not an alluvial site, and as with most of the non-alluvial sites, geomorphic characters remained primarily the same from 1999 through 2003. (Bankfull elevation of cross-section 1 appears to have been erroneously identified in 2003.) Banks seem to be steepening in cross-section 3, and the profile appears to be slightly steepening. Water temperatures appear to be very conducive to trout production. However, due to the volume of water at this site, no electroshocking surveys have been conducted. The site appeared to have slightly elevated phosphates, and the sixth highest fecal coliform in 2003. This was the other of two sites that showed a clear decline from 1999 to 2001 in all five macroinvertebrate metrics.

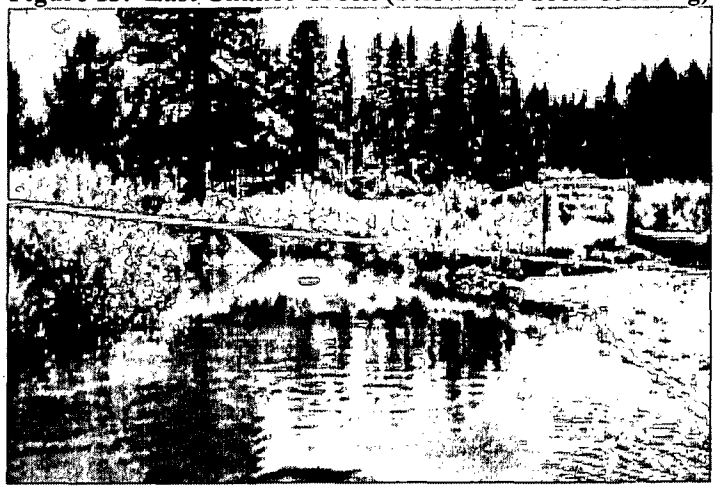
Figure 12. North Fork Feather River above the East Branch (@ Gansner Bar)

Total Watershed Acreage: 704,000
This site is not alluvial either, and is highly regulated, being downstream of Lake Almanor, Butt Valley dam, and Caribou Reservoir. Here again, most geomorphic parameters were static, with a couple of ambiguous changes. The reach was shortened in 2001 due for safety. Water temperatures are conducive for trout, but the reach has not been electroshocked because of too much water. The site had relatively good water quality, with some of the lowest fecal coliform counts, and mostly static macroinvertebrate metrics.

Last Chance Creek at Doyle Crossing

(No photo) This is a Continuous Recording Station. As with the downstream Monitoring Reach site, temperatures at this site are too warm for trout production.

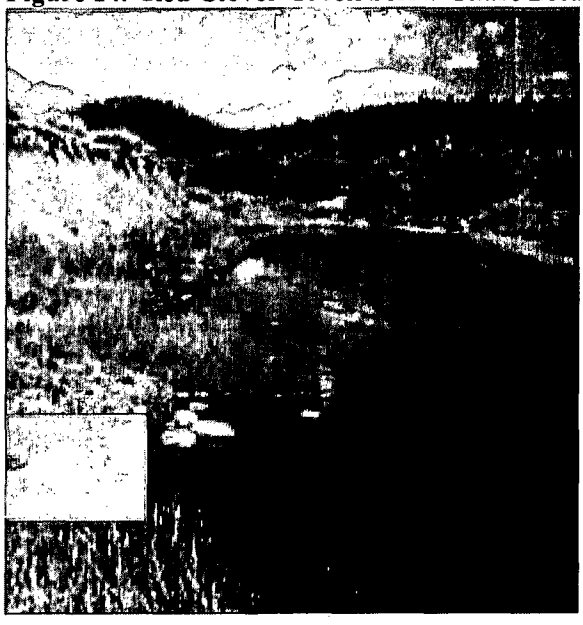
Figure 13. Last Chance Creek (below Murdock Crossing)



Watershed Acreage: (approx.) 81,790

This site showed an ambiguous mix of trends in geomorphic parameters, except for a steady improvement in entrenchment (i.e. its becoming less entrenched) and pool to riffle ratios. There was a slight, but steady decrease in residual pool depth, and a coarsening of substrate. Slope remained static. For water quality, Last Chance Creek is one of the warmest sites monitored, with a steadily increasing absolute max temperature. Some heavy metal concentrations, were notable, with the second highest Al & Mn; 3rd highest Zn, Hg, Fe and Cd; and 4th highest Cu and Pb. There were no other notable water quality parameters. No trout were detected in either year of fish surveys, although they have been known from this location historically.

Figure 14. Red Clover Creek below Chase Bridge



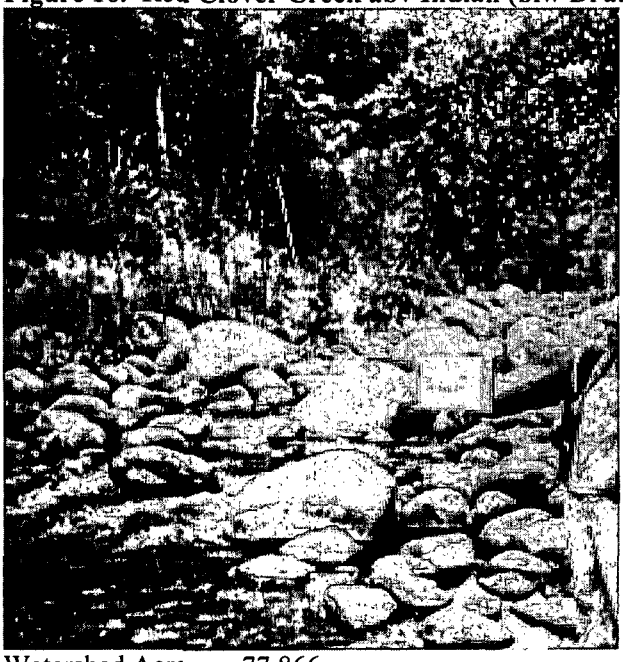
Red Clover Creek has had several sites monitored. SCI was completed by the Forest Service in 1995 below the Chase Bridge (there was a later survey they did above the bridge, and another 1995 Forest Service survey at Notson Bridge). The FRCRM crew was able to locate the cross-section markers from 1995, and repeated the survey in 2003 (a profile was done here as well in 2001). The CRM decided to add this site to its SCI surveys because of the pending work to be completed just upstream on private land, and because the Drum Bridge site is not alluvial. (The FS is also planning restoration work at this site.) The slope stayed the same between 2001 and 2003. Substrate showed some coarsening, and the channel was slightly more entrenched. Because of the recent addition of this site to the CRM surveys, there were no water quality samples taken. A Hobo temperature logger was lost in 2003, presumably due to beaver. The fish survey in 2003 captured one rainbow trout as well as suckers and dace.

Figure 15. Red Clover Creek at Notson Bridge

Watershed Acreage: 69,190

This is a continuous recording station site, here looking downstream from the bridge. Temperatures appear to be slightly increasing at this site from 2000 to 2003.

Figure 16. Red Clover Creek abv Indian (blw Drum Bridge)



Watershed Acreage: 77,866

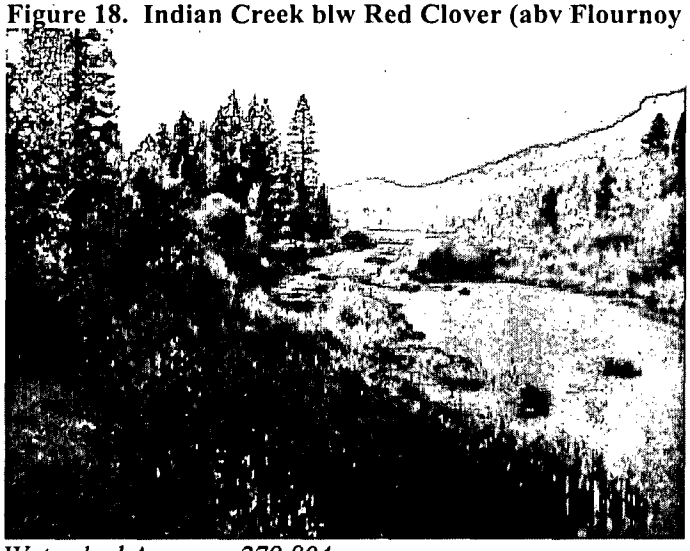
As mentioned above, this site is not alluvial. No geomorphic survey was conducted here in 2003. Between 1999 and 2001, all geomorphic parameters were basically static, except for a decrease in pooltail fines and the pool:riffle ratio. Temperature generally improved or was static from 2001 to 2003, as would be expected with the increased precipitation between those years, and was conducive to trout production both years. This section of Red Clover Creek is known as a good trout fishery, but no electroshocking survey has been done. Other water quality parameters were generally par with the other sites, although there was a slight increase in orthophosphate from 2001 to 2003.

Figure 17. Indian Creek abv Red Clover (DWR weir)

Watershed Acreage: (approx.) 71,300

This is a continuous recording station site. Temperatures generally followed the flow trend, and were generally good for trout production. Flows at this site, however, are affected by Antelope dam, which is approximately 10 miles upstream.

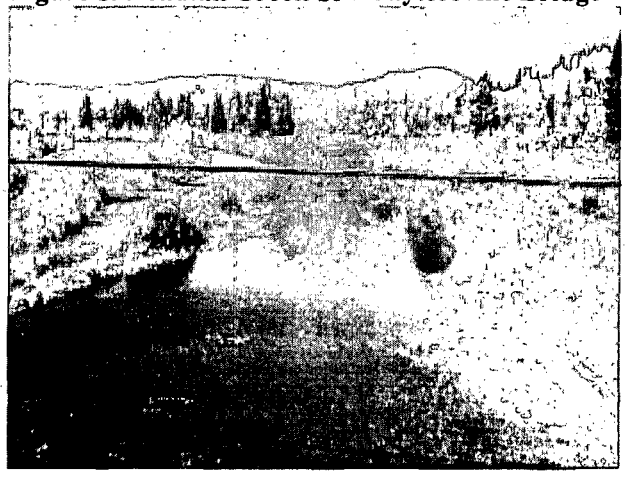
Figure 18. Indian Creek blw Red Clover (abv Flournoy Bridge)



Watershed Acreage: 279,804

This photo is of the downstream of the bridge, where Continuous Recording Station calibration measurements are made. The Monitoring Reach, above the bridge, was originally to be placed above Red Clover Creek, although in this location, it does help put flow and precipitation data at Taylorsville in context of upper vs. mid-watershed sources. The geomorphic parameters were basically the same between years, except maximum bank full depth seems to be increasing, and the upper pools deepening. The temperature trend was unexpected because 2003 was similar to 2001, despite the increase in flows and cooler air temperatures. This site was also generally warmer than the DWR weir site. There was fairly good water quality at this site, except in bacteria, which showed the 4th highest total coliform in 2001, and fecal coliform in 2003. This site was also one of the top 8 total coliform sites in 2003. There was much higher fish productivity in 2003 than 2001, which may have been due to the water year, or, perhaps the microhabitats sampled.

Figure 19. Indian Creek blw Taylorsville Bridge



Watershed Acreage: 343,289
This site is both a Monitoring Reach and a Continuous Recording Station. Geomorphic parameters were basically the same at this site as well, with a slight coarsening of substrate. Unfortunately, the temperature sensor was out of the water at this site in the summer. There were no notable water quality parameters. There were more salmonids captured in 2003 than 2001, probably due to flows. This site was also monitored for storm turbidity in 2001 and 2002 under Prop 204 funding. In the 2001 sampling period, there were an estimated 114 tons of suspended sediment that moved through this site.

Figure 20. Lights Creek (abv Deadfall Bridge)

Watershed Acreage: 67,721
This site is both a continuous recording station and a Monitoring Reach. As mentioned above, despite increasing precipitation from 2001 to 2003, Lights Creek has shown a steady decline in the 7-day average minimum flow. Geomorphic parameters showed an ambiguous mixture of trends, although a slight but steady decrease in BF depth and entrenchment. Cross-sections 1 and 3 also showed a steady decrease in cross-sectional area, all of which could either point to an improving trend or increased sediment supply from upstream sources. Absolute max temperature and the 7-day max rose steadily from 1999 to 2003. Other temperature metrics followed the flow pattern, as expected. This site also had one of the 3 highest ammonia readings in 2001, and moderately elevated total phosphorus (P), and ortho-phosphate. Lights Creek also ranked fairly high in metals, with the highest concentrations of Cu, Ag, and Mn; second highest Al, Cd, Fe and Zn; third highest Cr; 4th highest As and Se; and 5th in Ni; and 7th in Hg. The total coliform test covered the plate in 2001, and had the 5th highest fecal count. In '03 the site was in the top 8 in total coliform, and top 2 in fecal. In the two years of electroshock sampling, no salmonids were captured, as would be expected considering the high temperatures. This, also, was the only site with bullheads present in 2003. This site was also monitored for storm turbidity in 2001 and 2002 under Prop 204 funding. In the 2001 sampling period, there were an estimated 60 tons of suspended sediment that moved through this site.

Figure 21. Wolf Creek

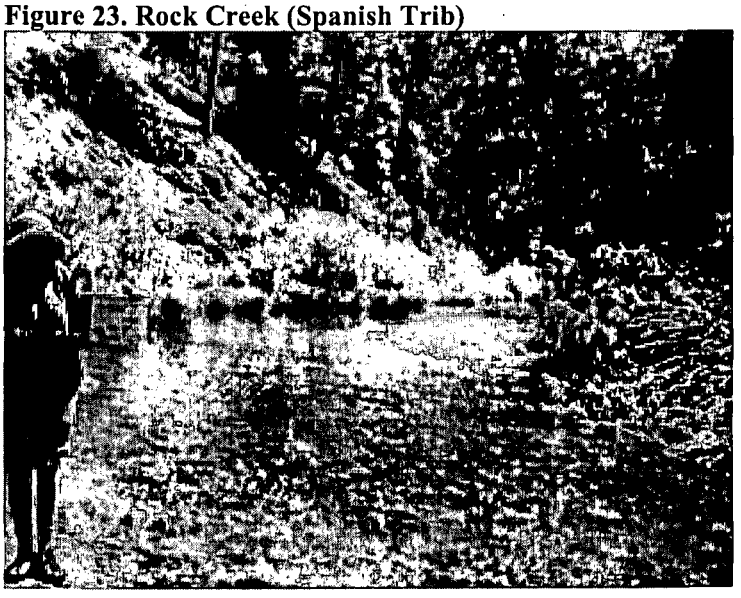
There are two monitoring sites on Wolf Creek; a Continuous Recording Station on the Main St Bridge in Greenville, and a Monitoring Reach about one mile downstream near the town park. Both sites are entrenched. This is the most urban of all of the monitoring sites, and was also the site of an intensive three-phase CRM restoration project in the early 90's. Trends in geomorphic parameters were mostly ambiguous. However, pebble counts showed an improving trend, and cross-section 2 appears to be deepening. The increase in pool numbers is probably due more to a change in pool definition than a change in the reach. Temperatures increased slightly from the upper site to the lower site in 2001, the only year with data from both sites. Both sites were marginal for trout production, and in fact, no trout were captured in '01 or '03. There does not appear to be a nutrient problem, and there was a decrease in both phosphorus concentrations from '01 to '03. Although, Wolf Cr had the highest Hg concentration of any site (and the 5th highest As). Coliform changed for the worse between years, with low total in '01, and 8th highest in fecal; moving up to one of the top 8 in total coliform in '03, and one of the top two in fecal. This site was also monitored for storm turbidity, with results in the 204 report. This site was also monitored for storm turbidity in 2001 and 2002 under Prop 204 funding. In the 2001 sampling period, there were an estimated five tons of suspended sediment that moved through this site.

Figure 22. Indian Creek abv Spanish Creek (@ Dawn Institute)

Watershed Acreage: (approx) 478,590

This site is at the mouth of Indian Creek. It is not located at the mouth of Indian Valley, however, and water travels through an eight-mile canyon before reaching this site. Geomorphic parameters were basically static or ambiguous in this non-alluvial reach. Pebble counts showed a coarsening of material from 2001 to 2003. This site had the highest total dissolved solids, with high electroconductivity and alkalinity as well. Phosphorus was detected, but was not in as high concentration as some other sites. Metals were somewhat high, with the 2nd highest As concentration; the 3rd highest concentrations of Cu, Mn & Se. Coliform was relatively low (except 9th highest total coliform in '03). This site was not electroshocked due to the volume of water.

Figure 23. Rock Creek (Spanish Trib)



Watershed Acreage: 24,416
Major land use: timbered National Forest land
Geomorphic parameters were basically static. This site is actively mined, and the increase in residual pool depth may have been due to mining (as could be the increased max bankfull depth at cross-section 3 and coarsened pebble counts). This creek has good water temperatures for trout production, which was corroborated in the electroshock surveys both years. As expected, both temperature and macros followed the flow trend. Rock Creek was also low in nutrients, and the only metal of note was the 2nd highest concentration of Ni. In both '01 and '03 this site was one of the highest in total coliform, but one of the lowest in fecal coliform.

Figure 24. Spanish Creek at Hwy 70 (Gansner Park)

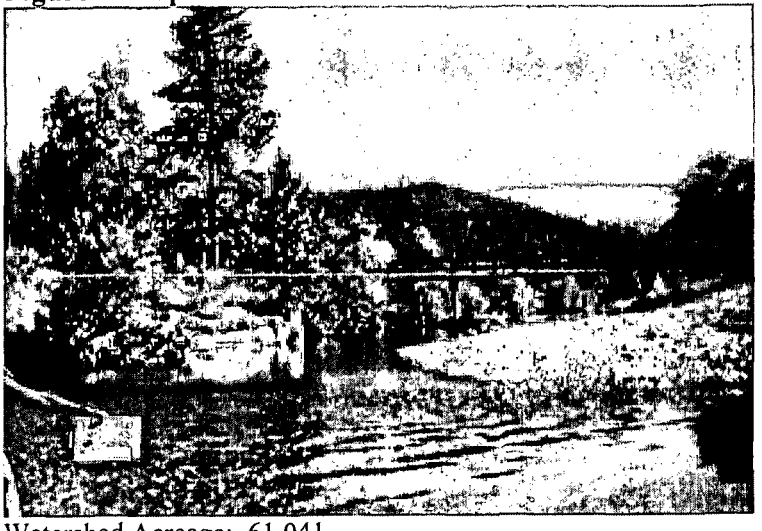
Watershed Acreage: (approx) 55,500
This is Continuous Recording Station site. This recorder is also equipped with a turbidity meter. And, as expected, the turbidity follows the flow. However, there was some low flow turbidity due to construction just upstream of the sensor. Flows at this site may be skewed due to a beaver dam downstream of the sensor, but as with any site with beaver activity, the final flow data are calibrated to negate that effect, to the fullest extent possible. This site shows slight temperature impairment. In summer 2003 a Hobotemp recorder was placed upstream above Rock Creek. Those data have not yet been summarized. That information may be helpful in the Spanish Creek Assessment, which began in December 2003. The assessment is expected to lead to channel stabilization projects.

Figure 25. Greenhorn Creek abv Spanish Creek

Watershed Acreage: 44,695

The site is located at the mouth of Greenhorn Creek, after it travels through American Valley. Geomorphic changes at this site include a barely perceptible increase in average bankfull width, and corresponding increasing width to depth ratio. Entrenchment, however, is remaining steady. The pool to riffle ratio and residual pool depth is also steadily increasing, and substrate particles decreasing in size, all of which point to some changes taking place that warrant continued monitoring. The slope was the same from 2001 to 2003, and perhaps the change from 1999 is due to a survey error (this is the first site that is surveyed each year). There was a general improvement in temperatures (i.e. cooling) from 2001 to 2003, as expected with the increased flows. Greenhorn temperatures are marginally good for trout, and this site was low in nutrients. No metal concentrations were particularly noteworthy. Bacteria could be a concern, with this site tied with the neighboring Spanish abv Greenhorn site for the 3rd highest concentration of fecal coliform in 2003. Random turbidity monitoring showed an expected increase in turbidity from just above American Valley to this site at the mouth. Fish productivity followed the flow trend, increasing in productivity from 2001 to 2003.

Figure 26. Spanish abv Greenhorn



Watershed Acreage: 61,041

This site is adjacent to the Greenhorn abv Spanish site, also at the mouth of American Valley. Geomorphic parameters were basically static, but showed a slight increase in width, depth and entrenchment, a slight decrease in pool-tail fines, and a coarsening of the bedload. Temperatures were marginally good for trout in '01. Nutrients could be a concern with the 2nd highest nitrate/nitrite concentrations of any site. This site also had the highest Ni concentration. As mentioned above, this site had high fecal coliform in '03, but had low total coliform in both years. Random turbidity monitoring showed a steady increase in turbidity from above American Valley to this site. This site was also consistently more turbid than the neighboring mouth of Greenhorn Creek. The 2003 fish sampling effort captured more trout than in 2001, but there was a shift toward brown trout.

Figure 27. Spanish Creek abv Indian Creek

Watershed Acreage: 129,305

This site is characterized as depositional, but not really alluvial, as it is in a canyon. Geomorphic metrics were mostly static or ambiguous, although the slope increased and pools deepened slightly. Temperatures are marginally good for trout production. In 2001 temperatures increased slightly from abv Greenhorn Creek to here. Neither nutrients nor metals appear to be problematic here. This site was also about median for coliform both years, but was in top 8 for total in '03. There were no electroshock fish surveys at this site, due to the volume of water. Also, of note is that during casual observances from the junction of highways 70 and 89, where Spanish and Indian Creeks join to form the East Branch North Fork Feather, Spanish Creek is almost always less turbid than Indian during high run-off or storm events.

Figure 28. East Branch North Fork Feather River abv North Fork Feather

Watershed Acreage:. 661,880

This site is not alluvial, and most geomorphic parameters were static, with a trend toward more fines in the substrate. Maximum bankfull depth also slightly increased. Temperatures here were very marginal for trout, and were generally warmer than Spanish or Indian Creeks, but Indian Creek appears to be the source of slightly warmer water. This site also had some of the highest EC and TDS readings, and was highest in As concentration (4^{th} in Ni, and 5^{th} in Cu). It also seems to have no nutrient problems, and was relatively low in coliform. No fish surveys were conducted here due to volume of water.

Figure 29. Middle Fork Feather River at Beckwourth

Geomorphic parameters were mostly ambiguous at this site. However, some trends did show that pebbles coarsened, and that the channel is imperceptibly increasing in entrenchment, with a deepening average bankfull depth, and max bankfull depth increasing at cross-sections 1 and 3, all of which could indicate a declining trend, and at least warrant further monitoring. Slope is only graphed from the 1999 survey, because water surface elevations were not available due to a dry channel in 2001 and 2003. When there is water in the channel, it is marginal for trout. Presumably because of the low flow, this site had the worst overall water quality. It had the highest TDS and EC, and was five times higher in phosphorus than the next highest site. It also had the highest ammonia, and second highest nitrate/nitrite. It had the highest concentration of Al, Cd, Cr, Fe, Pb and Zn; 2nd highest Se and Cu; 3rd highest As; and 4th highest Hg and Mn. It was not sampled in September '03, but had the highest fecal coliform in '01. Again, due to lack of continuous surface water, there has not been a fish survey at this site, and macros were only collected in '99.

Figure 30. Sulphur Creek at Clio

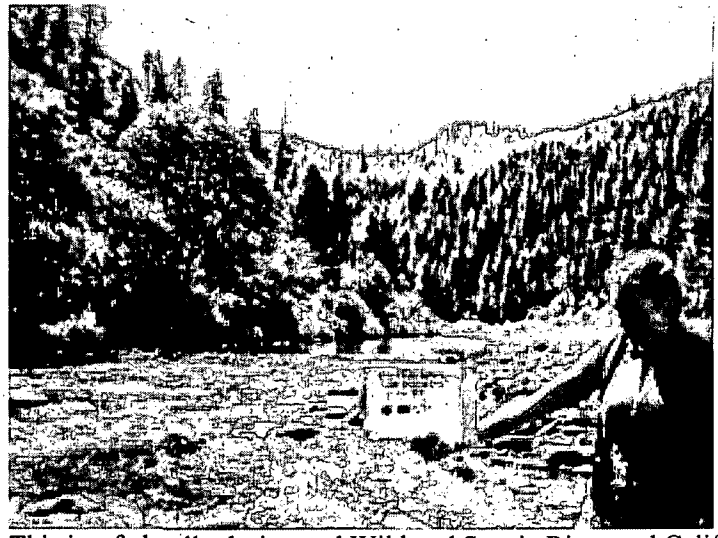
Watershed Acreage: 25,300

This site is just above the mouth of Sulphur before it drains into the Middle Fork Feather River. A continuously recording station is scheduled to be installed here in early 2004. There is a Forest Service SCI site further upstream in this watershed above Mohawk Valley. Data from these two sites will be compared and incorporated into the Sulphur Creek Watershed Assessment. Most geomorphic parameters were static at this site, with the exception of barely perceptible decreasing entrenchment, coarsening of substrate, and an increase in max BF depth at xsecs 2 and 3. There appears to be a slight warming trend in temperature from '01 to '03, which should be more closely monitored, since flows increased, and one would expect temperatures to improve. Temperatures in both years were fairly conducive to trout production. This site was a close second to the MFFR at Beckwourth in high nutrient concentrations; it also had the 3rd highest fecal coliform in '01, and 2nd highest in '03. Turbidity at three sites along the mainstem and at two tributaries is being randomly monitored by volunteers as part of the citizen monitoring portion of the Watershed Assessment. This site had the highest Se. There were salmonids captured in both '01 and '03, with an increase in productivity in '03. This site also had the highest fish species diversity of any site in '03 (perhaps because its so close to the Middle Fork).

Figure 31. Jamison Creek

This watershed has had extensive historic mining, which left a legacy of an unstable channel within Plumas-Eureka State Park. The site is non-alluvial, and was basically static in all geomorphic parameters. As expected, temperatures improved from '01 to '03, and were conducive to trout both years. Nutrients and coliform were also not an issue at this site. The site had the 2nd highest Hg of any site. The only fish survey was conducted in '01, when only rainbow trout were captured. Opposing the declining flow trend from '99 to '01, this was the one site where macroinvertebrate metrics showed an improving trend.

Figure 32. Middle Fork Feather River abv Nelson Creek



This is a federally designated Wild and Scenic River and California Wild Trout Fishery. There was basically no change in geomorphic parameters at this non-alluvial site, except for a steady decrease in percent fines, and a fining of the substrate. Temperatures in '01 were marginal for trout production. Nutrients and bacteria were low in all categories, except for a surprising 3rd highest concentration of total phosphorus in '01, and inclusion in the top 8 highest total coliform in '03. The only noteworthy metals result here is the 5th highest concentration of Hg. Fish were not surveyed at this site due to high volume of water.

CHAPTER IV

RECOMMENDATIONS FOR FUTURE MONITORING

General

As mentioned previously, the data above provide a good picture of baseline conditions to which future conditions can be compared. The collection of these data was somewhat intensive. This section attempts to recommend future monitoring efforts with the assumption of declining resources, and with the realization that it is the simplest and least expensive monitoring that is most likely to continue into the future for the long term. The FR-CRM's watershed monitoring program is an iterative process. It should be noted that the following are preliminary recommendations by CRM staff, and need to be evaluated further by the TAC. Table 14 at the end of this discussion suggests monitoring schedule.

- Geomorphic monitoring was designed for alluvial channels in relatively small (less than 10,000 acres) watersheds. While the TAC wanted to collect full baseline data at non-alluvial sites, these sites are the lowest priority for continued geomorphic monitoring, and would probably only be re-surveyed after a major event. GIS'ed permanent stakes will allow future geomorphic monitoring when further surveys are warranted.
- The best schedule for further geomorphic monitoring at alluvial sites would be event-driven (i.e. significant bedload movement). However, due to funding realities, if that is not possible, these sites should be re-surveyed on a five-year basis (or perhaps ten-year for bed-load samples).
- Water Quality – Sediment and temperature are the two highest water quality concerns in the upper Feather. Temperature is currently being continuously monitored at 8 stations throughout the watershed. Summer temperature data can be easily and inexpensively monitored at many sites of interest with Hobotemp loggers, and could continue on an annual or biennial basis. Sediment monitoring is more complicated than temperature. Currently, continuous recording turbidity meters are installed in Spanish at Hwy 70 (Gansner Park) and Indian at Taylorsville. Volunteers in Sulphur Creek and American Valley are randomly monitoring turbidity. To get a clear picture of sediment, however, depth integrated samples should be taken during storm events. This effort cost about $12,000 a year in Indian Valley alone, during relatively uneventful years. At this time, the TAC was not enthusiastic about investing limited resources in sediment monitoring, and felt that other parameters can show changes in the watershed.
- Flow- Flow is monitored at the Continuous Recording Stations. Especially when compared to precipitation data, flows can say a lot about watershed condition. These sites should continue to be maintained and calibrated.
- Biota- Fish population surveys should continue every five years. Macroinvertebrates should also be continued every five years, and be used as a screen for further water quality testing.

Goodrich Creek

This site is discontinued because of access denied by the landowner. If access is allowed once again, full geomorphic monitoring should continue here, as it is a good example of an alluvial system high in the North Fork Feather watershed.

Butt Creek

Lassen National Forest also has a Monitoring Reach site on Butt Creek. Before further monitoring, these sites need to be compared, and a determination made as to whether or not both sites should continue, or one eliminated.

North Fork Feather River above Lake Almanor (@ Domingo Springs)

Because this site is not alluvial, the need for another geomorphic survey should be evaluated only after a large flow event. Because of somewhat marginal baseline data results, it should continue to be monitored for water quality and macroinvertebrates.

North Fork Feather River above the East Branch (@ Gansner Bar)
Because this site is not alluvial, is highly regulated, and had relatively good baseline water quality data, it is low priority for further surveying of any type, unless warranted by other observations. Also, prior to future surveying, PG&E needs to be contacted to see if they have pertinent data. The primary utility of this site may be for an academic comparison of this sediment-starved system to the unregulated East Branch site.

Last Chance Creek (below Murdock Crossing)
Watershed Acreage: (approx.) 81,790
The Plumas National Forest also has a site on Last Chance Creek, relatively close to the CRM site. Before further monitoring at this site, the data between these sites needs to be compared, and perhaps, one site eliminated. (Or perhaps not, as the comparison could show how much site-specific noise there is in the data.) One of the sites, however, should be a high priority for further intensive monitoring. There is a Continuous Recording Station upstream at Doyle Crossing, and this watershed is a high priority for restoration. Data at this site are expected to show changes due to management and restoration changes. This is a high priority site.

Red Clover Creek below Chase Bridge
Red Clover Creek is another site with high priority for further intensive monitoring, as management changes and major restoration are planned upstream, as well as on-site by the Forest Service. See Last Chance, and apply here as well.

Red Clover Creek at Notson Bridge
The Continuous Recording Station at this site should be maintained, calibrated, and upgraded with dial-up or satellite remote data retrieval capabilities.

Red Clover Creek abv Indian (blw Drum Bridge)
This site is not alluvial, and should only be re-surveyed for geomorphic parameters when other observations warrant. Nutrients and temperature may be monitored more frequently, or monitored at Chase or Notson bridges.

Indian Creek abv Red Clover (DWR weir)
Since this site is already equipped with a Continuous Recording Station, it should continue to be monitored, (although flows at this site are highly affected by operations at Antelope Dam).

Indian Creek blw Red Clover (abv Flournoy Bridge)
Even though this site is alluvial, it is relatively lower priority for all monitoring because it is below Red Clover Creek. Although this site is upstream Grizzly Creek and other tributaries, as well as the millrace diversion above the Taylorsville Bridge. The Continuous Recording Station on Flournoy Bridge needs to be checked for accuracy.

Indian Creek blw Taylorsville Bridge
This site remains interesting for monitoring because it is at the beginning of Indian Valley, and is below the millrace diversion. Both Continuous Recording Data (including turbidity) and Monitoring Reach data are collected here. This site is a relatively high priority for monitoring.

Lights Creek (abv Deadfall Bridge)
This site is both a continuous recording station and a Monitoring Reach, and is relatively high priority for further intensive monitoring because of the marginal baseline data results, and because it is an important tributary to Indian Creek.

Wolf Creek
Same as Lights Creek.

Indian Creek abv Spanish Creek (@ Dawn Institute)
Indian Creek is a large and important creek in the Upper Feather, with major degraded valleys, and on-going restoration work. Much thought was given to the placement of this site at the mouth of Indian Creek. It is not an alluvial site, however, so geomorphic measures should only be taken after a large event. Water quality measured here is improved as it moves through the canyon after it leaves Indian Valley. The TAC needs to re-evaluate this site for its efficacy in answering questions about the Indian Creek watershed. Or, perhaps, to stay comparable to Spanish Creek data, a water quality station should be added to Indian Creek closer to the end of the valley (although, the TAC was not able to locate a good geomorphic station near the end of the valley).

Rock Creek (Spanish Trib)
This site is not alluvial, however it is at the base of an important tributary to upper Spanish Creek. The site is also actively mined, which presumably affects the geomorphic data. However, because of the intensive study and restoration work requested by landowners in American Valley, this site should remain a relatively high priority site for continued intensive monitoring.

Spanish Creek at Gansner Park
This is another Continuous Recording Station without a Monitoring Reach. Because of the assessment project, as well as the downstream Monitoring Reach, this recorder should be maintained and calibrated.

Greenhorn Creek abv Spanish Creek
The site is located at the mouth of Greenhorn Creek, after it travels through American Valley. It is an excellent site for monitoring water quality leaving American Valley, and geomorphic changes in response to changes in Spanish Creek. It is a high priority site for continued intensive monitoring. Water quality monitoring, however, could concentrate on bacteria levels and nutrients rather than metals.

Spanish abv Greenhorn
Same as Greenhorn above Spanish.

Spanish Creek abv Indian Creek
Similar to the Indian above Spanish site, this is non-alluvial, and perhaps needs to be re-evaluated for the efficacy of geomorphic measures. However, this site may continue to be interesting for temperature and water quality, as it is at the mouth of Spanish, and gives the final picture of Spanish Creek water before it mixes with Indian Creek, and after it has had a chance to run through about eight miles of canyon after leaving American Valley.

East Branch North Fork Feather River abv North Fork Feather
This site is not alluvial and is low priority for intensive monitoring. Further geomorphic monitoring would be conducted after a large event. Temperatures could continue to be monitored.

Middle Fork Feather River at Beckwourth
This site should continue to be monitored due to evidence in the baseline data of problems with channel stability, water quality, and flow. This site is also at the mouth of Sierra Valley, which may be seeing increased restoration efforts.

Sulphur Creek at Clio
This site is just above the mouth of Sulphur before it drains into the Middle Fork, and continues to be a high priority for intensive monitoring, as the Sulphur Creek Watershed Assessment is near completion, and restoration projects get underway.

Jamison Creek

This non-alluvial site should be sampled again only after a large flow event, as this channel has relatively large substrate, and seems to move only after large events.

Middle Fork Feather River abv Nelson Creek

This is a federally designated Wild and Scenic River and California Wild Trout Fishery. Because it is non-alluvial, this is another low priority site for further monitoring until after a high flow event.

Recommendations for Data Management

In the short-term, re-organize data from site-specific Excel spreadsheets to a database-like format in Excel. Continue to include spatial data in any monitoring work. Long-term data management may include conversion to an actual database, if resources become available. Current constraints to database conversion are the personnel skills that can manage this type of data management.

Recommendations for Field Surveys

- Take old profile and cross-section graphs to the field for reference in future cross-section and profile surveys. An attempt should be made to repeat the same elevations and features during each survey. This will aid in year to year comparison of the data.
- In surveying, closer attention needs to be paid to make sure the rod is exactly at the water surface elevation.
- Take the USDA-FS GTR RM-245 (Harrelson, et al. 1994) to the field to assist in bankfull determinations.
- Enter permanent (and perhaps transect cross-sections?) into the XSPRO program to determine bankfull cross-sectional area. Drive in a rebar stake at the next surveyed bankfull elevation to help determine bankfull in future surveys.
- For electrofishing, the Monitoring Reach files should be reviewed so that habitat types, locations and fishing effort can be repeated. Spanish Cr above Greenhorn should be re-evaluated as a sampling site, because of the presumably heavy fishing pressure at this site.

Recommendations for Flow Measurements

Continue to maintain and refine this data collection effort. Continuously recorded temperature and flow data are perhaps the most informative and least expensive of the watershed monitoring efforts. Continue to refine rating tables for each of the sites with flow measurements at needed stages. Annually calibrate temperature probes according to manufacturer's suggestions. Re-position the Taylorsville probe to accommodate both high and low flows. Examine Wolf Cr and Flournoy Bridge sites for malfunction, as the 2003 data seem anomalous. Determine what should be done with beaver dams downstream of sites. Continue to collect several more years of data to develop a 7-station average.

See Table 14 for a suggested monitoring schedule.

Table14. Suggested Monitoring Schedule (all stations are Monitoring Reaches unless otherwise noted)

Existing Station	Annual or Biennial	Priority	5 years or moderate event	Priority	10 Years or major event	Priority
Goodrich			Geomorph, WQ, Temp, Biota	M		
Butt*			Geomorph, WQ, Temp, Biota	M		
NFFR abv Almanor			WQ, Biota	M	Geomorph	M
NFFR abv EBNFFR					Geomorph, WQ	L
Last Chance*	temperature	H	Geomorph, WQ, Temp, Biota	H	Same as 5 yr	H
RedClover@ Chase	temperature	H	Geomorph, WQ, Temp, Biota	H	Same as 5 yr	H
RedClover blwDrum	temperature	M	WQ, Temp	M	Geomorph, WQ, Temp, Biota	M
Indian blw Red Clover	Continuous recorder here	N/A	Geomorph, WQ, Temp, Biota	ML	Same as 5 yr	ML
Indian blw TvilleBridge	Continuous recorder here	N/A	Geomorph, WQ, Temp, Biota	MH	Same as 5 yr	MH
Lights	Continuous recorder here	N/A	Geomorph, WQ, Temp, Biota	MH	Same as 5 yr	MH
Wolf	Continuous recorder here	N/A	Geomorph, WQ, Temp, Biota	MH	Same as 5 yr	MH
Indian abv Spanish*			WQ, Temp	M	Geomorph, WQ, Temp, Biota	M
Additional Station- Indian blw Indian Valley	WQ, temp	M				
Rock			Geomorph, WQ, Temp, Biota	MH	Same as 5 yr	MH
Greenhorn abvSpanish	temperature	H	Geomorph, WQ, Temp, Biota	H	Same as 5 yr	H
Spanish abv Greenhorn	temperature	H	Geomorph, WQ, Temp, Biota	H	Same as 5 yr	H
Spanish abv Indian*			WQ, Temp	M	Geomorph, WQ, Temp, Biota	M
EBNFFR			Temp	M	Geomorph, WQ, Temp, Biota	L
MFFR@ Beckwourth	temperature	H	Geomorph, WQ, Temp, Biota	H	Same as 5 yr	H
Sulphur	temperature	H	Geomorph, WQ, Temp, Biota	H	Same as 5 yr	H
Jamison					Geomorph, WQ, Temp, Biota	M
MFFR abv Nelson					Geomorph, WQ, Temp, Biota	M

*More information is needed before the next monitoring effort (see discussion above).

REFERENCES

"Stream Condition Inventory Guidebook" version 4.0, United Stated Department of Agriculture, Forest Service, Pacific Southwest Region, 1998.

"Feather River Coordinated Resource Management Monitoring Plan- 319(h) Program", 1997.

XSPRO: A channel cross-section analyzer. Grant, G. et al. 1992. USDA Forest Service & USDI Bureau of Land Management. Technical Note 387.

APPENDIX A
(of FRCRM Watershed Monitoring Program Final Report 2/2004)

Feather River Coordinated Resource Management
Pilot Watershed Monitoring Program
319(h) Clean Water Act Grant
Final Report

Prepared by Plumas Corporation
Quincy, CA
March 9,2001

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APPENDICES

Appendix A- Watershed Monitoring Pilot Plan
Appendix B- Quality Assurance Protection Plan
Appendix C- Stream Condition Inventory, Ver. 4, 1998
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Pilot Watershed Monitoring Program
319(h) Clean Water Act Grant
Final Report
March 9, 2001

Summary

In 1997, a Clean Water Act 319(h) granted was awarded to the Feather River Coordinated Resource Management (FRCRM) group to develop a Pilot Program for regional watershed monitoring in the upper Feather River basin. The specific purpose was to develop, field test, and evaluate protocols of a watershed monitoring network to obtain baseline and/or continuing data from which could be measured trends-through-time of watershed health. The general purpose was to begin a program of trend analysis with which to evaluate changes as they relate to land management and restoration efforts in the watershed.

The Pilot Program established twenty-one (21) permanent reference reaches (from which field data was collected on nine (9) physical, and two (2) biological parameters), two (2) sediment sampling sites, and eleven (11) continuous recording stations (which track stream-flow, water temperature and several water quality parameters). These are located in the North Fork (1100 mi^2), East Branch (1000 mi^2), and Middle Fork (1200 mi^2) watersheds as follows:

Watershed	Reference Reaches	Continuous Recording	Sediment
North Fork Feather	5	0	0
East Branch Feather	12	10	2
Middle Fork Feather	4	1	0

The field methods used in the reference reaches follow closely those described in the US Forest Service "Stream Condition Inventory Guidebook", version 4, 1998.

The Pilot Program was planned and developed in 1997- 98. The field data was collected from the reference reaches in 1999. The installation of equipment at the continuous recording sites was accomplished in 1999- 2000. The selection of sediment sites was made in 1999, with data collection initiated in 2000- 01.

As a special contribution to this system, Ca. Department of Water Resources purchased and installed a satellite-accessible weather station at Doyle Crossing in the Last Chance Creek watershed (upper east Branch).

Background and Setting

The Feather River Coordinated Resource Management (FRCRM) group, a proactive consortium of 21 public agencies, private sector groups, and local landowners (Table 1), was formed in 1985 in response to widespread erosion and channel degradation in the Feather River watershed. The FRCRM has collectively completed over 50 watershed projects in the Feather River basin since 1985 including studies and assessments, resource management plans, stream restoration projects, community outreach and educational efforts. Over 15 miles of stream and 4,000 riparian acres have been treated at a cost of over five million dollars, which was contributed largely by FRCRM partners. The goal of the FRCRM program is to improve watershed condition over time, reduce erosion, restore meadow function, improve water quality and enhance habitat for fish and wildlife.

Table 1: Feather River Coordinated Resource Management Signatory Members

California Department of Forestry & Fire Protection
California Dept. of Fish & Game
California Dept. of water Resources
California Regional Water Quality Control Board
USDA- Natural Resources Conservation Service
U.S. Army Corps of Engineers
Feather River Resource Conservation District
California Dept. of Transportation
California Dept. of Parks & Recreation
Plumas County Community Development Commission
North Cal-Neva Resource Conservation and Development Area

Plumas County
Feather River College
Pacific Gas & Electric
Plumas Corporation
USDA- USFS, Plumas National Forest
Plumas Unified School District
USDA- Farm Services Agency
Salmonid Restoration Federation
U.S. Fish & Wildlife Service
Univ. of Calif. Cooperative Extension

The Feather River watershed is located in California's northern Sierra Nevada, where the North, South and Middle Forks drain 3,222 square miles of variable terrain from the Great Basin Escarpment westward through the Sierran crest into the Sacramento River (Figure 1). The study area includes three (3) USGS Hydrologic Unit Code watersheds: HUC #18020121, North Fork Feather; HUC #18020122, East Branch, North Fork Feather; HUC #18020123, Middle Fork Feather. Elevation ranges from 2,250 to over 10,000 feet, and annual precipitation varies broadly from more than 70 inches on the wet western slopes to less that 12 inches on the arid east side. Vegetation is diverse and ranges from productive mixed conifer and deciduous forests in the west to sparse sage/yellow pine plant communities in the east. The Plumas National Forest manages most of the forested uplands while the mid-elevation alluvial valleys are predominantly in private ownership.

The Feather River watershed has long been recognized for its recreational and aesthetic value. An abundance of montane rivers, lakes and reservoirs grace the landscape, creating both summer and winter recreational opportunities. Water originating from this area represents a significant component of the State Water Project, which provides high quality water to meet downstream urban and agricultural demand. In addition, a series of hydroelectric dams, powerhouses and reservoirs produce over 4,000 MW of power, while the watershed produces significant forest and agricultural outputs. Water is, therefore, a valuable commodity in this resource-dependent community, and maintaining stable watershed condition is a key element in promoting economic and environmental stability.

The Feather River watershed has been impacted by 140 years of intense human use. Mining, over-grazing, timber harvesting, wildfire, railroad and road construction effects have all contributed to a watershed-wide stream channel entrenchment process. This entrenchment resulted in accelerated erosion, degraded water quality, decreased vegetation and soil productivity, and degraded terrestrial and aquatic habitats. Functionally, the disconnection of stream channels from their floodplains and meadows has led

to a dramatic change in hydrology, leading to reduced summer flow, higher summer water temperature, lower water tables, reduced meadow storage capacity, and a trend from perennial to intermittent flow. Many downcut streams no longer sustain late-season flow, causing adverse consequences to riparian and upland vegetation, aquatic communities, and downstream water users (Ponce and Lindquist 1990).

The FRCRM recognized that restoring watershed function was a major priority for reversing erosional trends. Stable, well-vegetated streams with functioning meadows, aquifers and uplands are critical in maintaining good watershed condition. Achieving this stable state begins with reestablishing water and sediment retention and release functions in headwater meadows, which is the current focus of the FRCRM (Lindquist and Wilcox 2000). Restoration activities play an important role in accelerating improvement in watershed function, the local economy and downstream uses. The results of this monitoring program will help the FRCRM assess the long-term trends in watershed condition in response to projects and may provide useful information in the future to help prioritize limited restoration funding to areas of greatest need.

Project Work Plan

The pilot monitoring program was developed in 1997-1998 under the guidance of FRCRM Monitoring Technical Advisory Committee (TAC). The program was implemented over a two-year period, from 1998-2000. The first year focused on developing a strategy and work plan (Appendix A) that was realistic, feasible and met project objectives. Data collection took place the second year of the project for both the reference reach and permanent station components which is described in more detail in the *Sampling Design and Protocol* section of this document.

The overall objectives of this program are to:

- Develop, implement and evaluate a monitoring program which documents, at the watershed scale, long-term trends in watershed condition cumulatively resulting from restoration activities, land management changes and natural processes in the Feather River basin.
- Develop a spatially referenced data management system to track, organize, and store monitoring data, facilitate analysis, provide a means for widespread distribution and education, and support production of reports needed to evaluate long-term trends. The system used should be compatible with other data sets managed by Quincy Library Group (QLG), Department of Water Resources (DWR), USFS, and others.
- When possible, use monitoring protocols currently used by resource management agencies to facilitate data sharing and to improve data analysis.

The monitoring approach consists of three basic components designed to address project objectives. They are:

- Biennial monitoring of physical and biological parameters at 21 designated permanent response reference reaches.
- Installation of 11 permanent recording stations where data loggers continuously record streamflow and temperature data, and where water chemistry samples are collected manually.
- Regional physical and climatic data are collected at a newly installed weather station at Doyle Crossing. This weather station was purchased and installed by CDWR as a contribution to the project ($25,000). The Doyle Crossing weather station is satellite-accessed, with real-time data available through the Ca. Data Exchange Center (CDEC).

Major tasks carried out in this pilot program include:

- the development of a monitoring work plan;
- purchase and installation of monitoring equipment;

- reference reach initial surveys;
- direct measurements of stream flow for rating permanent stations;
- collection of turbidity, flow and stream temperature data via data logger;
- manual collection of water chemistry samples;
- development of a GIS-based data management system and web interface;
- installation of one meteorological station;
- securing landowner agreements to access equipment and collect data on private land;
- identify and secure funding for the monitoring program beyond the two year pilot phase.

1. Sampling Design and Protocols

Reference Reach Monitoring

Objective: Monitor physical and biological parameters in selected reference reaches at 21 locations in the watershed on a biennial basis. The data is expected to provide a baseline condition with which to discern changes in watershed condition resulting from land management, restoration and natural processes.

Reference reaches were selected based on several criteria. The major criteria include channel sensitivity to change, current and future management activity, accessibility for data collection, position in the watershed and reach length. From a monitoring perspective, we are more interested in sensitive or response reaches since these sites react more quickly to changes in management and natural events, and therefore, will demonstrate change more readily in a long term monitoring program. The selected reaches should be representative of the system. Sites selected for this program are characterized as low gradient, alluvial and have minimum on-site disturbance to avoid data "noise". The reaches are located at or near the base of each sub-watershed to provide a cumulative measure, and are at least 20 channel widths in length (which is the designated minimum length of each reference reach).

The fieldwork for reference reach data collection is conducted by a team of trained technicians that are supervised by an experienced crew leader with extensive field and data collection experience and a technical background in hydrology and biology. To the extent possible, the fieldwork will follow scientific procedures and protocols that are well established in the primary literature or common practices of federal or state resource agencies in the watershed. Data quality control is discussed more fully in the FRCRM Quality Assurance Protection Plan (Appendix B) prepared as part of this CWA 319 grant.

Sampling Approach

The monitoring approach relies heavily on established procedures developed by resource management agencies and on collective expertise offered by FRCRM contributors. It was designed particularly in terms of assessing changes in channel structure, habitat and water quality factors. Field sampling procedures are based on protocols described in the "Stream Condition Inventory Guidebook" (SCI) version 4.0 (1998) (Appendix C). These protocols were developed over a five-year period (1993-98) by fisheries biologists and hydrologists in the US Forest Service Region 5, with support for sampling design and statistical analysis from the USFS Pacific Southwest Research Station. SCI methods were critiqued and in some cases modified by the FRCRM Monitoring Committee to meet project needs. Parameters included in the sampling design and the location of reference reaches are listed on Table 2.

The intent was to provide protocols that can be consistently applied in assessing and monitoring stream conditions in the Pacific Southwest Region, which includes the Feather River basin. Attributes were tested that had been demonstrated through research to be indicative of stream condition, could be sampled

by seasonal field crews, and yet had low enough measurement error to be useful in describing changes in stream habitat with a moderate to high level of confidence. The intensity of data collection meets the objective of comparing data over time, or from other streams with a reasonable level of statistical confidence.

Biennial reference reaches were established at the locations listed in Table 2 below. Physical and biological data collected at each reach is listed. Location of each site in the watershed is shown on Figure 2.

Table 2: Enumerated Reference Reaches

Reach #	Location	Reach #	Location
1.	NFFR above Lake Almanor	12.	Indian Creek at Taylorsville
2.	Goodrich Creek above Mountain Meadows Reservoir	13.	Indian Creek acw Spanish Creek
3.	NFFR below Lake Almanor	14.	Spanish Creek acw Rock Creek
4.	Butt Creek above Butt Valley Reservoir	15.	Greenhorn Creek acw Spanish Creek
5.	NFFR acw** EBNFFR	16.	Spanish Creek acw Greenhorn Creek
6.	EBNFFR acw NFFR	17.	Spanish Creek acw Indian Creek
7.	Wolf Creek above confluence with Indian Creek	18.	Middle Fork Feather River (MFFR) at Beckwourth
8.	Lights Creek acw Indian Creek	19.	Sulphur Creek acw MFFR
9.	Last Chance Creek acw Red Clover Creek	20.	Jamison Creek acw MFFR
10.	Red Clover Creek acw Last Chance Creek	21.	MFFR acw Nelson Creek
11.	Indian Creek acw Red Clover Creek		

**acw = above confluence with

Reference Reach Data Collection

Monitoring is conducted on a biennial basis. Physical and biological parameters are listed below:

- ***Channel morphology***, including channel cross sections, channel slope, channel substrate sampling, and pool tail fines. Transect data includes bank stability, shade, width/depth ratio, stream shore water depth, and bank angle. Bankfull discharge will be estimated based on these measurements.
- ***Water chemistry***, including water and air temperature.
- ***Habitat***, including spatial distribution of fast and slow water via longitudinal gradient (i.e. pool and riffle orientation), pools (size, depth and number), pool tail substrate, shading, and stream bank stability (i.e. vegetation cover).
- ***Macro-invertebrates***, including analysis of population numbers and species diversity in comparison to Sierra Nevada reference sites. Not originally part of SCI protocol, but has been added on with the availability of reference site data.
- ***Aquatic fauna***, including fish surveys to identify species present and herpeto-fauna.
- ***Aerial and ground photographs***, to provide visual documentation of instream and upland changes in vegetation and channel structure, and to support other monitoring results.

Results of long-term data analysis will be integrated with other Feather River watershed monitoring activities underway or contemplated by the USDA Forest Service, DWR, UCCE, QLG and others. A Technical Advisory Committee (TAC) composed of FRCRM Monitoring Committee members, agency specialists, and academic reviewers provided technical guidance and oversight on the implementation of the project. The TAC members were identified in spring 1999.

2. Permanent Station Monitoring

Objective: The primary objective of the permanent monitoring stations is to record stream stage over a broad range of flow conditions in order to provide a comparative measure of the changes at each station over time and to possibly detect changes in hydrographic conditions related to stream restoration efforts. Secondary objectives to provide comparative measures of expected changes at each station over time include monitoring stream temperature, and air temperature at each location. The water temperature provides supplemental information regarding the condition of the channel upstream of the monitoring site as well as some indication of the source water's characteristics. Air temperature can be used to explain behavior of water temperature as well as some hydrographic events. Water quality samples are collected manually to allow for further analysis of the origin, age and movement of in-stream flow.

Sampling Approach

Eleven sites were identified as appropriate permanent sampling stations. The name and respective data collection for each station are listed in Table 2. Criteria used to select a site include the existence of a bridge that equipment could be bolted to (one exception), a relatively stable location to install sensors, good access and a lower position in the respective drainage.

For Permanent Station monitoring, most data is being collected electronically and downloaded by field personnel on 60-day intervals. The equipment installed, discussed below, is state-of-the-art and is maintained and downloaded by experts familiar with the geographic area and the equipment. Technicians working with the FRCRM have extensive experience on with this equipment and bring that expertise to the FRCRM program.

Samples collected at permanent stations are listed in Table 3 below. Location of each site in the watershed is shown on Figure 3.

TABLE 3: Measurements taken at permanent stations

Station #	Location	Stream Flow & Temp.	Staff Gage	Weather Station*	Sediment & Turbidity	Water Quality
1.	Last Chance Creek at Doyle Crossing	X	X	X		X
2.	Red Clover Creek at Notson Bridge	X	X			X
3.	Indian Creek at Taylorsville	X	X	X	X	X
4.	Indian Creek at Flournoy Bridge	X	X			X
5.	Middle Fork Feather River at Sloat		X			
6.	Indian Creek above confluence with Red Clover	X	X			X
7.	Spanish Creek at Keddie (existing USGS)	X	X			
8.	Spanish Creek at Gansner Bridge	X	X			X
9.	Wolf Creek at Greenville Main Street Bridge	X	X		X	X
10.	Lights Creek at Deadfall Bridge	X	X			X
11.	Indian Creek at Crescent Mills	X	X			X

* Data taken at weather stations includes: rainfall, temperature, relative humidity, wind speed, wind direction, atmospheric pressure.

Permanent Station Data Collection

Monitoring is conducted continuously for data collected by data loggers, and on 60-day intervals for manually collected data. Parameters are listed below:

- Continuously monitor ***water temperature*** and ***stage*** at eleven permanent sampling stations with a Campbell 500 data logger system;
- Conduct continuous ***turbidity*** monitoring during high flow seasons at two stations with a laser sensor;
- Collect ***conductivity, pH, and isotopic samples*** manually at all stations during routine maintenance of data loggers;
- Collect ***bedload and suspended sediment*** data in various flow regimes at two stations;
- Collect ***flow*** data at various stages to produce stage/discharge rating curves for each station, and
- Collect ***climatic data*** at two installed meteorological stations that are linked via satellite to the CDEC database. Data includes relative humidity, temperature, wind speed, wind direction, atmospheric pressure, evapo-transpiration, solar radiation and precipitation.

Equipment Installation

Following an evaluation of available monitoring equipment, the study team chose the CR10X datalogger and associated equipment manufactured by Campbell Scientific to instrument each site. Table 4 and Table 5 provide details regarding the instrumentation deployed at each permanent station. This Campbell equipment was chosen largely based on the long-standing presence of the manufacturer in the remote monitoring market place and the reputation of product reliability. The CR10X was selected because of its ease of programming, flexibility and expandability.

Stream stage is measured using standard pressure transducer technology. Pressure transducers were selected because they provide acceptable accuracy while allowing rapid low cost deployment. The selected Druck 5-psi pressure transducers are accurate to ± 0.01 ft. over a range of 11.53 ft. These units have a typical life span of approximately 5 years. Pressure transducers measure the depth of water over the sensor probe, which is converted to the reference gage height using a site-specific mathematical formula. The reference gage heights are then used in conjunction flow measurements to develop a stage/discharge rating table that can be applied to the collected data from the instrument

The primary problem associated with transducers is a drift in relative accuracy. This drift can be due to age, changes in barometric pressure, and extreme ambient temperatures. The inaccuracies associated with changes in barometric pressure are minimized through the use of a vent tube from the sensor to the atmosphere. Fluctuations related to changes in temperature are calculated to be less than the accuracy resolution that is required of the instrument. Accuracy drift related to age can be accounted for with a strict QA/QC policy that evaluates change in transducer readings compared with reference gage heights.

Table 4:Permanent Station Monitoring Equipment

Equipment Description	Deployment Location
Datalogger (Campbell CR10X)	All stations
Air temperature sensor	All stations
Gill radiation shield	All stations
Druck 5 psi transducer	All stations
Turbidity (Analite 195)	Taylorsville, Doyle Crossing
Water temperature sensor	All stations
Battery (33 amp/hr gell cell)	All stations
Solar Panel	Doyle Crossing, Notson Bridge
Lockable enclosure (sealed)	All stations
Protective enclosure (metal)	All stations
Stilling well /probe attachment	All stations

Table 5: Permanent Station Installation Information

Station	Stream	Installation Date	Station Configuration
Notson Bridge	Red Clover Creek	10/22/1999	Full station installation
Taylorsville Bridge	Indian Creek	10/29/1999	Full station installation
DWR Weir	Indian Creek	11/04/1999	Full station installation
Flournoy Bridge	Indian Creek	11/05/1999	Full station installation
Doyle Crossing Bridge	Last Chance Crk	11/19/1999	Up-graded existing
Wolf Creek Main Street	Wolf Creek	12/21/1999	Full station installation
Deadfall Bridge	Lights Creek	12/28/1999	Full station installation
Moccasin Reef at Hwy. 89	Indian Creek	01/06/2000	Staff gage only
Spanish Creek at Quincy	Spanish Creek	Pending	Full Station Installation Spring, 2001

Installation Methods

The specific method of equipment installation at each site was determined during scoping surveys conducted in April 1999. The location of each station is associated with a road bridge or flow control structure to help facilitate installation. Installation methods consisted of installing a permanent probe-mount housing in the stream below the minimum expected water level. The probe-mount housing was typically mounted to the bridge pier or bedrock. The primary objective of this type of installation is to prevent any movement in the probe-mount housing during high flow events.

A protective metal enclosure was then installed on the bridge or other suitable structure above the anticipated high water level. A sealed instrument enclosure was mounted inside the protective metal enclosure. Flexible and/or rigid conduit was then buried and/or attached to the bridge structure to provide a protected channel for the probe cables between the metal enclosure and the in-water probe-mount housing.

The probes were mounted inside the probe-mount housing using an aluminum pinch block. This method of attachment allows for a secure immovable attachment with ease of maintenance and repair of the equipment.

The CR10X data loggers were then installed and data collection initiated. The data loggers were programmed to sample stream stage and temperature every 15-minutes and using this data calculate and record an hourly average. The loggers were also programmed to roll-up the 15-minute information on daily basis, calculating the daily maximum, minimum, and average stream stage, and average daily stream and air temperature. Other parameters (instrument operation) were also included in the daily roll-up.

In addition to the pressure transducers a reference staff gage was installed at each station. This provided a permanent reference to facilitate checking transducer drift and providing a cross-reference to previous data when the transducer needs to be repaired or replaced.

Installation of the monitoring stations was begun in October 1999. Specific installation information for each station is included in Table 3. Seven of the eight permanent stations were installed by January 2000. The station at Spanish Creek was not installed as a result of logistical delays and the onset of high flows which prevented the attachment of the probe-mount housing below the minimum water level. Installation of the Spanish Creek station is scheduled for spring 2001. The existing station on Last Chance Creek at Doyle Crossing was upgraded with the installation of a CR10X to conform to the other stations in the monitoring network.

Flow, sediment and water quality monitoring

Discharge measurements at differing stages have been taken at eight locations. These measurements are taken on a measured cross-section with a Price 622 velocimeter mounted on a rod for wading or suspended by cable from a bridge crane, bridge board or truck mounted boom as needed. The protocol for these measurements is detailed in the QAPP. This data will be used to develop flow rating curves once enough points have been established.

Suspended sediment data will also be collected at two permanent station sites (see Table 3). Data will be collected using either a rod or cable system as per flow measurements above. The protocol for this sampling program is detailed in the QA/QC. Minimal turbidity and suspended sediment measurements have been collected due to relatively low flows and equipment delivery delays for the year 2000 winter period. No bedload sampling has been undertaken for the reasons stated above.

FRCRM staff manually collects water quality data when data loggers at permanent stations are downloaded, usually on 60-day intervals. This is an ancillary monitoring component conducted at the request of Plumas Geo-Hydrology and Desert Research Institute (DRI). The purpose is to analyze the naturally occurring chemical and isotopic characteristics in order to determine the origin of the water (surface, shallow meadow, deep aquifer, etc.) by season. DRI has offered to conduct the analysis so samples are labeled and sent to their facilities in Reno, Nevada.

Data Management and Analysis

The data will be used to provide a baseline from which to monitor long-term trends in the condition of the Upper Feather River watershed. It will also be used to document trends in watershed condition cumulatively resulting from restoration activities and natural events. To facilitate this comparative analysis, a series of Excel spreadsheets have been developed by Ken Cawley (Feather River College) for reference reach data and by Mike Kossow and Tim Sagraves (consulting watershed specialists) for permanent station data. (Water chemistry data is being analyzed separately by Desert Research Institute so is not discussed here). The spreadsheets are formatted to store the data as it is collected (in the case of data loggers) and to facilitate trend analysis. They are linked to a spatially referenced data management system or Geographic Information System (GIS) that was developed by the CDWR and California State University Chico scientists. Data layers will be set up for each parameter consistent with layers already developed by the Plumas National Forest to encourage data sharing. The data will be distributed via the FRCRM website and through the data "clearinghouse" on the California State University Chico website.

These data will provide critical input to the restoration program conducted by the FRCRM. Identification of conditions throughout the watershed will allow prioritization of restoration projects in terms of location and goals. This data may also be useful in quantifying the benefits of past restoration efforts. Information on watershed condition will serve as baseline data for future projects.

The data and analyses will be available to a wide resource management audience, including local land management agencies, academics and private landowners. These data will hopefully inform land

management decisions made by many organizations and individuals, which have the potential of affecting the Feather River watershed. In addition, this information will be useful to the public to gain insight on the overall condition of the Feather River watershed, and the connections between land use, restoration, and watershed condition. The data will be made available to a broad audience through the FRCRM website and through the CSU Chico website as previously mentioned.

Reference Reach Data

Reference reach data was collected in four passes along the stream, as detailed in the QAPP (Appendix B). The tables in Appendix D summarize all data for the Greenhorn Creek acw Spanish Creek Reference Reach is included as an example of the data output and how the spreadsheets are formatted. The raw data for all passes is currently stored at Plumas Corporation and is available to FRCRM members upon request. Due to the vast amount of raw data, data made available via the Internet for broader distribution will generally be in the summary table format.

Macroinvertebrate samples were collected, labeled and stored as described in the QAPP. The National Aquatic Monitoring Center, Utah Dept. of Fish & Wildlife, Ogden, Utah, which was recommended by Plumas National Forest staff, will process the samples. Samples will be sent out for identification once the Ambient Water Quality Monitoring contract is in place.

Water and ambient air temperature is monitored at each reference reach site with HOBO Temp data loggers. The temperature loggers are installed at the lower end of each reach in early June and collected in early September. Temperatures will be recorded to determine mean maximum temperature for the period July1- August 31. The full temperature range for this period will also be recorded through hourly measurements for a minimum of 1468 data points (1 hr./62+ days). Software will be provided by the Lassen National Forest to manage and analyze the data.

Channel substrate samples are processed using nested sieves for <4mm particles and a millimetric ruler for >4mm particles. The purpose is to quantify the bed characteristics by weight/particle size class. This information will provide baseline information with which to compare future bed composition changes relative to watershed restoration projects, management changes and natural processes. This sampling methodology is more sensitive to changes in finer sediment classes (<2mm) than the standard Wolman pebble counts.

Permanent Station Data

The Campbell data loggers record stream stage, along with ambient air and water temperature data, in fifteen-minute intervals, year-round. The data loggers are capable of storing up to six (6) months of data. FRCRM staff and contract technicians download data on a bi-monthly interval. This more frequent operation is undertaken to ensure reliable station continuity and detect potential problems that would compromise data reliability. The data from the logger is entered into a laptop computer, station diagnostics are performed, then data is transported to Plumas Corporation and electronically entered into the data archive.

Automated turbidity measurements are being recorded at two (2) stations, Doyle Crossing and Indian Creek- Taylorsville Bridge, using Analite 195 laser sensors, a nephelometric (n.t.u.) probe. This is new technology that the FRCRM considered worthy of demonstration and critique for effectiveness and maintainability.

Figure 4a. is an example of data output that plots the average water temperature for Wolf Creek at Main St. Bridge, one of the instrumented permanent stations. Figure 4b. characterizes output for stream flow at the same location.

Rating Tables are being developed for each permanent station. In order to correlate stage records to stream flow volume, direct flow measurements are conducted at a variety of stages to develop a station-specific rating table. Table 6 is the preliminary rating table for Spanish Creek @ Gansner Bridge. These tables then allow for the assignment of discharge values to the recorded stages in the absence of direct measurement. It is anticipated that an initial minimum of seven readings will be necessary to develop an accurate rating curve, depending on the measurement site characteristics. The opportunity to conduct direct measurement at stages above bankfull (1.5 year return interval) are dependent on infrequent weather events and may require several years to accomplish. Due to instability, some stations may also require rating curves to be periodically re-calculated.

Results and Discussion

Reference Reach Monitoring

Each of the 21 reference reaches were monumented and monitored. One original reach (Hamilton Branch, below Lake Almanor) was exchanged for Goodrich Creek, above Mountain Meadows Reservoir. This was done because of the boulder nature, poor access and the reach lack of ability to respond to Hamilton Branch.

There were no major problems with the monitoring equipment or with the monitoring crew. Crew training took a week in the field during the monitoring of the first two reaches. Data collection oversight and additional training continued to insure that protocols and procedures were followed on each reach. Monitoring of each of the 21 reach took between 16-17 hours once the crew was trained.

The monitoring crew consisted of one Crew Leader (the contractor) and 3 Feather River College students and one crewmember supplied by DWR. It was necessary for the college students to return to college prior to completing all 21 reaches. The last two reaches were completed by the Crew leader and one crewmember.

The collection of maximum sediment lens depth (S*) proved to be unworkable in most of the field conditions encountered and was dropped from data collection. The collection of aquatic fauna data was taken during the last of the four pass taken on each reach. This may have resulted in limited observations of fauna due to the disturbance caused by the first three passes. The installation of temperature data loggers on each reach proved to be difficult for the first monitoring season because the exact location of the reach to be monitored was not determined until a site visit took place. The temperature loggers need to remain at the reach for 60 to 90 days. Reaches monitored later in the field season have no temperature data because loggers could not be installed for the amount of time necessary to follow protocols.

Permanent Station Monitoring

All of the operating stations functioned without failure during the 1999-2000 high runoff period. No loss of data occurred as a result of monitoring equipment failure. On July 2, 2000, the Red Clover Creek at Notson Bridge station was vandalized and the transducer cable was damaged. Replacement was completed on August 11, 2000.

Installation of air temperature sensors was delayed when it was determined that the probes where fabricated incorrectly and had to be returned. A test of the new air temperature probes at Notson

indicated that they required special programming which was successfully completed in August 2000. The remaining air temperature probes were installed in the fall of 2000. The data loggers are programmed to record internal temperature that can be used as an indicator of ambient air temperature during the period when the air sensors are not deployed.

During the final phase of discussions regarding station configuration it was determined that an attempt to measure turbidity should be made at two stations. These stations (Taylorsville and Last Chance Creek) were selected primarily do to their ease of installation and the general thinking that they would provide the most useful information. The probe selected to monitor turbidity was the Analite Model 195 nephelometric probe. These units have a built in wiping mechanism that helps to eliminate biofouling caused by long term immersion. The deployment of these probes was delayed by the onset of high flows. These units will be deployed in summer 2001.

In addition to the completion of station installations and special probe deployment, other activities scheduled for 2001 include: compiling and developing the stream stage versus flow relationship to allow conversion of transducer readings to discharge, and a routine maintenance effort at each station to prepare for the high flow period.

Water quality data collected manually by FRCRM staff has not been received from DRI. This is due to the limited amount of samples collected to date. DRI is committed to carrying out this analysis in the upcoming field season when more samples are collected and analyzed.

Recommendations

Reference Reach Monitoring:

For the purpose of the Watershed Monitoring Program, two of the original SCI protocols have been dropped or replaced by other protocols and three additional protocols have been added. Large woody debris (LWD) counts and pebble counts have been dropped from the protocol. Pebble counts have been replaced by the sieve analysis of channel substrate material collected from point bars as well as riffle pavement and sub-pavement.

Pebble counts, while a relatively inexpensive method of characterizing bed surface composition, do not accurately represent all sediment size fractions being transported by the channel in bankfull or greater events. The smaller particle sizes, which will be most affected by changes in watershed condition, are often winnowed out of the surface component by the more frequent, longer duration sub-bankfull flows. Bar and riffle subpavement samples, which are collected below the bed surface and not subject to winnowing, more accurately represent the full range of sediment load. The drawback to this type of sampling is that the processing of these multiple samples is labor-intensive and expensive.

Recommendation: Significant changes in channel substrate composition are likely to be relatively slow due to in-channel storage and the infrequent interval of bed mobilizing flows. Therefore, collection and processing of substrate samples should be conducted at every second or third biennial visit, or, the next visit after the watershed has been subjected to a to-be-defined threshold hydrologic event (i.e. 10-year flood).

Water surface longitudinal channel profile survey and macroinvertebrate sampling have been added to the monitoring protocols for this project. Channel profiles are important in helping to determine the changes in the channel configuration, slope and geometry over time. Macroinvertebrate sampling is important in adding a biological element to the monitoring and provides a useful index to assess changes in biological integrity.

Temperature data loggers need to be installed on all reaches prior to the start of the monitoring season and retrieved as soon as the last reach is completed. This will provide the same number of monitored days for each reach. Data loggers need to be cabled into streams and riparian areas to limit loss or theft of the equipment in areas that have high public visitation for recreation.

Recommendation: Maximum sediment lens depth (S*) measurements were originally designed to measure sediment in shallow pools in small wading streams. This proved to be unworkable for most of reaches due to deep pools and low water visibility. The protocol dropped.

Recommendation: Aquatic Fauna data needs to be collected as the first pass before any channel disturbance takes place.

Recommendation: Originally a 5 person crew was used to conduct the monitoring. A crew of 4 would work just as well, especially if some of the measurements may be dropped from the procedure.

All other standard SCI protocols were implemented without undue difficulty and appear to provide useful baseline information.

Permanent Station Monitoring

In general the permanent station installations went well with very few problems. The selected equipment has performed beyond expectations at all locations. The attributes of each station site were thoroughly analyzed prior to selection to balance the opportunities and limitations specific to each. There does not appear to have been any significant deviation from the original analysis.

Installation is a fairly straightforward operation in which a two-person team can easily install one station a day assuming adequate prior material preparation. Adequate material preparation includes having all installation housings prefabricated uniformly, a complete selection of mounting hardware of various sizes and types, drilling templates, extra tool bits, batteries and a fully programmed logger with wiring diagrams.

Since initial installation, the only failure was gunfire vandalism at the Notson Bridge site. Bullets pierced the cable conduit and severed the sensor cables.

Recommendation: At this juncture no changes are recommended.

Flow and sediment monitoring

Streamflow monitoring has been conducted, and continuing at each of the stations. To date, this has been accomplished with the primary objective of developing a discharge rating table for each station. Since station installation there have been only modest changes in streamflow at any of the stations. This condition has resulted in very few (average of 3/station) streamflow measurements being conducted. Each direct measurement has an average cost of approximately $200.00. In order to maximize the utility of these initial measurements, stage change thresholds to be measured were identified and prioritized that would provide reliable data points for rating table development. At most stations streamflows have not yet reached many of these threshold points. In general, the intent was to conduct several measurements at/near summer baseflow, then conduct measurements a .5' increments and, whenever a significant change in channel form occurred (bankfull stage, full-wetted gully, etc.). Most of the monitored streams have not achieved even a bankfull stage since station operations began.

More intensive streamflow monitoring will be conducted at those stations where sediment monitoring is being undertaken. Each time sediment sampling is conducted a flow measurement will be performed, regardless of the above described stage thresholds. These activities will generally be conducted and funded under the scope of other watershed projects, such as Proposition 204 and will augment the trend monitoring program. For the same reasons cited above, lack of streamflow, minimal sediment monitoring has been accomplished to date.

Recommendation: No changes are recommended at this time.

References:

"Stream Condition Inventory Guidebook" version 4.0, United Stated Department of Agriculture, Forest Service, Pacific Southwest Region, 1998.

"East Branch, North Fork Feather River Erosion Control Strategy", Clifton, 1994

"Management of Baseflow Augmentation: A Review", Ponce and Lindquist, 1990

"New Concepts for Meadow Restoration in the Northern Sierra Nevada", Lindquist and Wilcox, 2000

"Feather River Coordinated Resource Management Monitoring Plan- 319(h) Program", 1997

APPENDIX C – CROSS-SECTIONS
Stream Condition Inventory-
Cross-section Discussion
12/22/03

Background:

The Feather River Coordinated Resource Management (FRCRM) group, under a variety of funding programs, has been conducting watershed trend monitoring since 1999. This monitoring has utilized a variety of metrics at multiple spatial and temporal scales. The purpose of this monitoring is to ascertain trends in watershed function. Utilization of multiple metrics over a range of time and space scales allows for analyses that incorporate both qualitative and quantitative data and observations. The following is a discussion of quantified cross-section data buttressed with qualitative observation of sediment related inputs (discharge and sediment supply) at the watershed scale over the previous decade.

Flow Regime/Sediment Input Discussion:

The Feather River watershed has experienced two (2) distinct climatic regimes over the last decade. Water year (WY) 1992-3 was the first year of a six-year period (WY92-WY98) of much above normal precipitation. WY93-4 was the only dry year in the period. This period was characterized by frequent moderate to large flood events which culminated in the 1997 flood of record. WY1999-0 ushered in a four-year period (WY99-0 to present) of below normal precipitation with no flood events*. WY 2002-3 was the only year with normal precipitation, largely due to a very wet spring, which maintained an extended period of elevated in-channel flows.
Significant Flood Dates: Jan. '93, Jan. '95, Mar. '95, May '95, Jan. '97

Table #1- Total Annual Precipitation (inches of water); (Wilcox data, 1995-03, Genesee, Ca).

WY 95-96	WY 96-97	WY 97-98	WY 98-99	WY 99-00	WY 00-01	WY 01-02	WY 02-03	WY Ave.
54.55	58.90	60.70	47.80	43.65	23.60	33.60	49.60	46.55

Typically, large floods deliver significant sediment and debris inputs to the channel system throughout the watershed. Depending on magnitude and frequency these inputs result in a dynamic channel response of interrelated processes. The 1997 flood of record (~48,000 cfs./Indian Cr. @ Crescent Mills) affected each subwatershed differently. However, the net result was locally catastrophic delivery of sediments and debris from tributaries to the mainstem channels (Indian Creek, Spanish Creek, NFFR and MFFR). The more frequent, longer duration low flows begin a process of re-working the deposited materials concurrent with ongoing vegetation recovery.

*"No flood events" as used in this context means no flows exceeding a 2-year event at the watershed scale.

Sampling Methodologies:

The FRCRM established three (3) permanent cross-sections at each of the eighteen (18) monitoring reaches. An additional five (5) cross-sections are randomly selected and surveyed during each sampling period. These 5 cross-sections are not monumented and the location varies from period to period. The permanent cross-sections are intended to accurately represent changes in channel form

over time. The random cross-sections are intended to generally characterize overall channel condition. This discussion is focused on the permanent cross-sections, the data presented and observations on the efficacy of the survey methodology.

Results/Methodology Discussion:

Cross-section analyses typically use metrics that represent the bankfull channel form: bankfull width, bankfull mean depth, cross-sectional area and W/D ratio. Bankfull channel morphology is an inter-relational state of dynamic response to both the flow regime and the sediment supply. These responses are also a function of the structural attributes that evolve along the channel as part of the dynamism. As noted above, these cross-sections have all been surveyed in a period of drier years, which followed an abnormally wet five-year period. Typically, multi-year dry periods result in the establishment and hardening of the vegetative structure of the channel system. Un-interrupted, this vegetative response can set the stage for significant channel response/improvement when high flows and the attendant sediment supply resume.

The three biennial data sets represented here offer an excellent baseline for determining change when high flows/sediment supply resumes. The data has been summarized in the attached sheets with two (2) stratifications. Reach and year stratify the first data set. The second data set is stratified by cross-section. There were no discernible trend changes at either the reach or watershed scale.

The data does show significant variability from sample period to sample period regardless of stratification. This can generally be attributed to the subjective determination of the bankfull elevation. It is likely that the dry period vegetative response influenced some of the bankfull determinations leading to considerable 'noise' in data sets that generally did not, and would not be expected to, change significantly over the five year sampling period.

Bankfull determination has always been the controversial linchpin in geomorphic channel investigations. Generally, determinations that use a congruence of physical and biological indices are the most reliable. An excellent reference for survey crews to use would be, ***Stream Channel Reference Sites, USDA-FS General Technical Report, RM-245; Harrelson, Rawlins and Potyondy.*** Further, a semi-permanent stake (e.g. 12" length, 3/8" rebar) driven in to ground level at the bankfull elevation may help reduce the subjective noise. These stakes could be lost in high flow events, however, it may be worth the risk to 'tighten' the data sets on this critical parameter..

STREAM CONDITION INVENTORY- CROSS-SECTION ANALYSIS (page 1 of 6)							
Comparison of Selected Geomorphic Values(derived from 6 of 20 data sets):							
Stratified by Reach--							
Reach/YR/X-s#	A_{bkf} (ft^2)	A_{flp}(ft^2)	W_{bkf} (ft)	D_{mean}(ft)	W/D ratio		
Wolf Cr./ '99/ #1	32.5	132.5	19.6	1.66	11.82		
Wolf Cr./ '99/ #2	40	60	27.3	1.47	18.63		
Wolf Cr./ '99/ #3	27.5	67.5	23.5	1.17	20.08		
Average	**33.33**	**86.67**	**23.47**	**1.43**	**16.84**		
Wolf Cr./ '01/ #1	42.5	165	21	2.02	10.38		
Wolf Cr./ '01/ #2	50	130	28.8	1.74	16.59		
Wolf Cr./ '01/ #3	35	77.5	20.05	1.75	11.49		
Average	**42.50**	**124.17**	**23.28**	**1.84**	**12.82**		
Wolf Cr./ '03/ #1	25	60	17.55	1.42	12.32		
Wolf Cr./ '03/ #2	60	187.5	25.8	2.33	11.09		
Wolf Cr./ '03/ #3	32.5	80	24.8	1.31	18.92		
Average	**39.17**	**109.17**	**22.72**	**1.69**	**14.11**		
Stratified by Cross-section--							
Reach/X-s#/ YR	A_{bkf} (ft^2)	A_{flp}(ft^2)	W_{bkf} (ft)	D_{mean}(ft)	W/D ratio		
Wolf Cr./ #1/ '99	32.5	60	19.6	1.66	11.82		
Wolf Cr./ #1/ '01	42.5	165	21	2.02	10.38		
Wolf Cr./ #1/ '03	25	60	17.55	1.42	12.32		
Average	**33.33**	**95.00**	**19.38**	**1.70**	**11.51**		
Wolf Cr./ #2/ '99	40	60	27.3	1.47	18.63		
Wolf Cr./ #2/ '01	50	130	28.8	1.74	16.59		
Wolf Cr./ #2/ '03	60	187.5	25.8	2.33	11.09		
Average	**50.00**	**125.83**	**27.30**	**1.84**	**15.44**		
Wolf Cr./ #3/ '99	27.5	67.5	23.5	1.17	20.08		
Wolf Cr./ #3/ '01	35	77.5	20.05	1.75	11.49		
Wolf Cr./ #3/ '03	32.5	80	24.8	1.31	18.92		
Average	**31.67**	**75.00**	**22.78**	**1.41**	**16.83**		

STREAM CONDITION INVENTORY- CROSS-SECTION ANALYSIS (page 2 of 6)

Comparison of Selected Geomorphic Values(derived from 6 of 20 data sets):

Stratified by Reach--

Reach/YR/X-s#	A_{bkf} (ft^2)	A_{flp}(ft^2)	W_{bkf} (ft)	D_{mean}(ft)	W/D ratio
Lights Cr./ '99/ #1	87.5	137.5	47.2	1.85	25.46
Lights Cr./ '99/ #2	85	130	48.8	1.74	28.02
Lights Cr./ '99/ #3	85	260	53.7	1.58	33.93
Average	**85.83**	**175.83**	**49.90**	**1.73**	**29.13**
Lights Cr./ '01/ #1	55	82.5	49.95	1.10	45.36
Lights Cr./ '01/ #2	30	52.5	33.5	0.90	37.41
Lights Cr./ '01/ #3	37.5	145	20.1	1.87	10.77
Average	**40.83**	**93.33**	**34.52**	**1.29**	**31.18**
Lights Cr./ '03/ #1	42.5	82.5	46.4	0.92	50.66
Lights Cr./ '03/ #2	42.5	87.5	40	1.06	37.65
Lights Cr./ '03/ #3	35	132.5	22.4	1.56	14.34
Average	**40.00**	**100.83**	**36.27**	**1.18**	**34.21**

Stratified by Cross-section--

Reach/X-s#/ YR	A_{bkf} (ft^2)	A_{flp}(ft^2)	W_{bkf} (ft)	D_{mean}(ft)	W/D ratio
Lights Cr./ #1/ '99	87.5	137.5	47.2	1.85	25.46
Lights Cr./ #1/ '01	55	82.5	49.95	1.10	45.36
Lights Cr./ #1/ '03	42.5	82.5	46.4	0.92	50.66
Average	**61.67**	**100.83**	**47.85**	**1.29**	**40.49**
Lights Cr./ #2/ '99	85	130	48.8	1.74	28.02
Lights Cr./ #2/ '01	30	52.5	33.5	0.90	37.41
Lights Cr./ #2/ '03	42.5	87.5	40	1.06	37.65
Average	**52.50**	**90.00**	**40.77**	**1.23**	**34.36**
Lights Cr./ #3/ '99	85	260	53.7	1.58	33.93
Lights Cr./ #3/ '01	37.5	145	20.1	1.87	10.77
Lights Cr./ #3/ '03	35	132.5	22.4	1.56	14.34
Average	**52.50**	**179.17**	**32.07**	**1.67**	**19.68**

STREAM CONDITION INVENTORY- CROSS-SECTION ANALYSIS (page 3 of 6)

Comparison of Selected Geomorphic Values(derived from 6 of 20 data sets):

Stratified by Reach--

Reach/YR/X-s#	A_{bkf} (ft^2)	A_{flp}(ft^2)	W_{bkf} (ft)	D_{mean}(ft)	W/D ratio
Greenhorn/ '99/ #1	57.5	180	43.9	1.31	33.52
Greenhorn/ '99/ #2	90	200	40	2.25	17.78
Greenhorn/ '99/ #3	50	107.5	46.8	1.07	43.80
Average	**65.83**	**162.50**	**43.57**	**1.54**	**31.70**
Greenhorn/ '01/ #1	32.5	72.5	40.3	0.81	49.97
Greenhorn/ '01/ #2	52.5	57.5	35.4	1.48	23.87
Greenhorn/ '01/ #3	57.5	115	44.1	1.30	33.82
Average	**47.50**	**81.67**	**39.93**	**1.20**	**35.89**
Greenhorn/ '03/ #1	22.5	87.5	39.1	0.58	67.95
Greenhorn/ '03/ #2	90	162.5	38.9	2.31	16.81
Greenhorn/ '03/ #3	57.5	142.5	45.9	1.25	36.64
Average	**56.67**	**130.83**	**41.30**	**1.38**	**40.47**

Stratified by Cross-section--

Reach/X-s#/ YR	A_{bkf} (ft^2)	A_{flp}(ft^2)	W_{bkf} (ft)	D_{mean}(ft)	W/D ratio
Greenhorn/ #1/ '99	57.5	180	43.9	1.31	33.52
Greenhorn/ #1/ '01	32.5	72.5	40.3	0.81	49.97
Greenhorn/ #1/ '03	22.5	87.5	39.1	0.58	67.95
Average	**37.50**	**113.33**	**41.10**	**0.90**	**50.48**
Greenhorn/ #2/ '99	90	200	40	2.25	17.78
Greenhorn/ #2/ '01	52.5	57.5	35.4	1.48	23.87
Greenhorn/ #2/ '03	90	162.5	38.9	2.31	16.81
Average	**60.00**	**123.61**	**38.83**	**1.54**	**30.71**
Greenhorn/ #3/ '99	50	107.5	46.8	1.07	43.80
Greenhorn/ #3/ '01	57.5	115	44.1	1.30	33.82
Greenhorn/ #3/ '03	57.5	142.5	45.9	1.25	36.64
Average	**55.00**	**121.67**	**45.60**	**1.21**	**38.09**

STREAM CONDITION INVENTORY- CROSS-SECTION ANALYSIS (page 4 of 6)

Comparison of Selected Geomorphic Values(derived from 6 of 20 data sets):

Stratified by Reach--

Reach/YR/X-s#	A_{bkf} (ft^2)	A_{flp}(ft^2)	W_{bkf} (ft)	D_{mean}(ft)	W/D ratio
Sulphur Cr./ '99/ #1	60	142.5	49.3	1.22	40.51
Sulphur Cr./ '99/ #2	32.5	80	33.4	0.97	34.32
Sulphur Cr./ '99/ #3	62.5	165	53.8	1.16	46.31
Average	**51.67**	**129.17**	**45.50**	**1.12**	**40.38**
Sulphur Cr./ '01/ #1	40	117.5	45.4	0.88	51.53
Sulphur Cr./ '01/ #2	42.5	90	35.1	1.21	28.99
Sulphur Cr./ '01/ #3	62.5	205	52.1	1.20	43.43
Average	**48.33**	**137.50**	**44.20**	**1.10**	**41.32**
Sulphur Cr./ '03/ #1	47.5	135	46.1	1.03	44.74
Sulphur Cr./ '03/ #2	42.5	97.5	37.2	1.14	32.56
Sulphur Cr./ '03/ #3	72.5	190	55.2	1.31	42.03
Average	**54.17**	**140.83**	**46.17**	**1.16**	**39.78**

Stratified by Cross-section--

Reach/X-s#/ YR	A_{bkf} (ft^2)	A_{flp}(ft^2)	W_{bkf} (ft)	D_{mean}(ft)	W/D ratio
Sulphur Cr./ #1/ '99	60	142.5	49.3	1.22	40.51
Sulphur Cr./ #1/ '01	40	117.5	45.4	0.88	51.53
Sulphur Cr./ #1/ '03	47.5	135	46.1	1.03	44.74
Average	**49.17**	**131.67**	**46.93**	**1.04**	**45.59**
Sulphur Cr./ #2/ '99	32.5	80	33.4	0.97	34.32
Sulphur Cr./ #2/ '01	42.5	90	35.1	1.21	28.99
Sulphur Cr./ #2/ '03	42.5	97.5	37.2	1.14	32.56
Average	**39.17**	**89.17**	**35.23**	**1.11**	**31.96**
Sulphur Cr./ #3/ '99	62.5	165	53.8	1.16	46.31
Sulphur Cr./ #3/ '01	62.5	205	52.1	1.20	43.43
Sulphur Cr./ #3/ '03	72.5	190	55.2	1.31	42.03
Average	**65.83**	**186.67**	**53.70**	**1.22**	**43.92**

STREAM CONDITION INVENTORY- CROSS-SECTION ANALYSIS (page 5 of 6)

Comparison of Selected Geomorphic Values(derived from 6 of 20 data sets):

Stratified by Reach--

Reach/YR/X-s#	A_{bkf} (ft^2)	A_{flp}(ft^2)	W_{bkf} (ft)	D_{mean}(ft)	W/D ratio
EBNFFR@NF/ '99/ #1	200	360	98.6	2.03	48.61
EBNFFR@NF/ '99/ #2	320	1137.5	115.3	2.78	41.54
EBNFFR@NF/ '99/ #3	440	872.5	140.6	3.13	44.93
Average	**320.00**	**790.00**	**118.17**	**2.64**	**45.03**
EBNFFR@NF/ '01/ #1	335	552.5	124.2	2.70	46.05
EBNFFR@NF/ '01/ #2	415	1232.5	129.3	3.21	40.29
EBNFFR@NF/ '01/ #3	380	782.5	167.6	2.27	73.92
Average	**376.67**	**855.83**	**140.37**	**2.72**	**53.42**
EBNFFR@NF/ '03/ #1	417.5	677.5	122.4	3.41	35.88
EBNFFR@NF/ '03/ #2	425	1275	130.5	3.26	40.07
EBNFFR@NF/ '03/ #3	385	790	152.1	2.53	60.09
Average	**409.17**	**914.17**	**135.00**	**3.07**	**45.35**

Stratified by Cross-section--

Reach/X-s#/ YR	A_{bkf} (ft^2)	A_{flp}(ft^2)	W_{bkf} (ft)	D_{mean}(ft)	W/D ratio
EBNFFR@NF/ #1/ '99	200	360	98.6	2.03	48.61
EBNFFR@NF/ #1/ '01	335	552.5	124.2	2.70	46.05
EBNFFR@NF/ #1/ '03	417.5	677.5	122.4	3.41	35.88
Average	**317.50**	**530.00**	**115.07**	**2.71**	**43.51**
EBNFFR@NF/ #2/ '99	320	1137.5	115.3	2.78	41.54
EBNFFR@NF/ #2/ '01	415	1232.5	129.3	3.21	40.29
EBNFFR@NF/ #2/ '03	425	1275	130.5	3.26	40.07
Average	**386.67**	**1215.00**	**125.03**	**3.08**	**40.63**
EBNFFR@NF/ #3/ '99	440	872.5	140.6	3.13	44.93
EBNFFR@NF/ #3/ '01	380	782.5	167.6	2.27	73.92
EBNFFR@NF/ #3/ '03	385	790	152.1	2.53	60.09
Average	**401.67**	**815.00**	**153.43**	**2.64**	**59.65**

STREAM CONDITION INVENTORY- CROSS-SECTION ANALYSIS (page 6 of 6)

Comparison of Selected Geomorphic Values(derived from 6 of 20 data sets):

Stratified by Reach--

Reach/YR/X-s#	A_{bkf} (ft^2)	A_{flp}(ft^2)	W_{bkf} (ft)	D_{mean}(ft)	W/D ratio
MFFR@Nelson/ '99/ #1	202.5	422.5	77.5	2.61	29.66
MFFR@Nelson/ '99/ #2	320	552.5	127.9	2.50	51.12
MFFR@Nelson/ '99/ #3	150	425	103.5	1.45	71.42
Average	**224.17**	**466.67**	**102.97**	**2.19**	**50.73**
MFFR@Nelson/ '01/ #1	207.5	427.5	77.2	2.69	28.72
MFFR@Nelson/ '01/ #2	325	547.5	126.8	2.56	49.47
MFFR@Nelson/ '01/ #3	202.5	552.5	107.75	1.88	57.33
Average	**245.00**	**509.17**	**103.92**	**2.38**	**45.18**
MFFR@Nelson/ '03/ #1	210	415	77	2.73	28.23
MFFR@Nelson/ '03/ #2	297.5	922.5	124.4	2.39	52.02
MFFR@Nelson/ '03/ #3	135	422.5	71.2	1.90	37.55
Average	**214.17**	**586.67**	**90.87**	**2.34**	**39.27**

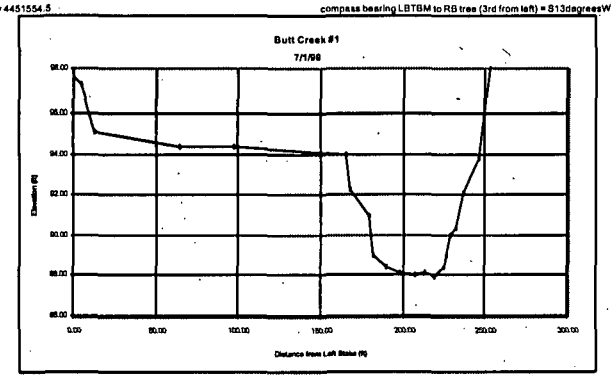
Stratified by Cross-section--

Reach/X-s#/ YR	A_{bkf} (ft^2)	A_{flp}(ft^2)	W_{bkf} (ft)	D_{mean}(ft)	W/D ratio
MFFR@Nelson/ #1/ '99	202.5	422.5	77.5	2.61	29.66
MFFR@Nelson/ #1/ '01	207.5	427.5	77.2	2.69	28.72
MFFR@Nelson/ #1/ '03	210	415	77	2.73	28.23
Average	**206.67**	**421.67**	**77.23**	**2.68**	**28.87**
MFFR@Nelson/ #2/ '99	320	552.5	127.9	2.50	51.12
MFFR@Nelson/ #2/ '01	325	547.5	126.8	2.56	49.47
MFFR@Nelson/ #2/ '03	297.5	922.5	124.4	2.39	52.02
Average	**314.17**	**674.17**	**126.37**	**2.49**	**50.87**
MFFR@Nelson/ #3/ '99	150	425	103.5	1.45	71.42
MFFR@Nelson/ #3/ '01	202.5	552.5	107.75	1.88	57.33
MFFR@Nelson/ #3/ '03	135	422.5	71.2	1.90	37.55
Average	**162.50**	**466.67**	**94.15**	**1.74**	**55.43**

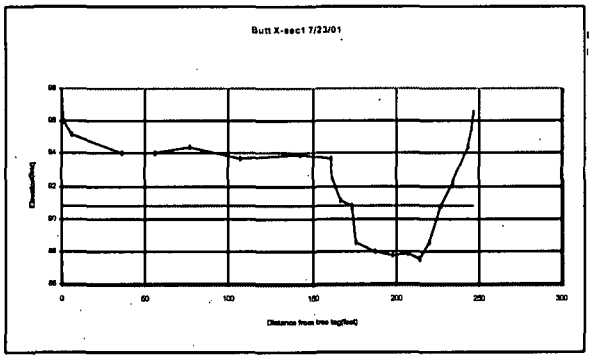
UTM X-coord = 652357.9
UTM Y coord = 4451554.5

all measurements in feet

TBM on ponderosa tree on left bank with orange diamond tag
compass bearing LBTBM to RB tree (3rd from left) = S13degreesW

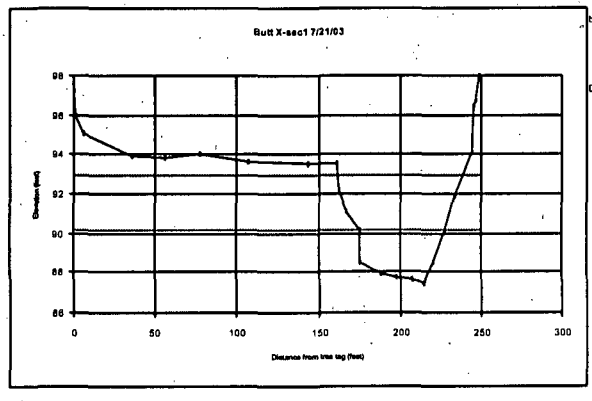


Dark Blue Line w/Markers=Basic Cross Section



Butt Cr: 7/23/01

Dist from left stake	Total depth	Elevation	Bankfull Elevation	2xBankfull Elevation	Notes
0	2.68	97.32	90.8	94.06	TBM-LB
1.3	3.95	96.05	90.8	94.06	
6	4.8	95.2	90.8	94.06	
36	5.98	94.02	90.8	94.06	
56.1	5.97	94.03	90.8	94.06	
76.6	5.66	94.34	90.8	94.06	
107	6.27	93.73	90.8	94.06	
143	6.09	93.91	90.8	94.06	
161	6.33	93.67	90.8	94.06	TOBL
162.7	7.81	92.39	90.8	94.06	
167	8.84	91.16	90.8	94.06	
174	9.2	90.8	90.8	94.06	BFL
175.8	11.42	88.58	90.8	94.06	LEW
188	12.06	87.94	90.8	94.06	
198.5	12.2	87.8	90.8	94.06	
207	12.18	87.82	90.8	94.06	
214	12.46	87.54	90.8	94.06	T
220.1	11.45	88.55	90.8	94.06	REW
227.3	9.2	90.8	90.8	94.06	BFR
234	7.87	92.13	90.8	94.06	
242.85	5.64	94.36	90.8	94.06	TOBR
245.5	4.43	95.57	90.8	94.06	
248.8	3.46	96.54	90.8	94.06	TBM-RB



butt crosection-1
7/21/03

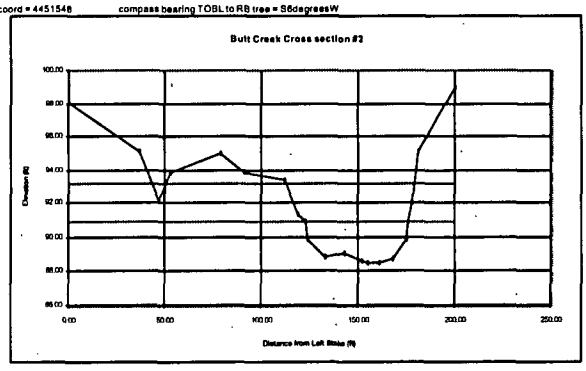
Dist from left t	Total Depth	Elevation	Bankfull depth	Bankfull elevation	2x Bankfull depth	Notes
0	2.8	97.2		90.19	92.96	tbm
1.3	4	96		90.19	92.96	
6	4.86	95.14		90.19	92.96	
36	6.09	93.91		90.19	92.96	
56.1	6.12	93.88		90.19	92.96	
76.6	5.97	94.03		90.19	92.96	
107	6.39	93.61		90.19	92.96	
143	6.49	93.51		90.19	92.96	
161	6.41	93.59		90.19	92.96	tobl
162.7	7.82	92.18		90.19	92.96	
167	8.84	91.16		90.19	92.96	
175	9.81	90.19	0	90.19	92.96	bfl
175.8	11.45	88.55	1.64	90.19	92.96	wel
188	12.11	87.89	2.3	90.19	92.96	
198.5	12.23	87.77	2.42	90.19	92.96	
207	12.37	87.63	2.56	90.19	92.96	
214.8	12.58	87.42	2.77	90.19	92.96	t
220.5	11.51	88.49	1.7	90.19	92.96	wer
227.2	9.81	90.19	0	90.19	92.96	bfr
234	8.11	91.89		90.19	92.96	
243.8	5.89	94.11		90.19	92.96	tobr
245.5	3.51	96.49		90.19	92.96	
246.8	3.3	96.7		90.19	92.96	
250.5	1.19	98.81		90.19	92.96	endr

TOPipe=Top of pipe/bench mark
LEW=Left edge of water
REW=Right edge of water
MPD=Maximum pool depth
TBM=Temporary bench mark
PCT=Pool tail crest
TP=Turning point
TOPool=Top of pool
S-MAX=Max depth sediment lens
LB=Left bank
RB=Right bank
TOB=Top of bank
BF=Bankfull
T=Thalweg

Three Year SUMMARY			Mean	Max	Width:	Flood-	Entrench
	Cross-	Bankfull	Bankfull	Bankfull	Depth	prone	ment
Year	section	Width	Depth	Depth	Ratio	width	Ratio
1999	1	48.5	1.6	2.03	30.3	70.16	1.45
2001	1	53.30	2.36	3.26	22.58	186.65	3.50
2003	1	52.20	1.91	2.77	27.29	76.90	1.47

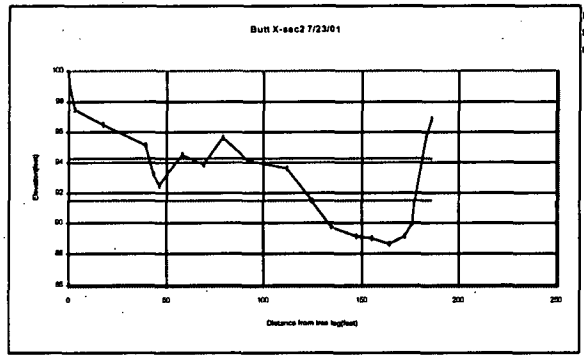
UTM X-coord = 652225.9 TBM on ponderosa pine on LB w/ orange diamond tag 1-Jul-99 all measurements in feet

UTM Y-coord = 4451548 compass bearing TOBL to RB tree = S6degreesW



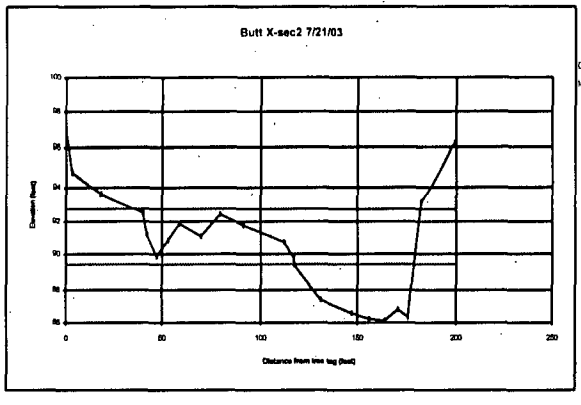
Dist. From Left Stake	Total Elevation	Bankfull Elevation	2xBankfull Elevation
0.00	99.14	90.84	93.15
0.01	98.10	90.84	93.15
38.60	95.15	90.84	93.15
46.90	92.20	90.84	93.15
52.60	93.88	90.84	93.15
79.00	94.99	90.84	93.15
91.20	93.91	90.84	93.15
112.20	93.40	90.84	93.15
118.70	91.38	90.84	93.15
123.40	90.84	90.84	93.15
124.20	*89.84*	*90.84*	*93.15*
132.60	88.62	90.84	93.15
143.00	89.07	90.84	93.15
152.20	88.60	90.84	93.15
154.90	88.53	90.84	93.15
161.10	88.56	90.84	93.15
167.70	88.76	90.84	93.15
175.40	89.84	90.84	93.15
175.80	90.84	90.84	93.15
177.80	92.00	90.84	93.15
181.30	95.06	90.84	93.15
200.00	98.98	90.84	93.15

Blue Line=2x Bankfull Elev Red Line=Mean Bankfull Elev Dark Blue Line w/Markers=Basic Cross Section



Butt Cr: 7/23/01

Dist from left stake	Total depth	Total Elevation	Bankfull Elevation	2xBankfull Elevation	Notes
0	0.57	99.43	91.45	94.2	TBM-LB
3	2.51	97.49	91.45	94.2	
18	3.56	96.44	91.45	94.2	
40	4.92	95.08	91.45	94.2	
43.6	6.75	93.25	91.45	94.2	
46.3	7.56	92.44	91.45	94.2	
50.1	6.8	93.2	91.45	94.2	
56.3	5.49	94.51	91.45	94.2	
69.2	6.15	93.85	91.45	94.2	
79.3	4.43	95.57	91.45	94.2	
91.9	5.9	94.1	91.45	94.2	
112	8.41	93.59	91.45	94.2	TOBL
124.6	8.55	91.45	91.45	94.2	BFL
134	*10.31*	*89.69*	*91.45*	*94.2*	*LEW*
147	10.9	89.1	91.45	94.2	
155.6	10.97	89.03	91.45	94.2	
164	11.34	88.66	91.45	94.2	T
171.6	10.85	89.15	91.45	94.2	
178	*10.04*	*89.96*	*91.45*	*94.2*	*REW*
177.3	8.55	91.45	91.45	94.2	BFR
182.5	4.37	95.63	91.45	94.2	TOBR
185.6	3.16	96.84	91.45	94.2	TBM-RB



butt creek crosection-2

7/21/03

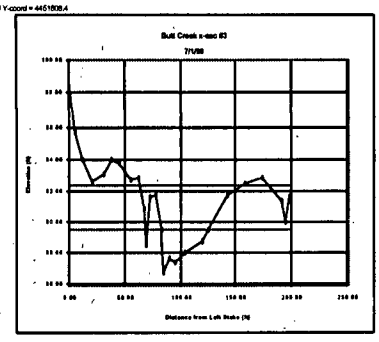
Dist from left stake	Total Depth	Bankfull depth	Total elevation	Bankfull elevation	2x bankfull elevation	Notes
0	3.15		96.85	89.4	92.73	tbml
3	5.12		94.88	89.4	92.73	
18	6.29		93.71	89.4	92.73	
40	7.41		92.59	89.4	92.73	
41.5	8.86		91.14	89.4	92.73	
46.7	10.12		89.88	89.4	92.73	trib
53	9.13		90.87	89.4	92.73	
58.3	8.13		91.87	89.4	92.73	
69.2	8.95		91.05	89.4	92.73	
79.3	7.54		92.46	89.4	92.73	
91.5	8.22		91.78	89.4	92.73	
112	9.28		90.72	89.4	92.73	tobl
117	10.24		89.76	89.4	92.73	
117.5	10.6	0	89.4	89.4	92.73	bfl
131.3	12.68	2.08	87.32	89.4	92.73	wet
147	13.47	2.87	86.53	89.4	92.73	
155.6	13.81	3.21	86.19	89.4	92.73	
163.5	13.93	3.33	86.07	89.4	92.73	t
170.4	13.2	2.6	86.8	89.4	92.73	
175.4	13.71	3.11	86.29	89.4	92.73	
176.7	12.46	1.86	87.54	89.4	92.73	wet
178.5	10.6	0	89.4	89.4	92.73	bfr
182.5	6.75		93.25	89.4	92.73	
199	3.78		96.22	89.4	92.73	

TOPipe=Top of pipe/bench mark
LEW=Left edge of water
REW=Right edge of water
MPD=Maximum pool depth
TBM=Temporary bench mark
PCT=Pool tail crest
TP=Turning point
TOPool=Top of pool
S-MAX=Max depth sediment lens
LB=Left bank
RB=Right bank
TOB=Top of bank
BF=Bankfull
T=Thalweg

Three Year SUMMARY			Mean	Max	Width:	Flood-	Entrench
Year	Cross-section	Bankfull Width	Bankfull Depth	Bankfull Depth	Depth Ratio	prone width	ment Ratio
1999	2	52.4	1.84	2.31	28.5	66.94	1.28
2001	2	52.70	1.87	2.79	28.18	144.00	2.73
2003	*2*	*61.00*	*2.38*	*3.33*	*25.60*	*142.20*	*2.33*

UTM X-coord = 652072.2 all measurements in feet

UTM Y-coord = 4451808.4

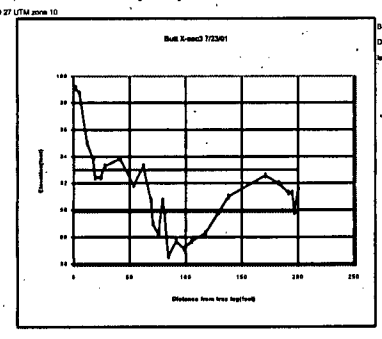


Dist. From Left Stake	Total Elevation	Bankfull Elevation	2xBankfull Elevation
0.00	99.25	89.6	92.26
0.01	98.68	89.6	92.26
5.00	95.83	89.6	92.26
13.00	94.01	89.6	92.26
20.00	92.65	89.6	92.26
31.00	93.08	89.6	92.26
38.00	94.02	89.6	92.26
46.50	93.76	89.6	92.26
58.30	92.74	89.6	92.26
61.60	92.82	89.6	92.26
67.50	90.77	89.6	92.26
69.70	89.62	89.6	92.26
73.50	91.52	89.6	92.26
78.50	91.71	89.6	92.26
83.30	89.50	89.6	92.26
83.90	88.49	89.6	92.26
84.50	88.74	89.6	92.26
90.00	87.61	89.6	92.26
95.90	87.34	89.60	92.26
104.30	88.00	89.6	92.26
119.10	86.67	89.6	92.26
134.90	89.50	89.6	92.26
143.00	91.70	89.6	92.26
158.00	92.44	89.6	92.26
173.00	92.81	89.6	92.26
190.90	91.30	89.6	92.26
195.20	89.94	89.6	92.26
198.00	91.53	89.6	92.26

Blue Line=2x Bankfull Elev Red Line=Mean Bankfull Elev Dark Blue Line w/Markers=Basic Cross Section

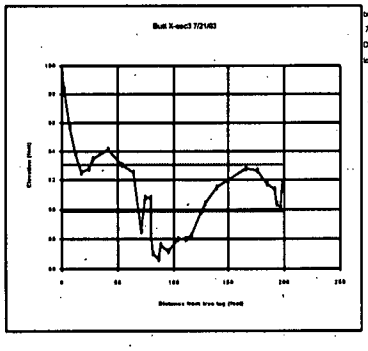
TBM on poderosa tree LB LBTBM to RB bearing = 619ddegmeeH

NAD 27 UTM zone 10



Butt Cr. 7/23/01

Dist from left stake	Total depth	Total Elevation	Bankfull Elevation	2xBankfu Elevation	Notes
1	0.65	99.14	89.82	93.03	TBM-LB
6	1.29	98.71	89.82	93.03	
12	5.04	94.96	89.82	93.03	
17.2	8.1	93.9	89.82	93.03	
19.4	7.54	92.46	89.82	93.03	
24.7	7.63	92.37	89.82	93.03	
27.4	6.67	93.33	89.82	93.03	
40.9	8.17	93.83	89.82	93.03	
52.8	8.2	91.8	89.82	93.03	
62.5	8.78	93.34	89.82	93.03	
69.9	9.23	90.77	89.82	93.03	
70.1	11.06	88.94	89.82	93.03	
75.5	11.83	88.17	89.82	93.03	
76.7	11.62	88.38	89.82	93.03	
79.7	9.27	90.73	89.82	93.03	TOBL
80.9	10.18	89.82	89.82	93.03	BFL
82	11.07	88.03	89.82	93.03	LEW
85.2	13.39	86.61	89.82	93.03	T
92.2	12.34	87.66	89.82	93.03	
98	12.81	87.19	89.82	93.03	
105.4	12.3	87.7	89.82	93.03	
117.5	11.78	88.22	89.82	93.03	
129	10.18	89.82	89.82	93.03	BFR
138.8	8.98	91.02	89.82	93.03	
171.2	7.37	92.63	89.82	93.03	
182.5	7.99	92.01	89.82	93.03	
191	8.65	91.34	89.82	93.03	
194.3	8.68	91.32	89.82	93.03	
196.3	10.11	89.89	89.82	93.03	
199.8	8.46	91.54	89.82	93.03	TBM-RS



butt crosection-3

7/21/03

Dist from left stake	Total Depth	Bankfull depth	Total elevation	Bankfull elevation	2xBankf ull	Notes
0	0.8		99.4	89.86	93.11	tbmrt
1	1.55		98.45	89.86	93.11	
7	4.3		95.7	89.86	93.11	
13	6.18		93.82	89.86	93.11	
16.2	7.4		92.6	89.86	93.11	
24	7.19		92.81	89.86	93.11	
28.4	6.64		93.46	89.86	93.11	
41.9	6.93		94.07	89.86	93.11	
53.8	6.97		93.03	89.86	93.11	
63.5	7.43		92.57	89.86	93.11	
71	11.5		88.5	89.86	93.11	trib
74	9.21		90.79	89.86	93.11	
79.9	9.17		90.83	89.86	93.11	tobl
80.5	10.14	0	89.86	89.86	93.11	bfl
80.5	11.61	1.47	88.39	89.86	93.11	wet
81.5	12.53	2.79	87.07	89.86	93.11	
86	13.39	3.25	86.61	89.86	93.11	t
89	12.4	2.26	87.6	89.86	93.11	
95.7	12.78	2.64	87.22	89.86	93.11	
104.5	12.03	1.89	87.97	89.86	93.11	
111.5	12	1.86	88	89.86	93.11	
116.5	11.79	1.65	88.21	89.86	93.11	wet
125.3	10.14	0	89.86	89.86	93.11	bfr
129	8.62		90.38	89.86	93.11	
139	8.53		91.47	89.86	93.11	
165.4	7.22		92.78	89.86	93.11	
175	7.32		92.68	89.86	93.11	
184.5	8.32		91.68	89.86	93.11	
190.6	8.68		91.32	89.86	93.11	
193	9.56		90.45	89.86	93.11	
195.7	9.9		90.1	89.86	93.11	
198	8.11		91.89	89.86	93.11	endr

TOPpe=Top of pipe/bench mark

LEW=Left edge of water

REW=Right edge of water

MPD=Maximum pool depth

TBM=Temporary bench mark

PCT=Pool tail crest

TP=Turning point

TOPool=Top of pool

S-MAX=Max depth sediment lens

LB=Left bank

RB=Right bank

TOB=Top of bank

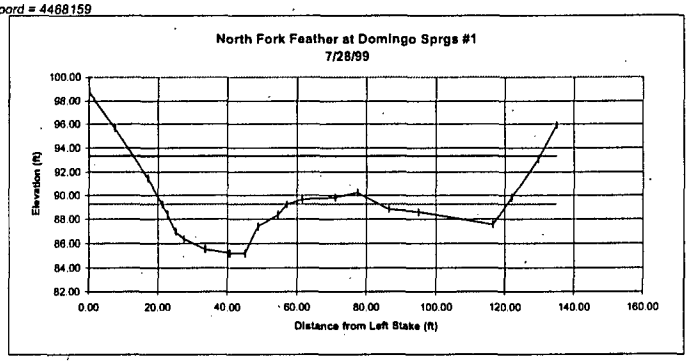
BF=Bankfull

T=Thalweg

Three Year SUMMARY		Mean		Max		Width:	Flood-	ntrenchr
Year	Cross-section	Bankfull Width	Bankfull Depth	Bankful Depth	Depth Ratio	width	prone	ment Ratio
1999	3	41.6	1.69	2.76	24.6	90.99	2.19	
2001	3	47.10	1.93	3.21	24.40	104.40	2.21	
2003	3	44.80	1.98	3.25	22.64	213.70	4.77	

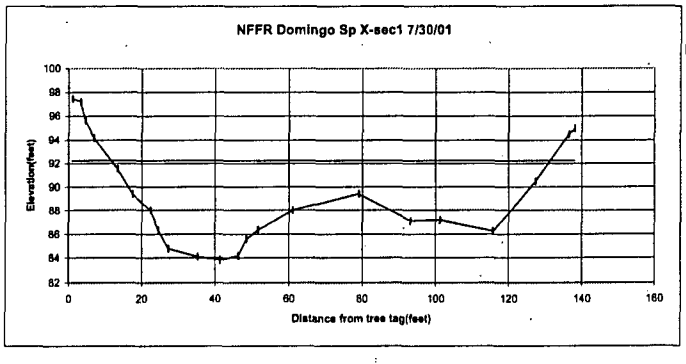
UTM X-COORD = 639652
UTM Y-coord = 4468159

North Fork Feather River ABV Lake Almanor Xsec 1



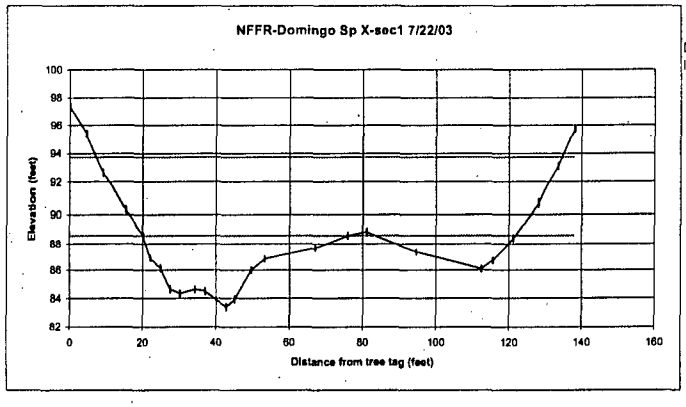
Dist. From Left Stake	Total Elevation	Bankfull Elevation	2xBankfull Elevation
0.00	98.80	89.27	93.33
7.50	95.70	89.27	93.33
17.00	91.50	89.27	93.33
21.30	89.27	89.27	93.33
22.70	88.45	89.27	93.33
25.00	86.97	89.27	93.33
27.40	86.38	89.27	93.33
33.50	85.56	89.27	93.33
40.50	85.21	89.27	93.33
45.00	85.21	89.27	93.33
48.70	87.40	89.27	93.33
54.40	88.39	89.27	93.33
57.00	89.27	89.27	93.33
61.50	89.68	89.27	93.33
71.00	89.86	89.27	93.33
77.50	90.26	89.27	93.33
88.40	88.84	89.27	93.33
95.00	88.61	89.27	93.33
116.50	87.57	89.27	93.33
122.00	89.85	89.27	93.33
129.50	93.10	89.27	93.33
135.00	95.92	89.27	93.33

Blue Line=2x Bankfull Elev Red Line=Mean Bankfull Elev Dark Blue Line w/Markers=Basic Cross Section



NFFR Domingo 7/30/01

Dist. From left stake	Total depth	Total Elevation	Bankfull Elevation	2xBankfull Elevation	Notes
1	2.55	97.45	88.05	92.24	TBM-LB
3.3	2.81	97.19	88.05	92.24	
4.5	4.36	95.64	88.05	92.24	
7	5.84	94.16	88.05	92.24	
13.3	8.44	91.56	88.05	92.24	
17.4	10.58	89.42	88.05	92.24	
22.4	11.95	88.05	88.05	92.24	BFL
24.6	13.61	86.39	88.05	92.24	LEW
27.3	15.2	84.8	88.05	92.24	
35.3	15.89	84.11	88.05	92.24	
41.3	16.14	83.86	88.05	92.24	T
46.3	15.82	84.18	88.05	92.24	
48.5	14.4	85.6	88.05	92.24	
51.6	13.62	86.38	88.05	92.24	REW
61	11.95	88.05	88.05	92.24	BFR
79	10.55	89.45	88.05	92.24	
93.1	12.87	87.13	88.05	92.24	
101.1	12.79	87.21	88.05	92.24	
115.7	13.73	86.27	88.05	92.24	
127.2	9.51	90.49	88.05	92.24	
136.5	5.52	94.48	88.05	92.24	
138	5.01	94.99	88.05	92.24	



7/22/03 nffr above almanor crosection-1

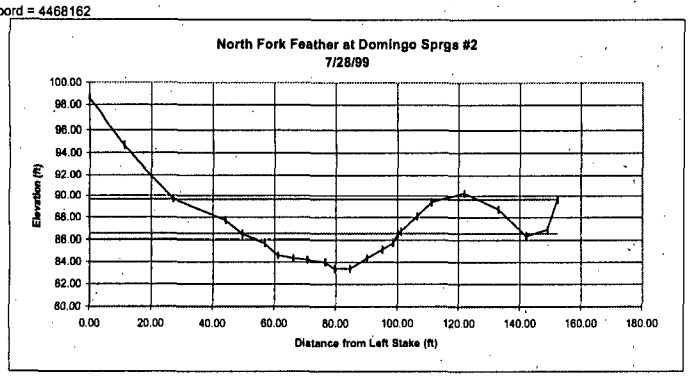
Dist from left stake	Total Depth	Bankfull depth	Total elevation	Bankfull elevation	2x bankfull elevation	Notes
0	2.66		97.34	88.6	93.74	tbml
4.5	4.58		95.42	88.6	93.74	
9.1	7.36		92.64	88.6	93.74	
15.3	9.64		90.36	88.6	93.74	
20.2	11.4	0	88.6	88.6	93.74	bfl
22	13.09	1.69	86.91	88.6	93.74	wel
24.8	13.86	2.46	86.14	88.6	93.74	
27.4	15.36	3.96	84.64	88.6	93.74	
30.1	15.65	4.25	84.35	88.6	93.74	
34.2	15.39	3.99	84.61	88.6	93.74	
37	15.51	4.11	84.49	88.6	93.74	
42.6	16.54	5.14	83.46	88.6	93.74	t
45	16.03	4.63	83.97	88.6	93.74	
49.5	14.01	2.61	85.99	88.6	93.74	
53.2	13.17	1.77	86.83	88.6	93.74	wer
67	12.31	0.91	87.69	88.6	93.74	
75.9	11.4	0	88.6	88.6	93.74	bfr
81	11.14		88.86	88.6	93.74	
94.5	12.61		87.39	88.6	93.74	
112.4	13.91		86.09	88.6	93.74	
115.5	13.28		86.72	88.6	93.74	
121.2	11.58		88.42	88.6	93.74	
128	9.28		90.72	88.6	93.74	
133.5	6.9		93.1	88.6	93.74	
138	4.27		95.73	88.6	93.74	endr

TOPipe=Top of pipe/bench mark
LEW=Left edge of water
REW=Right edge of water
MPD=Maximum pool depth
TBM=Temporary bench mark
PCT=Pool tail crest
TP=Turning point
TOPool=Top of pool
S-MAX=Max depth sediment lens
LB=Left bank
RB=Right bank
TOB=Top of bank
BF=Bankfull
T=Thalweg
all measurements in feet

Three Year SUMMARY			Mean	Max	Width:	Flood-	Entrench
	Cross-	Bankfull	Bankfull	Bankfull	Depth	prone	ment
Year	section	Width	Depth	Depth	Ratio	width	Ratio
1999	1	35.70	2.57	4.06	13.87	117.09	3.28
2001	1	38.60	2.62	4.19	14.73	116.80	3.03
2003	1	55.70	2.96	5.14	18.82	126.30	2.27

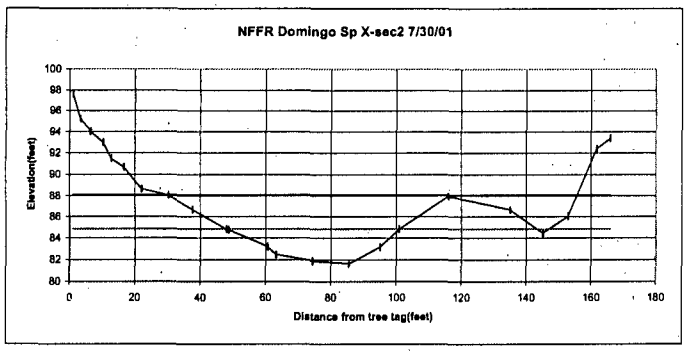
UTM X-coord = 639621
UTM Y-coord = 4468162

North Fork Feather River abv Lake Almanor X-sec 2



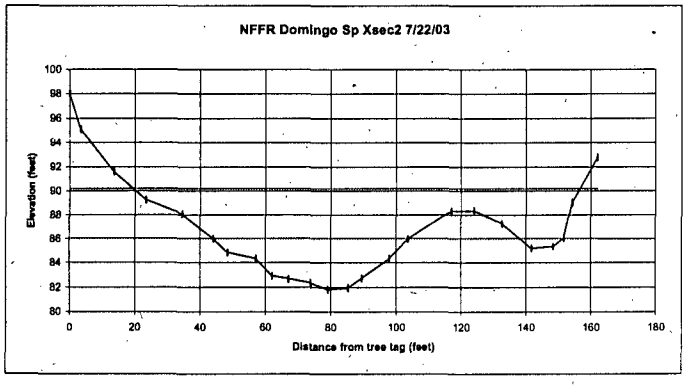
Dist. From Left Stake	Total Elevation	Bankfull Elevation	2xBankfull Elevation
0.00	98.59	86.525	89.65
11.00	94.72	86.525	89.65
27.00	89.70	86.525	89.65
44.00	87.74	86.525	89.65
49.40	86.51	86.525	89.65
56.80	85.69	86.525	89.65
61.00	84.62	86.525	89.65
66.00	84.35	86.525	89.65
70.50	84.20	86.525	89.65
76.40	84.01	86.525	89.65
79.50	83.40	86.525	89.65
84.50	83.42	86.525	89.65
90.00	84.38	86.525	89.65
95.00	85.20	86.525	89.65
98.40	85.72	86.525	89.65
100.00	86.54	86.525	89.65
101.00	86.74	86.525	89.65
106.30	88.10	86.525	89.65
111.00	89.39	86.53	89.65
121.70	90.25	86.525	89.65
133.00	88.78	86.525	89.65
142.00	86.32	86.525	89.65
149.00	86.88	86.525	89.65
152.30	89.68	86.525	89.65

Blue Line=2x Bankfull Elev Red Line=Mean Bankfull Elev Dark Blue Line w/Markers=Basic Cross Section



NFFR Domingo 7/30/01

Dist. From left stake	Total depth	Total Elevation	Bankfull Elevation	2xBankfull Elevation	Notes
1	2.36	97.64	84.87	88.08	TBM-LB
3.2	4.78	95.22	84.87	88.08	
6.3	5.95	94.05	84.87	88.08	
10.2	6.97	93.03	84.87	88.08	
12.7	8.49	91.51	84.87	88.08	
16.6	9.28	90.72	84.87	88.08	
22	11.36	88.64	84.87	88.08	
30.2	11.94	88.06	84.87	88.08	
37.5	13.31	86.69	84.87	88.08	
47.8	15.13	84.87	84.87	88.08	BFL
48.5	15.2	84.8	84.87	88.08	
60.4	16.78	83.22	84.87	88.08	LEW
63	17.51	82.49	84.87	88.08	
74.2	18.07	81.93	84.87	88.08	
85.4	18.34	81.66	84.87	88.08	T
94.8	16.8	83.2	84.87	88.08	REW
100.8	15.13	84.87	84.87	88.08	BFR
116	12.03	87.97	84.87	88.08	
135	13.33	86.67	84.87	88.08	
145	15.52	84.48	84.87	88.08	
152.8	13.94	86.06	84.87	88.08	
161.7	7.55	92.45	84.87	88.08	
166	6.58	93.42	84.87	88.08	End



7/22/03 nffr above almanor crosection-2

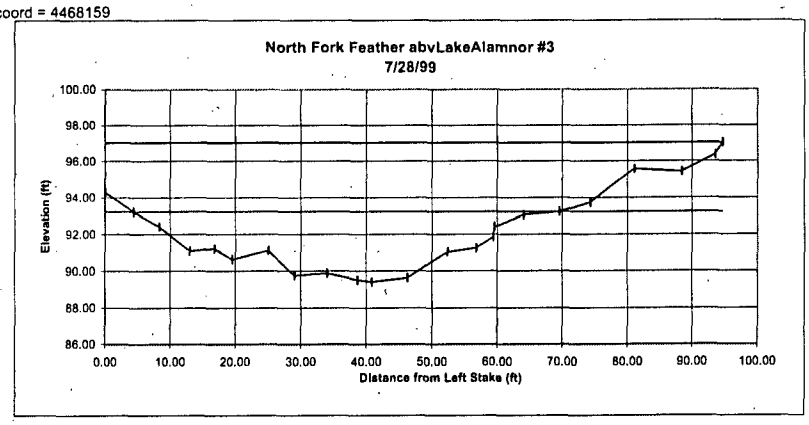
Dist from left stake	Total Depth	Bankfull depth	Total elevation	Bankfull elevation	2x bankfull elevation	Notes
0	1.93		98.07	86.01	90.19	tbml
3.3	4.88		95.12	86.01	90.19	
13.5	8.4		91.6	86.01	90.19	
23.3	10.71		89.29	86.01	90.19	
34.4	11.9		88.1	86.01	90.19	
44	13.99	0	86.01	86.01	90.19	bfl
48.3	15.15	1.16	84.85	86.01	90.19	
57	15.65	1.66	84.35	86.01	90.19	wel
62	17.09	3.1	82.91	86.01	90.19	
67	17.3	3.31	82.7	86.01	90.19	
73.8	17.62	3.63	82.38	86.01	90.19	
79	18.17	4.18	81.83	86.01	90.19	t
85.2	18.04	4.05	81.96	86.01	90.19	
89.4	17.25	3.26	82.75	86.01	90.19	
97.9	15.64	1.65	84.36	86.01	90.19	wer
103.6	13.99	0	86.01	86.01	90.19	bfr
116.8	11.64		88.36	86.01	90.19	
123.8	11.61		88.39	86.01	90.19	
132.6	12.7		87.3	86.01	90.19	
141.7	14.78		85.22	86.01	90.19	
148.4	14.63		85.37	86.01	90.19	
151.7	13.91		86.09	86.01	90.19	
154.1	10.92		89.08	86.01	90.19	
161.9	7.24		92.76	86.01	90.19	endr

TOPipe=Top of pipe/bench mark
LEW=Left edge of water
REW=Right edge of water
MPD=Maximum pool depth
TBM=Temporary bench mark
PCT=Pool tail crest
TP=Turning point
TOPool=Top of pool
S-MAX=Max. depth sediment lense
LB=Left bank
RB=Right bank
TOB=Top of bank
BF=Bankfull
T=Thalweg
all measurements in feet

Three Year SUMMARY		Mean	Max	Width:	Flood-	Entrench
	Cross-	Bankfull	Bankfull	Depth	prone	ment
Year	section	Width	Depth	Depth	Ratio	width	Ratio
1999	2	50.60	2.01	3.11	25.20	124.83	2.47
2001	2	53.00	1.70	3.21	31.17	122.40	2.30
2003	2	59.60	2.60	4.18	22.92	134.60	2.26

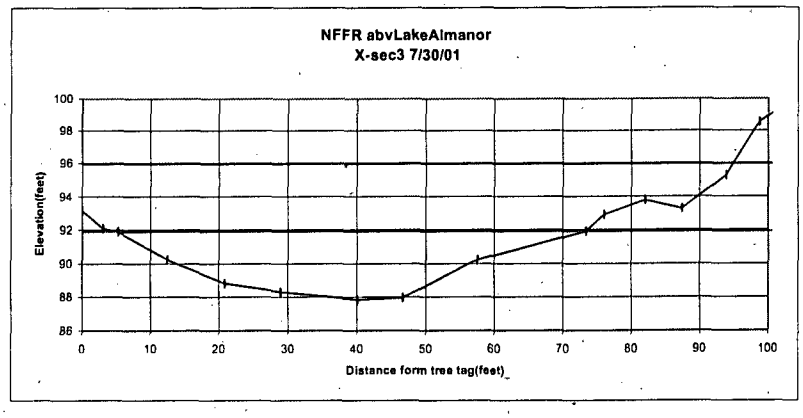
UTM X-coord = 639513
UTM Y-coord = 4468159

North Fork Feather River abv Lake Almanor X-sec 3



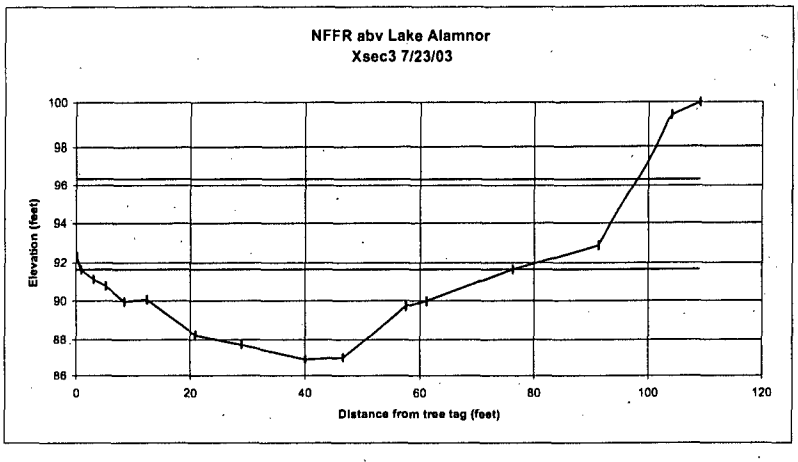
Dist. From Left Stake	Total Elevation	Bankfull Elevation	2xBankfull Elevation
0.00	94.30	93.24	97.04
4.40	93.24	93.24	97.04
8.30	92.42	93.24	97.04
13.00	91.09	93.24	97.04
16.80	91.22	93.24	97.04
19.50	90.63	93.24	97.04
25.00	91.12	93.24	97.04
29.00	89.78	93.24	97.04
34.00	89.90	93.24	97.04
38.60	89.54	93.24	97.04
40.80	89.44	93.24	97.04
46.20	89.66	93.24	97.04
52.30	91.04	93.24	97.04
56.70	91.26	93.24	97.04
59.30	91.85	93.24	97.04
59.50	92.40	93.24	97.04
64.00	93.07	93.24	97.04
69.50	93.24	93.24	97.04
74.30	93.75	93.24	97.04
81.00	95.57	93.24	97.04
88.30	95.41	93.24	97.04
93.50	96.36	93.24	97.04
94.60	97.04	93.24	97.04

Blue Line=2x Bankfull Elev **Red Line=Mean Bankfull Elev** **Dark Blue Line w/Markers=Basic Cross Section**



NFFR Domingo 7/30/01

Dist. From left stake	Total depth	Total Elevation	Bankfull Elevation	2xBankfull Elevation	Notes
0	6.83	93.17	91.9	95.96	TBM-LB
3	7.91	92.09	91.9	95.96	
5.2	8.1	91.9	91.9	95.96	BFL
12.4	9.75	90.25	91.9	95.96	LEW
20.8	11.15	88.85	91.9	95.96	
28.9	11.67	88.33	91.9	95.96	
40	12.16	87.84	91.9	95.96	T
46.6	12.03	87.97	91.9	95.96	
57.5	9.77	90.23	91.9	95.96	REW
73.3	8.1	91.9	91.9	95.96	BFR
76	7.1	92.9	91.9	95.96	
82	6.2	93.8	91.9	95.96	
87.4	6.72	93.28	91.9	95.96	
93.8	4.75	95.25	91.9	95.96	
98.8	1.46	98.54	91.9	95.96	
101	0.84	99.16	91.9	95.96	



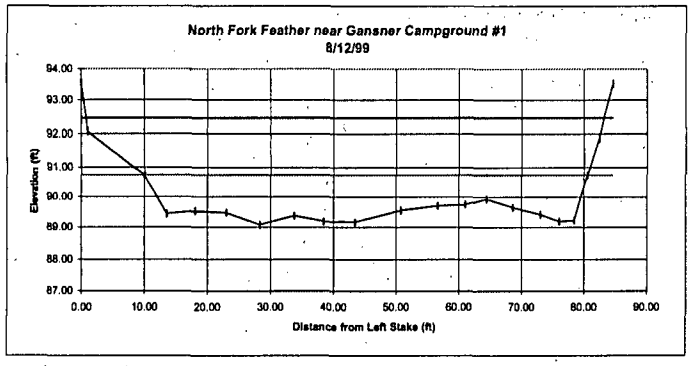
nffr above almanor crosection-3
7/23/03

Dist from left stake	Total Depth	Bankfull depth	Total elevation	bankfull elevation	2x bankfull elevation	Notes
0	7.64		92.36	91.65	96.37	tbml
0.8	8.35	0	91.65	91.65	96.37	bfl
3	8.86	0.51	91.14	91.65	96.37	
5.2	9.21	0.86	90.79	91.65	96.37	
8.4	10.04	1.69	89.96	91.65	96.37	wel
12.4	9.92	1.57	90.08	91.65	96.37	
20.8	11.75	3.4	88.25	91.65	96.37	
28.9	12.26	3.91	87.74	91.65	96.37	
40	13.07	4.72	86.93	91.65	96.37	t
46.6	12.97	4.62	87.03	91.65	96.37	
57.5	10.28	1.93	89.72	91.65	96.37	
61.1	10	1.65	90	91.65	96.37	wer
76.2	8.35	0	91.65	91.65	96.37	bfr
91.2	7.08		92.92	91.65	96.37	
104	0.63		99.37	91.65	96.37	
109	0		100	91.65	96.37	end

TOPipe=Top of pipe/bench mark
LEW=Left edge of water
REW=Right edge of water
MPD=Maximum pool depth
TBM=Temporary bench mark
PCT=Pool tail crest
TP=Turning point
TOPool=Top of pool
S-MAX=Max. depth sediment lense
LB=Left bank
RB=Right bank
TOB=Top of bank
BF=Bankfull
T=Thalweg
all measurements in feet

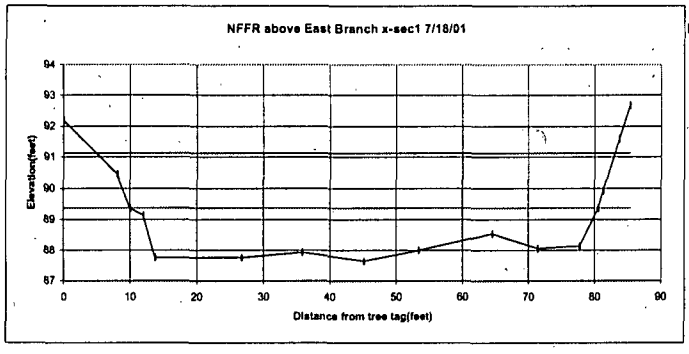
Three Year SUMMARY			Mean	Max	Width:	Flood-	Entrench-
Year	Cross-section	Bankfull Width	Bankfull Depth	Bankfull Depth	Depth Ratio	prone width	ment Ratio
1999	3	65.10	2.28	3.80	28.57	94.60	1.45
2001	3	68.10	2.56	4.06	26.60	105.00	1.54
2003	3	75.40	2.26	4.72	33.36	112.30	1.49

All measurement in feet



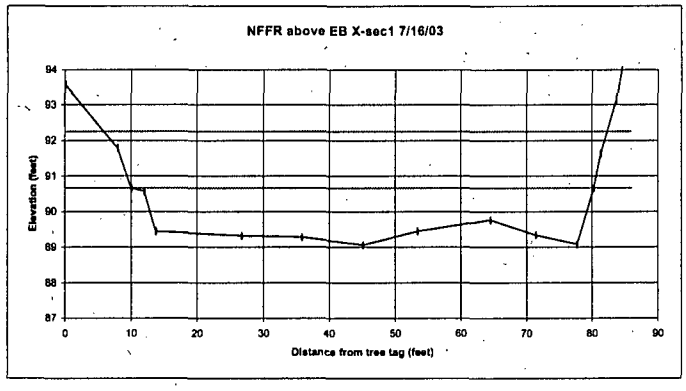
Dist. From Left Stake	Total Elevation	Bankfull Elevation	2xBankfull Elevation
0.00	93.56	90.76	92.44
1.00	92.08	90.76	92.44
10.00	90.76	90.76	92.44
10.00	90.76	90.76	92.44
13.50	89.44	90.76	92.44
18.00	89.53	90.76	92.44
23.00	89.48	90.76	92.44
28.30	89.08	90.76	92.44
33.80	89.38	90.76	92.44
38.40	89.19	90.76	92.44
43.40	89.17	90.76	92.44
50.70	89.56	90.76	92.44
56.60	89.71	90.76	92.44
61.00	89.75	90.76	92.44
64.40	89.93	90.76	92.44
68.60	89.65	90.76	92.44
73.00	89.42	90.76	92.44
76.00	89.19	90.76	92.44
78.40	89.23	90.76	92.44
80.50	90.76	90.76	92.44
80.50	90.76	90.76	92.44
82.40	91.89	90.76	92.44
84.60	93.54	90.76	92.44

Blue Line=2x Bankfull Elev **Red Line=Mean Bankfull Elev** **Dark Blue Line w/Markers=Basic Cross Section**



NFFR above EBFFR 7/18/01

Dist. From left stake	Total depth	Total Elevation	Bankfull Elevation	2xBankfull Elevation	Notes
0	7.81	92.19	89.37	91.12	TBM-LB
8	9.55	90.45	89.37	91.12	
10	10.63	89.37	89.37	91.12	BFL/LEW
12	10.86	89.14	89.37	91.12	
13.7	12.24	87.76	89.37	91.12	
26.7	12.24	87.76	89.37	91.12	
35.8	12.06	87.94	89.37	91.12	
45.1	12.36	87.64	89.37	91.12	T
53.4	12	88	89.37	91.12	
64.5	11.46	88.54	89.37	91.12	
71.4	11.94	88.06	89.37	91.12	
77.7	11.86	88.14	89.37	91.12	
80.5	10.63	89.37	89.37	91.12	BFR/REW
81.3	10.07	89.93	89.37	91.12	
83.7	8.4	91.6	89.37	91.12	
85.4	7.31	92.69	89.37	91.12	TBM-RB



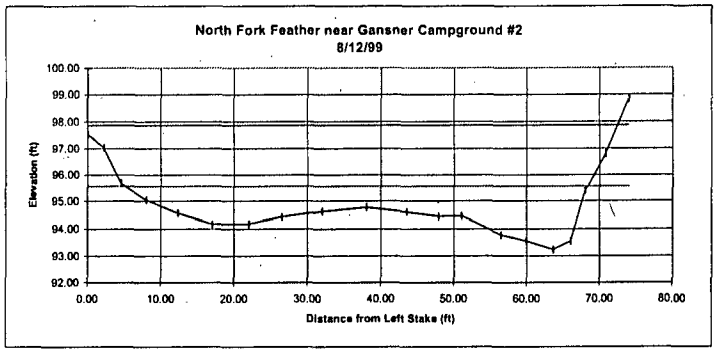
nffr at gansner cross-section-1
7/16/03

Dist from left stake	Total Depth	Bankfull depth	Total elevation	Bankfull elevation	2x Bankfull elevation	Notes
0	6.42		93.58	90.66	92.26	tbmf
8	8.21		91.79	90.66	92.26	tobl
10	9.34	0	90.66	90.66	92.26	bfl,wel
12	9.43	0.09	90.57	90.66	92.26	
13.7	10.55	1.21	89.45	90.66	92.26	
26.7	10.68	1.34	89.32	90.66	92.26	
35.8	10.71	1.37	89.29	90.66	92.26	
45.1	10.94	1.6	89.06	90.66	92.26	t
53.4	10.55	1.21	89.45	90.66	92.26	
64.5	10.23	0.89	89.77	90.66	92.26	
71.4	10.65	1.31	89.35	90.66	92.26	
77.7	10.92	1.58	89.08	90.66	92.26	
80.2	9.34	0	90.66	90.66	92.26	bfr,wer
81.3	8.37		91.63	90.66	92.26	
83.7	6.86		93.14	90.66	92.26	
86	4.29		95.71	90.66	92.26	tobr,endr

TOPipe=Top of pipe/bench mark
LEW=Left edge of water
REW=Right edge of water
MPD=Maximum pool depth
TBM=Temporary bench mark
PCT=Pool tail crest
TP=Turning point
TOPool=Top of pool
S-MAX=Max. depth sediment lense
LB=Left bank
RB=Right bank
TOB=Top of bank
BF=Bankfull
T=Thalweg

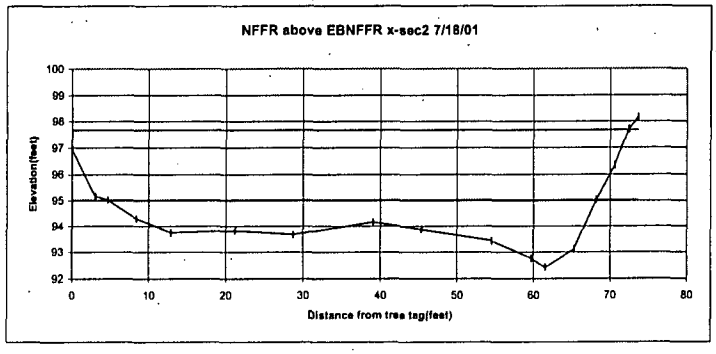
Three Year SUMMARY			Mean	Max	Width:	Flood-	Entrench-
Year	Cross-section	Bankfull Width	Bankfull Depth	Bankfull Depth	Depth Ratio	prone width	ment Ratio
1999	1	70.50	1.16	1.68	60.87	82.38	1.17
2001	1	70.50	1.13	1.73	62.38	82.97	1.17
2003	1	70.20	1.06	1.60	66.23	93.50	1.33

all measurements in feet



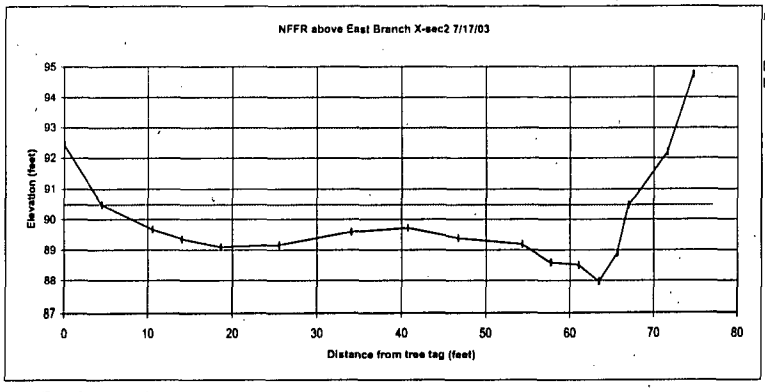
Dist. From Left Stake	Total Elevation	Bankfull Elevation	2xBankfull Elevation
0.00	97.55	95.555	97.87
2.20	97.04	95.555	97.87
4.50	95.70	95.555	97.87
4.50	95.70	95.555	97.87
8.00	95.05	95.555	97.87
12.30	94.58	95.555	97.87
17.00	94.18	95.555	97.87
22.00	94.19	95.555	97.87
26.50	94.44	95.555	97.87
32.00	94.64	95.555	97.87
38.00	94.78	95.555	97.87
43.50	94.61	95.555	97.87
47.90	94.45	95.555	97.87
51.00	94.47	95.555	97.87
56.40	93.78	95.555	97.87
59.90	93.55	95.555	97.87
63.60	93.24	95.555	97.87
66.00	93.55	95.555	97.87
68.00	95.41	95.56	97.87
68.00	95.41	95.555	97.87
70.80	96.80	95.555	97.87
74.00	98.84	95.555	97.87

Blue Line=2x Bankfull Elev **Red Line=Mean Bankfull Elev** **Dark Blue Line w/Markers=Basic Cross Section**



NFFR above EBFFR 7/18/01

Dist from Left stake	Total depth	Total Elevation	Bankfull Elevation	2xBankfull Elevation	Notes
0	3.02	96.98	95.04	97.66	TBM-LB
3	4.82	95.18	95.04	97.66	
4.6	4.96	95.04	95.04	97.66	BFL/LEW
8.3	5.7	94.3	95.04	97.66	
12.9	6.25	93.75	95.04	97.66	
21.2	6.17	93.83	95.04	97.66	
28.7	6.32	93.68	95.04	97.66	
39	5.84	94.16	95.04	97.66	
45.3	6.12	93.88	95.04	97.66	
54.5	6.56	93.44	95.04	97.66	
59.7	7.23	92.77	95.04	97.66	
61.5	7.58	92.42	95.04	97.66	T
65.3	6.88	93.12	95.04	97.66	
68.1	4.96	95.04	95.04	97.66	BFR/REW
70.6	3.64	96.36	95.04	97.66	
72.4	2.29	97.71	95.04	97.66	
73.6	1.83	98.17	95.04	97.66	TBM-RB



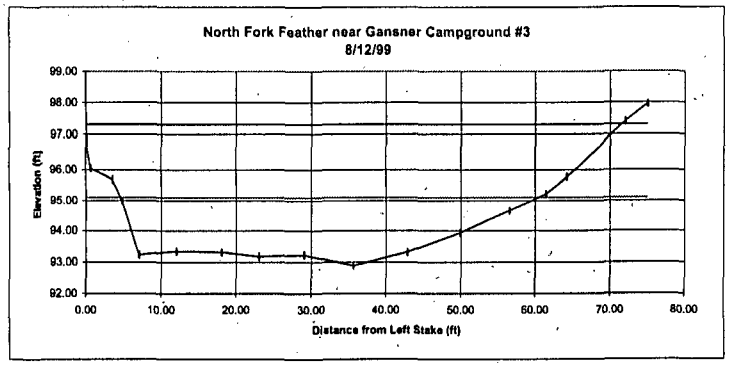
nffr at gansner cross-section-2
7/17/03

Dist from left stake	Total Depth	Bankfull depth	Total elevation	Bankfull elevation	2x Bankfull elevation	Notes
0	7.57		92.43	90.48	92.98	tbm!
4.5	9.52	0	90.48	90.48	92.98	bfl,wel
10.5	10.33	0.81	89.67	90.48	92.98	
14	10.65	1.13	89.35	90.48	92.98	
18.6	10.9	1.38	89.1	90.48	92.98	
25.5	10.83	1.31	89.17	90.48	92.98	
34	10.41	0.89	89.59	90.48	92.98	
40.7	10.28	0.76	89.72	90.48	92.98	
46.7	10.61	1.09	89.39	90.48	92.98	
54.3	10.81	1.29	89.19	90.48	92.98	
57.7	11.4	1.88	88.6	90.48	92.98	
61	11.48	1.96	88.52	90.48	92.98	
63.4	12.02	2.5	87.98	90.48	92.98	t
65.6	11.08	1.56	88.92	90.48	92.98	
67	9.52	0	90.48	90.48	92.98	bfr,wer
71.6	7.79		92.21	90.48	92.98	
74.7	5.23		94.77	90.48	92.98	
77	3.19		96.81	90.48	92.98	tobr,endr

TOPipe=Top of pipe/bench mark
LEW=Left edge of water
REW=Right edge of water
MPD=Maximum pool depth
TBM=Temporary bench mark
PCT=Pool tail crest
TP=Turning point
TOPool=Top of pool
S-MAX=Max. depth sediment lense
LB=Left bank
RB=Right bank
TOB=Top of bank
BF=Bankfull
T=Thalweg

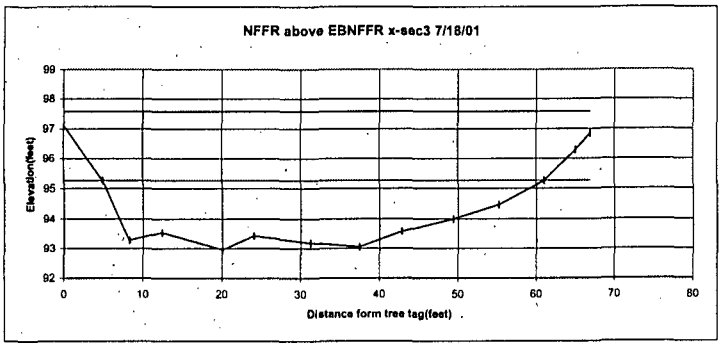
Three Year SUMMARY		Mean	Max	Width:	Flood-	Entrench-
	Cross-	Bankfull	Bankfull	Depth	prone	ment
Year	section	Width	Depth	Depth	Ratio	width	Ratio
1999	2	63.50	1.30	2.46	48.68	72.48	1.14
2001	2	63.50	1.36	2.62	46.69	76.40	1.20
2003	2	62.50	1.27	2.50	49.06	76.50	1.22

all measurements in feet



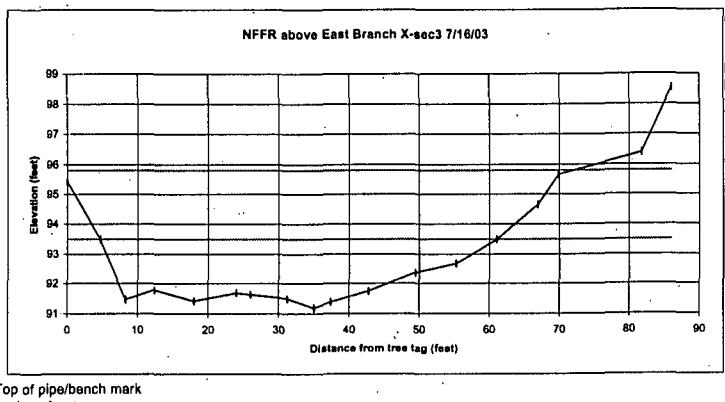
Dist. From Left Stake	Total Elevation	Bankfull Elevation	2xBankfull Elevation
0.00	96.90	95.105	97.31
0.60	96.05	95.105	97.31
3.50	95.69	95.105	97.31
4.80	94.99	95.105	97.31
4.80	94.99	95.105	97.31
7.00	93.23	95.105	97.31
12.00	93.35	95.105	97.31
18.00	93.31	95.105	97.31
23.00	93.18	95.105	97.31
29.00	93.23	95.105	97.31
35.60	92.90	95.105	97.31
42.80	93.32	95.105	97.31
49.90	93.94	95.105	97.31
56.50	94.66	95.105	97.31
61.40	95.22	95.105	97.31
61.40	95.22	95.105	97.31
64.20	95.77	95.105	97.31
72.00	97.41	95.105	97.31
75.00	97.97	95.11	97.31

Blue Line=2x Bankfull Elev **Red Line=Mean Bankfull Elev** **Dark Blue Line w/Markers=Basic Cross Section**



NFFR above EBFFR 7/18/01

Dist. From left stake	Total depth	Total Elevation	Bankfull Elevation	2xBankfull Elevation	Notes
0	2.87	97.13	95.27	97.58	TBM-LB
4.9	4.73	95.27	95.27	97.58	BFL/LEW
8.3	6.72	93.28	95.27	97.58	
12.4	6.45	93.55	95.27	97.58	
20	7.04	92.96	95.27	97.58	T
24	6.57	93.43	95.27	97.58	
31.2	6.81	93.19	95.27	97.58	
37.4	6.94	93.06	95.27	97.58	
42.8	6.41	93.59	95.27	97.58	
49.4	6	94	95.27	97.58	
55.2	5.53	94.47	95.27	97.58	
61	4.73	95.27	95.27	97.58	BFR/REW
65	3.71	96.29	95.27	97.58	
66.9	3.16	96.84	95.27	97.58	TBM-RB



nffr at gansner crosection-3
7/16/03

Dist from left stake	Total Depth	Bankfull depth	Total elevation	Bankfull elevation	2x Bankfull elevation	Notes
0	4.56		95.44	93.5	95.81	tbml
4.7	6.5	0	93.5	93.5	95.81	bfl,wel
8.3	8.53	2.03	91.47	93.5	95.81	
12.4	8.21	1.71	91.79	93.5	95.81	
18	8.58	2.08	91.42	93.5	95.81	
24	8.31	1.81	91.69	93.5	95.81	
26	8.36	1.86	91.64	93.5	95.81	
31.2	8.5	2	91.5	93.5	95.81	
35	8.81	2.31	91.19	93.5	95.81	t
37.4	8.61	2.11	91.39	93.5	95.81	
42.8	8.25	1.75	91.75	93.5	95.81	
49.4	7.64	1.14	92.36	93.5	95.81	
55.2	7.32	0.82	92.68	93.5	95.81	
61	6.5	0	93.5	93.5	95.81	bfr,wer
66.9	5.35		94.65	93.5	95.81	
69.9	4.33		95.67	93.5	95.81	
81.7	3.6		96.4	93.5	95.81	
86	1.45		98.55	93.5	95.81	

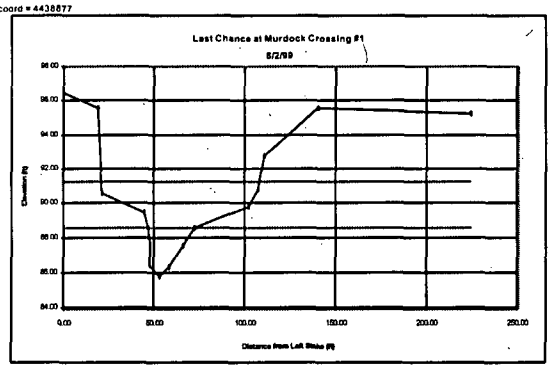
TOPipe=Top of pipe/bench mark
LEW=Left edge of water
REW=Right edge of water
MPD=Maximum pool depth
TBM=Temporary bench mark
PCT=Pool tail crest
TP=Turning point
TOPool=Top of pool
S-MAX=Max. depth sediment fense
LB=Left bank
RB=Right bank
TOB=Top of bank
BF=Bankfull
T=Thalweg

Three Year SUMMARY			Mean	Max	Width:	Flood-	Entrench-
Year	Cross-section	Bankfull Width	Bankfull Depth	Bankfull Depth	Depth Ratio	prone width	ment Ratio
1999	3	56.60	1.21	2.09	46.71	71.52	1.26
2001	3	56.10	1.60	2.31	35.06	81.05	1.44
2003	3	56.30	1.64	2.31	34.43	83.00	1.47

UTM X-coord = 708793

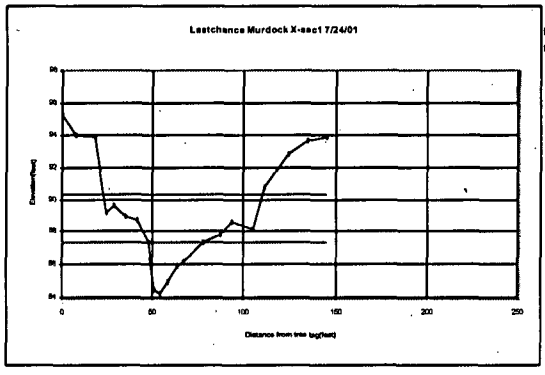
UTM Y-coord = 4438877

Last Chance Cr below Murdock X-ing x-sec 1



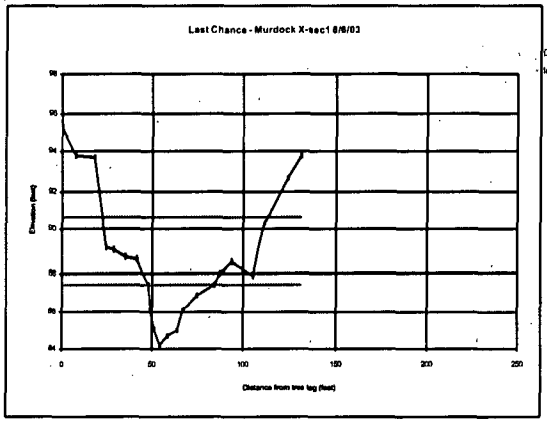
Dist. From Left Stake	Total Elevation	Bankfull Elevation	2xBankfull Elevation
0.00	96.45	88.52	91.23
16.90	95.60	88.52	91.23
21.30	90.60	88.52	91.23
45.00	89.43	88.52	91.23
47.00	88.52	88.52	91.23
47.50	87.70	88.52	91.23
48.00	86.45	88.52	91.23
53.00	85.61	88.52	91.23
59.00	86.33	88.52	91.23
66.00	87.57	88.52	91.23
72.50	88.52	88.52	91.23
102.30	89.78	88.52	91.23
107.50	90.82	88.52	91.23
111.00	92.76	88.52	91.23
140.30	95.52	88.52	91.23
224.00	95.25	88.52	91.23

Blue Line=2x Bankfull Elev Red Line=Mean Bankfull Elev Dark Blue Line w/Markers=Basic Cross Section



LastChance-Murdock 7/24/01

Dist. From left stake	Total depth	Total Elevation	Bankfull Elevation	2XBankfull Elevation	Notes
0	4.67	95.33	87.32	90.39	TBM-LB
7	5.98	94.02	87.32	90.39	
18	6.07	93.93	87.32	90.39	TOBL
24	10.77	89.23	87.32	90.39	
28.8	10.37	89.63	87.32	90.39	
34.5	11.11	88.89	87.32	90.39	
41	11.32	88.68	87.32	90.39	
47.6	12.68	87.32	87.32	90.39	BFL
48.9	13.89	86.11	87.32	90.39	LEW
50.8	15.49	84.51	87.32	90.39	
54.4	15.75	84.25	87.32	90.39	T
58.4	15.01	84.99	87.32	90.39	
64	14.12	85.88	87.32	90.39	
66.6	13.68	86.14	87.32	90.39	REW
77.7	12.68	87.32	87.32	90.39	BFR
86.4	12.25	87.75	87.32	90.39	
92.7	11.42	88.58	87.32	90.39	
104.5	11.84	88.16	87.32	90.39	
110.7	9.16	90.84	87.32	90.39	
123.7	7.22	92.78	87.32	90.39	
134.1	6.34	93.66	87.32	90.39	
145.6	6.15	93.85	87.32	90.39	TBM-RB



8/6/03 last chance crosection-1

Dist from left stake	Total Depth	Bankfull depth	Total elevation	Bankfull elevation	2x Bankfull elevation	Notes
0	4.76		95.24	87.44	90.67	tbml
7	6.16		93.84	87.44	90.67	
18	6.26		93.74	87.44	90.67	tobl
24	10.9		89.1	87.44	90.67	
28.8	10.96		89.04	87.44	90.67	
34.5	11.29		88.71	87.44	90.67	
41	11.44		88.56	87.44	90.67	
47.6	12.56	0	87.44	87.44	90.67	bfl
49	13.79	1.23	86.21	87.44	90.67	wal
50.4	14.65	2.29	85.15	87.44	90.67	
54	15.79	3.23	84.21	87.44	90.67	t
58.4	15.26	2.7	84.74	87.44	90.67	
64	14.93	2.37	85.07	87.44	90.67	
66.6	13.67	1.31	86.13	87.44	90.67	war
73.8	13.02	0.46	86.96	87.44	90.67	
84	12.56	0	87.44	87.44	90.67	bfr
86.4	12.02		87.98	87.44	90.67	
92.7	11.49		88.51	87.44	90.67	
104.5	12.13		87.87	87.44	90.67	
110.7	9.63		90.37	87.44	90.67	tobr
123.7	7.35		92.65	87.44	90.67	
131	6.24		93.76	87.44	90.67	endr

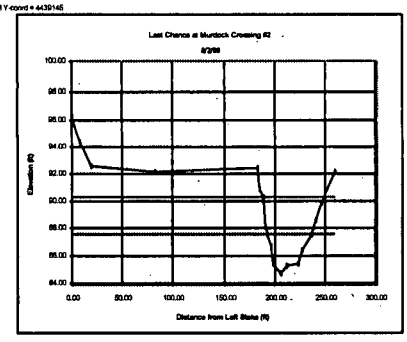
TOPipe=Top of pipe/bench mark
LEW=Left edge of water
REW=Right edge of water
MPD=Maximum pool depth
TBM=Temporary bench mark
PCT=Pool tail crest
TP=Turning point
TOPool=Top of pool
S-MAX=Max depth sediment lens
LB=Left bank
RB=Right bank
TOB=Top of bank
BF=Bankfull
T=Thalweg

Three Year SUMMARY		Mean	Max	Width:	Flood-	Entrench-
	Cross-	Bankfull	Bankfull	Depth	prone	ment
Year	section	Width	Depth	Depth	Ratio	width	Ratio
1999	1	25.50	1.75	2.71	14.59	87.23	3.42
2001	1	30.10	1.72	3.07	17.50	87.10	2.89
2003	1	36.40	1.70	3.23	21.42	89.80	2.47

UTM X-coord = 726960

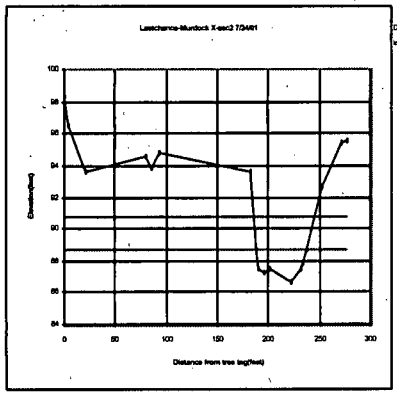
UTM Y-coord = 4439145

Last Chance Cr below Murdock X-ing x-sec 2

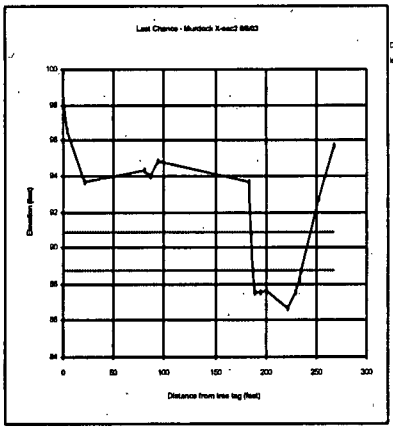


Dist. From Left Stake	Total Elevation	Bankfull Elevation	2xBankfull Elevation
0.00	96.25	87.52	90.34
7.70	94.41	87.52	90.34
18.30	92.55	87.52	90.34
82.00	92.20	87.52	90.34
184.00	92.40	87.52	90.34
186.00	90.80	87.52	90.34
188.50	90.30	87.52	90.34
190.80	89.15	87.52	90.34
193.00	87.52	87.52	90.34
197.00	86.70	87.52	90.34
199.40	85.49	87.52	90.34
205.60	84.70	87.52	90.34
212.70	85.34	87.52	90.34
222.80	85.43	87.52	90.34
227.20	86.38	87.52	90.34
236.50	87.52	87.52	90.34
241.30	88.61	87.52	90.34
247.30	89.88	87.52	90.34
259.40	92.08	87.52	90.34

Blue Line=2x Bankfull Elev Red Line=Mean Bankfull Elev Dark Blue Line w/Markers=Basic Cross Section



Dist. From left stake	Total depth	Total Elevation	Bankfull Elevation	2XBankfull Elevation	Notes
0	1.74	98.28	88.69	90.74	TBM-LB
3.2	3.52	96.48	88.69	90.74	
21.7	6.34	93.65	88.69	90.74	
80.6	5.43	94.57	88.69	90.74	
86.2	6.13	93.87	88.69	90.74	
93	5.23	94.77	88.69	90.74	
182.5	6.4	93.6	88.69	90.74	TOBL
188	11.31	88.69	88.69	90.74	BFL
189.8	12.52	87.48	88.69	90.74	LEW
195.7	12.81	87.19	88.69	90.74	
200.7	12.57	87.43	88.69	90.74	
222	13.36	86.64	88.69	90.74	T
231.8	12.55	87.45	88.69	90.74	REW
233.7	12.12	87.88	88.69	90.74	
236.4	11.31	88.69	88.69	90.74	BFR
252.6	7.32	92.68	88.69	90.74	
271.1	4.65	95.45	88.69	90.74	TOBR
276.9	4.42	95.58	88.69	90.74	TBM-RB



8/6/03 last chance correction 2

Dist from left stake	Total Depth	Bankfull depth	Total elevation	Bankfull elevation	2x Bankfull elevation	Notes
0	1.74		98.28	88.77	90.84	lbml
3.2	3.44		96.58	88.77	90.84	
21.7	6.33		93.67	88.77	90.84	
80.6	5.84		94.36	88.77	90.84	
86.2	6.05		93.95	88.77	90.84	
93	5.2		94.8	88.77	90.84	
182.5	6.35		93.65	88.77	90.84	
184.5	9.19		90.81	88.77	90.84	
187.7	11.23	0	88.77	88.77	90.84	blf
189.3	12.46	1.23	87.54	88.77	90.84	wel
195.7	12.5	1.27	87.5	88.77	90.84	
200.7	12.37	1.14	87.63	88.77	90.84	
222	13.3	2.07	86.7	88.77	90.84	t
229.8	12.45	1.22	87.55	88.77	90.84	wer
233.7	11.78	0.55	88.22	88.77	90.84	
236.9	11.23	0	88.77	88.77	90.84	blf
252.5	7.25		92.75	88.77	90.84	
267.6	4.28		95.72	88.77	90.84	end lobr

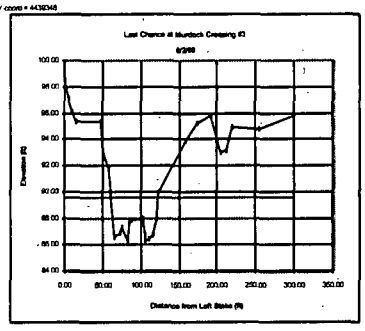
TOPipe=Top of pipe/bench mark
LEW=Left edge of water
REW=Right edge of water
MPD=Maximum pool depth
TBM=Temporary bench mark
PCT=Pool tail crest
TP=Turning point
TOPool=Top of pool
S-MAX=Max. depth sediment lenses
LB=Left bank
RB=Right bank
TOB=Top of bank
BF=Bankfull
T=Thalweg
all measurements in feet

Three Year SUMMARY		Mean		Max	Width:Depth	Flood-prone	Entrench-ment
Year	Cross-section	Bankful Width	Bankful Depth	Bankfull Depth	Ratio	width	Ratio
1999	2	43.50	1.86	2.82	23.35	61.62	1.42
2001	2	48.40	1.15	2.05	42.08	58.00	1.19
2003	2	46.20	1.07	2.07	45.11	58.70	1.22

UTM x-coord = 709184

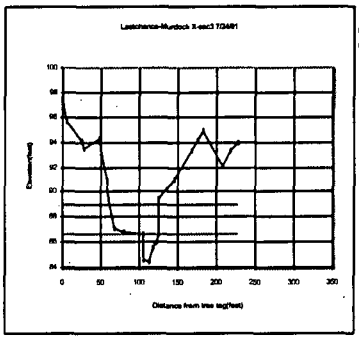
UTM y-coord = 4436348

Last Chance Cr below Murdock X-ing xsec 3



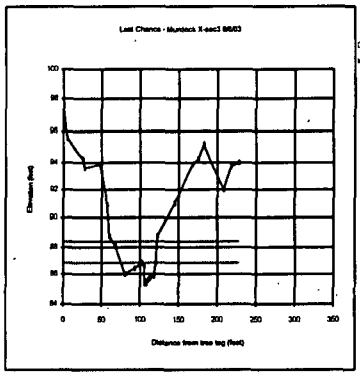
Blue Line=2x Bankfull Elev Red Line=Mean Bankfull Elev Dark Blue Line w/Markers=Elastic Cross Section

Dist. From Left Stake	Total Elevation	Bankfull Elevation	2xBankfull Elevation
0.00	98.59	87.9	89.47
4.00	97.18	87.9	89.47
9.00	96.09	87.9	89.47
16.00	95.28	87.9	89.47
47.00	96.28	87.9	89.47
51.00	93.15	87.9	89.47
57.50	91.72	87.9	89.47
59.30	89.98	87.9	89.47
66.40	88.68	87.9	89.47
73.00	88.97	87.9	89.47
74.80	87.36	87.9	89.47
82.80	88.33	87.9	89.47
85.40	87.83	87.9	89.47
102.80	87.90	87.9	89.47
105.00	88.78	87.9	89.47
105.01	88.36	87.9	89.47
110.00	88.50	87.9	89.47
118.40	88.72	87.9	89.47
121.80	87.80	87.90	89.47
123.00	89.95	87.9	89.47
156.00	93.84	87.9	89.47
173.00	95.23	87.9	89.47
190.80	95.78	87.9	89.47
204.00	93.03	87.9	89.47
212.80	93.23	87.9	89.47
220.00	94.88	87.9	89.47
254.00	94.73	87.9	89.47
300.00	95.82	87.9	89.47



LastChance-Murdock 7/24/01

Dist. From left stake	Total depth	Total Elevation	Bankfull Elevation	2XBankfull Elevation	Notes
0	2.46	97.85	88.7	88.93	TBM-LB
6	4.41	95.89	88.7	88.93	
24.4	6.85	94.15	88.7	88.93	
27.5	6.6	93.5	88.7	88.93	
48	5.8	94.2	88.7	88.93	TOBL
58.1	9.02	90.98	88.7	88.93	
59.9	10.52	89.48	88.7	88.93	
66.4	12.83	87.17	88.7	88.93	
79	13.18	86.82	88.7	88.93	
103.8	13.3	86.7	88.7	88.93	BFL
105	14.46	85.54	88.7	88.93	LEW
108	15.31	84.69	88.7	88.93	
112.3	15.53	84.47	88.7	88.93	T
116	14.52	85.48	88.7	88.93	REW
121.5	13.82	86.06	88.7	88.93	
124	13.3	86.7	88.7	88.93	BFR
126	10.59	89.41	88.7	88.93	TOBL
144.5	8.95	91.05	88.7	88.93	
168	6.75	93.25	88.7	88.93	
174	5.9	94.1	88.7	88.93	
183.6	5.07	94.93	88.7	88.93	
207.3	7.94	92.06	88.7	88.93	
218.7	6.69	93.31	88.7	88.93	
226.6	6.11	93.89	88.7	88.93	End



8/6/03 last chance cross section-3

Dist from left stake	Total Depth	Bankfull depth	Total elevation	Bankfull elevation	2x Bankfull elevation	Notes
0	2.4		97.8	88.84	88.36	Bmk
6	4.38		95.81	88.84	88.36	
24.4	6.72		94.29	88.84	88.36	
27.5	6.4		93.8	88.84	88.36	
48	6.18		93.62	88.84	88.36	tobl
57.3	9.2		90.8	88.84	88.36	
59.9	11.22		88.78	88.84	88.36	
66.4	11.83		88.17	88.84	88.36	
79	14.01		85.99	88.84	88.36	
93.3	13.59		86.41	88.84	88.36	
101.9	13.16	0	86.84	88.84	88.36	bl
103.9	13.34	0.18	86.66	88.84	88.36	
104.8	14.33	1.17	85.67	88.84	88.36	wet
105.3	14.62	1.46	85.38	88.84	88.36	
107	14.67	1.51	85.33	88.84	88.36	t
108.8	14.55	1.39	85.45	88.84	88.36	
109.9	14.38	1.22	85.62	88.84	88.36	
111.7	14.29	1.13	85.71	88.84	88.36	wet
117.1	14.07	0.91	85.93	88.84	88.36	
120.2	13.16	0	86.84	88.84	88.36	bl
123.1	11.25		88.75	88.84	88.36	tobl
145.5	9.09		90.91	88.84	88.36	
168	6.15		93.85	88.84	88.36	
174	5.7		94.3	88.84	88.36	
183.6	4.85		95.15	88.84	88.36	
207.3	8.12		91.88	88.84	88.36	
218.3	6.31		93.69	88.84	88.36	
226.6	0		94	88.84	88.36	end

TOPpc=Top of pool/trench mark

LEW=Left edge of water

REW=Right edge of water

MPD=Maximum pool depth

TBM=Temporary bench mark

PCT=Pool tail crest

TP=Turning point

TOPool=Top of pool

S-MAX=Max depth sediment lens

LB=Left bank

RB=Right bank

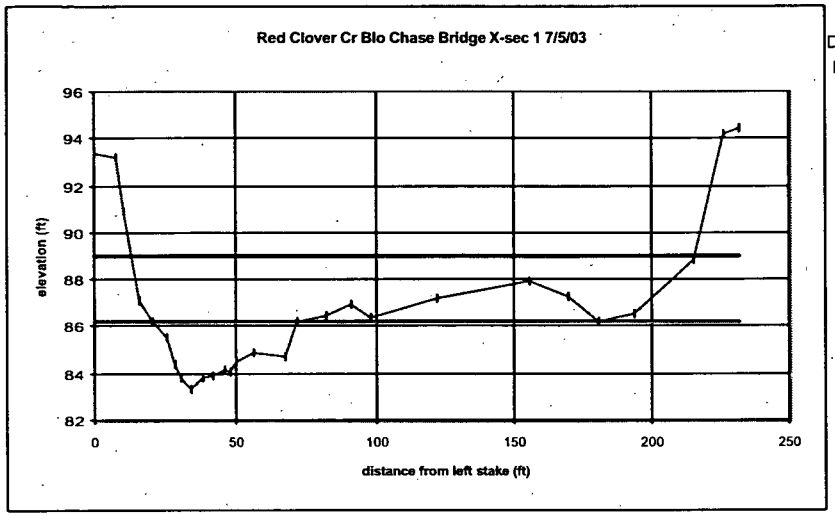
TOB=Top of bank

BF=Bankfull

T=Thalweg

Three Year SUMMARY		Mean Cross-section	Mean Bankful Width	Mean Bankful Depth	Max Bankful Depth	Width: Depth Ratio	Flood-prone width	Entrenchment Ratio
Year								
1999		3	19.10	1.31	1.55	14.55	62.32	3.26
2001		3	20.20	1.20	2.23	16.83	65.30	3.23
2003		3	18.30	1.00	1.51	18.36	60.20	3.29

Red Clover Cr Below Chase Bridge X-sec 1



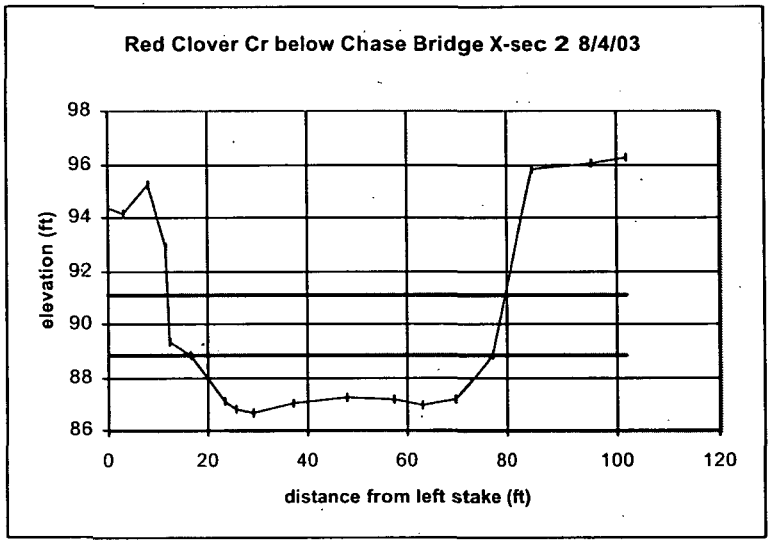
BFL=Bankfull Left
BFR=Bankfull Right
WE=Waters edge
T=Thalwag
TOB=Top of Bank
TUC=Top of undercut
Buc=Bottom of undercut
UCW=Undercutwidth

7/5/03 red clover below chase crosection-1

Dist from left stak	Total Depth	Bankfull depth	Total elevation	Bankfull elevation	2x bankfull elevation	Notes
0	6.67		93.33	86.17	89.03	tbml
8	6.77		93.23	86.17	89.03	tobl
10.3	9.12		90.88	86.17	89.03	
16.2	12.88		87.12	86.17	89.03	
20.9	13.83	0	86.17	86.17	89.03	bfl
26	14.43	0.6	85.57	86.17	89.03	
28.7	15.58	1.75	84.42	86.17	89.03	wel
30.8	16.18	2.35	83.82	86.17	89.03	
34	16.69	2.86	83.31	86.17	89.03	t
38	16.19	2.36	83.81	86.17	89.03	
42.1	16.09	2.26	83.91	86.17	89.03	
46.2	15.84	2.01	84.16	86.17	89.03	
47.8	15.91	2.08	84.09	86.17	89.03	
50.4	15.53	1.7	84.47	86.17	89.03	wer
56.5	15.11	1.28	84.89	86.17	89.03	
67.3	15.26	1.43	84.74	86.17	89.03	
71.5	13.83	0	86.17	86.17	89.03	bfr
82.4	13.59		86.41	86.17	89.03	
91.4	13.06		86.94	86.17	89.03	
98	13.6		86.4	86.17	89.03	
122	12.82		87.18	86.17	89.03	
155	12.07		87.93	86.17	89.03	
169.3	12.77		87.23	86.17	89.03	
180.2	13.8		86.2	86.17	89.03	
193.8	13.43		86.57	86.17	89.03	
215	11.15		88.85	86.17	89.03	
226.5	5.78		94.22	86.17	89.03	tobr
231.9	5.55		94.45	86.17	89.03	endr

Two Year SUMMARY			Mean	Max	Width:	Flood-	Entrench-
Year	Cross-section	Bankfull Width	Bankfull Depth	Bankfull Depth	Depth Ratio	prone width	ment Ratio
1995	1	55.1	1.47	2.27	37.5	60.61	1.1
2003	1	50.60	1.72	2.86	29.42	202.30	4.00

Red Clover Cr below Chase Bridge X-sec 2

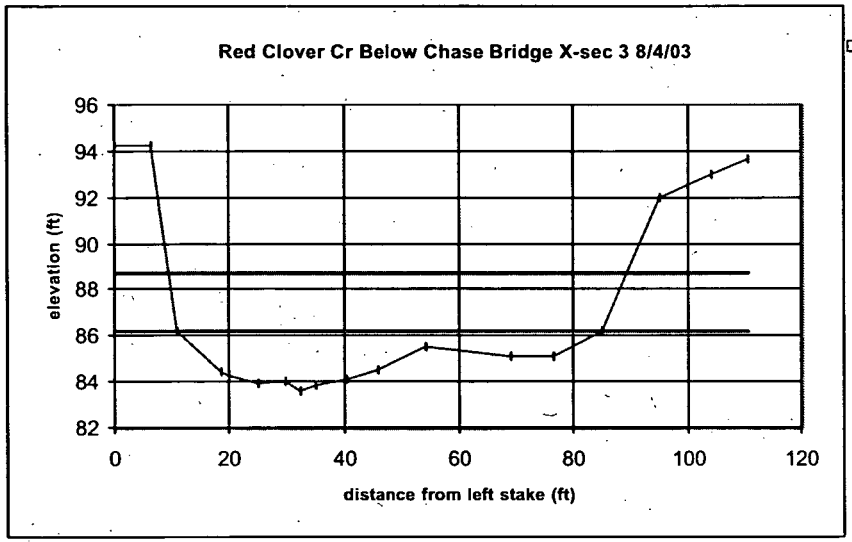


rd clover below chase crosection-2				8/4/03		
Dist from left stake	Total Depth	Bankfull depth	Total elevation	Bankfull elevation	2x bankfull elevation	Notes
0	5.64		94.36	88.84	91.06	tbml
3	5.89		94.11	88.84	91.06	
8	4.8		95.2	88.84	91.06	tobl
11.5	7.07		92.93	88.84	91.06	
12.2	10.64		89.36	88.84	91.06	
16.4	11.16	0	88.84	88.84	91.06	bfl
23.5	12.91	1.75	87.09	88.84	91.06	wel
25.6	13.22	2.06	86.78	88.84	91.06	
29	13.38	2.22	86.62	88.84	91.06	t
37	12.95	1.79	87.05	88.84	91.06	
48	12.76	1.6	87.24	88.84	91.06	
57.5	12.81	1.65	87.19	88.84	91.06	
63	13.07	1.91	86.93	88.84	91.06	
69.7	12.87	1.71	87.13	88.84	91.06	wer
77	11.16	0	88.84	88.84	91.06	bfr
85.4	4.19		95.81	88.84	91.06	tobr
95.3	3.97		96.03	88.84	91.06	
102	3.71		96.29	88.84	91.06	endr

BFL=Bankfull Left
BFR=Bankfull Right
WE=Waters edge
T=Thalwag
TOB=Top of Bank
TUC=Top of undercut
Buc=Bottom of undercut
UCW=Undercutwidth
all measurements in feet

Two Year SUMMARY			Mean	Max	Width:	Flood-	Entrench-
Year	Cross-section	Bankfull Width	Bankfull Depth	Bankfull Depth	Depth Ratio	prone width	ment Ratio
1995	2	64.4	1.39	2.48	46	180.32	2.8
2003	2	60.60	1.63	2.22	37.18	65.60	1.08

Red Clover Cr below Chase Bridge X-sec 3



8/4/03 red clover crosection-3

Dist from left stake	Total Depth	Bankfull depth	Total elevation	Bankfull elevation	2x bankfull elevation	Notes
0	5.74		94.26	86.16	88.71	tbml
6.5	5.79		94.21	86.16	88.71	tobl
10.9	13.84	0	86.16	86.16	88.71	bfl
18.4	15.59	1.75	84.41	86.16	88.71	wel
20	15.74	1.9	84.26	86.16	88.71	
25	16.08	2.24	83.92	86.16	88.71	
29.5	15.99	2.15	84.01	86.16	88.71	
32.3	16.39	2.55	83.61	86.16	88.71	t
35	16.12	2.28	83.88	86.16	88.71	
40.4	15.91	2.07	84.09	86.16	88.71	
46	15.52	1.68	84.48	86.16	88.71	wer
54.4	14.51	0.67	85.49	86.16	88.71	
69	14.89	1.05	85.11	86.16	88.71	
76.4	14.93	1.09	85.07	86.16	88.71	
85	13.84	0	86.16	86.16	88.71	bfr
95	8		92	86.16	88.71	tobr
104	6.98		93.02	86.16	88.71	
110.4	6.35		93.65	86.16	88.71	endr

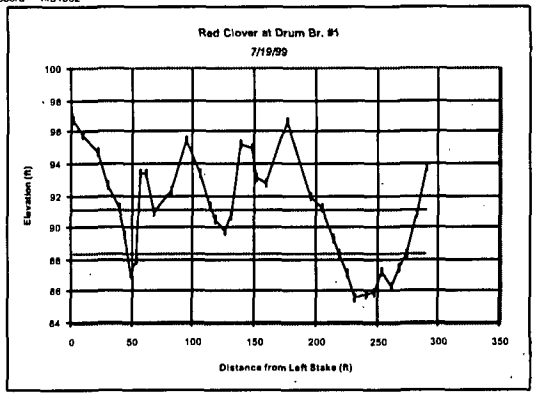
BFL=Bankfull Left
BFR=Bankfull Right
WE=Waters edge
T=Thalwag
TOB=Top of Bank
TUC=Top of undercut
Buc=Bottom of undercut
UCW=Undercutwidth
all measurements in feet

Two Year SUMMARY			Mean	Max	Width:	Flood-	Entrench-
Year	Cross-section	Bankfull Width	Bankfull Depth	Bankfull Depth	Depth Ratio	prone width	ment Ratio
1995	3	36.6	1.4	2.66	26.1	71.00	1.94
2003	3	74.10	1.62	2.55	45.74	79.60	1.07

UTM X-coord = 700048

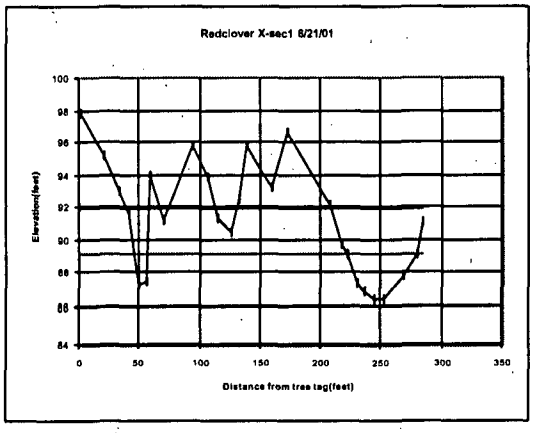
UTM Y-coord = 4434962

Red Clover Cr belowDrum Bridge X-sec 1



Blue Line=2x Bankfull Elev Red Line=Mean Bankfull Elev Dark Blue Line w/Markers=Basic Cross Section

Dist. From Left Stake	Total Elevation	Bankfull Elevation	2xBankfull Elevation
0.00	97.30	88.37	91.14
1.00	96.78	88.37	91.14
10.00	95.84	88.37	91.14
21.40	94.85	88.37	91.14
29.50	92.65	88.37	91.14
39.50	91.22	88.37	91.14
43.70	89.51	88.37	91.14
48.30	87.16	88.37	91.14
54.00	87.94	88.37	91.14
56.80	93.38	88.37	91.14
60.70	93.37	88.37	91.14
66.00	91.01	88.37	91.14
81.70	92.35	88.37	91.14
95.00	95.40	88.37	91.14
105.70	93.34	88.37	91.14
114.00	91.34	88.37	91.14
118.00	90.48	88.37	91.14
126.00	89.81	88.37	91.14
130.30	90.68	88.37	91.14
139.00	95.20	88.37	91.14
147.70	94.99	88.37	91.14
152.00	93.19	88.37	91.14
158.50	92.77	88.37	91.14
176.00	96.69	88.37	91.14
195.00	91.94	88.37	91.14
205.00	91.16	88.37	91.14
215.00	89.28	88.37	91.14
219.90	88.37	88.37	91.14
225.50	87.12	88.37	91.14
231.70	85.60	88.37	91.14
240.50	85.78	88.37	91.14
247.20	85.91	88.37	91.14
253.70	87.22	88.37	91.14
262.00	86.31	88.37	91.14
268.50	87.48	88.37	91.14
274.70	88.37	88.37	91.14
282	90.86	88.37	91.14
290	93.71	88.37	91.14



RedClover 6/21/01

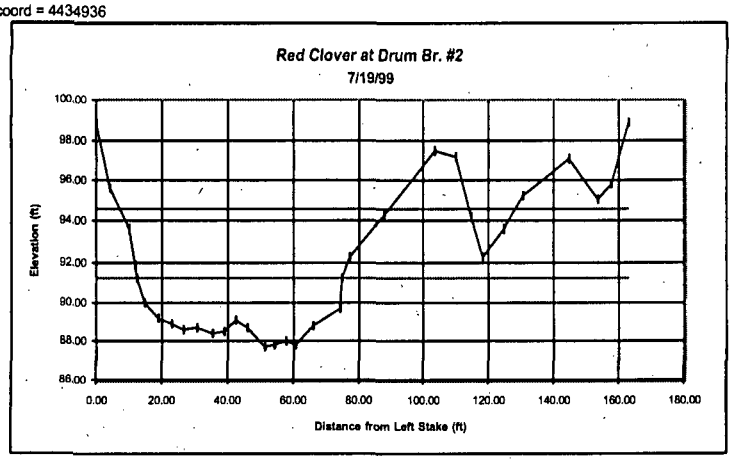
Dist. From left stake	Total depth	Total Elevation	Bankfull Elevation	2XBankfull Elevation	Notes
2	2.21	97.79	89.08	91.85	TBM-LB
21	4.85	95.15	89.08	91.85	
33.55	6.97	93.03	89.08	91.85	
42.3	8.52	91.48	89.08	91.85	
49	12.9	87.1	89.08	91.85	
55.5	12.6	87.4	89.08	91.85	
59.7	6.1	93.9	89.08	91.85	
70	8.8	91.2	89.08	91.85	
95	4.23	95.77	89.08	91.85	
106.4	6.18	93.82	89.08	91.85	
115	8.7	91.3	89.08	91.85	
126	9.62	90.38	89.08	91.85	
133	7.55	92.45	89.08	91.85	
139.5	4.24	95.76	89.08	91.85	
150.9	5.7	94.3	89.08	91.85	
159.1	6.77	93.23	89.08	91.85	
173	3.36	96.64	89.08	91.85	TOBL
207.5	7.91	92.09	89.08	91.85	
218.15	10.3	89.7	89.08	91.85	
222.5	10.92	89.08	89.08	91.85	BFL
229.7	12.67	87.33	89.08	91.85	LEW
237	13.24	86.76	89.08	91.85	
245.1	13.69	86.31	89.08	91.85	T
253.2	13.65	86.35	89.08	91.85	
269	12.3	87.7	89.08	91.85	
279	10.92	89.08	89.08	91.85	BFR
284.4	9	91	89.08	91.85	TOBR

TOPipe=Top of pipe/bench mark
LEW=Left edge of water
REW=Right edge of water
MPD=Maximum pool depth
TBM=Temporary bench mark
PCT=Pool tail crest
TP=Turning point
TOPool=Top of pool
S-MAX=Max. depth sediment lense
LB=Left bank
RB=Right bank
TOB=Top of bank
BF=Bankfull
T=Thalweg

Two Year SUMMARY		Mean	Max	Width:	Flood-	Entrench-
Year	Cross-section	Bankfull Width	Bankfull Depth	Bankfull Depth	Depth Ratio	prone width	ment Ratio
1999	1	55.50	2.20	2.77	25.28	312.62	5.63
2001	1	54.50	1.83	2.77	29.78	427.90	7.85

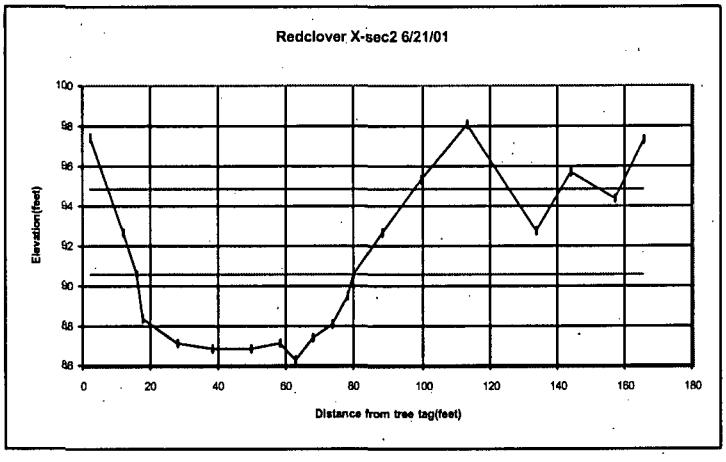
UTM X-coord = 700191
UTM Y-coord = 4434936

Red Clover Cr below Drum Bridge X-sec 2



Blue Line=2x Bankfull Elev **Red Line=Mean Bankfull Elev** **Dark Blue Line w/Markers=Basic Cross Section**

Dist. From Left Stake	Total Elevation	Bankfull Elevation	2xBankfull Elevation
0.00	98.80	91.19	94.62
4.00	95.63	91.19	94.62
9.80	93.61	91.19	94.62
11.70	91.91	91.19	94.62
12.60	91.19	91.19	94.62
14.90	89.94	91.19	94.62
18.60	89.16	91.19	94.62
23.20	88.85	91.19	94.62
26.70	88.62	91.19	94.62
30.90	88.75	91.19	94.62
35.50	88.38	91.19	94.62
39.00	88.49	91.19	94.62
42.30	89.11	91.19	94.62
46.20	88.75	91.19	94.62
51.50	87.76	91.19	94.62
54.50	87.88	91.19	94.62
57.80	88.06	91.19	94.62
61.00	87.84	91.19	94.62
66.00	88.80	91.19	94.62
74.30	89.68	91.19	94.62
74.90	91.19	91.19	94.62
77.60	92.31	91.19	94.62
88.00	94.28	91.19	94.62
103.00	97.45	91.19	94.62
110.00	97.18	91.19	94.62
114.70	94.19	91.19	94.62
118.20	92.26	91.19	94.62
124.40	93.59	91.19	94.62
130.50	95.31	91.19	94.62
144.60	97.06	91.19	94.62
153.50	95.07	91.19	94.62
157.50	95.85	91.19	94.62
162.70	98.83	91.19	94.62



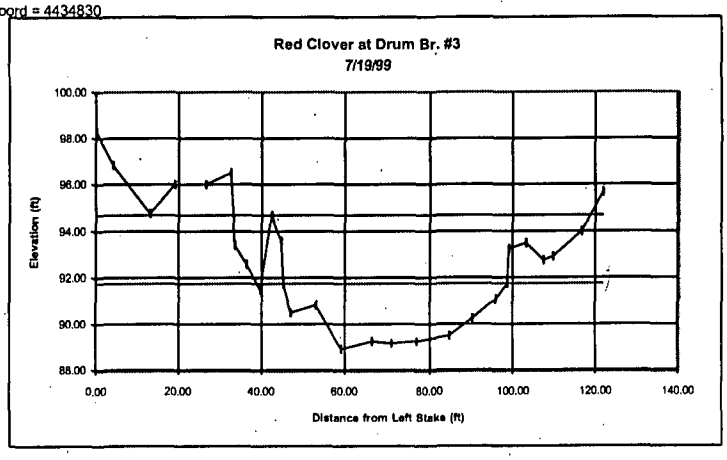
RedClover 6/21/01

Dist. From left stake	Total depth	Total Elevation	Bankfull Elevation	2XBankfull Elevation	Notes
2	2.57	97.43	90.55	94.86	TBM-LB
11.8	7.37	92.63	90.55	94.86	TOBL
16	9.45	90.55	90.55	94.86	BFL
17.7	11.62	88.38	90.55	94.86	LEW
28	12.81	87.19	90.55	94.86	
37.9	13.11	86.89	90.55	94.86	
49.5	13.11	86.89	90.55	94.86	
58	12.9	87.1	90.55	94.86	
62.8	13.76	86.24	90.55	94.86	T
67.6	12.56	87.44	90.55	94.86	
73.4	11.9	88.1	90.55	94.86	REW
77.9	10.49	89.51	90.55	94.86	
79.9	9.45	90.55	90.55	94.86	BFR
88.45	7.37	92.63	90.55	94.86	
99.6	4.67	95.33	90.55	94.86	
113.2	1.9	98.1	90.55	94.86	
133.7	7.21	92.79	90.55	94.86	
144.3	4.32	95.68	90.55	94.86	
157.4	5.63	94.37	90.55	94.86	
166	2.7	97.3	90.55	94.86	

TOPipe=Top of pipe/bench mark
LEW=Left edge of water
REW=Right edge of water
MPD=Maximum pool depth
TBM=Temporary bench mark
PCT=Pool tail crest
TP=Turning point
TOPool=Top of pool
S-MAX=Max. depth sediment lense
LB=Left bank
RB=Right bank
TOB=Top of bank
BF=Bankfull
T=Thalweg

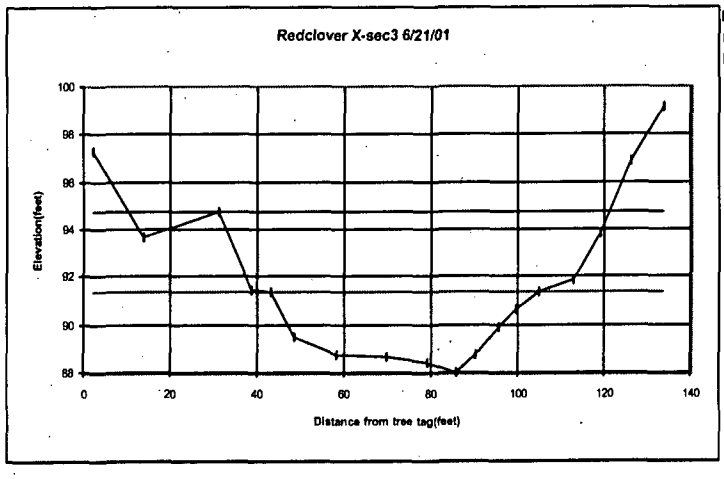
Two Year SUMMARY		Mean	Max	Width:	Flood-	Entrench-
	Cross-	Bankfull	Bankfull	Depth	prone	ment
Year	section	Width	Depth	Depth	Ratio	width	Ratio
1999	2	62.30	2.52	3.43	24.74	121.15	1.94
2001	2	61.90	2.72	4.31	22.75	111.50	1.80

UTM X-coord = 700417
UTM Y-coord = 4434830



Blue Line=2x Bankfull Elev Red Line=Mean Bankfull Elev Dark Blue Line w/Markers=Basic Cross Section

Dist. From Left Stake	Total Elevation	Bankfull Elevation	2xBankfull Elevation
0.00	98.36	91.76	94.63
4.00	96.85	91.76	94.63
13.00	94.76	91.76	94.63
19.00	96.04	91.76	94.63
26.50	95.99	91.76	94.63
32.30	96.49	91.76	94.63
33.60	93.40	91.76	94.63
36.00	92.62	91.76	94.63
39.30	91.51	91.76	94.63
42.40	94.69	91.76	94.63
44.60	93.60	91.76	94.63
45.00	91.76	91.76	94.63
46.80	90.51	91.76	94.63
53.00	90.84	91.76	94.63
58.80	88.89	91.76	94.63
66.40	89.29	91.76	94.63
71.00	89.15	91.76	94.63
77.00	89.29	91.76	94.63
84.70	89.53	91.76	94.63
90.20	90.21	91.76	94.63
95.80	91.09	91.76	94.63
98.80	91.76	91.76	94.63
99.00	93.26	91.76	94.63
103.50	93.46	91.76	94.63
107.50	92.74	91.76	94.63
109.80	92.90	91.76	94.63
117.00	93.96	91.76	94.63
122.00	95.69	91.76	94.63



RedClover 6/21/01

Dist. From left stake	Total depth	Total Elevation	Bankfull Elevation	2XBankfull Elevation	Notes
2	2.68	97.32	91.38	94.77	TBM-LB
13.65	6.32	93.68	91.38	94.77	
31.2	5.29	94.71	91.38	94.77	TOBL
38.7	8.58	91.42	91.38	94.77	
43.25	8.62	91.38	91.38	94.77	BFL
48.4	10.51	89.49	91.38	94.77	LEW
58.2	11.27	88.73	91.38	94.77	
69.9	11.37	88.63	91.38	94.77	
78.9	11.59	88.41	91.38	94.77	
85.8	12.01	87.99	91.38	94.77	T
90	11.28	88.72	91.38	94.77	
95.65	10.1	89.9	91.38	94.77	REW
99.65	9.39	90.61	91.38	94.77	
105.1	8.62	91.38	91.38	94.77	BFR
113	8.13	91.87	91.38	94.77	
119	6.19	93.81	91.38	94.77	TOBR
126	3.14	96.86	91.38	94.77	
133.7	0.85	99.15	91.38	94.77	End

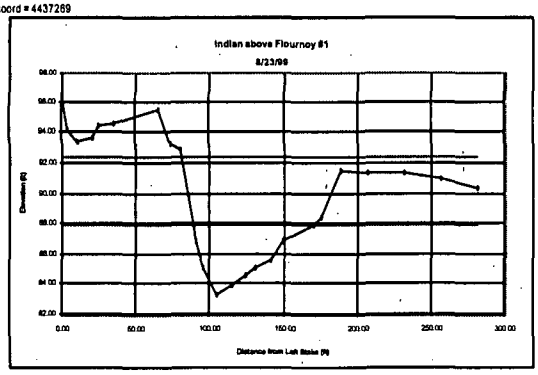
TOPipe=Top of pipe/bench mark
LEW=Left edge of water
REW=Right edge of water
MPD=Maximum pool depth
TBM=Temporary bench mark
PCT=Pool tail crest
TP=Turning point
TOPool=Top of pool
S-MAX=Max. depth sediment lense
LB=Left bank
RB=Right bank
TOB=Top of bank
BF=Bankfull
T=Thalweg

Two Year SUMMARY		Mean	Max	Width:	Flood-	Entrench-
	Cross-	Bankfull	Bankfull	Bankfull Depth	prone	ment
Year	section	Width	Depth	Depth	Ratio	width	Ratio
1999	3	53.80	1.89	2.87	28.42	85.85	1.60
2001	3	59.85	2.05	3.39	29.19	85.50	1.42

UTM X-coord = 697855

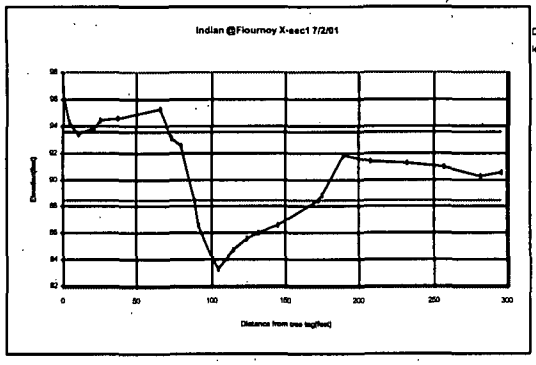
UTM Y-coord = 4437269

Indian Cr below Red Clover X-sec 1



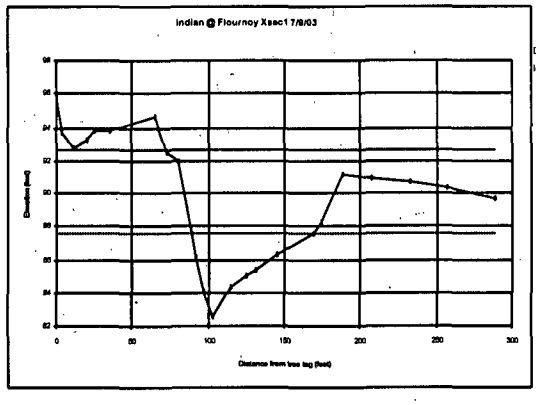
Dist. From Left Stake	Total Elevation	Bankfull Elevation	2xBankfull Elevation
0.00	96.45	87.86	92.38
4.00	94.12	87.86	92.38
11.00	93.34	87.86	92.38
20.50	93.62	87.86	92.38
25.00	94.46	87.86	92.38
36.00	94.53	87.86	92.38
65.00	95.42	87.86	92.38
73.00	93.20	87.86	92.38
80.00	92.93	87.86	92.38
89.50	87.86	87.86	92.38
91.00	86.85	87.86	92.38
95.00	85.05	87.86	92.38
105.00	83.34	87.86	92.38
115.00	83.94	87.86	92.38
124.00	84.62	87.86	92.38
131.50	85.09	87.86	92.38
141.70	85.55	87.86	92.38
149.50	86.63	87.86	92.38
170.50	87.88	87.86	92.38
175.00	88.38	87.86	92.38
189.00	91.47	87.86	92.38
207.00	91.37	87.86	92.38
232.00	91.32	87.86	92.38
257.00	90.93	87.86	92.38
282.00	90.26	87.86	92.38

Blue Line=2x Bankfull Elev Red Line=Mean Bankfull Elev Dark Blue Line w/Markers=Basic Cross Section



Indian above Flornoy 7/2/01

Dist. From left stake	Total depth	Total Elevation	Bankfull Elevation	2XBankfull Elevation	Notes
0	3.53	98.47	88.48	93.64	TBM-LB
4	5.72	94.28	88.48	93.64	
11	6.64	93.36	88.48	93.64	
20.5	6.15	93.85	88.48	93.64	
25	5.54	94.46	88.48	93.64	
36	5.43	94.57	88.48	93.64	
65	4.7	95.3	88.48	93.64	TOBL
73	6.86	93.14	88.48	93.64	
80	7.39	92.61	88.48	93.64	
88.5	11.52	88.48	88.48	93.64	BFL
91.9	13.49	86.51	88.48	93.64	LEW
100	15.85	84.15	88.48	93.64	
104.65	16.68	83.32	88.48	93.64	T
115	15.31	84.69	88.48	93.64	
124	14.38	85.62	88.48	93.64	
131.5	14.06	85.94	88.48	93.64	
145.3	13.42	86.58	88.48	93.64	REW
172.5	11.52	88.48	88.48	93.64	BFR
175	11.2	88.8	88.48	93.64	
189	8.15	91.85	88.48	93.64	TOBR
207	8.55	91.45	88.48	93.64	
232	8.78	91.22	88.48	93.64	
257	9.02	90.98	88.48	93.64	
282	9.65	90.35	88.48	93.64	
296	9.42	90.58	88.48	93.64	



7/9/03 indian at rc crosect-1

Dist from left stake	Total Depth	Bankfull depth	Total elevation	bankfull elevation	2x bankfull elevatoin	Notes
0	4.29		95.71	87.61	92.61	tbml
4	6.3		93.7	87.61	92.61	
11	7.17		92.83	87.61	92.61	
20.5	6.7		93.3	87.61	92.61	
25	6.15		93.85	87.61	92.61	
36	6.13		93.87	87.61	92.61	
65	5.35		94.65	87.61	92.61	tobl
73	7.45		92.55	87.61	92.61	
80	8.04		91.96	87.61	92.61	
88.5	12.39	0	87.61	87.61	92.61	bfl
91.7	13.8	1.41	86.2	87.61	92.61	wel
98	15.93	3.54	84.07	87.61	92.61	
103.5	17.39	5	82.61	87.61	92.61	t
115	15.69	3.3	84.31	87.61	92.61	
124	15.01	2.62	84.99	87.61	92.61	
131.5	14.65	2.26	85.35	87.61	92.61	
144.5	13.74	1.35	86.26	87.61	92.61	wer
169.5	12.39	0	87.61	87.61	92.61	blr
174.7	11.74		88.26	87.61	92.61	
188	8.89		91.11	87.61	92.61	tobr
207	9.09		90.91	87.61	92.61	
232	9.29		90.71	87.61	92.61	
257	9.64		90.36	87.61	92.61	
288	10.37		89.63	87.61	92.61	endr

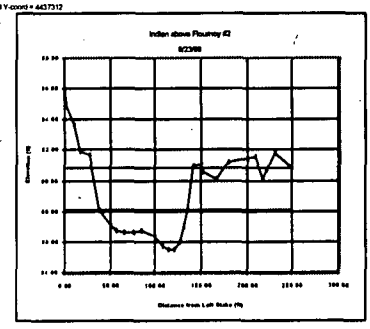
TOPipe=Top of pipe/bench mark
LEW=Left edge of water
REW=Right edge of water
MPD=Maximum pool depth
TBM=Temporary bench mark
PCT=Pool tail crest
TP=Turning point
TOPool=Top of pool
S-MAX=Max depth sediment lens
LB=Left bank
RB=Right bank
TOB=Top of bank
BF=Bankfull
T=Thalweg

Three Year SUMMARY			Mean	Max	Width:	Flood-	Entrench-
	Crosa-	Bankfull	Bankfull	Bankfull	Depth	prone	ment
Year	section	Width	Depth	Depth	Ratio	width	Ratio
1999	1	81.0	2.70	4.52	30.0	201.0	2.5
2001	1	84.0	2.81	5.18	29.8	212.0	2.5
2003	1	81.0	2.44	5.00	33.3	224.0	2.8

UTM X-coord = 697979

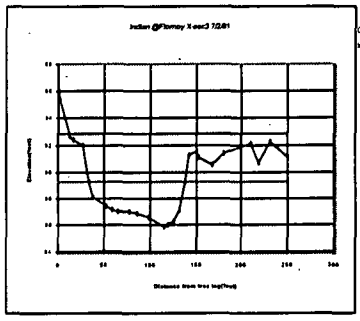
UTM Y-coord = 4437312

Indian Cr below Red Clover X-sec 2



Blue Line=2x Bankfull Elev Red Line=Mean Bankfull Elev Dark Blue Line w/Markers=Basic Cross Section

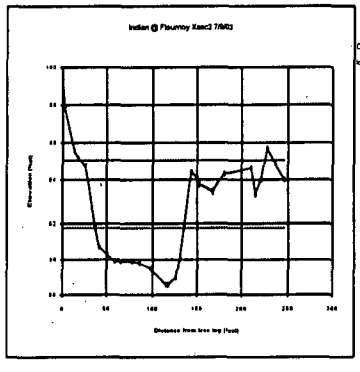
Dist. From Left Bank	Total Elevation	Bankfull Elevation	2x Bankfull Elevation
0.00	96.18	88.11	90.77
2.00	94.83	88.11	90.77
9.80	93.64	88.11	90.77
16.50	91.93	88.11	90.77
26.60	91.63	88.11	90.77
37.80	88.11	88.11	90.77
51.50	87.10	88.11	90.77
67.70	86.78	88.11	90.77
84.00	86.89	88.11	90.77
78.70	86.62	88.11	90.77
85.30	86.70	88.11	90.77
98.50	86.40	88.11	90.77
108.00	86.72	88.11	90.77
114.30	86.45	88.11	90.77
119.80	86.49	88.11	90.77
126.00	86.02	88.11	90.77
131.30	86.66	88.11	90.77
136.00	88.11	88.11	90.77
141.80	90.86	88.11	90.77
150.00	91.08	88.11	90.77
153.00	90.55	88.11	90.77
167.00	90.10	88.11	90.77
180.00	91.15	88.11	90.77
209.00	91.55	88.11	90.77
217.00	90.11	88.11	90.77
222.00	90.71	88.11	90.77
230.00	91.65	88.11	90.77
250.00	90.86	88.11	90.77



Indian above Flomoy 7/2/01

Dist. From left bank	Total depth	Total Elevation	Bankfull Elevation	2XBankfull Elevation	Notes
0	3.44	96.58	89.35	92.81	TBM-LB
2	4.73	95.27	89.35	92.81	
13.5	7.22	92.78	89.35	92.81	
18.5	7.56	92.44	89.35	92.81	
28.5	8.05	91.95	89.35	92.81	TOBL
34.6	10.65	89.35	89.35	92.81	BFL
36	11.91	88.09	89.35	92.81	
52.5	12.58	87.44	89.35	92.81	LEW
57.7	12.87	87.13	89.35	92.81	
64.9	13.07	86.93	89.35	92.81	
76.7	13.01	86.99	89.35	92.81	
85.3	13.11	86.89	89.35	92.81	
98.5	13.45	86.55	89.35	92.81	
115.6	14.11	85.89	89.35	92.81	T
119.8	14.02	85.98	89.35	92.81	
126	13.73	86.27	89.35	92.81	
131.9	12.62	87.18	89.35	92.81	REW
136.2	10.65	89.35	89.35	92.81	BFR
142.8	8.71	91.29	89.35	92.81	TOBR
150	8.48	91.65	89.35	92.81	
153	8.92	91.08	89.35	92.81	
167	9.48	90.52	89.35	92.81	
180	8.58	91.44	89.35	92.81	
209	7.92	92.08	89.35	92.81	
218	9.34	90.66	89.35	92.81	
230	7.78	92.22	89.35	92.81	
250	8.8	91.2	89.35	92.81	

TOPpe=Top of pipe/bench mark
LEW=Left edge of water
REW=Right edge of water
MPD=Maximum pool depth
TBM=Temporary bench mark
PCT=Pool tail crest
TP=Turning point
TOPool=Top of pool
S-MAX=Max. depth sediment lente
LB=Left bank
RB=Right bank
TOB=Top of bank
BF=Bankfull
T=Thalweg



7/9/03 indian at rc crosec-2

Dist from left	Total Depth	Bankfull depth	Total elevation	Bankfull elevation	2x Bankfull elevation	Notes
0	0.69		99.31	91.78	95.02	tbm
2	2.1		97.9	91.78	95.02	
13.5	4.5		95.5	91.78	95.02	
16.5	4.85		95.15	91.78	95.02	
26.5	6.32		94.68	91.78	95.02	tobl
36	8.22	0	91.78	91.78	95.02	bfl
40	9.22	1	90.78	91.78	95.02	wel
50.1	9.63	1.41	90.37	91.78	95.02	
57.7	10.05	1.83	89.95	91.78	95.02	
64.9	10.09	1.87	89.91	91.78	95.02	
76.7	10.08	1.86	89.92	91.78	95.02	
85.3	10.18	1.94	89.84	91.78	95.02	
98.5	10.55	2.33	89.45	91.78	95.02	
115.6	11.42	3.2	88.58	91.78	95.02	
119.1	11.46	3.24	88.54	91.78	95.02	t
126	11.01	2.79	88.99	91.78	95.02	
130.3	9.83	1.61	90.17	91.78	95.02	wer
136	8.22	0	91.78	91.78	95.02	bk
142.8	5.64		94.36	91.78	95.02	trcr
150	5.91		94.09	91.78	95.02	
153	6.29		93.71	91.78	95.02	
167	6.57		93.43	91.78	95.02	
180	5.71		94.29	91.78	95.02	
209	5.44		94.56	91.78	95.02	
214	6.7		93.3	91.78	95.02	
220	8.01		93.99	91.78	95.02	
229	4.4		95.6	91.78	95.02	
247	6.02		93.98	91.78	95.02	

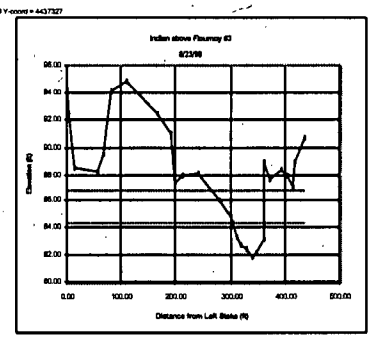
TOPpe=Top of pipe/bench mark
LEW=Left edge of water
REW=Right edge of water
MPD=Maximum pool depth
TBM=Temporary bench mark
PCT=Pool tail crest
TP=Turning point
TOPool=Top of pool
S-MAX=Max depth sediment lens
LB=Left bank
RB=Right bank
TOB=Top of bank
BF=Bankfull
T=Thalweg

Three Year SUMMARY		Mean Cross-section	Bankful Width	Mean Bankful Depth	Max Depth	Width: Depth Ratio	Flood-prone width	Entrenchment Ratio
Year								
1999		2	97.5	1.76	2.66	55.3	193.2	2.0
2001		2	103.6	2.29	3.46	45.2	303.6	2.9
2003		2	99.0	1.92	3.24	51.5	242.0	2.4

UTM X-coord = 8982237

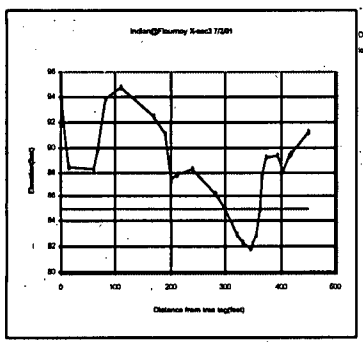
UTM Y-coord = 4437327

Indian Cr below Red Clover X-sec 3



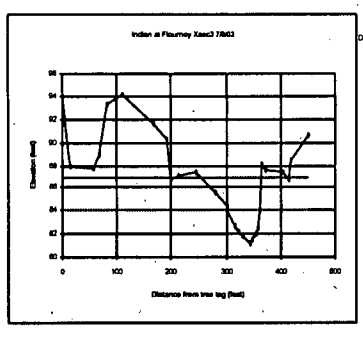
Blue Line=2x Bankfull Elev Red Line=Mean Bankfull Elev Dark Blue Line w/Markers=Basic Cross Section

Dist. From Left Bank	Total Elevation	Bankfull Elevation	2xBankfull Elevation
0.00	94.76	84.35	85.77
3.00	92.46	84.35	85.77
13.00	85.53	84.35	85.77
58.50	88.26	84.35	85.77
67.40	89.84	84.35	85.77
80.40	94.06	84.35	85.77
110.00	94.78	84.35	85.77
168.00	92.46	84.35	85.77
191.00	90.92	84.35	85.77
199.00	87.33	84.35	85.77
211.00	87.91	84.35	85.77
241.00	88.09	84.35	85.77
281.50	86.03	84.35	85.77
300.00	84.76	84.35	85.77
304.70	84.35	84.35	85.77
311.00	83.34	84.35	85.77
320.40	82.78	84.35	85.77
330.40	82.44	84.35	85.77
339.00	81.93	84.35	85.77
349.00	82.10	84.35	85.77
361.00	83.23	84.35	85.77
361.01	84.35	84.35	85.77
362.00	86.95	84.35	85.77
373.00	87.67	84.35	85.77
393.00	88.39	84.35	85.77
408.00	87.92	84.35	85.77
414.60	87.01	84.35	85.77
419.00	86.98	84.35	85.77
436.00	90.66	84.35	85.77



Indian above Flomoy 7/2/01

Dist. From left stake	Total depth	Total Elevation	Bankfull Elevation	2XBankfull Elevation	Notes
0	6.3	94.7	84.91	87.95	TBM-LB
3	7.69	92.32	84.91	87.98	
13	11.54	88.48	84.91	87.98	
58.5	11.8	88.2	84.91	87.98	
67.4	10.15	89.85	84.91	87.98	
80.4	6.12	93.88	84.91	87.98	
110	6.3	94.7	84.91	87.98	
168	7.61	92.39	84.91	87.98	
191	8.91	91.09	84.91	87.98	TOBL
199	12.54	87.46	84.91	87.98	
211	12.3	87.7	84.91	87.98	
241	11.81	88.19	84.91	87.98	
281.5	13.78	86.22	84.91	87.98	
300	15.06	84.94	84.91	87.98	
300.7	15.09	84.91	84.91	87.98	BFL
321.6	17.08	82.92	84.91	87.98	LEW
330.4	17.65	82.35	84.91	87.98	
344	18.14	81.86	84.91	87.98	T
349	17.84	82.16	84.91	87.98	
358.2	17.07	82.93	84.91	87.98	REW
363.8	15.09	84.91	84.91	87.98	BFR
367.5	12.33	87.67	84.91	87.98	TOBR
373	10.88	89.12	84.91	87.98	
393	10.68	89.32	84.91	87.98	
408	11.99	88.01	84.91	87.98	
414.5	10.74	89.26	84.91	87.98	
419	10.6	89.4	84.91	87.98	
449	8.84	91.16	84.91	87.98	



7/8/03 indian at rc crosscl-3

Dist from left	Total Dep	Bankfull c	Total elev	Bankfull e	2x Bankfu	Notes
0	6.03		93.97	84.05	86.08	tbm
3	7.91		92.09	84.05	86.08	
13	12.1		87.9	84.05	86.08	
58.5	12.31		87.69	84.05	86.08	
67.4	11.1		88.9	84.05	86.08	
80.4	6.68		93.32	84.05	86.08	
110	5.9		94.1	84.05	86.08	
168	8.31		91.69	84.05	86.08	
191	9.8		90.2	84.05	86.08	tobl
199	13.26		86.74	84.05	86.08	
211	12.99		87.01	84.05	86.08	
244	12.59		87.41	84.05	86.08	
281.5	14.47		85.53	84.05	86.08	
300	15.84		84.38	84.05	86.08	
302	15.95	0	84.05	84.05	86.08	bfl
316.6	17.35	1.41	82.84	84.05	86.08	wet
321.6	17.77	1.82	82.23	84.05	86.08	
330.4	18.18	2.23	81.82	84.05	86.08	
344.3	18.78	2.83	81.22	84.05	86.08	t
349	18.54	2.59	81.46	84.05	86.08	
358.2	18.04	2.09	81.96	84.05	86.08	
359.4	17.39	1.44	82.61	84.05	86.08	wet
362	15.95	0	84.05	84.05	86.08	tbr
367	11.94		88.06	84.05	86.08	tobr
373	12.4		87.6	84.05	86.08	
408	12.56		87.44	84.05	86.08	
413.6	13.19		86.81	84.05	86.08	
419	11.62		88.38	84.05	86.08	
449	9.43		90.57	84.05	86.08	

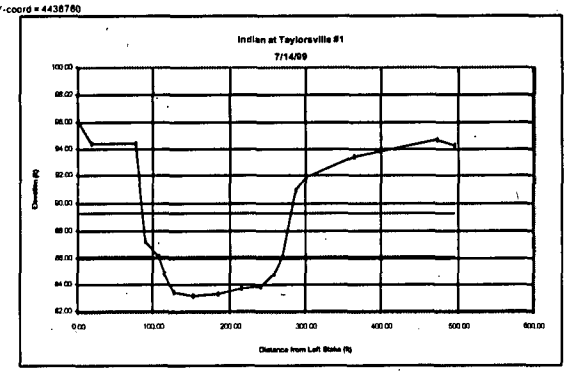
Three Year SUMMARY		Mean	Max	Width:	Flood-	Entren
Year	Cross-section	Bankful Width	Bankful Depth	Bankful Depth	Depth Ratio	prone width	ment Ratio
1999	3	56.3	1.71	2.42	32.9	94.6	1.7
2001	3	63.1	2.05	3.05	30.7	278.1	4.4
2003	3	60.0	1.60	2.83	33.3	214.9	3.6

TOPpe=Top of pipe/bench mark
LEW=Left edge of water
REW=Right edge of water
MPD=Maximum pool depth
TBM=Temporary bench mark
PCT=Pool tail crest
TP=Turning point
TOPool=Top of pool
S-MAX=Max depth sediment lens
LB=Left bank
RB=Right bank
TOB=Top of bank
BF=Bankfull
T=Thalweg

UTM X-coord = 684869

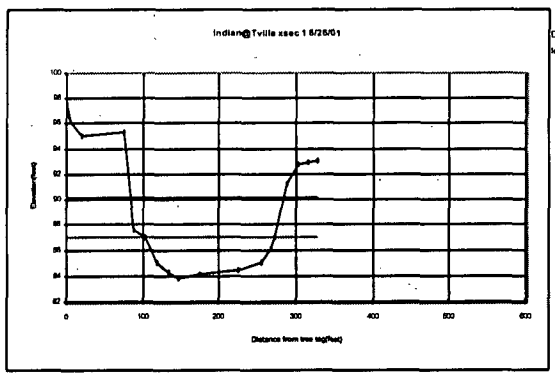
UTM Y-coord = 4438760

Indian Cr below T-ville Bridge X-sec 1



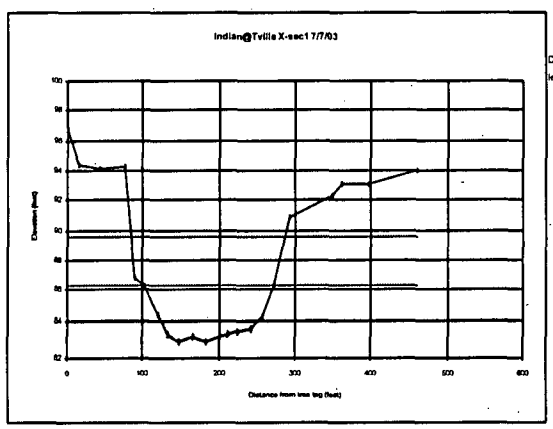
Dist. From Left Stake	Total Elevation	Bankfull Elevation	2xBankfull Elevation
0.00	96.15	86.18	89.26
19.00	94.50	86.18	89.26
76.00	94.52	86.18	89.26
89.20	87.26	86.18	89.26
108.80	*86.18*	*86.18*	*89.26*
115.00	84.88	86.18	89.26
128.30	83.44	86.18	89.26
153.60	83.10	86.18	89.26
186.60	83.27	86.18	89.26
215.00	83.74	86.18	89.26
242.50	83.82	86.18	89.26
259.70	84.86	86.18	89.26
270.60	86.18	86.18	89.26
288.50	90.90	86.18	89.26
299.00	91.96	86.18	89.26
364.70	93.46	86.18	89.26
471.80	94.80	86.18	89.26
495.60	94.36	86.18	89.26

Blue Line=2x Bankfull Elev Red Line=Mean Bankfull Elev Dark Blue Line w/Markers=Basic Cross Section



Indian @ Taloraville 6/26/01

Dist. From left stake	Total depth	Total Elevation	Bankfull Elevation	2XBankfull Elevation	Notes
0	2.36	97.64	86.97	90.19	TBM-LB
5.2	3.72	96.28	86.97	90.19	
19.4	4.92	95.08	86.97	90.19	
75.1	4.72	95.28	86.97	90.19	TOBL
89.4	12.38	87.62	86.97	90.19	
104.4	13.03	86.97	86.97	90.19	BFL
118.8	14.94	85.06	86.97	90.19	LEW
133	15.76	84.24	86.97	90.19	
148.6	16.25	83.75	86.97	90.19	T
175	15.89	84.11	86.97	90.19	
223.9	15.52	84.48	86.97	90.19	
254.5	14.99	85.01	86.97	90.19	REW
266.2	13.87	86.13	86.97	90.19	
271.9	13.03	86.97	86.97	90.19	BFR
287.6	8.73	91.27	86.97	90.19	TOBR
301.5	7.2	92.8	86.97	90.19	
314	7.15	92.85	86.97	90.19	
327.4	7.02	92.98	86.97	90.19	End



7/7/03 indian at tville crossect-1

Dist from left stake	Total Depth	Bankfull depth	Total elevation	Bankfull elevation	2x Bankfull elevation	Notes
0	3.25		96.75	86.25	89.61	tbml
15.4	5.65		94.35	86.25	89.61	
44	5.92		94.08	86.25	89.61	
75	5.75		94.25	86.25	89.61	tobl
87.8	13.14		86.86	86.25	89.61	
101	13.75	0	86.25	86.25	89.61	bfl
118.5	15.66	1.91	84.34	86.25	89.61	wel
133	16.76	3.01	83.24	86.25	89.61	
147	17.11	3.36	82.89	86.25	89.61	t
166	166	3.05	83.2	86.25	89.61	
182	17.07	3.32	82.93	86.25	89.61	
200	16.83	3.08	83.17	86.25	89.61	
211	16.64	2.89	83.36	86.25	89.61	
223.5	16.55	2.8	83.45	86.25	89.61	
240.4	16.48	2.73	83.52	86.25	89.61	
255.8	15.8	2.05	84.2	86.25	89.61	wer
271.5	13.75	0	86.25	86.25	89.61	bfr
292.5	9.11		90.89	86.25	89.61	tobr
349.5	7.65		92.35	86.25	89.61	
381.5	6.91		93.09	86.25	89.61	
397.5	6.96		93.04	86.25	89.61	
459.5	6.03		93.97	86.25	89.61	end

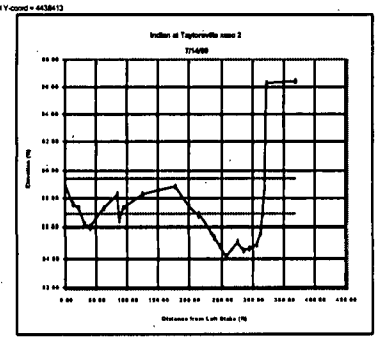
TOPipe=Top of pipe/bench mark
LEW=Left edge of water
REW=Right edge of water
MPD=Maximum pool depth
TBM=Temporary bench mark
PCT=Pool tail crest
TP=Turning point
TOPool=Top of pool
S-MAX=Max. depth sediment lense
LB=Left bank
RB=Right bank
TOB=Top of bank
BF=Bankfull
T=Thalweg
all measurements in feet

Three Year SUMMARY		Mean	Mean	Max	Width:	Flood-	Entrench-
	Cross-	Bankfull	Bankfull	Bankfull	Depth	prone	ment
Year	section	Width	Depth	Depth	Ratio	width	Ratio
1999	1	163.80	2.31	3.08	71.00	196.72	1.20
2001	1	167.50	2.00	3.22	83.75	261.40	1.56
2003	1	170.50	2.56	2.56	66.51	201.50	1.18

UTM X-coord = 684612

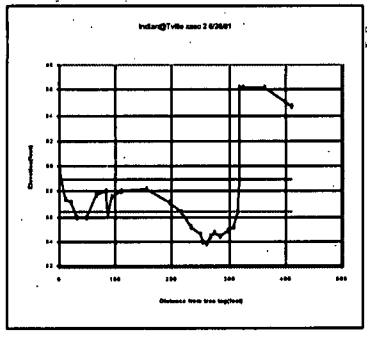
UTM Y-coord = 4438413

Indian Cr below T-ville Bridge x-sec 2



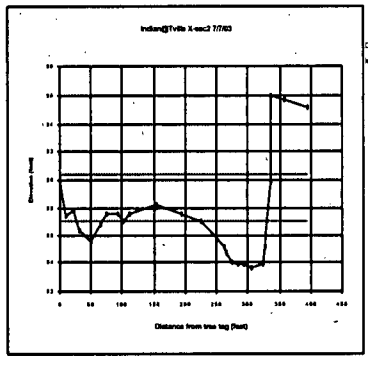
Dist. From Left Stake	Total Elevation	Bankfull Elevation	2xBankfull Elevation
1.00	88.95	88.76	89.41
13.00	87.57	88.76	89.41
23.00	87.34	88.76	89.41
31.50	88.07	88.76	89.41
41.60	85.91	88.76	89.41
61.00	87.29	88.76	89.41
82.80	88.18	88.76	89.41
88.50	88.38	88.76	89.41
93.20	87.24	88.76	89.41
123.50	88.29	88.76	89.41
148.00	88.46	88.76	89.41
178.00	88.84	88.76	89.41
200.00	87.31	88.76	89.41
213.00	88.68	88.76	89.41
213.50	88.76	88.76	89.41
237.50	88.46	88.76	89.41
249.50	84.85	88.76	89.41
257.80	84.11	88.76	89.41
277.50	85.18	88.76	89.41
286.00	84.61	88.76	89.41
296.60	84.65	88.76	89.41
306.70	85.04	88.76	89.41
313.10	88.85	88.76	89.41
315.80	88.76	88.76	89.41
318.80	88.63	88.76	89.41
322.00	88.33	88.76	89.41
370.00	88.41	88.76	89.41

Blue Line=Bankfull Elev Red Line=Mean Bankfull Elev Dark Blue Line w/Markers=Basic Cross Section



Indian @ Taborville 6/26/01

Dist. From left stake	Total depth	Total Elevation	Bankfull Elevation	2XBankfull Elevation	Notes
0	10.37	89.63	88.4	88.97	TBM-LB
10.4	12.51	87.49	88.4	88.97	
21.45	12.8	87.2	88.4	88.97	
29.3	14	86	88.4	88.97	
49	14	86	88.4	88.97	
64.35	12.31	87.69	88.4	88.97	
81.2	11.99	88.01	88.4	88.97	
85.1	13.92	86.08	88.4	88.97	
93.6	12.43	87.57	88.4	88.97	
108.85	11.89	88.02	88.4	88.97	
155.1	11.74	88.26	88.4	88.97	
195.1	12.86	87.14	88.4	88.97	
215.3	13.6	86.4	88.4	88.97	BFL
232.4	14.78	85.22	88.4	88.97	
249.5	15.5	84.5	88.4	88.97	LEW
255	15.99	84.01	88.4	88.97	
259.3	16.17	83.83	88.4	88.97	T
266	15.59	84.41	88.4	88.97	
275.65	15.22	84.78	88.4	88.97	
283.8	15.63	84.37	88.4	88.97	
289.1	15.16	84.84	88.4	88.97	REW
309.7	14.76	85.24	88.4	88.97	
313.8	13.6	86.4	88.4	88.97	BFR
317	11.04	88.96	88.4	88.97	
319.8	3.85	96.15	88.4	88.97	TOBR
324	3.78	96.22	88.4	88.97	
362	3.77	96.23	88.4	88.97	
410	5.34	94.66	88.4	88.97	TBM-RS



7/7/03 indian at tville crosscl-2

Dist from left stake	Total Depth	Bankfull depth	Total elevation	Bankfull elevation	2x Bankfull elevation	Notes
0	10.14		89.86	87.02	90.43	tbmi
10.6	12.64		87.36	87.02	90.43	lobl
21.45	12.22		87.78	87.02	90.43	
29.3	13.61		86.39	87.02	90.43	
49	14.5		85.5	87.02	90.43	
64.35	13.24		86.76	87.02	90.43	
74	12.5		87.5	87.02	90.43	
91	12.38		87.62	87.02	90.43	
101	12.98		87.02	87.02	90.43	
110	12.45		87.55	87.02	90.43	
155	11.82		88.18	87.02	90.43	
195	12.38		87.62	87.02	90.43	
200	12.58		87.42	87.02	90.43	
224.3	12.98	0	87.02	87.02	90.43	bfl
249.5	14.16	1.18	85.84	87.02	90.43	wsl
260.5	14.88	1.9	85.12	87.02	90.43	
288	15.32	2.34	84.68	87.02	90.43	
275.8	15.9	2.92	84.1	87.02	90.43	
284.5	16.1	3.12	83.9	87.02	90.43	
294	16.14	3.16	83.86	87.02	90.43	
299	16.21	3.23	83.79	87.02	90.43	
305	16.39	3.41	83.61	87.02	90.43	t
322.8	16.13	3.15	83.87	87.02	90.43	
328	14.85	1.87	85.15	87.02	90.43	wsr
331	12.98	0	87.02	87.02	90.43	tbl
336	10.15		89.85	87.02	90.43	
336.5	4.01		95.99	87.02	90.43	tobr
356	4.24		95.76	87.02	90.43	
368	4.88		95.12	87.02	90.43	end

TOPpe=Top of pipe/bench mark

LEW=Left edge of water

REW=Right edge of water

MPD=Maximum pool depth

TBM=Temporary bench mark

PCT=Pool tail crest

TP=Turning point

TOPool=Top of pool

S-MAX=Max depth sediment bars

LB=Left bank

RB=Right bank

TOB=Top of bank

BF=Bankfull

T=Thalweg

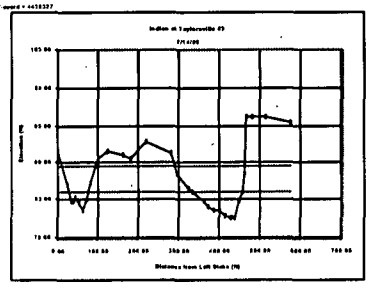
all measurements in feet

Three Year SUMMARY			Mean		Max	Width:	Flood-	Entren
	Cross-	Bankful	Bankful	Bankful	Depth	Depth	prone	ment
Year	section	Width	Depth	Depth	Ratio	width	Ratio	
1999	2	#####	1.82	2.65	56.36	#####	3.11	
2001	2	98.50	1.64	2.57	60.06	#####	5.11	
2003	2	#####	2.39	3.41	44.66	#####	4.72	

UTM X-coord = 664941

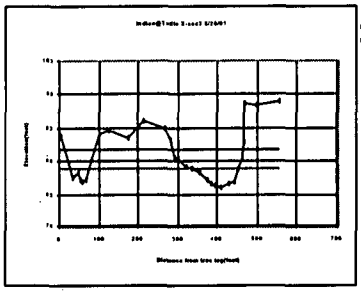
UTM Y-coord = 4438327

Indian Cr below Tville Bridge x-sec 3



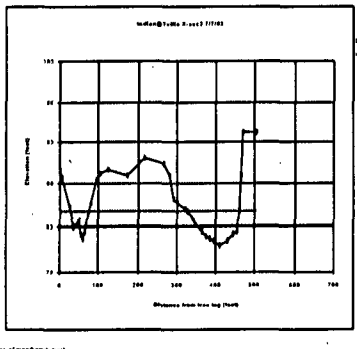
Blue Line=Top Bankfull Elev Red Line=Mean Bankfull Elev Dark Blue Line w/Markers=Bank Cross Section

Dist From Left Bank	Total Elevation	Bankfull Elevation	2xBankfull Elevation
0.00	93.93	94.67	97.69
23.00	93.13	94.67	97.69
53.30	93.82	94.67	97.69
94.30	93.71	94.67	97.69
41.00	93.58	94.67	97.69
51.00	93.63	94.67	97.69
69.20	91.69	94.67	97.69
71.00	93.06	94.67	97.69
68.20	93.31	94.67	97.69
59.00	93.45	94.67	97.69
134.00	93.45	94.67	97.69
102.40	93.19	94.67	97.69
109.00	93.53	94.67	97.69
216.70	93.73	94.67	97.69
201.00	93.34	94.67	97.69
209.00	97.99	94.67	97.69
234.00	93.48	94.67	97.69
323.00	94.95	94.67	97.69
331.40	94.97	94.67	97.69
361.00	93.77	94.67	97.69
371.00	93.19	94.67	97.69
399.00	91.93	94.67	97.69
402.30	91.45	94.67	97.69
414.00	89.88	94.67	97.69
428.00	89.66	94.67	97.69
438.00	90.08	94.67	97.69
449.00	92.76	94.67	97.69
456.00	94.07	94.67	97.69
461.00	90.50	94.67	97.69
466.00	91.14	94.67	97.69
481.00	94.74	94.67	97.69
515.00	94.11	94.67	97.69
574.00	93.38	94.67	97.69



Indian @ Taylorsville 5/26/01

Dist from left stake	Total depth	Total Elevation	Bankfull Elevation	2XBankfull Elevation	Notes
0	7.16	93.16	99.01	99.07	TSM LB
5	8.16	91.90	99.01	99.07	
24	12.66	97.91	99.01	99.07	
33	14.4	99.9	99.01	99.07	
49.9	13.61	99.15	99.01	99.07	
64	14.9	99.1	99.01	99.07	
88.1	15.16	94.91	99.01	99.07	
98.3	14.91	99.16	99.01	99.07	
92	11.94	99.46	99.01	99.07	
109.3	7.98	93.11	99.01	99.07	
124.7	7.23	93.71	99.01	99.07	T=Thalweg
174.3	6.44	91.96	99.01	99.07	
210.5	0	94	99.01	99.07	
267.3	9.83	93.97	99.01	99.07	TOBL
288.5	9.43	91.17	99.01	99.07	
293.3	13.43	99.97	99.01	99.07	
306	11.74	99.28	99.01	99.07	
318	12.77	97.23	99.01	99.07	
338.4	13.69	99.91	99.01	99.07	BFL
353.6	13.79	99.22	99.01	99.07	
374.8	14.96	99.08	99.01	99.07	LEW
383.5	15.37	94.83	99.01	99.07	
394	12.8	94.4	99.01	99.07	
408.3	10.66	94.15	99.01	99.07	T
428.1	10.37	94.93	99.01	99.07	
443.5	10.01	94.99	99.01	99.07	REW
454.1	13.06	99.01	99.01	99.07	BFR
468.4	11.76	99.33	99.01	99.07	
484.8	9.83	91.97	99.01	99.07	
498.5	5.25	94.75	99.01	99.07	TOBR T
499	3.81	94.46	99.01	99.07	
502	2.94	97.96	99.01	99.07	End



7/7/00 Indian at Tville crosssec 3

Dist from left stake	Total Depth	Bankfull depth	Total elevation	Bankfull elevation	2x bankfull elevation	Notes
0	10.20		93.74	94.94	97.88	start
5	11.3		93.7	94.94	97.88	
24	14.88		96.64	94.94	97.88	
33	17		93	94.94	97.88	
49.9	16.46		93.66	94.94	97.88	
64	17.71		93.29	94.94	97.88	
88.1	16.11		91.98	94.94	97.88	st
98.3	17.47		93.93	94.94	97.88	
92	14.37		93.93	94.94	97.88	
93	11.93		96.47	94.94	97.88	
109	10.97		99.13	94.94	97.88	
124	10.27		99.75	94.94	97.88	
174	11.11		96.93	94.94	97.88	
210	9.81		91.19	94.94	97.88	
267	9.73		99.37	94.94	97.88	total
288.5	11.95		96.95	94.94	97.88	
293	13.93		99.97	94.94	97.88	
306	14.43		99.99	94.94	97.88	
318	15.33		94.69	94.94	97.88	
327.5	13.44	0	94.96	94.94	97.88	BR
335.4	17.36	1.82	93.84	94.94	97.88	wet
374.8	17.73	2.36	93.31	94.94	97.88	
383.5	16.86	2.68	91.91	94.94	97.88	
394	16.37	2.93	91.93	94.94	97.88	
407.1	16.78	3.32	91.34	94.94	97.88	t
428	16.4	2.96	91.8	94.94	97.88	
443.5	17.97	3.23	93.33	94.94	97.88	
461.66	17.9	1.86	93.7	94.94	97.88	wet
466.5	15.44	0	94.94	94.94	97.88	BR
468	10.88		98.62	94.94	97.88	
487.5	8.7		96.9	94.94	97.88	refer
499	6.71		94.29	94.94	97.88	
501	5.56		94.32	94.94	97.88	ends

TOP=Top of pipe/Bankfull mark

LEW=Left edge of water

REW=Right edge of water

MPD=Maximum pool depth

TSM=Temporary bench mark

PCT=Pool tail crest

TP=Tailwing point

TOP=Top of point

S MAX=Max depth at/Riffle/run

LB=Left bank

RB=Right bank

TOB=Top of bank

BF=Bankfull

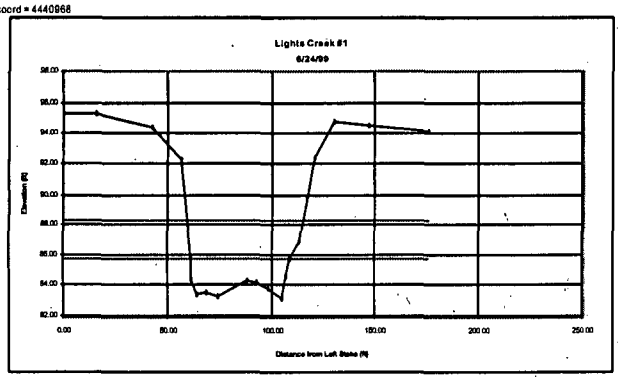
all measurements in feet

Three Year SUMMARY		Mean	Max	Width:	Flood-	Entrench
Year	Cross-section	Bankfull Width	Bankfull Depth	Bankfull Depth	Depth Ratio	prone width	ment Ratio
1998	3	125.40	2.49	3.62	50.61	461.78	3.80
2001	3	118.70	1.79	2.78	66.66	252.20	2.12
2003	3	129.00	2.25	3.32	57.42	174.70	1.35

UTM X-coord = 684402

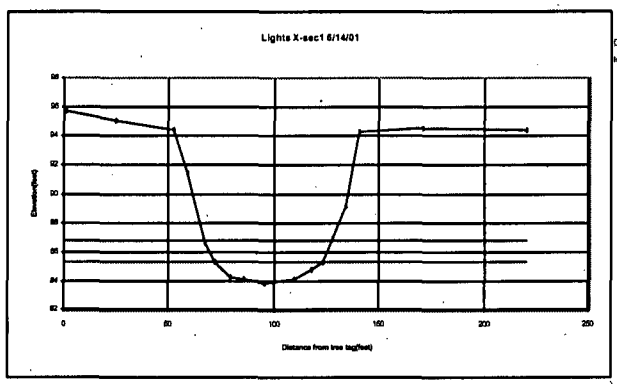
UTM Y-coord = 4440968

Lights Cr X-sec 1



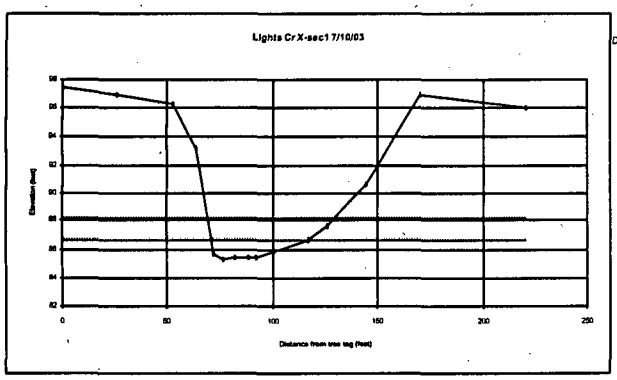
Dist. From Left Stake	Total Elevation	Bankfull Elevation	2xBankfull Elevation
0.00	95.30	85.75	88.3
16.00	95.35	85.75	88.3
43.00	94.45	85.75	88.3
56.60	92.20	85.75	88.3
61.10	85.75	85.75	88.3
61.60	84.45	85.75	88.3
64.00	83.40	85.75	88.3
69.00	83.60	85.75	88.3
74.00	83.34	85.75	88.3
87.90	84.27	85.75	88.3
93.20	84.19	85.75	88.3
98.20	83.85	85.75	88.3
104.60	83.20	85.75	88.3
106.50	84.56	85.75	88.3
108.30	85.75	85.75	88.3
113.00	86.85	85.75	88.3
121.00	92.35	85.75	88.3
130.30	94.75	85.75	88.3
147.00	94.55	85.75	88.3
176.00	94.10	85.75	88.3

Blue Line=2x Bankfull Elev Red Line=Mean Bankfull Elev Dark Blue Line w/Markers=Basic Cross Section



Lights 6/14/01

Dist. From left stake	Total depth	Total Elevation	Bankfull Elevation	2XBankfull Elevation	Notes
1	4.3	95.7	85.37	86.85	TBM-LB
25	4.9	95.1	85.37	86.85	
52	5.65	94.35	85.37	86.85	TOBL
59.2	8.55	91.45	85.37	86.85	
67.5	13.36	86.64	85.37	86.85	
72.05	14.63	85.37	85.37	86.85	BFL
78.8	15.71	84.29	85.37	86.85	
85.2	15.9	84.1	85.37	86.85	LEW
95.3	16.11	83.89	85.37	86.85	T
109.3	15.84	84.16	85.37	86.85	REW
118	15.2	84.8	85.37	86.85	
123	14.63	85.37	85.37	86.85	BFR
126	13.03	86.97	85.37	86.85	
134.2	10.75	89.25	85.37	86.85	
140.4	5.75	94.25	85.37	86.85	TOBR
170.9	5.42	94.58	85.37	86.85	
220.6	5.65	94.35	85.37	86.85	TBM-RB



7/10/03 lights crosection-1

Dist from te	Total Depth	Bankfull dep	Total elevat	Bankfull ele	2x Bankfull	Notes
0	2.5		97.5	86.75	88.2	tbml
26	3.02		96.98	86.75	88.2	
52	3.75		96.25	86.75	88.2	tobl
63	6.88		93.12	86.75	88.2	
70.5	13.25	0	86.75	86.75	88.2	bfl
71.5	14.29	1.04	85.71	86.75	88.2	wel
76	14.7	1.45	85.3	86.75	88.2	t
82.2	14.54	1.29	85.46	86.75	88.2	
88.2	14.52	1.27	85.48	86.75	88.2	
92.1	14.44	1.19	85.56	86.75	88.2	
100	14.16	0.91	85.84	86.75	88.2	wer
116.9	13.25	0	86.75	86.75	88.2	bfr
125.8	12.31		87.69	86.75	88.2	
144	9.42		90.58	86.75	88.2	
170	3.05		96.95	86.75	88.2	tobr
220.6	4		96	86.75	88.2	endr

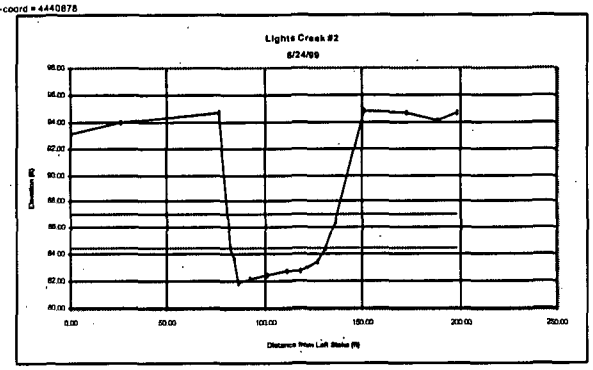
TOPipe=Top of pipe/bench mark
LEW=Left edge of water
REW=Right edge of water
MPD=Maximum pool depth
TBM=Temporary bench mark
PCT=Pool tail crest
TP=Turning point
TOPool=Top of pool
S-MAX=Max. depth sediment lense
LB=Left bank
RB=Right bank
TOB=Top of bank
BF=Bankfull
T=Thalweg
all measurements in feet

Three Year SUMMARY	Cross-section	Mean Bankfull Width	Mean Bankfull Depth	Max Bankfull Depth	Width: Depth Ratio	Flood-prone width	Entrenchment Ratio
Year							
1999	1	47.20	1.88	2.55	25.15	55.79	1.18
2001	1	49.95	0.94	1.48	53.13	65.23	1.30
2003	1	46.40	1.02	1.45	45.43	59.60	1.28

UTM X-coord = 664548

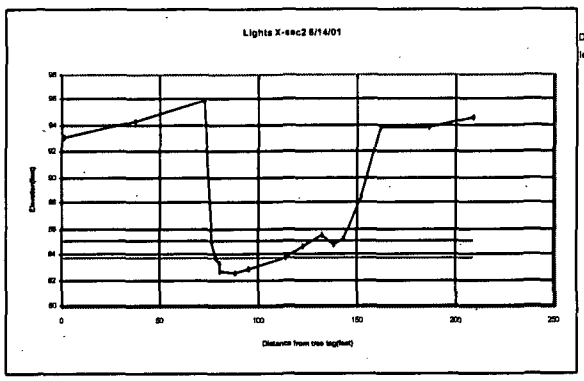
UTM Y-coord = 4440878

Lights Cr X-sec 2

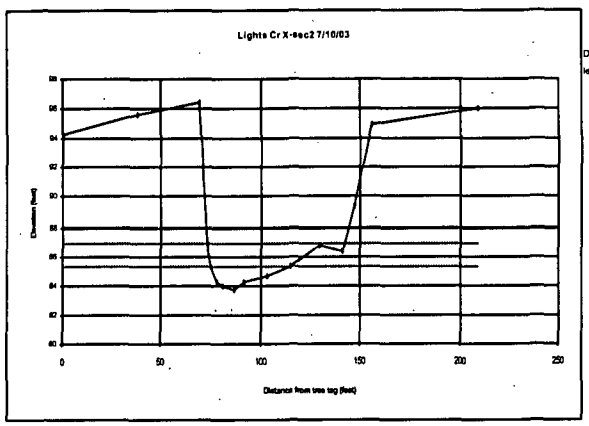


Dist. From Left Stake	Total Elevation	Bankfull Elevation	2xBankfull Elevation
0.00	93.15	84.46	87.07
26.00	94.00	84.46	87.07
76.50	94.67	84.46	87.07
82.20	84.46	84.46	87.07
84.70	83.57	84.46	87.07
86.30	81.85	84.46	87.07
92.00	82.20	84.46	87.07
101.00	82.45	84.46	87.07
111.00	82.75	84.46	87.07
118.40	82.74	84.46	87.07
126.60	83.48	84.46	87.07
131.00	84.46	84.46	87.07
136.20	*86.41*	*84.46*	*87.07*
151.00	94.83	84.46	87.07
173.00	94.75	84.46	87.07
188.00	94.05	84.46	87.07
198.00	94.65	84.46	87.07

Blue Line=2x Bankfull Elev Red Line=Mean Bankfull Elev Dark Blue Line w/Markers=Basic Cross Section



Lights Dist. From left stake	6/14/01 Total depth	Total Elevation	Bankfull Elevation	2XBankfull Elevation	Notes
1	6.93	93.07	83.78	84.99	TBM-LB
37	5.78	94.22	83.78	84.99	TOBL
72.5	4.09	95.91	83.78	84.99	
78.4	15.15	84.85	83.78	84.99	
78.8	16.22	83.78	83.78	84.99	BFL
80.5	16.74	83.26	83.78	84.99	
80.3	17.28	82.72	83.78	84.99	LEW
88.5	17.43	82.57	83.78	84.99	T
94.9	17.18	82.82	83.78	84.99	REW
113.3	16.22	83.78	83.78	84.99	BFR
122.4	15.4	84.6	83.78	84.99	
132.2	14.47	85.53	83.78	84.99	
138.7	15.18	84.82	83.78	84.99	
143.5	14.8	85.2	83.78	84.99	
151.5	*11.55*	*88.45*	*83.78*	*84.99*	
161.9	6.23	93.77	83.78	84.99	TOBR
166.5	6.14	93.86	83.78	84.99	
209.2	5.45	94.55	83.78	84.99	



7/10/03 lights crosection-2

Dist from left stake	Total Depth	Bankfull depth	Total elevation	Bankfull elevation	2x bankfull elevation	Notes
0	5.7		94.3	85.3	88.94	tbml
38	4.42		95.58	85.3	88.94	
69	3.8		96.4	85.3	88.94	tobl
73	13.18		86.82	85.3	88.94	
75	14.7	0	85.3	85.3	88.94	bfl
77.5	15.74	1.04	84.26	85.3	88.94	wel
80.5	16.05	1.35	83.95	85.3	88.94	
86.3	16.34	1.64	83.66	85.3	88.94	t
91.8	15.83	1.13	84.17	85.3	88.94	
103	*15.39*	*0.69*	*84.61*	*85.3*	*88.94*	*wer*
115	14.7	0	85.3	85.3	88.94	bfr
129	13.22		86.78	85.3	88.94	
141	13.59		86.41	85.3	88.94	
147	10.57		89.43	85.3	88.94	
155.6	5.02		94.98	85.3	88.94	tobr
209.2	4		96	85.3	88.94	endr

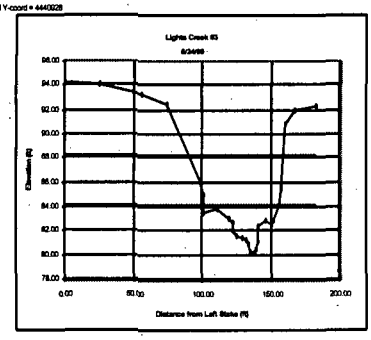
TOPipe=Top of pipe/bench mark
LEW=Left edge of water
REW=Right edge of water
MPD=Maximum pool depth
TBM=Temporary bench mark
PCT=Pool tail crest
TP=Turning point
TOPool=Top of pool
S-MAX=Max. depth sediment lense
LB=Left bank
RB=Right bank
TOB=Top of bank
BF=Bankfull
T=Thalweg
all measurements in feet

Three Year SUMMARY Year	Cross-section	Bankfull Width	Mean Bankfull Depth	Max Bankfull Depth	Width: Depth Ratio	Flood-prone width	Entrenchment Ratio
1999	2	48.80	1.74	2.61	28.05	56.62	1.16
2001	2	33.50	1.32	1.21	25.45	73.00	2.20
2003	*2*	*40.00*	*0.98*	*1.64*	*41.03*	*70.20*	*1.76*

UTM X-coord = 694806

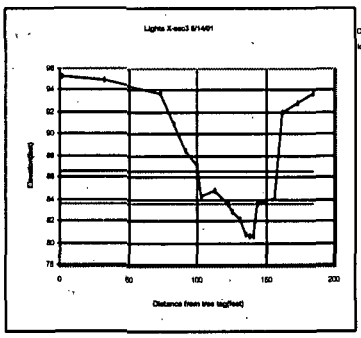
UTM Y-coord = 4440028

Lights Cr X-sec 3



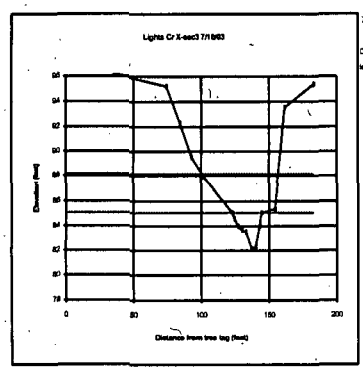
Dist. From Left Stake	Total Elevation	Bankfull Elevation	2xBankfull Elevation
0.00	94.25	84.16	88.26
26.00	94.00	84.16	88.26
57.00	93.20	84.16	88.26
74.00	92.60	84.16	88.26
88.00	88.08	84.16	88.26
101.80	85.06	84.16	88.26
102.00	84.18	84.16	88.26
102.01	83.59	84.16	88.26
111.00	83.66	84.16	88.26
120.00	82.97	84.16	88.26
122.70	82.53	84.16	88.26
123.10	82.09	84.16	88.26
125.30	81.59	84.16	88.26
129.00	81.34	84.16	88.26
132.90	81.20	84.16	88.26
134.00	80.96	84.16	88.26
134.83	80.34	84.16	88.26
137.70	80.06	84.16	88.26
139.10	80.36	84.16	88.26
140.70	81.05	84.16	88.26
141.00	82.35	84.16	88.26
147.00	82.90	84.16	88.26
150.90	82.46	84.16	88.26
152.10	82.65	84.16	88.26
155.70	84.16	84.16	88.26
158.30	85.50	84.16	88.26
160.40	90.75	84.16	88.26
167.80	91.90	84.16	88.26
183.00	92.36	84.16	88.26

Blue Line=2x Bankfull Elev Red Line=Main Bankfull Elev Dark Blue Line w/Markers=Basic Cross Section



Lights 6/14/01

Dist. From left stake	Total depth	Total Elevation	Bankfull Elevation	2XBankfull Elevation	Notes
1	4.76	95.25	83.59	88.53	TBM-LB
32	6.12	94.89	83.59	88.53	
73	6.19	93.81	83.59	88.53	TOBL
83	9.03	90.97	83.59	88.53	
91.5	11.52	88.48	83.59	88.53	
100	12.98	87.02	83.59	88.53	
103.3	15.75	84.25	83.59	88.53	
112	15.22	84.78	83.59	88.53	
123	16.41	83.59	83.59	88.53	BFL
125	17.03	82.97	83.59	88.53	
131	17.86	82.14	83.59	88.53	LEW
135.7	19.14	80.86	83.59	88.53	
137.5	19.35	80.65	83.59	88.53	T
140.9	19.31	80.69	83.59	88.53	
142.8	17.89	82.11	83.59	88.53	REW
144.1	16.41	83.59	83.59	88.53	BFR
156.3	15.91	84.09	83.59	88.53	
162.2	8.02	91.98	83.59	88.53	TOBR
173	7.11	92.89	83.59	88.53	
183.9	6.35	93.65	83.59	88.53	TBMR



7/10/03 lights crosection-3

Dist from left stake	Total Depth	Bankfull depth	Total elevation	Bankfull elevation	2x bankfull elevation	Notes
0	3.1		95.9	85.14	89.09	tbml
33	3.76		95.24	85.14	89.09	
74	4.77		95.23	85.14	89.09	tobl
84	7.74		92.26	85.14	89.09	
92.5	10.5		89.5	85.14	89.09	
101	11.99		88.01	85.14	89.09	
122.5	14.86	0	85.14	85.14	89.09	bfl
123.2	14.86	0	85.14	85.14	89.09	
124.2	15.38	0.52	84.62	85.14	89.09	
128.8	16.01	1.15	83.99	85.14	89.09	wel
130.6	16.29	1.43	83.71	85.14	89.09	
133.3	16.44	1.58	83.56	85.14	89.09	
137.7	17.81	2.95	82.19	85.14	89.09	t
140.2	17.7	2.84	82.3	85.14	89.09	
143	16.02	1.16	83.98	85.14	89.09	wer
144.9	14.86	0	85.14	85.14	89.09	bfr
154.6	14.59		85.41	85.14	89.09	
161	8.43		93.57	85.14	89.09	tobr
183	4.65		95.35	85.14	89.09	

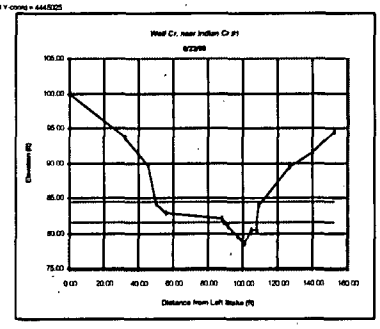
TOP=Top of pipe/bench mark
LEW=Left edge of water
REW=Right edge of water
MPD=Maximum pool depth
TBM=Temporary bench mark
PCT=Pool tail crest
TP=Turning point
TOP=Top of pool
S-MAX=Max. depth sediment lenses
LB=Left bank
RB=Right bank
TOB=Top of bank
BF=Bankfull
T=Thalweg
all measurements in feet

Three Year SUMMARY		Mean		Max	Width:	Flood-	Entrench-
Year	Cross-section	Bankful Width	Bankful Depth	Bankful Depth	Depth Ratio	prone width	ment Ratio
1999	3	53.70	2.25	4.10	23.86	69.60	1.30
2001	3	20.10	1.73	2.94	11.61	57.30	2.85
2003	3	22.40	1.29	2.95	17.33	49.90	2.23

UTM X-coord = 675083

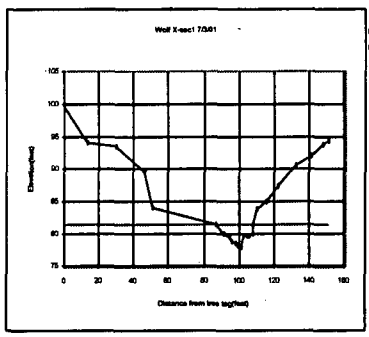
UTM Y-coord = 4445325

Wolf Cr X-sec 1



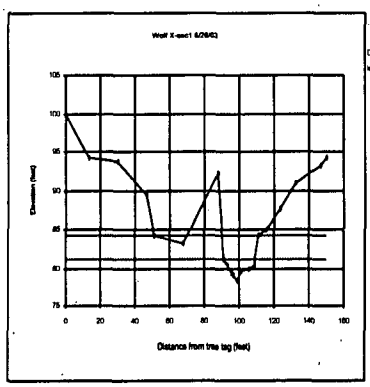
Dist. From Left Stake	Total Elevation	Bankfull Elevation	2x Bankfull Elevation
0.00	100.00	81.5	84.55
31.60	93.64	81.5	84.55
46.90	89.85	81.5	84.55
50.50	84.08	81.5	84.55
56.00	82.80	81.5	84.55
67.50	82.15	81.5	84.55
68.80	81.50	81.5	84.55
91.00	80.89	81.5	84.55
96.60	79.50	81.5	84.55
100.80	78.45	81.5	84.55
104.00	80.30	81.5	84.55
108.10	80.51	81.5	84.55
108.20	81.50	81.5	84.55
109.40	83.79	81.5	84.55
126.75	89.10	81.5	84.55
140.00	91.60	81.5	84.55
152.00	94.40	81.5	84.55

Blue Line=2x Bankfull Elev Red Line=Mean Bankfull Elev Dark Blue Line w/Markers=Basic Cross Section



Wolf 7/3/01

Dist. From left stake	Total depth	Total Elevation	Bankfull Elevation	2XBankfull Elevation	Notes
0	0.42	99.59	81.49	84.99	TBM-LB
13	5.8	94.2	81.49	84.99	
30	6.34	93.66	81.49	84.99	
46.8	10.65	89.35	81.49	84.99	TOBL
50.7	15.9	84.1	81.49	84.99	
67.5	18.51	81.49	81.49	84.99	BFL
82.1	20.02	79.98	81.49	84.99	LEW
84.7	20.6	79.4	81.49	84.99	
98.3	21.26	78.74	81.49	84.99	
98	21.5	78.5	81.49	84.99	
99.2	21.85	78.15	81.49	84.99	
100	21.85	78.15	81.49	84.99	
101.2	22.01	77.99	81.49	84.99	T
102.8	20.41	79.59	81.49	84.99	
104.6	20.43	79.57	81.49	84.99	
106.2	20.42	79.58	81.49	84.99	
107.9	20.09	79.91	81.49	84.99	
108.5	18.51	81.49	81.49	84.99	BFR
110.5	18.08	83.92	81.49	84.99	
116.9	14.98	85.02	81.49	84.99	
123	12.63	87.37	81.49	84.99	
132.3	8.49	90.51	81.49	84.99	
141.8	6.05	91.95	81.49	84.99	
147.7	6.09	93.91	81.49	84.99	
151.4	5.48	94.52	81.49	84.99	Pump-house



6/26/03 wolf crossec1-1

Dist from left stake	Total Depth	Bankfull depth	Total elevation	Bankfull elevation	2x bankfull elevation	Notes
0	0.14		99.86	81.23	84.17	tbm
13	5.82		94.18	81.23	84.17	
30	6.33		93.67	81.23	84.17	
46.8	10.66		89.34	81.23	84.17	tobl
50.7	15.78		84.22	81.23	84.17	
68	16.92		83.08	81.23	84.17	
67.5	7.83		92.17	81.23	84.17	
81.45	18.77	0	81.23	81.23	84.17	bfl
83.25	19.56	0.79	80.44	81.23	84.17	wet
86.5	20.69	1.92	79.31	81.23	84.17	
98.9	20.81	2.04	79.19	81.23	84.17	
99.3	21.71	2.94	78.29	81.23	84.17	t
101.2	20.5	1.73	79.5	81.23	84.17	
108	20.15	1.38	79.85	81.23	84.17	
108.5	19.74	0.97	80.26	81.23	84.17	wer
109	18.77	0	81.23	81.23	84.17	blr
110.6	15.76		84.25	81.23	84.17	
115	15		85	81.23	84.17	tbbr
123	12.38		87.62	81.23	84.17	
132.3	8.22		90.78	81.23	84.17	
147	6.73		93.27	81.23	84.17	
150	6.87		94.13	81.23	84.17	

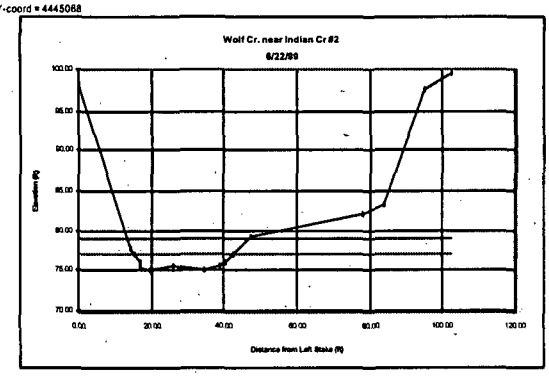
TOP=Top of pipe/bench mark
LEW=Left edge of water
REW=Right edge of water
MPD=Maximum pool depth
TBM=Temporary bench mark
PCT=Pool tail crest
TP=Turning point
TOP=Top of pool
S-MAX=Max depth sediment lens
LB=Left bank
RB=Right bank
TOB=Top of bank
BF=Bankfull
T=Thalweg
all measurements in feet

Three Year SUMMARY	Cross-section	Mean Bankful Width	Mean Bankful Depth	Max Bankfull Depth	Width: Depth Ratio	Flood-prone width	Entrenchment Ratio
Year							
1999	1	19.60	1.57	3.05	12.48	61.76	3.15
2001	1	21.00	2.44	3.50	9.41	#####	9.29
2003	1	17.55	1.47	2.94	11.93	58.20	3.32

UTM X-coord = 676101

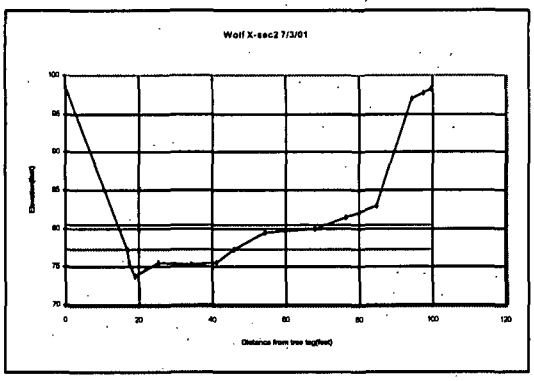
UTM Y-coord = 4445068

Wolf Cr X-sec 2

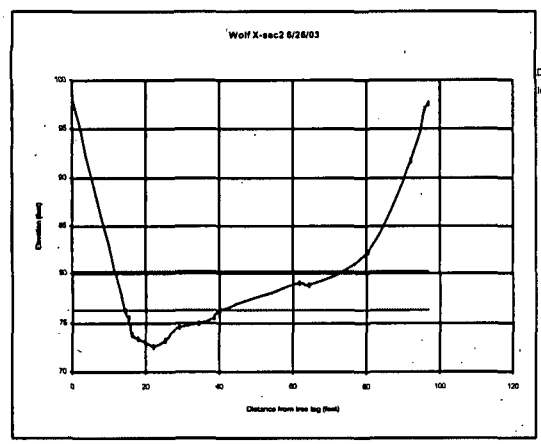


Dist. From Left Stake	Total Elevation	Bankfull Elevation	2xBankfull Elevation
0.00	98.22	77.04	79.04
14.50	77.65	77.04	79.04
15.20	77.04	77.04	79.04
17.00	76.00	77.04	79.04
17.10	75.27	77.04	79.04
19.80	75.04	77.04	79.04
26.00	75.63	77.04	79.04
34.50	75.19	77.04	79.04
39.00	75.54	77.04	79.04
40.40	75.96	77.04	79.04
42.50	77.04	77.04	79.04
47.00	79.23	77.04	79.04
78.00	82.00	77.04	79.04
84.00	83.35	77.04	79.04
95.00	97.70	77.04	79.04
102.50	99.40	77.04	79.04

Blue Line=2x Bankfull Elev Red Line=Mean Bankfull Elev Dark Blue Line w/Markers=Basic Cross Section



Wolf	7/3/01				
Dist. From left stake	Total depth	Total Elevation	Bankfull Elevation	2XBankfull Elevation	Notes
0	1.55	98.45	77.17	80.47	TBM-LB
16.9	22.83	77.17	77.17	80.47	BFL
17.5	24.6	75.4	77.17	80.47	LEW
18.8	26.13	73.87	77.17	80.47	T
25	24.61	75.39	77.17	80.47	
34.2	24.74	75.26	77.17	80.47	
41.3	24.54	75.46	77.17	80.47	REW
45.7	22.83	77.17	77.17	80.47	BFR
54.4	20.57	79.43	77.17	80.47	
68	19.89	80.11	77.17	80.47	
76.2	18.43	81.57	77.17	80.47	
84.6	16.97	83.03	77.17	80.47	
94.4	2.88	97.12	77.17	80.47	TOBR
97.3	2.33	97.67	77.17	80.47	
99.5	1.74	98.26	77.17	80.47	



6/26/03 wolf crossect-2

Dist from left stake	Total Depth	Bankfull depth	Total elevation	Bankfull elevation	2x Bankfull elevation	Notes
0	1.86		98.14	76.4	80.33	tbm
14.3	23.6	0	76.4	76.4	80.33	bfl
15.1	24.42	0.82	75.58	76.4	80.33	wel
16.5	26.29	2.69	73.71	76.4	80.33	
18	26.68	3.08	73.32	76.4	80.33	
22	27.53	3.93	72.47	76.4	80.33	t
25	26.77	3.17	73.23	76.4	80.33	
29	25.54	1.94	74.46	76.4	80.33	
34	25.08	1.48	74.92	76.4	80.33	
36.3	24.39	0.79	75.61	76.4	80.33	wer
40.1	23.6	0	76.4	76.4	80.33	bfr
61.4	20.85		79.15	76.4	80.33	
64	21.2		78.8	76.4	80.33	
80.3	17.82		82.18	76.4	80.33	
92.2	8.26		91.74	76.4	80.33	
95.6	2.96		97.04	76.4	80.33	tobr
97	2.43		97.57	76.4	80.33	end r

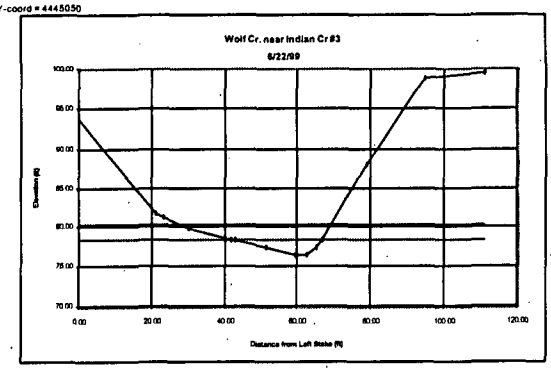
TOPipe=Top of pipe/bench mark
LEW=Left edge of water
REW=Right edge of water
MPD=Maximum pool depth
TBM=Temporary bench mark
PCT=Pool tail crest
TP=Turning point
TOPool=Top of pool
S-MAX=Max. depth sediment lense
LB=Left bank
RB=Right bank
TOB=Top of bank
BF=Bankfull
T=Thalweg

Three Year SUMMARY			Mean	Max	Width:	Flood-	Entrench-
	Cross-	Bankfull	Bankfull	Bankfull	Depth	prone	ment
Year	section	Width	Depth	Depth	Ratio	width	Ratio
1999	2	27.30	1.52	2.00	17.94	33.09	1.21
2001	2	28.80	1.74	3.30	16.50	79.50	2.76
2003	2	25.80	1.99	3.93	12.97	63.50	2.46

UTM X-coord = 676246

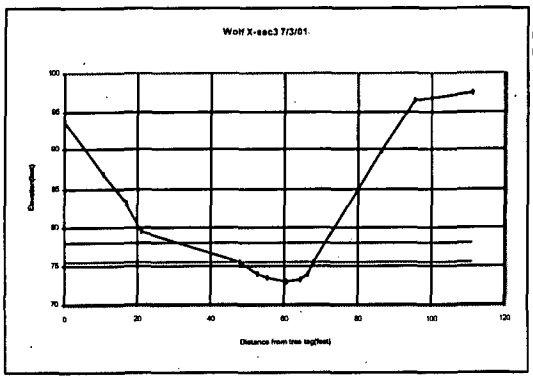
UTM Y-coord = 4445050

Wolf Cr X-sec 3



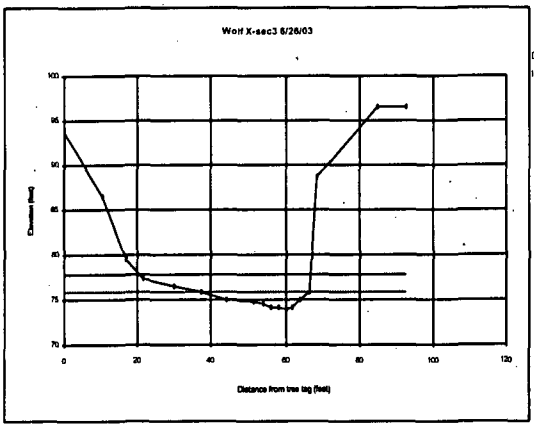
Dist. From Left Stake	Total Elevation	Bankfull Elevation	2xBankfull Elevation
0.00	93.75	78.39	80.34
21.00	81.83	78.39	80.34
23.00	81.22	78.39	80.34
30.00	79.90	78.39	80.34
42.00	78.44	78.39	80.34
43.00	78.39	78.39	80.34
51.30	77.53	78.39	80.34
59.20	76.44	78.39	80.34
62.50	76.45	78.39	80.34
64.60	77.33	78.39	80.34
66.50	78.39	78.39	80.34
78.50	87.92	78.39	80.34
94.50	98.90	78.39	80.34
111.00	99.58	78.39	80.34

Blue Line=2x Bankfull Elev Red Line=Mean Bankfull Elev Dark Blue Line w/Markers=Basic Cross Section



Wolf 7/3/01

Dist. From left stake	Total depth	Total Elevation	Bankfull Elevation	2XBankfull Elevation	Notes
0	6.19	93.81	75.44	77.91	TBM-LB
10.5	13.2	86.8	75.44	77.91	TOBL
16.8	16.82	83.18	75.44	77.91	
21.3	20.49	79.51	75.44	77.91	
48.05	24.56	75.44	75.44	77.91	BFL
52.75	26.07	73.93	75.44	77.91	LEW
55.1	26.45	73.55	75.44	77.91	
60.3	27.03	72.97	75.44	77.91	T
64.3	26.67	73.33	75.44	77.91	
66.2	26.07	73.93	75.44	77.91	REW
68.1	24.56	75.44	75.44	77.91	BFR
86.5	10.18	89.82	75.44	77.91	
95	3.48	96.52	75.44	77.91	TOBR
111	2.44	97.56	75.44	77.91	TBM-RB



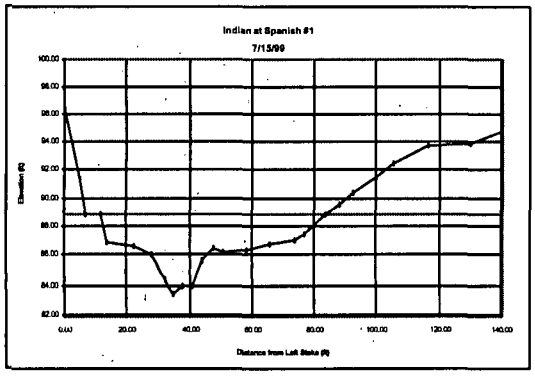
6/26/03 wolf crossect-3

Dist from left stake	Total Depth	Bankfull depth	Total elevation	Bankfull elevation	2x Bankfull elevation	Notes
0	6.28		93.72	75.86	77.83	tbml
10.5	13.55		86.45	75.86	77.83	tobl
16.8	pp			75.86	77.83	
21.3	20.54		79.46	75.86	77.83	
30.1	22.5		77.5	75.86	77.83	
37.3	23.5		76.5	75.86	77.83	
43.8	24.14	0	75.86	75.86	77.83	bfl
51.3	24.96	0.82	75.04	75.86	77.83	wel
54	25.23	1.09	74.77	75.86	77.83	
56	25.45	1.31	74.55	75.86	77.83	
58	25.79	1.65	74.21	75.86	77.83	
60	25.93	1.79	74.07	75.86	77.83	
62	26.11	1.97	73.89	75.86	77.83	t
64	25.91	1.77	74.09	75.86	77.83	
66.7	24.96	0.82	75.04	75.86	77.83	wer
68.6	24.14	0	75.86	75.86	77.83	bfr
85	11.26		88.74	75.86	77.83	
93	3.42		96.58	75.86	77.83	tobr
105	3.54		96.46	75.86	77.83	endr

TOPipe=Top of pipe/bench mark
LEW=Left edge of water
REW=Right edge of water
MPD=Maximum pool depth
TBM=Temporary bench mark
PCT=Pool tail crest
TP=Turning point
TOPool=Top of pool
S-MAX=Max. depth sediment lense
LB=Left bank
RB=Right bank
TOB=Top of bank
BF=Bankfull
T=Thalweg
all measurements in feet

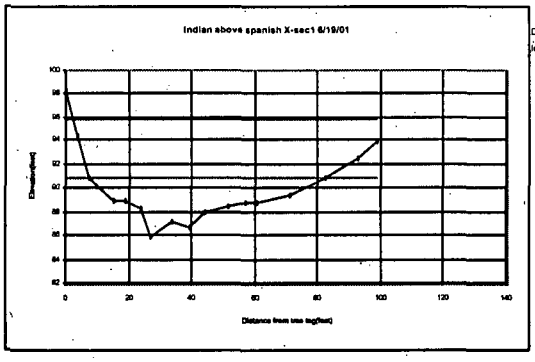
Three Year SUMMARY		Mean	Max	Width:	Flood-	Entrench-
	Cross-	Bankfull	Bankfull	Depth	prone	ment
Year	section	Width	Depth	Depth	Ratio	width	Ratio
1999	3	23.50	1.45	1.95	16.18	41.35	1.76
2001	3	20.05	1.58	2.47	12.68	60.60	3.03
2003	3	24.80	1.25	1.97	19.89	45.90	1.85

Indian Cr abv Spanish X-sec 1



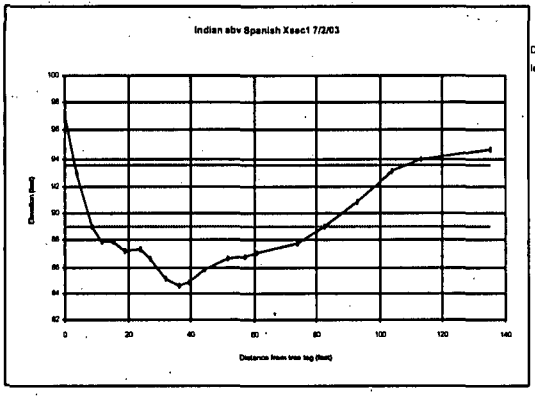
Blue Line=2x Bankfull Elev Red Line=Mean Bankfull Elev Dark Blue Line w/Markers=Basic Cross Section

Dist. From Left Stake	Total Elevation	Bankfull Elevation	2xBankfull Elevation
0.00	96.39	88.77	94.07
5.00	91.33	88.77	94.07
7.10	88.77	88.77	94.07
11.60	88.77	88.77	94.07
13.50	88.79	88.77	94.07
22.50	88.53	88.77	94.07
26.00	85.93	88.77	94.07
32.30	84.48	88.77	94.07
34.70	83.47	88.77	94.07
38.00	83.93	88.77	94.07
40.90	83.92	88.77	94.07
44.10	85.60	88.77	94.07
47.60	86.46	88.77	94.07
51.00	86.12	88.77	94.07
58.20	86.23	88.77	94.07
65.50	88.69	88.77	94.07
73.50	88.69	88.77	94.07
77.00	87.45	88.77	94.07
83.60	88.77	88.77	94.07
86.20	89.51	88.77	94.07
92.50	90.36	88.77	94.07
100.00	91.53	88.77	94.07
105.20	92.43	88.77	94.07
116.60	93.79	88.77	94.07
130.20	93.98	88.77	94.07
140.00	94.62	88.77	94.07



Indian above Spanish 6/19/01

Dist. From left stake	Total depth	Total Elevation	Bankfull Elevation	2XBankfull Elevation	Notes
0	1.55	98.45	90.89	95.88	TBM-LB
3.5	5.65	94.35	90.89	95.88	
7.6	9.11	90.89	90.89	95.88	BFL
15.6	11.02	88.98	90.89	95.88	
19.2	11.11	88.89	90.89	95.88	LEW
23.8	11.79	88.21	90.89	95.88	
27	14.1	85.9	90.89	95.88	T
33.5	12.93	87.07	90.89	95.88	
39.35	13.36	86.64	90.89	95.88	
44.2	12.1	87.9	90.89	95.88	
51.8	11.65	88.35	90.89	95.88	
57.1	11.26	88.74	90.89	95.88	
60.5	11.18	88.82	90.89	95.88	REW
71.25	10.68	89.32	90.89	95.88	
82.5	9.11	90.89	90.89	95.88	BFR
92.5	7.49	92.51	90.89	95.88	
99.1	6.14	93.86	90.89	95.88	TBM-RB



7/2/03 indian acw spanish crossection-1

Dist from left stake	Total Depth	Bankfull depth	Total elevation	Bankfull elevation	2x Bankfull elevation	Notes
0	2.94		97.06	89.06	93.57	tbml
3.5	7.1		92.9	89.06	93.57	
8.5	10.94	0	89.06	89.06	93.57	bfl
11.7	12.09	1.15	87.91	89.06	93.57	wel
15.6	12.16	1.22	87.84	89.06	93.57	
19.2	12.81	1.87	87.19	89.06	93.57	
23.8	12.68	1.74	87.32	89.06	93.57	
27	13.38	2.44	86.62	89.06	93.57	
32	14.88	3.94	85.12	89.06	93.57	
36	15.45	4.51	84.55	89.06	93.57	t
39.3	15.2	4.26	84.8	89.06	93.57	
44.2	14.16	3.22	85.84	89.06	93.57	
51.8	13.33	2.39	86.67	89.06	93.57	
57.1	13.26	2.32	86.74	89.06	93.57	
60.5	13	2.06	87	89.06	93.57	
73.4	12.27	1.33	87.73	89.06	93.57	wer
82.5	10.94	0	89.06	89.06	93.57	bk
92.5	9.12		90.88	89.06	93.57	
104	6.86		93.14	89.06	93.57	tobr
113	6.03		93.97	89.06	93.57	
135	54		94.6	89.06	93.57	endr

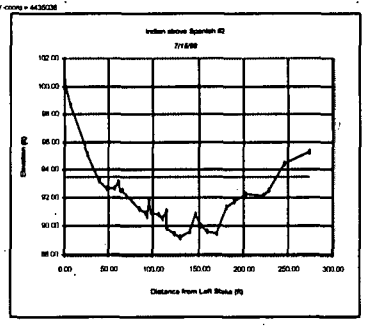
TOPipe=Top of pipe/bench mark
LEW=Left edge of water
REW=Right edge of water
MPD=Maximum pool depth
TBM=Temporary bench mark
PCT=Pool tail crest
TP=Turning point
TOPool=Top of pool
S-MAX=Max. depth sediment lense
LB=Left bank
RB=Right bank
TOB=Top of bank
BF=Bankfull
T=Thalweg

Three Year SUMMARY			Mean	Max	Width:	Flood-	Entrench-
	Cross-	Bankfull	Bankfull	Bankfull	Depth	prone	ment
Year	section	Width	Depth	Depth	Ratio	width	Ratio
1999	1	76.70	2.82	5.30	27.21	129.16	1.68
2001	1	74.90	2.58	4.99	29.03	80.40	1.07
2003	1	74.00	2.32	4.51	31.90	103.40	1.40

UTM X-coord = 872932

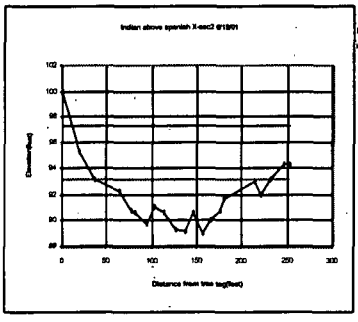
UTM Y-coord = 4436038

Indian Cr abv Spanish X



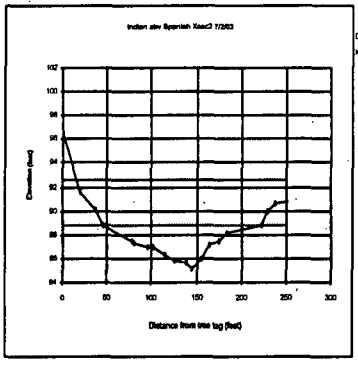
Blue Line=2x Bankfull Elev Red Line=Mean Bankfull Elev Dark Blue Line w/Markers=Basic Cross Section

Dist. From Left Stake	Total Elevation	Bankfull Elevation	2xBankfull Elevation
0.00	100.32	93.525	97.9
7.00	98.66	93.525	97.9
25.01	95.20	93.525	97.9
38.60	93.30	93.525	97.9
47.80	92.72	93.525	97.9
56.00	92.73	93.525	97.9
61.00	93.16	93.525	97.9
63.00	92.64	93.525	97.9
64.00	92.61	93.525	97.9
64.00	91.21	93.525	97.9
69.90	90.90	93.525	97.9
93.20	90.65	93.525	97.9
94.70	91.73	93.525	97.9
98.70	91.00	93.525	97.9
108.00	90.77	93.525	97.9
110.80	90.58	93.525	97.9
114.40	91.13	93.525	97.9
116.40	89.67	93.525	97.9
122.20	89.50	93.53	97.9
129.00	89.15	93.525	97.9
140.00	89.60	93.525	97.9
147.00	90.84	93.525	97.9
153.80	90.02	93.525	97.9
160.00	89.88	93.525	97.9
170.80	89.53	93.525	97.9
180.80	91.41	93.525	97.9
190.20	91.73	93.525	97.9
203.30	92.38	93.525	97.9
222.20	92.12	93.525	97.9
239.20	92.61	93.525	97.9
248.00	94.44	93.525	97.9
275.00	95.21	93.525	97.9



Indian above Spanish 6/19/01

Dist. From left stake	Total depth	Total Elevation	Bankfull Elevation	2XBankfull Elevation	Notes
1	0.02	99.88	93.15	97.31	TBM-LB
19.85	4.72	96.28	93.15	97.31	TOB-LB
35.8	6.85	93.15	93.15	97.31	BFL
65	7.83	92.17	93.15	97.31	
78.3	9.28	90.72	93.15	97.31	
80.9	9.37	90.63	93.15	97.31	LEW
94.8	10.22	89.78	93.15	97.31	
102.15	8.97	91.03	93.15	97.31	
114.5	9.42	90.58	93.15	97.31	
126.2	10.71	89.29	93.15	97.31	
137.6	10.79	89.21	93.15	97.31	
145.3	9.4	90.6	93.15	97.31	
155.65	11.01	88.99	93.15	97.31	T
164.9	10.03	89.97	93.15	97.31	
175.13	9.22	90.78	93.15	97.31	REW
179.75	8.3	91.7	93.15	97.31	
213.8	6.08	93.02	93.15	97.31	
220.3	8.07	91.93	93.15	97.31	
231.75	8.65	93.15	93.15	97.31	BFR
246	5.79	94.21	93.15	97.31	TOB-RB
253.7	6.8	94.2	93.15	97.31	TBM-RB



7/2/03

Dist from left stake	Total Depth	Bankfull depth	Total elevation	Bankfull elevation	2x Bankfull elevation	Notes
0	3.42		98.58	98.86	92.62	tbm
19.85	8.4		91.8	98.86	92.62	lobf
35.8	8.92		90.08	98.86	92.62	
44.3	11.14	0	88.86	98.86	92.62	bfl
78.5	12.45	1.31	87.55	98.86	92.62	wel
80.9	12.86	1.64	87.32	98.86	92.62	
94.8	13.1	1.88	86.6	98.86	92.62	
102.5	13.03	1.89	86.97	98.86	92.62	
114.5	13.73	2.59	86.27	98.86	92.62	
126	14.23	3.09	85.77	98.86	92.62	
137.6	14.31	3.17	85.69	98.86	92.62	
145	14.9	3.76	85.1	98.86	92.62	t
155.6	14.02	2.88	85.98	98.86	92.62	
164.9	12.87	1.73	87.13	98.86	92.62	
174.4	12.45	1.31	87.55	98.86	92.62	wer
183	11.87	0.73	88.13	98.86	92.62	
223	11.14	0	88.86	98.86	92.62	bfr
229	10.1		89.9	98.86	92.62	
237	9.34		90.66	98.86	92.62	
250	9.22		90.78	98.86	92.62	tob,end

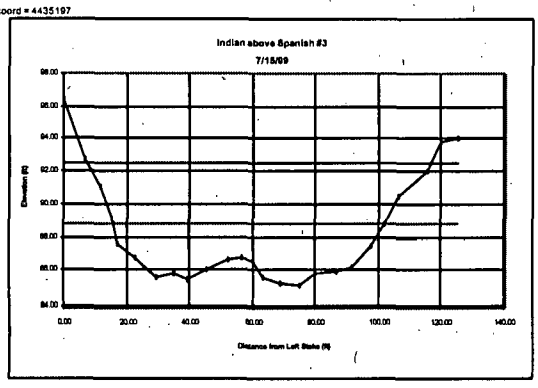
TOPpe=Top of pipe/bench mark
LEW=Left edge of water
REW=Right edge of water
MPD=Maximum pool depth
TBM=Temporary bench mark
PCT=Pool tail crest
TP=Turning point
TOPool=Top of pool
S-MAX=Max. depth sediment terrac
LB=Left bank
RB=Right bank
TOB=Top of bank
BF=Bankfull
T=Thalweg

Three Year SUMMARY		Mean	Max	Width/	Flood-	Entrench-
	Cross-	Bankful	Bankful	Depth	prone	ment
Year	section	Width	Depth	Depth	Ratio	width	Ratio
1999	2	#####	1.93	3.46	94.37	#####	1.45
2001	2	#####	2.30	4.16	84.30	#####	1.47
2003	2	#####	2.00	3.76	89.49	#####	1.51

UTM X-coord = 672974

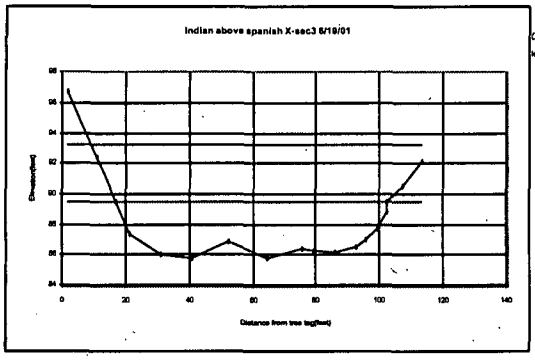
UTM Y-coord = 4435197

Indian Cr abv Spanish X-sec 3



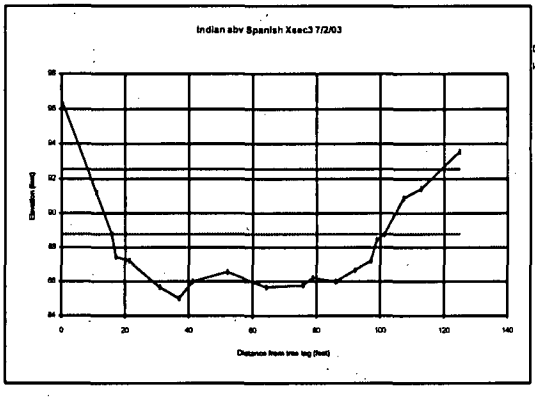
Dist. From Left Stake	Total Elevation	Bankfull Elevation	2xBankfull Elevation
0.00	96.45	88.79	92.53
7.00	92.73	88.79	92.53
11.90	91.05	88.79	92.53
16.10	88.79	88.79	92.53
16.90	87.59	88.79	92.53
22.70	88.79	88.79	92.53
29.80	85.59	88.79	92.53
34.90	85.80	88.79	92.53
39.50	85.44	88.79	92.53
45.50	88.00	88.79	92.53
52.00	88.60	88.79	92.53
58.20	88.78	88.79	92.53
60.00	88.55	88.79	92.53
63.00	85.57	88.79	92.53
68.70	85.15	88.79	92.53
74.80	85.05	88.79	92.53
80.00	85.74	88.79	92.53
86.50	85.88	88.79	92.53
91.50	86.19	88.79	92.53
97.60	87.47	88.79	92.53
102.10	88.79	88.79	92.53
106.20	90.51	88.79	92.53
115.50	91.96	88.79	92.53
119.50	93.83	88.79	92.53
125.00	94.09	88.79	92.53

Blue Line=2x Bankfull Elev Red Line=Mean Bankfull Elev Dark Blue Line w/Markers=Basic Cross Section



Indian above Spanish 6/19/01

Dist. From left stake	Total depth	Total Elevation	Bankfull Elevation	2XBankfull Elevation	Notes
2	3.2	96.8	89.46	93.21	TBM-LB
10.7	7.65	92.35	89.46	93.21	TOB-LB
17.2	10.54	89.46	89.46	93.21	BFL
21.3	12.59	87.41	89.46	93.21	LEW
31.2	13.99	86.01	89.46	93.21	
41	14.28	85.72	89.46	93.21	T
52.2	13.14	86.86	89.46	93.21	
64.4	14.21	85.79	89.46	93.21	
75.6	13.64	86.36	89.46	93.21	
79	13.73	86.27	89.46	93.21	
85.9	13.91	86.09	89.46	93.21	
92.3	13.44	86.56	89.46	93.21	
95.8	13.01	86.99	89.46	93.21	REW
99	12.22	87.78	89.46	93.21	
102	11.09	88.91	89.46	93.21	
102.3	10.54	89.46	89.46	93.21	BFR
107	9.46	90.54	89.46	93.21	
113	7.92	92.08	89.46	93.21	



7/2/03 Indian acw spanish crossection-3

Dist from left stake	Total Depth	Bankfull depth	Total elevation	Bankfull elevation	2x Bankfull elevation	Notes
0	3.4		96.8	88.77	92.52	tbml
10.7	6.79		91.21	88.77	92.52	tobl
15.5	11.23	0	88.77	88.77	92.52	bfl
17	12.54	1.31	87.46	88.77	92.52	wel
21.3	12.79	1.56	87.21	88.77	92.52	
31.2	14.31	3.08	85.69	88.77	92.52	
36.8	14.98	3.75	85.02	88.77	92.52	t
41	14.04	2.81	85.96	88.77	92.52	
52.2	13.48	2.25	86.52	88.77	92.52	
64.4	14.28	3.05	85.72	88.77	92.52	
75.6	14.23	3	85.77	88.77	92.52	
79	13.76	2.53	86.24	88.77	92.52	
85.9	14	2.77	86	88.77	92.52	
92.3	13.38	2.15	86.62	88.77	92.52	
96.9	12.73	1.5	87.27	88.77	92.52	wer
99	11.6	0.37	88.4	88.77	92.52	
101.5	11.23	0	88.77	88.77	92.52	bfr
107	9.08		90.92	88.77	92.52	
113	8.53		91.47	88.77	92.52	
125	6.45		93.55	88.77	92.52	endr

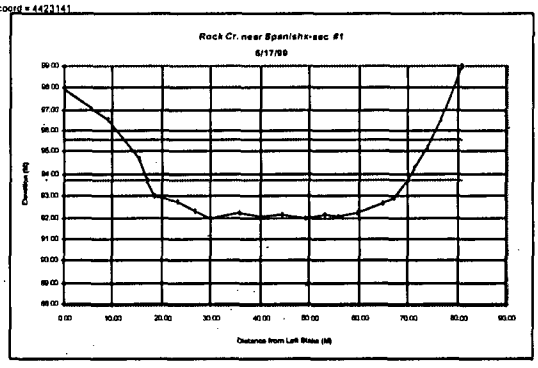
TOPipe=Top of pipe/bench mark
LEW=Left edge of water
REW=Right edge of water
MPD=Maximum pool depth
TBM=Temporary bench mark
PCT=Pool tail crest
TP=Turning point
TOPool=Top of pool
S-MAX=Max. depth sediment fense
LB=Left bank
RB=Right bank
TOB=Top of bank
BF=Bankfull
T=Thalweg

Three Year SUMMARY		Mean	Max	Width:	Flood-	Entrench-
	Cross-	Bankfull	Bankfull	Depth	prone	ment
Year	section	Width	Depth	Depth	Ratio	width	Ratio
1999	3	86.00	2.66	3.74	32.38	109.14	1.27
2001	3	83.10	2.52	3.75	32.97	104.30	1.25
2003	3	86.00	2.15	3.75	39.96	108.00	1.26

UTM X-coord = 869002

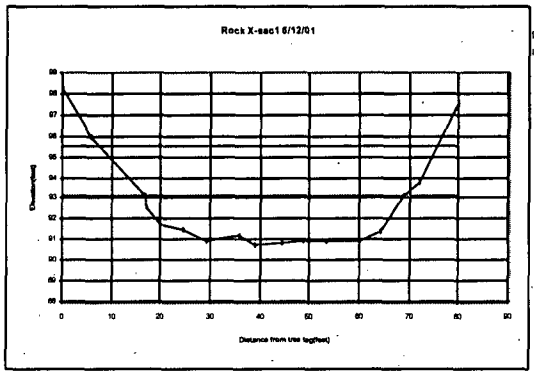
UTM Y-coord = 4423141

Rock Cr (Spanish Trib) X-sec 1



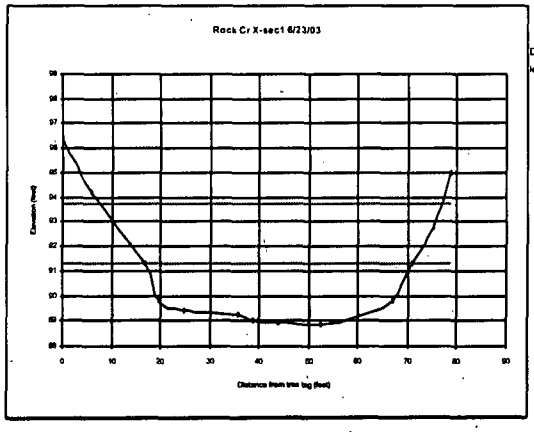
Dist. From Left Stake	Total Elevation	Bankfull Elevation	2xBankfull Elevation
0.00	97.93	93.7336	95.53606
9.10	96.52	93.7336	95.53606
15.20	94.69	93.7336	95.53606
17.00	93.73	93.7336	95.53606
18.60	92.98	93.7336	95.53606
23.00	92.76	93.7336	95.53606
26.90	92.32	93.7336	95.53606
29.90	91.99	93.7336	95.53606
35.60	92.19	93.7336	95.53606
39.90	92.03	93.7336	95.53606
44.50	92.16	93.7336	95.53606
49.20	91.93	93.7336	95.53606
53.00	92.09	93.7336	95.53606
56.00	92.03	93.7336	95.53606
59.60	92.19	93.7336	95.53606
64.70	92.65	93.7336	95.53606
67.20	92.95	93.7336	95.53606
69.80	93.73	93.7336	95.53606
71.00	94.29	93.73	95.53606
74.00	95.21	93.7336	95.53606
78.70	96.52	93.7336	95.53606
81.00	98.98	93.7336	95.53606

Blue Line=2x Bankfull Elev *Red Line=Mean Bankfull Elev* *Dark Blue Line w/Markers=Basic Cross Section*



Rock 6/12/01

Dist. From left stake	Total depth	Total Elevation	Bankfull Elevation	2XBankfull Elevation	Notes
0	1.7	98.3	93.12	95.48	TBM-LB
6	3.99	96.01	93.12	95.48	
16.9	6.88	93.12	93.12	95.48	BFL
17.3	7.42	92.58	93.12	95.48	
19.7	8.24	91.76	93.12	95.48	
24.7	8.55	91.45	93.12	95.48	LEW
29.3	9.07	90.93	93.12	95.48	
35.8	8.79	91.21	93.12	95.48	
38.9	9.24	90.76	93.12	95.48	T
44.3	9.16	90.84	93.12	95.48	
48.8	9.09	90.91	93.12	95.48	
53.4	9.06	90.94	93.12	95.48	
60	9.03	90.97	93.12	95.48	
64.4	8.8	91.4	93.12	95.48	REW
69	6.88	93.12	93.12	95.48	BFR
72	6.2	93.8	93.12	95.48	
80	2.43	97.57	93.12	95.48	End



6/23/03 rock acw spanish crossect-1

Dist from left stake	Total Depth	Bankfull depth	Total elevation	Bankfull elevation	2x bankfull elevation	Notes
0	3.59		96.41	91.3	93.7	tbm
6	5.63		94.17	91.3	93.7	
16.9	8.7	0	91.3	91.3	93.7	bfl
19.7	10.17	1.47	89.83	91.3	93.7	wel
24.7	10.59	1.89	89.41	91.3	93.7	
35.6	10.72	2.02	89.28	91.3	93.7	
38.9	11	2.3	89	91.3	93.7	
44	11.09	2.39	88.91	91.3	93.7	
52.6	11.1	2.4	88.9	91.3	93.7	t
60	10.82	2.12	89.18	91.3	93.7	
67	10.2	1.5	89.8	91.3	93.7	wer
70.9	8.7	0	91.3	91.3	93.7	blr
75	7.21		92.79	91.3	93.7	
78.8	5.02		94.98	91.3	93.7	end

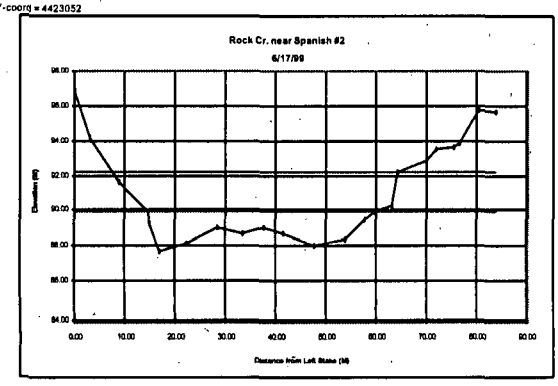
TOPipe=Top of pipe/bench mark
LEW=Left edge of water
REW=Right edge of water
MPD=Maximum pool depth
TBM=Temporary bench mark
PCT=Pool tail crest
TP=Turning point
TOPool=Top of pool
S-MAX=Max depth sediment lens
LB=Left bank
RB=Right bank
TOB=Top of bank
BF=Bankfull
T=Thalweg
all measurements in feet

Three Year SUMMARY		*Mean*	*Max*	*Width:*	*Flood-*	*Entrench-*
Year	Cross-section	Bankfull Width	Bankfull Depth	Bankfull Depth	Depth Ratio	prone width	ment Ratio
1999	1	52.80	1.40	1.80	37.74	62.31	1.18
2001	1	52.10	1.71	2.36	30.46	67.80	1.30
2003	1	54.00	1.79	2.40	30.21	66.60	1.23

UTM X-coord = 888844

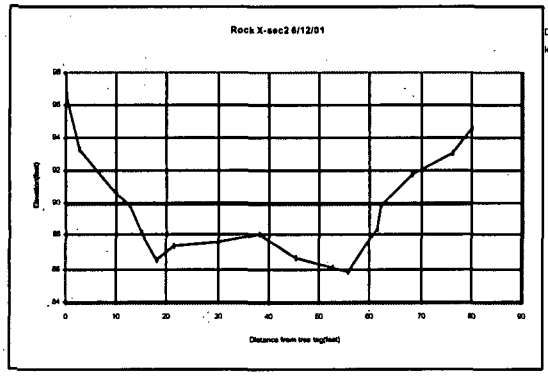
UTM Y-coord = 4423052

Rock Cr (Spanish trib) X-sec 2



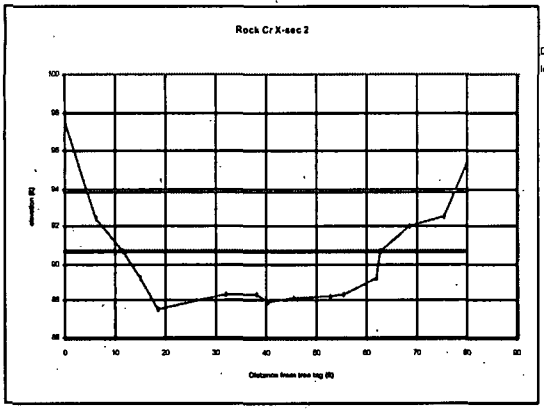
Dist. From Left Stake	Total Elevation	Bankfull Elevation	2xBankfull Elevation
0.00	96.66	89.94423	92.15879
3.00	94.16	89.94423	92.15879
9.00	91.60	89.94423	92.15879
14.60	89.94	89.94423	92.15879
15.00	89.30	89.94423	92.15879
17.00	87.73	89.94423	92.15879
22.30	88.12	89.94423	92.15879
28.40	89.09	89.94423	92.15879
33.30	88.66	89.94423	92.15879
37.60	89.07	89.94423	92.15879
41.60	88.71	89.94423	92.15879
47.60	87.99	89.94423	92.15879
53.90	88.32	89.94423	92.15879
57.50	89.44	89.94423	92.15879
59.60	89.94	89.94423	92.15879
63.00	90.26	89.94423	92.15879
64.40	92.13	89.94423	92.15879
70.10	92.85	89.94423	92.15879
71.90	93.54	89.94	92.15879
75.40	93.62	89.94423	92.15879
76.60	93.83	89.94423	92.15879
80.30	95.80	89.94423	92.15879
84.00	95.67	89.94423	92.15879

Blue Line=2x Bankfull Elev Red Line=Mean Bankfull Elev Dark Blue Line w/Markers=Basic Cross Section



Rock 6/12/01

Dist. From left stake	Total depth	Total Elevation	Bankfull Elevation	2XBankfull Elevation	Notes
0	3.25	96.75	89.89	93.93	TBM-LB
2.8	6.77	93.23	89.89	93.93	
9.8	9.4	90.6	89.89	93.93	
12.7	10.11	89.89	89.89	93.93	BFL
14.8	11.84	88.16	89.89	93.93	LEW
17.85	13.4	86.6	89.89	93.93	
21.4	12.65	87.35	89.89	93.93	
29.95	12.42	87.58	89.89	93.93	
36	11.94	88.06	89.89	93.93	
45.2	13.34	86.66	89.89	93.93	
52.7	13.95	86.05	89.89	93.93	
55.5	14.15	85.85	89.89	93.93	T
61.5	11.59	88.41	89.89	93.93	REW
62.25	10.11	89.89	89.89	93.93	BFR
68.4	8.24	91.76	89.89	93.93	TOBR
76.1	6.92	93.08	89.89	93.93	
80	5.45	94.55	89.89	93.93	TBM-RB



6/23/03 rock acw spanish crossect-2

Dist from left stake	Total Depth	Bankfull depth	Total elevation	Bankfull elevation	2x Bankfull elevation	Notes
0	2.42		97.58	90.72	93.89	tbm
6.1	7.58		92.42	90.72	93.89	
11.4	9.28	0	90.72	90.72	93.89	bfl
15	10.74	1.46	89.26	90.72	93.89	wel
18.5	12.45	3.17	87.55	90.72	93.89	t
32	11.67	2.39	88.33	90.72	93.89	
38	11.6	2.32	88.4	90.72	93.89	
40.5	12.01	2.73	87.99	90.72	93.89	
45.2	11.85	2.57	88.15	90.72	93.89	
52.7	11.75	2.47	88.25	90.72	93.89	
55.5	11.63	2.35	88.37	90.72	93.89	
62	10.78	1.5	89.22	90.72	93.89	wer
62.5	9.28	0	90.72	90.72	93.89	blr
68.5	7.98		92.02	90.72	93.89	
75.5	7.5		92.5	90.72	93.89	tobr
80	4.6		95.4	90.72	93.89	end

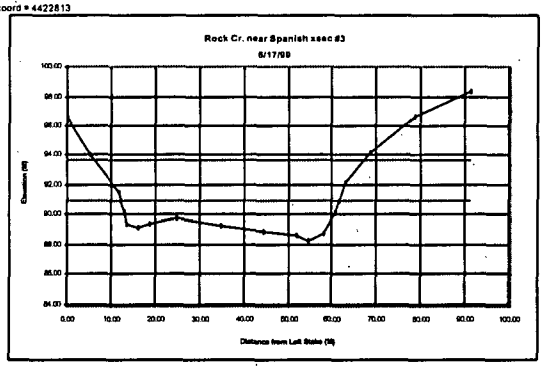
TOPipe=Top of pipe/bench mark
LEW=Left edge of water
REW=Right edge of water
MPD=Maximum pool depth
TBM=Temporary bench mark
PCT=Pool tail crest
TP=Turning point
TOPool=Top of pool
S-MAX=Max. depth sediment lense
LB=Left bank
RB=Right bank
TOB=Top of bank
BF=Bankfull
T=Thalweg

Three Year SUMMARY		Mean	Max	Width:	Flood-	Entrench-
	Cross-	Bankfull	Bankfull	Depth	prone	ment
Year	section	Width	Depth	Depth	Ratio	width	Ratio
1999	2	45.00	1.29	2.21	34.82	56.97	1.27
2001	2	49.55	2.43	4.04	20.39	75.40	1.52
2003	2	51.10	2.10	3.17	24.38	74.00	1.45

UTM X-coord = 668631

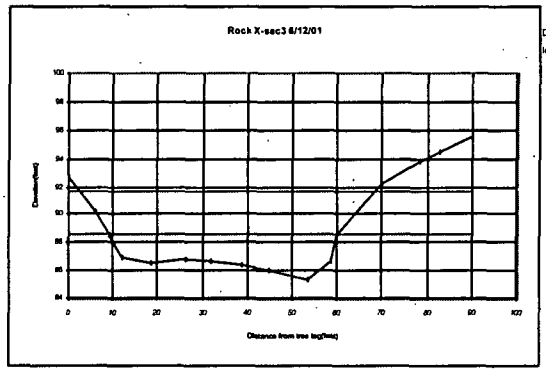
UTM Y-coord = 4422813

Rock Cr (Spanish trib) X-sec 3



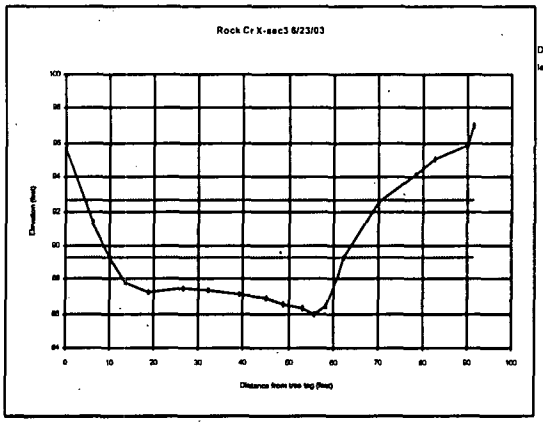
Dist. From Left Stake	Total Elevation	Bankfull Elevation	2xBankfull Elevation
0.00	98.65	90.91207	93.53675
5.15	94.03	90.91207	93.53675
12.00	91.40	90.91207	93.53675
12.10	90.91	90.91207	93.53675
13.00	90.12	90.91207	93.53675
13.60	89.44	90.91207	93.53675
16.00	89.14	90.91207	93.53675
18.60	89.34	90.91207	93.53675
25.00	89.80	90.91207	93.53675
35.00	89.30	90.91207	93.53675
44.70	88.81	90.91207	93.53675
52.00	88.58	90.91207	93.53675
54.80	88.29	90.91207	93.53675
58.00	88.78	90.91207	93.53675
60.70	90.12	90.91207	93.53675
61.45	90.91	90.91207	93.53675
62.80	92.06	90.91207	93.53675
68.80	94.13	90.91207	93.53675
78.80	98.65	90.91	93.53675
91.20	98.36	90.91207	93.53675

Blue Line=2x Bankfull Elev Red Line=Mean Bankfull Elev Dark Blue Line w/Markers=Basic Cross Section



Rock 6/12/01

Dist. From left stake	Total depth	Total Elevation	Bankfull Elevation	2XBankfull Elevation	Notes
0	7.32	92.66	88.54	91.7	TBM-LB
6.1	9.65	90.15	88.54	91.7	TOBL
9.2	11.46	88.54	88.54	91.7	BFL
12	13.03	86.97	88.54	91.7	
16.5	13.42	86.58	88.54	91.7	
26.4	13.12	86.88	88.54	91.7	
32	13.32	86.68	88.54	91.7	LEW
39	13.63	86.37	88.54	91.7	
45	13.95	86.05	88.54	91.7	
53.3	14.62	85.38	88.54	91.7	T
58.6	13.32	86.68	88.54	91.7	REW
59.8	11.46	88.54	88.54	91.7	BFR
70	7.85	92.15	88.54	91.7	TOBR
78.4	6.15	93.85	88.54	91.7	
82.7	5.5	94.5	88.54	91.7	
89.9	4.5	95.5	88.54	91.7	
89.9	3.56	96.44	88.54	91.7	TBM-RB



6/23/03 rock acw spanish crossect-3

Dist from left stake	Total Depth	Bankfull depth	Total elevation	Bankfull elevation	2x Bankfull elevation	Notes
0	4.28		95.72	89.29	92.62	tbm
6.1	8.61		91.39	89.29	92.62	
10	10.71	0	89.29	89.29	92.62	bfl
13.5	12.18	1.47	87.82	89.29	92.62	wel
16.5	12.72	2.01	87.28	89.29	92.62	
26.4	12.55	1.84	87.45	89.29	92.62	
32	12.63	1.92	87.37	89.29	92.62	
39	12.89	2.18	87.11	89.29	92.62	
45	13.15	2.44	86.85	89.29	92.62	
49	13.44	2.73	86.56	89.29	92.62	
53.3	13.75	3.04	86.25	89.29	92.62	
55.9	14.04	3.33	85.96	89.29	92.62	t
58.6	13.56	2.85	86.44	89.29	92.62	
61	11.82	1.11	88.18	89.29	92.62	wer
62.5	10.71	0	89.29	89.29	92.62	blr
70	7.45		92.55	89.29	92.62	
78.4	5.87		94.13	89.29	92.62	
82.7	5		95	89.29	92.62	
89.9	4.17		95.83	89.29	92.62	
91.4	2.95		97.05	89.29	92.62	tbmr

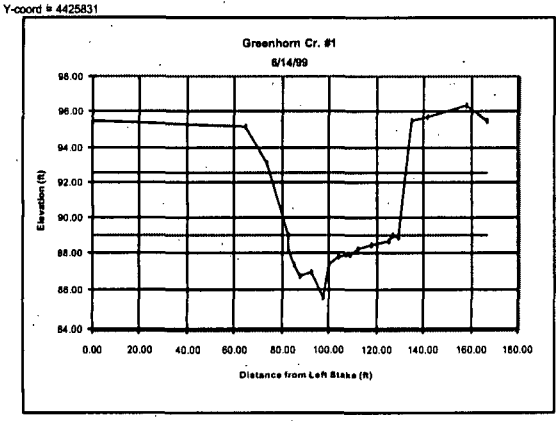
TOPipe=Top of pipe/bench mark
LEW=Left edge of water
REW=Right edge of water
MPD=Maximum pool depth
TBM=Temporary bench mark
PCT=Pool tail crest
TP=Turning point
TOPool=Top of pool
S-MAX=Max depth sediment lens
LB=Left bank
RB=Right bank
TOB=Top of bank
BF=Bankfull
T=Thalweg

Three Year SUMMARY		Mean	Max	Width:	Flood-	Entrench-
	Cross-	Bankfull	Bankfull	Depth	prone	ment
Year	section	Width	Depth	Depth	Ratio	width	Ratio
1999	3	49.35	1.66	2.62	29.70	60.51	1.23
2001	3	50.60	1.90	3.16	26.60	65.80	1.30
2003	3	52.50	2.08	3.33	25.28	66.80	1.27

UTM X-coord = 678091

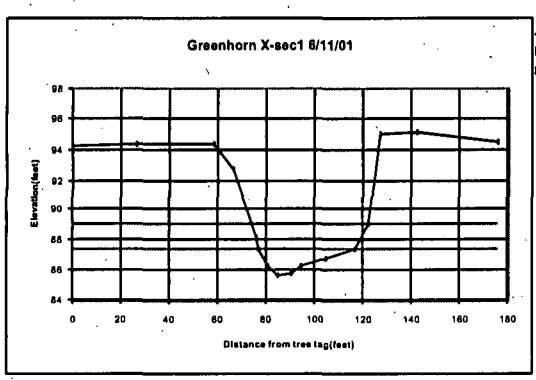
UTM Y-coord = 4425831

Greenhorn Cr X-sec 1



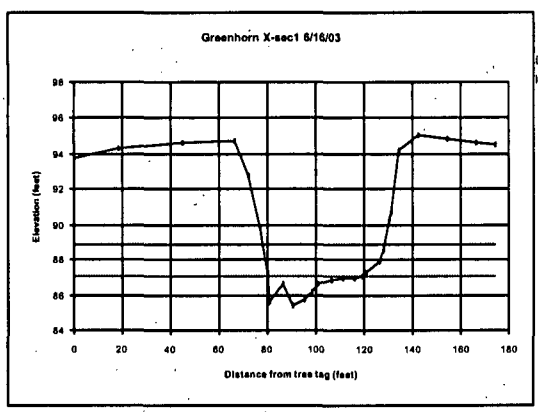
Dist. From Left Stake	Total Elevation	Bankfull Elevation	2xBankfull Elevation
0.00	95.54	89.00919	92.51969
65.00	95.21	89.00919	92.51969
73.30	93.08	89.00919	92.51969
83.00	89.01	89.00919	92.51969
83.00	88.22	89.00919	92.51969
85.30	87.37	89.00919	92.51969
87.20	86.68	89.00919	92.51969
92.20	86.94	89.00919	92.51969
97.00	85.50	89.00919	92.51969
100.00	87.34	89.00919	92.51969
103.60	87.86	89.00919	92.51969
109.00	87.93	89.00919	92.51969
112.40	88.25	89.00919	92.51969
117.90	88.45	89.00919	92.51969
125.10	88.68	89.00919	92.51969
126.90	89.01	89.00919	92.51969
129.60	88.91	89.00919	92.51969
134.60	95.47	89.00919	92.51969
141.40	95.70	89.01	92.51969
158.20	96.38	89.00919	92.51969
166.70	95.51	89.00919	92.51969

Blue Line=2x Bankfull Elev Red Line=Mean Bankfull Elev Dark Blue Line w/Markers=Basic Cross Section



June 11, 2001 Cross-section measurement

Dist. From left stake	Total Depth	Total Elevation	Bankfull Elevation	2xBankfull Elevation	Notes
0	5.8	94.2	87.36	89.02	TBM
28	5.68	94.32	87.36	89.02	
58	5.63	94.37	87.36	89.02	TOBL
66.5	7.27	92.73	87.36	89.02	
75.6	11.88	88.12	87.36	89.02	
78.7	12.64	87.36	87.36	89.02	BFL
80.5	13.75	86.25	87.36	89.02	WEL
85	14.3	85.7	87.36	89.02	T
90.5	14.22	85.78	87.36	89.02	
94.5	13.7	86.3	87.36	89.02	WER
105	13.2	86.8	87.36	89.02	
116.4	12.64	87.36	87.36	89.02	BFR
122.7	10.93	89.07	87.36	89.02	
127	5.08	94.92	87.36	89.02	TOBR
142	4.85	95.15	87.36	89.02	
176	5.57	94.43	87.36	89.02	END



6/16/03 green hon Xsect-1

Dist from left stake	Total Depth	Bankfull depth	Total elevation	Bankfull elevation	2x bankfull elevation	Notes
0	6.2		93.8	87.03	88.85	tbm lb
18	5.67		94.33	87.03	88.85	
45	5.35		94.65	87.03	88.85	
66	5.29		94.71	87.03	88.85	tobl
72	7.19		92.81	87.03	88.85	
76.5	10.18		89.82	87.03	88.85	
80	12.72	0	87.28	87.03	88.85	bfl
80.1	12.97	0.25	87.03	87.03	88.85	wel
80.62	14.33	1.61	85.67	87.03	88.85	
86.4	13.44	0.72	86.56	87.03	88.85	
90.7	14.54	1.82	85.46	87.03	88.85	t
95	14.24	1.52	85.76	87.03	88.85	
98	13.78	1.06	86.22	87.03	88.85	
101.15	13.41	0.69	86.59	87.03	88.85	
106.35	13.16	0.44	86.84	87.03	88.85	
111.1	13.03	0.31	86.97	87.03	88.85	
115.8	13.05	0.33	86.95	87.03	88.85	
119.2	12.94	0.22	87.06	87.03	88.85	wer
120.8	12.72	0	87.28	87.03	88.85	bfr
126	12.13		87.87	87.03	88.85	
127.8	11.46		88.54	87.03	88.85	
130.2	9.73		90.27	87.03	88.85	
131.05	9.22		90.78	87.03	88.85	
134.2	5.78		94.22	87.03	88.85	tobr
142	4.95		95.05	87.03	88.85	
154.5	5.14		94.86	87.03	88.85	
166	5.35		94.65	87.03	88.85	
174	5.5		94.5	87.03	88.85	

All measurements in feet

TOPipe=Top of pipe/bench mark

LEW=Left edge of water

REW=Right edge of water

MPD=Maximum pool depth

TBM=Temporary bench mark

PCT=Pool tail crest

TP=Turning point

TOPool=Top of pool

S-MAX=Max depth sediment lens

LB=Left bank

RB=Right bank

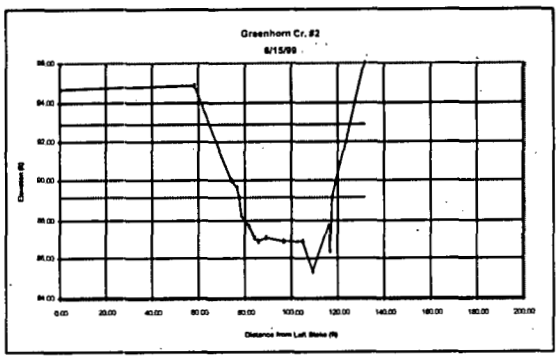
TOB=Top of bank

BF=Bankfull

T=Thalweg

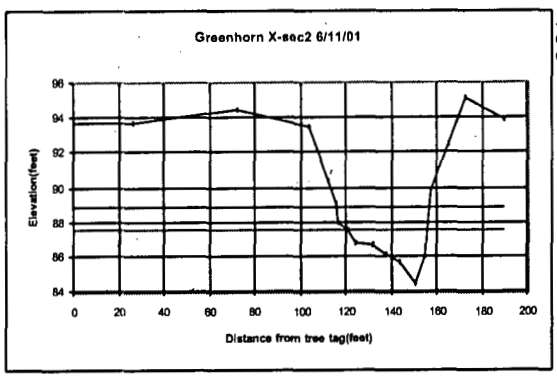
Three Year SUMMARY		Mean	Max	Width:	Flood-	Entrench
Year	Cross-section	Bankfull Width	Bankfull Depth	Bankfull Depth	Depth Ratio	prone width	ment Ratio
1999	1	43.90	1.44	3.51	30.39	57.72	1.31
2001	1	40.30	1.00	1.66	40.50	48.80	1.21
2003	1	39.10	0.75	1.82	52.13	50.70	1.30

Greenhorn Cr X-sec 2



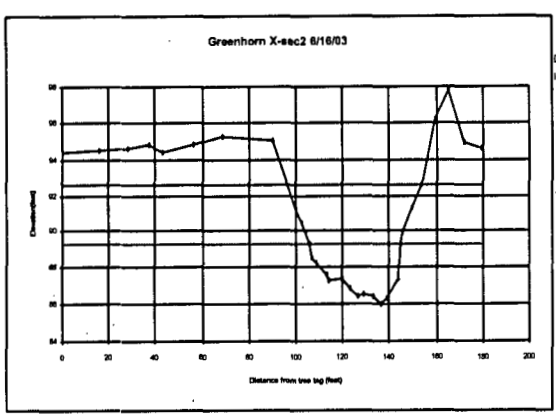
Dist. From Left Stake	Total Elevation	Bankfull Elevation	2xBankfull Elevation
0.00	94.62	89.14042	92.88058
58.00	94.85	89.14042	92.88058
74.40	89.98	89.14042	92.88058
76.50	89.63	89.14042	92.88058
77.70	89.14	89.14042	92.88058
78.20	88.25	89.14042	92.88058
81.50	87.63	89.14042	92.88058
84.00	87.14	89.14042	92.88058
85.80	86.94	89.14042	92.88058
88.90	87.11	89.14042	92.88058
97.00	86.91	89.14042	92.88058
104.80	86.88	89.14042	92.88058
109.20	85.40	89.14042	92.88058
116.00	87.66	89.14042	92.88058
116.40	87.70	89.14042	92.88058
116.80	87.04	89.14042	92.88058
117.00	86.38	89.14042	92.88058
117.70	89.14	89.14042	92.88058
132.00	96.10	89.14	92.88058
145.00	99.80	89.14042	92.88058

Blue Line=2x Bankfull Elev Red Line=Mean Bankfull Elev Dark Blue Line w/Markers=Basic Cross Section



June 11, 2001 Cross-Section Measurements

Dist. From Left Stake	Total Depth	Total Elevation	Bankfull Elevation	2xBankfull Elevation	Notes
0	6.35	93.65	87.48	88.88	TBM
26	6.36	93.64	87.48	88.88	
72	5.57	94.43	87.48	88.88	
104	6.52	93.48	87.48	88.88	TOBL
112	9.64	90.36	87.48	88.88	
115.6	*10.9*	*89.1*	*87.48*	*88.88*	
117	12.01	87.99	87.48	88.88	
120.5	12.52	87.48	87.48	88.88	BFL
124.1	13.28	86.72	87.48	88.88	
131.8	13.39	86.61	87.48	88.88	
138.2	13.89	86.11	87.48	88.88	WEL
143.9	14.35	85.65	87.48	88.88	
150.3	15.61	84.39	87.48	88.88	T
154.8	14.04	85.96	87.48	88.88	WER
155.9	12.52	87.48	87.48	88.88	BFR
157.6	10.21	89.79	87.48	88.88	
165.3	7.55	92.45	87.48	88.88	
172.4	4.84	95.16	87.48	88.88	TOBR
190	6.12	93.88	87.48	88.88	END



6/16/03 greenhorn x-sect2

Dist from left stake	Total Depth	Bankfull depth	Total elevation	Bankfull elevation	2x Bankfull elevation	Notes
0	5.61		94.39	89.3	92.56	tbm
16	5.45		94.55	89.3	92.56	
28	5.38		94.62	89.3	92.56	
37.5	5.23		94.77	89.3	92.56	
42.6	5.65		94.35	89.3	92.56	
58.2	*5.15*		*94.85*	*89.3*	*92.56*	
68.8	4.75		95.25	89.3	92.56	
89.9	4.93		95.07	89.3	92.56	tobl
100	8.74		91.26	89.3	92.56	
102.5	9.54		90.46	89.3	92.56	
105.9	10.7		*89.3*	89.3	92.56	bfl
108.3	11.42	1.71	88.58	89.3	92.56	
113	12.41	1.98	87.59	89.3	92.56	
114	12.68	1.93	87.32	89.3	92.56	wal
120.2	12.63	2.39	87.37	89.3	92.56	
123.2	13.09	2.81	86.91	89.3	92.56	
126.1	13.51	2.77	86.49	89.3	92.56	
128.9	13.47	2.64	86.53	89.3	92.56	
133.1	13.54	3.26	86.46	89.3	92.56	
136.1	13.96	2.95	86.04	89.3	92.56	t
138.95	13.65	1.91	86.35	89.3	92.56	
143.6	12.81	0	87.39	89.3	92.56	wer
144.8	10.7	-0.63	89.3	89.3	92.56	bfr
145.7	*10.07*		*89.93*	*89.3*	*92.56*	
149.3	8.69		91.31	89.3	92.56	
153.4	7.44		92.56	89.3	92.56	
159.5	3.8		96.2	89.3	92.56	tobr
165	2.21		97.79	89.3	92.56	
172.3	5.11		94.89	89.3	92.56	
179	5.35		94.65	89.3	92.56	end

all measurements in feet

TOPipe=Top of pipe/bench mark

LEW=Left edge of water

REW=Right edge of water

MPD=Maximum pool depth

TBM=Temporary bench mark

PCT=Pool tail crest

TP=Turning point

TOPool=Top of pool

S-MAX=Max depth sediment lens

LB=Left bank

RB=Right bank

TOB=Top of bank

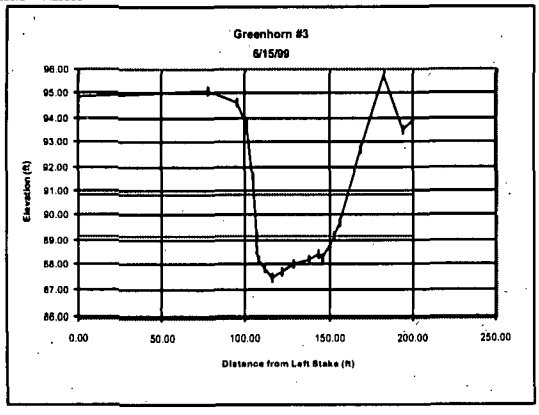
BF=Bankfull

T=Thalweg

Three Year SUMMARY		Mean	Mean	Max	Width:	Flood-	Entrenc
Year	Cross-section	Bankfull Width	Bankfull Depth	Bankfull Depth	Depth Ratio	prone width	ment Ratio
1999	2	40.00	2.05	3.74	19.49	80.79	1.52
2001	2	35.40	1.30	1.38	27.20	46.20	1.30
2003	2	38.90	2.10	3.26	18.52	55.80	1.43

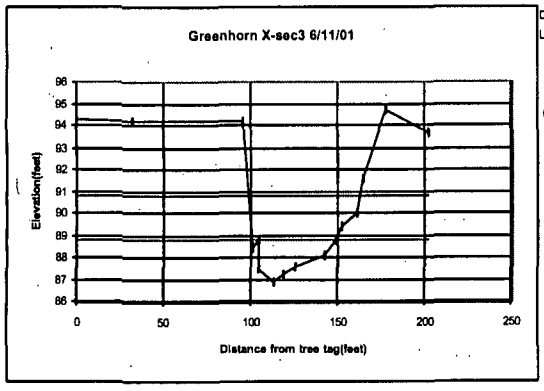
UTM X-coord = 678221
UTM Y-coord = 4425656

Greenhorn Cr X-sec 3

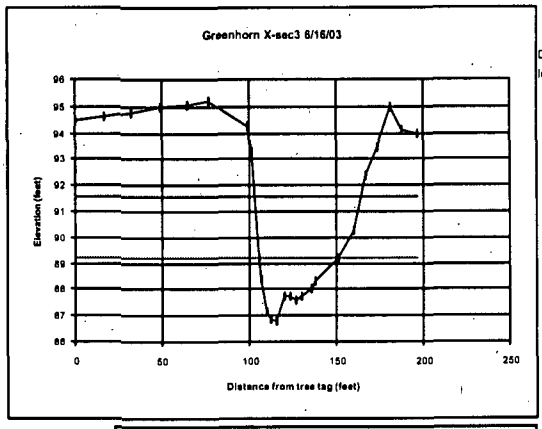


Dist. From Left Stake	Total Elevation	Bankfull Elevation	2xBankfull Elevation
0.00	94.85	89.14042	90.84646
77.30	95.14	89.14042	90.84646
95.00	94.62	89.14042	90.84646
100.70	93.73	89.14042	90.84646
104.20	91.57	89.14042	90.84646
106.30	89.14	89.14042	90.84646
106.90	88.62	89.14042	90.84646
107.80	88.16	89.14042	90.84646
111.10	87.66	89.14042	90.84646
115.30	87.43	89.14042	90.84646
122.00	87.70	89.14042	90.84646
129.00	87.99	89.14042	90.84646
138.00	88.16	89.14042	90.84646
143.00	88.42	89.14042	90.84646
145.60	88.29	89.14042	90.84646
151.00	88.85	89.14042	90.84646
153.10	89.14	89.14042	90.84646
156.00	89.73	89.14042	90.84646
168.50	92.72	89.14	90.84646
183.00	95.77	89.14042	90.84646
194.00	93.47	89.14042	90.84646
200.00	93.90	89.14042	90.84646

Blue Line=2x Bankfull Elev Red Line=Mean Bankfull Elev Dark Blue Line w/Markers=Basic Cross Section



Dist. From Left Stake	Total Depth	Total Elevation	Bankfull Elevation	2xBankfull Elevation	Notes
0	5.77	94.23	88.82	90.81	TBM
32	5.82	94.18	88.82	90.81	
96	5.86	94.14	88.82	90.81	TOBL
101.4	11.53	88.47	88.82	90.81	
104.8	11.18	88.82	88.82	90.81	BFL
104.9	12.52	87.48	88.82	90.81	WEL
112.8	13.17	86.83	88.82	90.81	T
118.5	12.75	87.25	88.82	90.81	
125	12.44	87.56	88.82	90.81	
142.7	11.82	88.08	88.82	90.81	WER
148.9	11.18	88.82	88.82	90.81	BFR
152.5	10.64	89.36	88.82	90.81	
161	8.98	90.02	88.82	90.81	
164.3	8.44	91.56	88.82	90.81	
177.4	5.32	94.68	88.82	90.81	TOBR
202	6.33	93.67	88.82	90.81	END



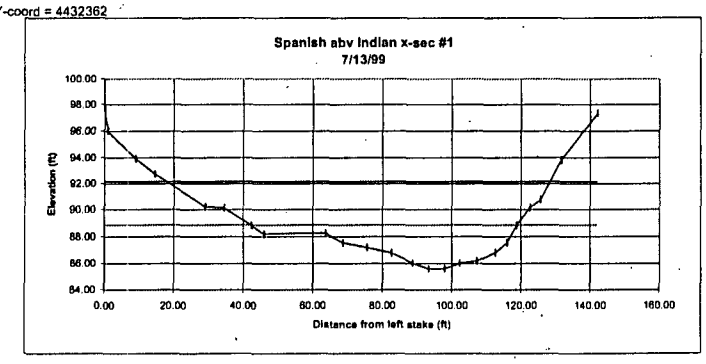
6/16/03 Greenhorn Xsect-3

Dist from left stake	Total Depth	Bankfull depth	Total elevation	Bankfull elevation	2x bankfull elevation	Notes
0	5.5		94.5	89.2	91.57	tbm
17	5.39		94.61	89.2	91.57	
32.5	5.26		94.74	89.2	91.57	
49	5.05		94.95	89.2	91.57	
64	4.92		95.08	89.2	91.57	
77	4.79		95.21	89.2	91.57	
98.4	5.77		94.23	89.2	91.57	tobl
101	6.68		93.32	89.2	91.57	
105.1	10.8	0	89.2	89.2	91.57	bfl
106.7	11.6	0.8	88.4	89.2	91.57	wel
110.4	12.81	2.01	87.19	89.2	91.57	
112.1	13.14	2.34	86.86	89.2	91.57	
115.6	13.17	2.37	86.83	89.2	91.57	
119.5	12.29	1.49	87.71	89.2	91.57	
123	12.26	1.46	87.74	89.2	91.57	
127	12.42	1.62	87.58	89.2	91.57	
130.2	12.29	1.49	87.71	89.2	91.57	
135	11.96	1.16	88.04	89.2	91.57	wer
137.3	11.67	0.87	88.33	89.2	91.57	
151	10.8	0	89.2	89.2	91.57	bfr
159.6	9.75		90.25	89.2	91.57	
166.5	7.61		92.39	89.2	91.57	
173.6	6.53		93.47	89.2	91.57	
180.6	5		95	89.2	91.57	tobr
187.7	5.9		94.1	89.2	91.57	
196.5	6.02		93.98	89.2	91.57	end

all measurements in feet
TOPipe=Top of pipe/bench mark
LEW=Left edge of water
REW=Right edge of water
MPD=Maximum pool depth
TBM=Temporary bench mark
PCT=Pool tail crest
TP=Turning point
TOPool=Top of pool
S-MAX=Max depth sediment lens
LB=Left bank
RB=Right bank
TOB=Top of bank
BF=Bankfull
T=Thalweg

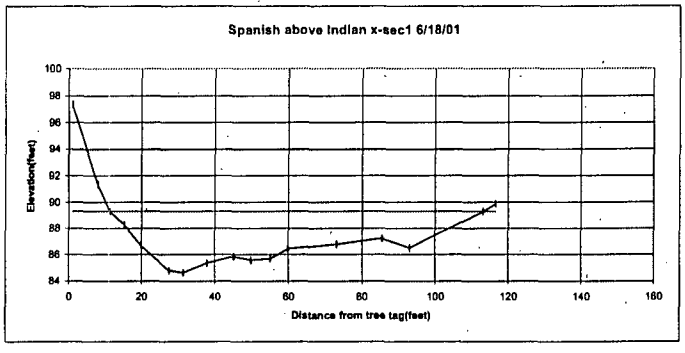
Three Year SUMMAR'		Mean	Max	Width:	Flood-	Entrenc
Year	Cross-section	Bankfull Width	Bankfull Depth	Bankfull Depth	Depth Ratio	prone width	ment Ratio
1999	3	46.80	0.99	1.71	47.10	55.85	1.19
2001	3	44.10	1.15	1.99	38.30	65.00	1.47
2003	3	45.90	1.41	2.37	32.55	60.70	1.32

UTM X-coord = 673368
UTM Y-coord = 4432362



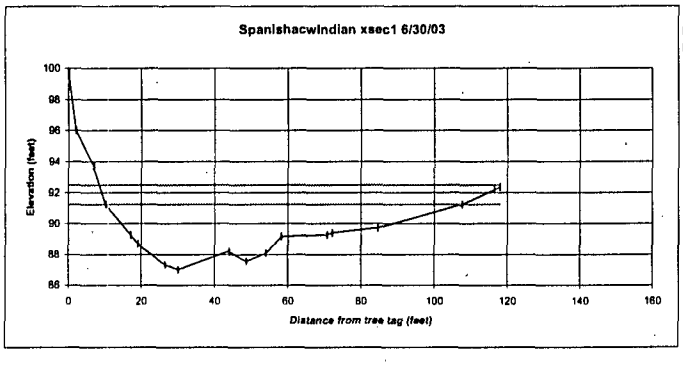
Dist. From Left Stake	Total Elevation	Bankfull Elevation	2xBankfull Elevation
0.00	97.65	88.86	92.14
1.00	96.05	88.86	92.14
9.00	93.94	88.86	92.14
14.50	92.76	88.86	92.14
29.00	90.25	88.86	92.14
34.50	90.17	88.86	92.14
42.30	88.86	88.86	92.14
46.00	88.21	88.86	92.14
63.60	88.29	88.86	92.14
68.60	87.56	88.86	92.14
75.50	87.23	88.86	92.14
82.50	86.80	88.86	92.14
88.60	86.06	88.86	92.14
93.20	85.58	88.86	92.14
97.80	85.60	88.86	92.14
102.20	86.03	88.86	92.14
107.20	86.18	88.86	92.14
112.50	86.84	88.86	92.14
116.00	87.59	88.86	92.14
118.70	88.86	88.86	92.14
122.50	90.16	88.86	92.14
125.50	90.76	88.86	92.14
131.50	93.85	88.86	92.14
142.00	97.32	88.86	92.14

Blue Line=2x Bankfull Elev **Red Line=Mean Bankfull Elev** **Dark Blue Line w/Markers=Basic Cross Section**



Spanish Above Indian 6/18/01

Dist. From left stake	Total depth	Total Elevation	Bankfull Elevation	2XBankfull Elevation	Notes
1	2.81	97.39	89.31	93.97	TBM-LB
8	8.64	91.36	89.31	93.97	
11.2	10.69	89.31	89.31	93.97	BFL
15.1	11.7	88.3	89.31	93.97	
19.9	13.34	86.66	89.31	93.97	LEW
27.4	15.2	84.8	89.31	93.97	
31.3	15.35	84.65	89.31	93.97	T
37.8	14.64	85.36	89.31	93.97	
45	14.13	85.87	89.31	93.97	
49.7	14.41	85.59	89.31	93.97	
55	14.29	85.71	89.31	93.97	
59.8	13.56	86.44	89.31	93.97	REW
73	13.21	86.79	89.31	93.97	
85.5	12.78	87.22	89.31	93.97	
93	13.49	86.51	89.31	93.97	
113	10.69	89.31	89.31	93.97	BFR
116.5	10.12	89.88	89.31	93.97	

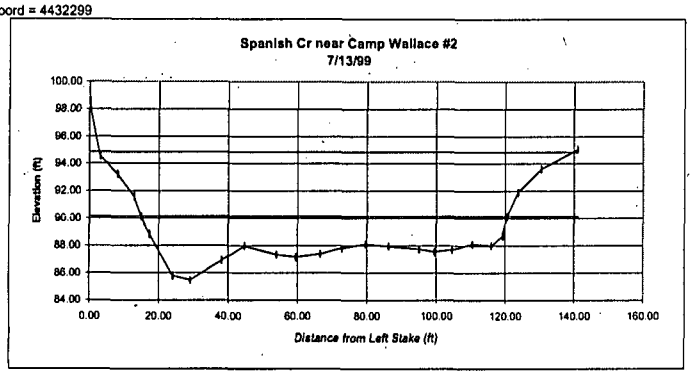


Dist from left stake	Total Depth	Bankfull depth	total elevation	bankfull elevation	2x bankfull elevation	Notes
0	0.2		99.8	91.25	92.48	tbml
2	3.97		96.03	91.25	92.48	tobl
7	6.33		93.67	91.25	92.48	
10.2	8.75	0	91.25	91.25	92.48	bfl
17	10.71	1.96	89.29	91.25	92.48	wel
19	11.29	2.54	88.71	91.25	92.48	
26.5	12.67	3.92	87.33	91.25	92.48	
30	12.98	4.23	87.02	91.25	92.48	t
44	11.78	3.03	88.22	91.25	92.48	
48.7	12.45	3.7	87.55	91.25	92.48	
54	11.9	3.15	88.1	91.25	92.48	
58	10.82	2.07	89.18	91.25	92.48	
70.5	10.71	1.96	89.29	91.25	92.48	wer
72	10.58	1.83	89.42	91.25	92.48	
84.5	10.26	1.51	89.74	91.25	92.48	
107.5	8.75	0	91.25	91.25	92.48	bfr
116.5	7.8		92.2	91.25	92.48	
118	7.62		92.38	91.25	92.48	end,tobr

TOPipe=Top of pipe/bench mark
LEW=Left edge of water
REW=Right edge of water
MPD=Maximum pool depth
TBM=Temporary bench mark
PCT=Pool tail crest
TP=Turning point
TOPool=Top of pool
S-MAX=Max. depth sediment lense
LB=Left bank
RB=Right bank
TOB=Top of bank
BF=Bankfull
T=Thalweg

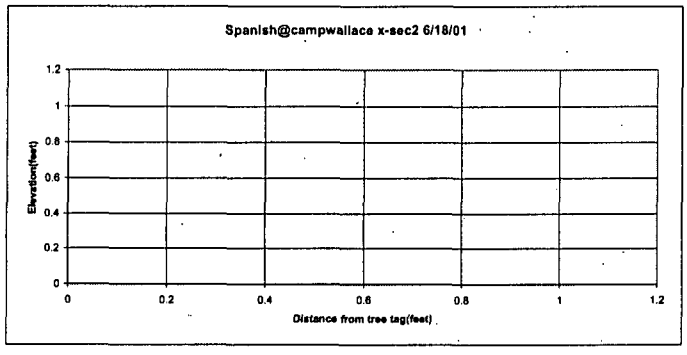
Three Year SUMMARY			Mean	Max	Width:	Flood-	Entrench-
Year	Cross-section	Bankfull Width	Bankfull Depth	Bankfull Depth	Depth Ratio	prone width	ment Ratio
1999	1	76.40	2.03	3.28	37.65	110.10	1.44
2001	1	101.80	2.90	4.66	35.10	151.80	1.49
2003	1	97.30	2.49	4.23	39.05	147.30	1.51

UTM X-coord = 673593
UTM Y-coord = 4432299

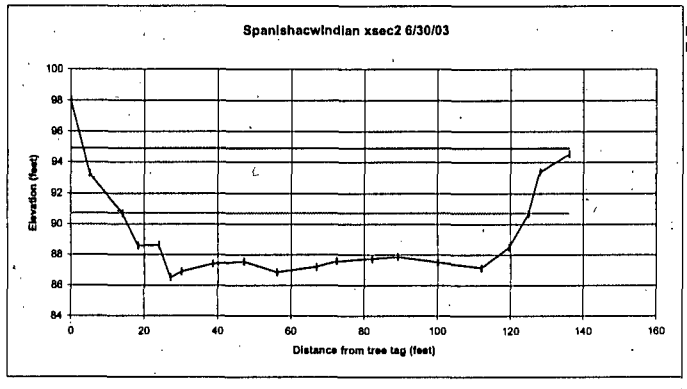


Blue Line=2x Bankfull Elev Red Line=Mean Bankfull Elev Dark Blue Line w/Markers=Basic Cross Section

Dist. From Left Stake	Total Elevation	Bankfull Elevation	2xBankfull Elevation
0.00	98.61	90.14	94.82
3.00	94.54	90.14	94.82
8.00	93.24	90.14	94.82
12.80	91.62	90.14	94.82
14.80	90.14	90.14	94.82
17.30	88.84	90.14	94.82
24.00	85.78	90.14	94.82
29.00	85.46	90.14	94.82
38.00	86.94	90.14	94.82
44.60	87.97	90.14	94.82
53.80	87.34	90.14	94.82
59.40	87.17	90.14	94.82
66.50	87.39	90.14	94.82
72.70	87.80	90.14	94.82
79.50	88.11	90.14	94.82
86.20	87.95	90.14	94.82
95.00	87.74	90.14	94.82
99.50	87.55	90.14	94.82
104.70	87.68	90.14	94.82
110.50	88.11	90.14	94.82
116.00	87.98	90.14	94.82
119.30	88.69	90.14	94.82
120.50	90.14	90.14	94.82
123.70	91.90	90.14	94.82
130.50	93.60	90.14	94.82
141.00	95.06	90.14	94.82



Dist. From left stake	Total depth	Total Elevation	Bankfull Elevation	2XBankfull Elevation	Notes
1	1.15	98.85	91.71	96.86	TBM-LB
6	5.81	94.19	91.71	96.86	TOBL
14	8.29	91.71	91.71	96.86	BFL
19	10.75	89.25	91.71	96.86	LEW
30	13.44	86.56	91.71	96.86	T
39.6	11.72	88.28	91.71	96.86	
57	12.33	87.67	91.71	96.86	
73.3	11.52	88.48	91.71	96.86	
92.1	11.23	88.77	91.71	96.86	
101	11.66	88.34	91.71	96.86	
113	11.64	88.36	91.71	96.86	
123	10.84	89.16	91.71	96.86	REW
123	8.29	91.71	91.71	96.86	BFR
127.4	7.08	92.92	91.71	96.86	
131	5.52	94.48	91.71	96.86	TOBR
142	2.8	97.2	91.71	96.86	

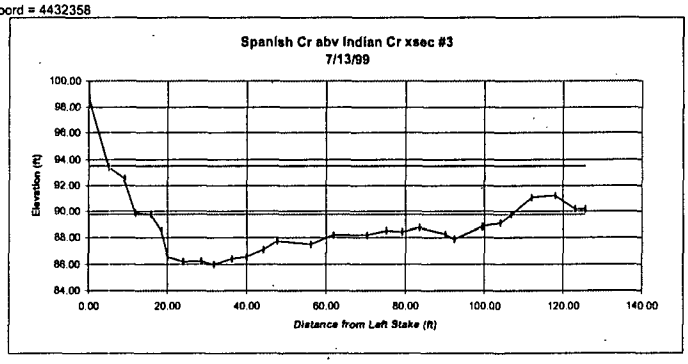


Dist from left stake	Total Depth	Bankfull depth	Total elevation	Bankfull elevation	2x Bankfull elevation	Notes
0	1.96		98.04	90.71	94.9	tbmf
5	6.7		93.3	90.71	94.9	tobl
14	9.29	0	90.71	90.71	94.9	bfl
18.2	11.41	2.12	88.59	90.71	94.9	wel
24	11.37	2.08	88.63	90.71	94.9	
27	13.48	4.19	86.52	90.71	94.9	t
30	13.1	3.81	86.9	90.71	94.9	
38.6	12.6	3.31	87.4	90.71	94.9	
47	12.45	3.16	87.55	90.71	94.9	
56	13.14	3.85	86.86	90.71	94.9	
66.8	12.79	3.5	87.21	90.71	94.9	
72.3	12.43	3.14	87.57	90.71	94.9	
82	12.28	2.99	87.72	90.71	94.9	
89	12.13	2.84	87.87	90.71	94.9	
100	12.49	3.2	87.51	90.71	94.9	
112	12.86	3.57	87.14	90.71	94.9	
119.5	11.51	2.22	88.49	90.71	94.9	wer
125	9.29	0	90.71	90.71	94.9	bfr
128	6.61		93.39	90.71	94.9	
136	5.45		94.55	90.71	94.9	tobr

TOPipe=Top of pipe/bench mark
LEW=Left edge of water
REW=Right edge of water
MPD=Maximum pool depth
TBM=Temporary bench mark
PCT=Pool tail crest
TP=Turning point
TOPool=Top of pool
S-MAX=Max. depth sediment lense
LB=Left bank
RB=Right bank
TOB=Top of bank
BF=Bankfull
T=Thalweg

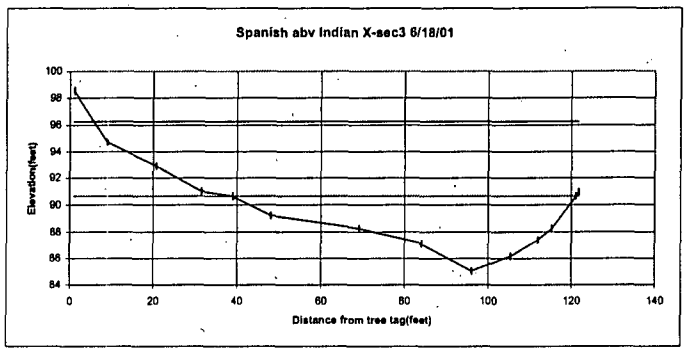
Three Year SUMMARY			Mean	Max	Width:	Flood-	Entrench-
	Cross-	Bankfull	Bankfull	Bankfull	Depth	prone	ment
Year	section	Width	Depth	Depth	Ratio	width	Ratio
1999	2	105.70	2.58	4.68	40.95	136.48	1.29
2001	2	109.00	3.05	5.15	35.70	135.60	1.24
2003	2	111.00	2.93	4.19	37.86	136.50	1.23

UTM X-coord = 673699 all measurements are in feet
UTM Y-coord = 4432358

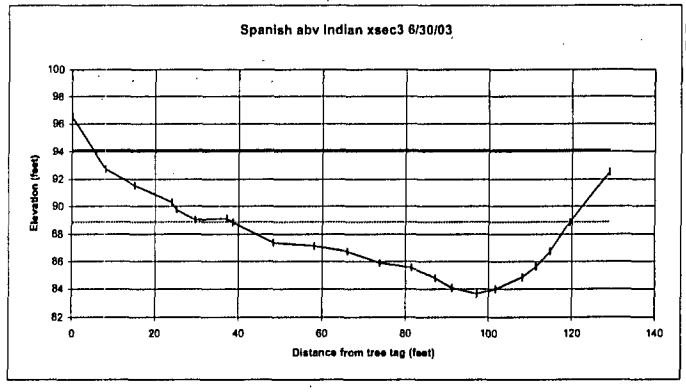


Blue Line=2x Bankfull Elev *Red Line=Mean Bankfull Elev* *Dark Blue Line w/Markers=Basic Cross Section*

Dist. From Left Stake	Total Elevation	Bankfull Elevation	2xBankfull Elevation
0.00	98.75	89.76	93.51
5.00	93.42	89.76	93.51
9.00	92.55	89.76	93.51
11.70	89.87	89.76	93.51
15.70	89.76	89.76	93.51
18.40	88.46	89.76	93.51
20.00	86.57	89.76	93.51
24.00	86.20	89.76	93.51
28.50	86.25	89.76	93.51
31.60	86.01	89.76	93.51
36.20	86.42	89.76	93.51
40.00	86.56	89.76	93.51
44.00	87.09	89.76	93.51
47.50	87.75	89.76	93.51
56.00	87.48	89.76	93.51
61.70	88.21	89.76	93.51
70.20	88.19	89.76	93.51
75.00	88.51	89.76	93.51
79.00	88.41	89.76	93.51
83.50	88.75	89.76	93.51
90.00	88.26	89.76	93.51
92.30	87.88	89.76	93.51
99.30	88.81	89.76	93.51
104.00	89.10	89.76	93.51
106.70	89.76	89.76	93.51
112.00	91.10	89.76	93.51
118.00	91.24	89.76	93.51
123.00	90.20	89.76	93.51
125.60	90.17	89.76	93.51



Dist. From left stake	Total depth	Total Elevation	Bankfull Elevation	2XBankfull Elevation	Notes
1	1.44	98.56	90.66	96.26	TBM-LB
9	5.27	94.73	90.66	96.26	TOBL
20.6	7.08	92.92	90.66	96.26	
31.5	8.98	91.02	90.66	96.26	
39	9.34	90.66	90.66	96.26	BFL
48	10.77	89.23	90.66	96.26	
69	11.72	88.28	90.66	96.26	LEW
84	12.86	87.14	90.66	96.26	
96	14.94	85.06	90.66	96.26	T
105.4	13.81	86.19	90.66	96.26	
111.9	12.58	87.42	90.66	96.26	
115.1	11.73	88.27	90.66	96.26	REW
121	9.34	90.66	90.66	96.26	BFR
121.8	9.03	90.97	90.66	96.26	



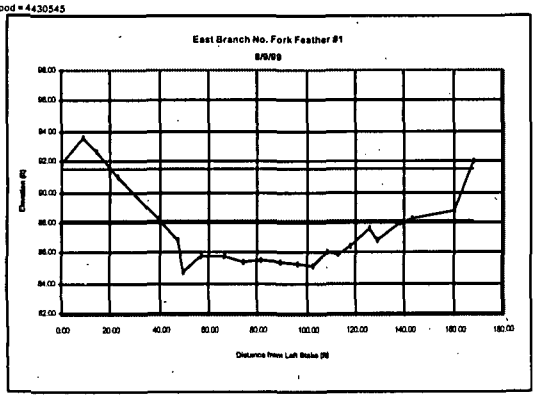
Dist from left stake	Total Depth	Bankfull depth	Total elevation	Bankfull elevation	2x bankfull elevation	Notes
0	3.46		96.54	88.89	94.11	tbml
8	7.22		92.78	88.89	94.11	
15	8.45		91.55	88.89	94.11	tob
23.9	9.69		90.31	88.89	94.11	
25	10.21		89.79	88.89	94.11	
29.5	10.95		89.05	88.89	94.11	
37	10.84		89.16	88.89	94.11	
38.5	11.11	0	88.89	88.89	94.11	bfl
48.2	12.6	1.49	87.4	88.89	94.11	
58	12.85	1.74	87.15	88.89	94.11	
66	13.23	2.12	86.77	88.89	94.11	wel
73.7	14.09	2.98	85.91	88.89	94.11	
81.3	14.43	3.32	85.57	88.89	94.11	
87	15.18	4.07	84.82	88.89	94.11	
91	15.9	4.79	84.1	88.89	94.11	
97	16.33	5.22	83.67	88.89	94.11	t
101.5	15.99	4.88	84.01	88.89	94.11	
108	15.13	4.02	84.87	88.89	94.11	
111.3	14.36	3.25	85.64	88.89	94.11	
114.7	13.24	2.13	86.76	88.89	94.11	wer
119.4	11.11	0	88.89	88.89	94.11	bfr
129	7.46		92.54	88.89	94.11	endr

TOPipe=Top of pipe/bench mark
LEW=Left edge of water
REW=Right edge of water
MPD=Maximum pool depth
TBM=Temporary bench mark
PCT=Pool tail crest
TP=Turning point
TOPool=Top of pool
S-MAX=Max. depth sediment lense
LB=Left bank
RB=Right bank
TOB=Top of bank
BF=Bankfull
T=Thalweg

Three Year SUMMARY			Mean	Max	Width:	Flood-	Entrench-
	Cross-	Bankfull	Bankfull	Bankfull	Depth	prone	ment
Year	section	Width	Depth	Depth	Ratio	width	Ratio
1999	3	91.00	2.13	3.75	42.66	141.00	1.55
2001	3	83.00	2.80	5.60	29.28	137.50	1.67
2003	3	80.90	3.08	5.22	26.29	131.50	1.63

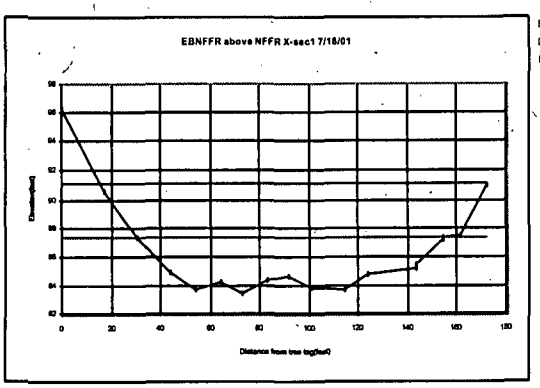
UTM X-coord = 651875 all measurements in feet

UTM Y-coord = 4430545



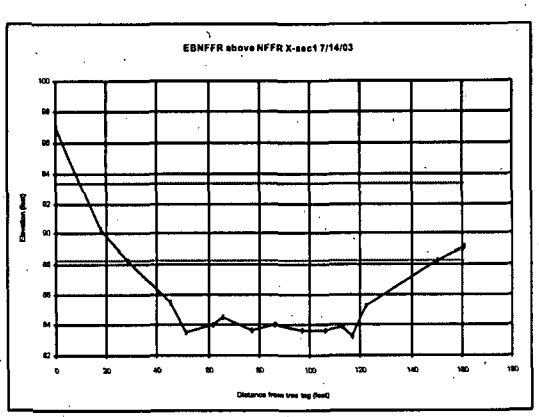
Dist. From Left Stake	Total Elevation	Bankfull Elevation	2xBankfull Elevation
0.00	91.83	88.095	91.45
9.00	93.61	88.095	91.45
14.00	92.64	88.095	91.45
22.50	91.02	88.095	91.45
39.40	88.27	88.095	91.45
47.00	88.78	88.095	91.45
50.00	84.74	88.095	91.45
56.90	85.73	88.095	91.45
66.20	85.79	88.095	91.45
74.00	85.35	88.095	91.45
81.00	85.46	88.095	91.45
89.00	85.40	88.095	91.45
96.50	85.26	88.095	91.45
103.00	85.08	88.095	91.45
108.00	88.05	88.095	91.45
113.00	85.85	88.095	91.45
118.00	86.43	88.095	91.45
125.50	87.54	88.095	91.45
129.00	86.80	88.10	91.45
138.00	87.92	88.095	91.45
143.00	88.26	88.095	91.45
160.00	88.75	88.095	91.45
168.00	92.05	88.095	91.45

Blue Line=2x Bankfull Elev Red Line=Mean Bankfull Elev Dark Blue Line w/Markers=Basic Cross Section



EBNFFR above NFFR 7/16/01

Dist. From left stake	Total depth	Total Elevation	Bankfull Elevation	2XBankfull Elevation	Notes
0	3.68	98.32	87.32	91.18	TBM
17.5	9.43	90.57	87.32	91.18	
30.2	12.68	87.32	87.32	91.18	BFL
43.8	15.04	84.96	87.32	91.18	LEW
54.3	16.26	83.74	87.32	91.18	
64	15.8	84.2	87.32	91.18	
72.6	16.54	83.46	87.32	91.18	T
82.6	15.56	84.44	87.32	91.18	
91.2	15.4	84.6	87.32	91.18	
101.3	16.18	83.82	87.32	91.18	
114.2	16.3	83.7	87.32	91.18	
124	15.17	84.83	87.32	91.18	REW
143.2	14.85	85.15	87.32	91.18	
143.4	14.55	85.45	87.32	91.18	
154	12.89	87.11	87.32	91.18	
154.4	12.68	87.32	87.32	91.18	BFR
161.3	12.55	87.45	87.32	91.18	
172	8.97	91.03	87.32	91.18	END



ebnffr crossection-1

7/14/03

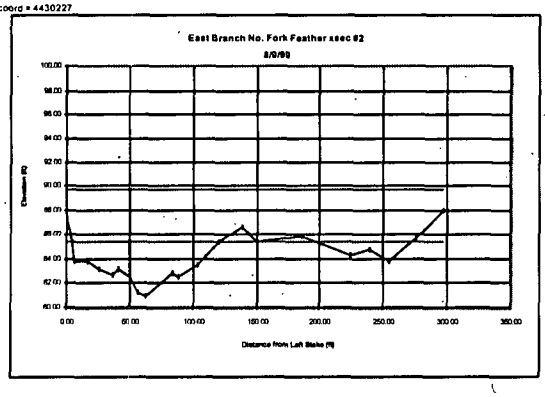
Dist from left stake	Total Depth	Bankfull depth	Total elevation	bankfull elevation	2x bankfull elevation	Notes
0	3.07		96.93	88.24	93.27	tbm
17.5	9.69		90.31	88.24	93.27	tobl
28	11.76	0	88.24	88.24	93.27	bfl
45.3	14.51	2.75	85.49	88.24	93.27	wel
50.6	16.44	4.68	83.56	88.24	93.27	
61.4	15.95	4.19	84.05	88.24	93.27	
65.7	15.48	3.72	84.52	88.24	93.27	
77	16.32	4.56	83.68	88.24	93.27	
86	16	4.24	84	88.24	93.27	
96.7	16.41	4.65	83.59	88.24	93.27	
106.3	16.35	4.59	83.65	88.24	93.27	
113	16.07	4.31	83.93	88.24	93.27	
117	16.79	5.03	83.21	88.24	93.27	t
121.7	14.78	3.02	85.22	88.24	93.27	wer
150.4	11.76	0	88.24	88.24	93.27	blr
161	10.88		89.12	88.24	93.27	endr

TOPipe=Top of pipe/bench mark
LEW=Left edge of water
REW=Right edge of water
MPD=Maximum pool depth
TBM=Temporary bench mark
PCT=Pool tail crest
TP=Turning point
TOPool=Top of pool
S-MAX=Max. depth sediment lense
LB=Left bank
RB=Right bank
TOB=Top of bank
BF=Bankfull
T=Thalweg

Three Year SUMMARY		Mean	Max	Width:	Flood-	Entrench-
	Cross-	Bankfull	Bankfull	Depth	prone	ment
Year	section	Width	Depth	Depth	Ratio	width	Ratio
1999	1	98.60	2.26	3.53	43.63	141.95	1.44
2001	1	124.20	2.49	3.86	49.87	169.00	1.36
2003	1	122.40	3.81	5.03	32.11	160.30	1.31

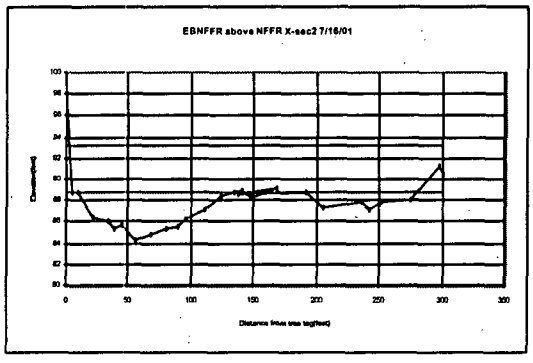
UTM X-coord = 652079 all measurements in feet

UTM Y-coord = 4430227



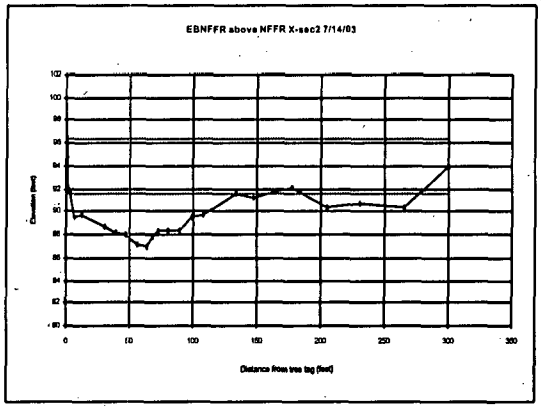
Blue Line=2x Bankfull Elev Red Line=Mean Bankfull Elev Dark Blue Line w/Markers=Basic Cross Section

Dist. From Left Stake	Total Elevation	Bankfull Elevation	2xBankfull Elevation
0.00	93.88	85.33	89.72
0.01	87.38	85.33	89.72
4.80	85.33	85.33	89.72
6.50	83.84	85.33	89.72
18.00	83.79	85.33	89.72
25.70	83.15	85.33	89.72
36.00	82.84	85.33	89.72
41.30	83.19	85.33	89.72
50.60	82.49	85.33	89.72
57.00	81.29	85.33	89.72
62.00	80.94	85.33	89.72
83.90	82.87	85.33	89.72
89.00	82.50	85.33	89.72
103.80	83.50	85.33	89.72
110.00	84.15	85.33	89.72
120.10	85.33	85.33	89.72
138.00	86.63	85.33	89.72
150.80	85.38	85.33	89.72
185.00	85.90	85.33	89.72
224.00	84.25	85.33	89.72
238.40	84.75	85.33	89.72
254.00	83.78	85.33	89.72
275.50	85.64	85.33	89.72
296.00	87.99	85.33	89.72



EBNFFR above NFFR 7/16/01

Dist. From left stake	Total depth	Total Elevation	Bankfull Elevation	2XBankfull Elevation	Notes
0	2.2	97.8	88.77	93.26	TBM
4.2	11.23	88.77	88.77	93.26	BFL
9	11.25	88.75	88.77	93.26	
21.4	13.64	86.36	88.77	93.26	LEW
34.5	13.86	86.14	88.77	93.26	
39	14.67	85.33	88.77	93.26	
45.3	14.3	85.7	88.77	93.26	
56	15.72	84.28	88.77	93.26	T
66	15.22	84.78	88.77	93.26	
80.4	14.71	85.29	88.77	93.26	
90	14.52	85.48	88.77	93.26	
95	13.72	86.28	88.77	93.26	REW
110.5	12.85	87.15	88.77	93.26	
124.1	11.68	88.32	88.77	93.26	
133.5	11.23	88.77	88.77	93.26	BFR
141	11.02	88.98	88.77	93.26	
147.8	11.73	88.27	88.77	93.26	
168.6	10.91	89.09	88.77	93.26	
136.7	11.5	88.5	88.77	93.26	
191.3	11.25	88.75	88.77	93.26	
205.2	12.72	87.28	88.77	93.26	
236	12.15	87.85	88.77	93.26	
242	12.92	87.08	88.77	93.26	
251.6	12.16	87.84	88.77	93.26	
274.5	11.94	88.06	88.77	93.26	
297	8.68	91.32	88.77	93.26	
300.6	9.42	90.58	88.77	93.26	END



abnffr crosection-2 7/14/03

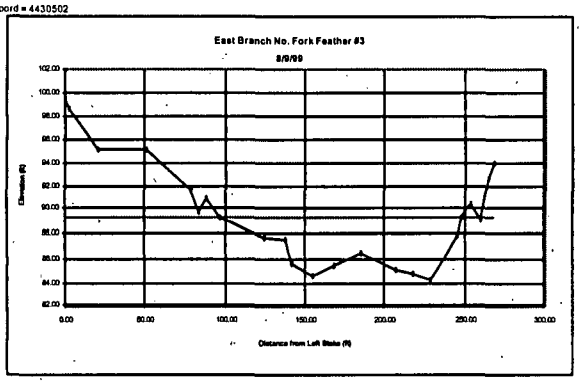
Dist from left stake	Total Depth	Bankfull depth	Total elevation	Bankfull elevation	2x bankfull elevation	Notes
0	0.79		99.21	91.65	96.34	tbml
2	7.99		92.01	91.65	96.34	
3	8.35	0	91.65	91.65	96.34	blf
6.5	10.37	2.02	89.63	91.65	96.34	wel
12.4	10.22	1.87	89.78	91.65	96.34	
30	11.34	2.99	88.66	91.65	96.34	
39.7	11.73	3.38	88.27	91.65	96.34	
47.7	11.93	3.58	88.07	91.65	96.34	
55.8	12.81	4.46	87.19	91.65	96.34	
63.4	13.04	4.69	86.96	91.65	96.34	
68.8	12.21	3.86	87.79	91.65	96.34	t
73	11.61	3.26	88.39	91.65	96.34	
79.8	11.57	3.22	88.43	91.65	96.34	
89.5	11.61	3.26	88.39	91.65	96.34	
98.7	10.42	2.07	89.58	91.65	96.34	
107.1	10.28	1.93	89.72	91.65	96.34	
133.5	8.35	0	91.65	91.65	96.34	wer
147.5	8.68		91.32	91.65	96.34	blf
177.6	7.87		92.13	91.65	96.34	
204.4	9.63		90.37	91.65	96.34	
230.9	9.18		90.82	91.65	96.34	
265	9.61		90.39	91.65	96.34	
300	6.09		93.91	91.65	96.34	

TOPipe=Top of pipe/bench mark
LEW=Left edge of water
REW=Right edge of water
MPD=Maximum pool depth
TBM=Temporary bench mark
PCT=Pool tail crest
TP=Turning point
TOPool=Top of pool
S-MAX=Max depth sediment lens
LB=Left bank
RB=Right bank
TOB=Top of bank
BF=Bankfull
T=Thalweg

Three Year SUMMARY		Mean	Max	Width:	Flood-	Entrench
	Cross-	Bankfull	Bankfull	Depth	prone	ment
Year	section	Width	Depth	Depth	Ratio	width	Ratio
1999	2	*115.30*	*2.47*	*4.39*	*46.73*	*294.80*	*2.56*
2001	2	129.30	2.41	4.49	53.65	342.00	2.64
2003	2	130.50	3.48	4.89	37.54	327.40	2.51

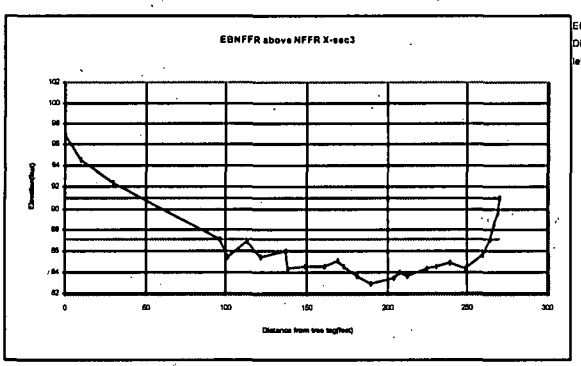
UTM X-coord = 652407 all measurements are in feet

UTM Y-coord = 4430502



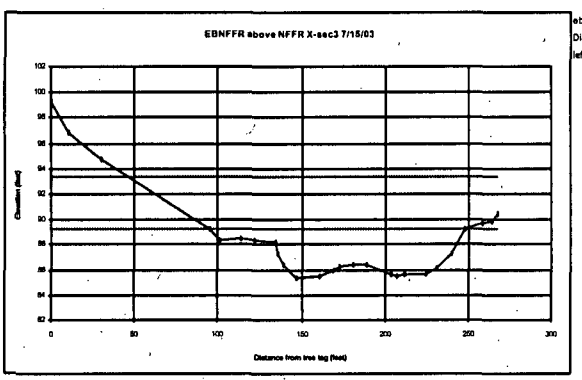
Dist. From Left Stake	Total Elevation	Bankfull Elevation	2xBankfull Elevation
0.00	99.48	89.2	93.98
2.00	98.69	89.2	93.98
21.00	95.10	89.2	93.98
51.00	95.09	89.2	93.98
79.00	91.56	89.2	93.98
83.00	89.86	89.2	93.98
88.00	90.98	89.2	93.98
97.00	89.20	89.2	93.98
125.00	87.71	89.2	93.98
138.00	87.55	89.2	93.98
142.00	85.75	89.2	93.98
155.00	84.75	89.2	93.98
168.50	85.50	89.2	93.98
184.60	86.62	89.2	93.98
206.70	85.26	89.2	93.98
218.00	84.87	89.2	93.98
228.50	84.42	89.2	93.98
245.00	87.83	89.2	93.98
247.60	89.20	89.20	93.98
250.70	89.86	89.2	93.98
254.00	90.32	89.2	93.98
260.00	89.03	89.2	93.98
265.30	92.52	89.2	93.98
268.60	93.98	89.2	93.98

Blue Line=2x Bankfull Elev Red Line=Mean Bankfull Elev Dark Blue Line w/Markers=Basic Cross Section



EBNFFR above NFFR 7/16/01

Dist. From left stake	Total depth	Total Elevation	Bankfull Elevation	2XBankfull Elevation	Notes
0	3	97	86.96	90.94	TBM-LB
10	5.35	94.65	86.96	90.94	
30	7.57	92.43	86.96	90.94	
96.3	13.04	86.96	86.96	90.94	BFL
100.5	14.56	85.44	86.96	90.94	
113	13.2	86.8	86.96	90.94	
121.5	14.58	85.42	86.96	90.94	
137	13.96	86.04	86.96	90.94	
138.5	15.57	84.43	86.96	90.94	LEW
148.4	15.52	84.48	86.96	90.94	
161	15.48	84.52	86.96	90.94	
169	15.02	84.98	86.96	90.94	
172.8	15.42	84.58	86.96	90.94	
181	16.36	83.64	86.96	90.94	
189	17.02	82.98	86.96	90.94	T
204	16.5	83.5	86.96	90.94	
207.3	16.06	83.94	86.96	90.94	
212.5	16.36	83.64	86.96	90.94	
224.3	15.65	84.35	86.96	90.94	
230.1	15.42	84.58	86.96	90.94	REW
238.6	15.1	84.9	86.96	90.94	
248	15.57	84.43	86.96	90.94	
258.6	14.42	85.58	86.96	90.94	
263.9	13.04	86.96	86.96	90.94	BFR
266.5	11.46	88.54	86.96	90.94	
268.6	10.41	89.59	86.96	90.94	
269.5	8.91	91.09	86.96	90.94	END



ebnffr crosssection-3 7/15/03

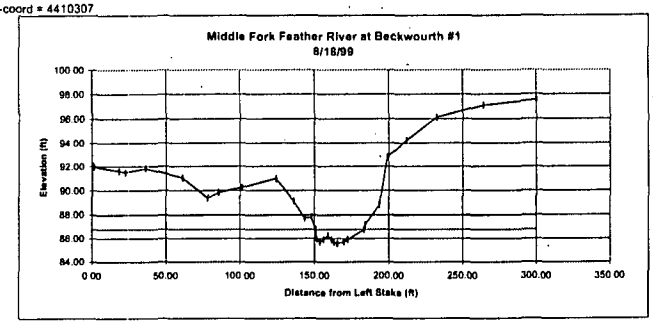
Dist from left stake	Total Depth	Bankfull depth	Total elevation	Bankfull elevation	2x bankfull	Notes
0	0.8		99.2	89.32	93.38	tbml
10	3.08		96.92	89.32	93.38	
30	5.2		94.8	89.32	93.38	tobl
95.3	10.68	0	89.32	89.32	93.38	bfl
100.5	11.58	0.9	88.42	89.32	93.38	
113	11.52	0.84	88.48	89.32	93.38	
121.5	11.71	1.03	88.29	89.32	93.38	
134.3	11.74	1.06	88.26	89.32	93.38	
135.5	12.7	2.02	87.3	89.32	93.38	wel
138.5	13.57	2.89	86.43	89.32	93.38	
147.1	14.74	4.06	85.26	89.32	93.38	t
161	14.45	3.77	85.55	89.32	93.38	
169	14.13	3.45	85.87	89.32	93.38	
172.8	13.81	3.13	86.19	89.32	93.38	
181	13.56	2.88	86.44	89.32	93.38	
189	13.63	2.95	86.37	89.32	93.38	
204	14.35	3.67	85.65	89.32	93.38	
207.3	14.46	3.78	85.54	89.32	93.38	
212.5	14.42	3.74	85.58	89.32	93.38	
224.3	14.29	3.61	85.71	89.32	93.38	
230.1	13.68	3.2	86.12	89.32	93.38	
240.3	12.68	2	87.32	89.32	93.38	wer
247.4	10.68	0	89.32	89.32	93.38	bfr
258.6	10.2		89.8	89.32	93.38	
263.9	10.11		89.89	89.32	93.38	
267	9.55		90.45	89.32	93.38	

TOPipe=Top of pipe/bench mark
LEW=Left edge of water
REW=Right edge of water
MPD=Maximum pool depth
TBM=Temporary bench mark
PCT=Pool tail crest
TP=Turning point
TOPool=Top of pool
S-MAX=Max depth sediment lens
LB=Left bank
RB=Right bank
TOB=Top of bank
BF=Bankfull
T=Thalweg

Three Year SUMMARY		Mean	Max	Width:	Flood-	Entrench
	Cross-	Bankfull	Bankfull	Depth	prone	ment
Year	section	Width	Depth	Ratio	width	Ratio
1999	3	150.80	3.17	4.78	47.45	214.30	1.42
2001	3	167.80	2.20	3.98	76.18	211.40	1.26
2003	3	152.10	2.58	4.06	59.00	207.20	1.36

UTM X-coord. = 722738
UTM Y-coord = 4410307

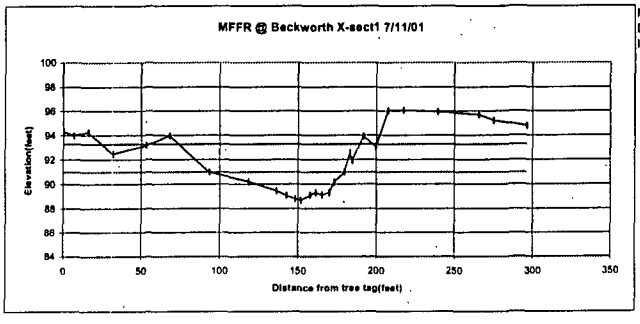
All measurements are in feet



Blue Line=2x Bankfull Elev Red Line=Mean Bankfull Elev Dark Blue Line w/Markers=Basic Cross Section

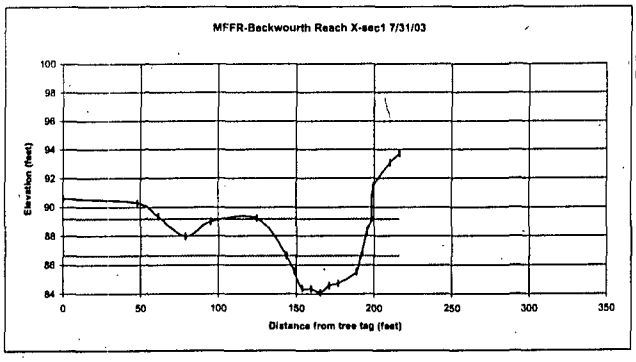
Dist. From Left Stake	Total Elevation	Bankfull Elevation
0.00	92.11	86.77
1.00	91.98	86.77
18.00	91.60	86.77
22.30	91.49	86.77
36.00	91.82	86.77
61.00	91.07	86.77
78.00	89.39	86.77
85.00	89.85	86.77
101.00	90.25	86.77
124.00	91.00	86.77
136.00	89.15	86.77
143.30	87.72	86.77
148.00	87.81	86.77
150.50	86.77	86.77
151.20	85.97	86.77
153.50	85.71	86.77
155.80	85.92	86.77
159.00	86.28	86.77
161.20	85.90	86.77
163.00	85.69	86.77
165.30	85.57	86.77
169.50	85.72	86.77
172.00	85.93	86.77
183.20	86.77	86.77
184.00	87.20	86.77
193.50	88.80	86.77
199.00	92.83	86.77
212.00	94.24	86.77
232.00	96.12	86.77
264.00	97.11	86.77
300.00	97.57	86.77

UTM X-coord. = 722739
UTM Y-coord = 4410308



Middle Fork Feather at Beckworth 7/11/01

Dist. From left stake	Total depth	Total Elevation	Bankfull Elevation	2xBankfull Elevation	Notes
0	5.68	94.34	90.99	93.26	TBM
6.6	6	94	90.99	93.26	
15.8	5.73	94.27	90.99	93.26	
31.7	7.51	92.49	90.99	93.26	
53	6.83	93.17	90.99	93.26	
67.8	6.03	93.97	90.99	93.26	
93.6	9.01	90.99	90.99	93.26	BFL
118.3	9.81	90.19	90.99	93.26	
136	10.53	89.47	90.99	93.26	
142.4	10.92	89.08	90.99	93.26	
147.8	11.18	88.82	90.99	93.26	
151.5	11.28	88.72	90.99	93.26	T
157.3	10.89	89.11	90.99	93.26	
161.1	10.69	89.31	90.99	93.26	
165	10.86	89.14	90.99	93.26	
169.8	10.69	89.31	90.99	93.26	
172.8	9.82	90.18	90.99	93.26	
179.5	9.01	90.99	90.99	93.26	BFR
183.05	7.45	92.55	90.99	93.26	
184.5	8.07	91.93	90.99	93.26	
191.2	6.04	93.96	90.99	93.26	
199.3	6.93	93.07	90.99	93.26	
207	3.95	96.05	90.99	93.26	TOBR
217	3.93	96.07	90.99	93.26	
238.9	4.05	95.95	90.99	93.26	
265.4	4.28	95.72	90.99	93.26	
274.8	4.75	95.25	90.99	93.26	
298.1	5.18	94.82	90.99	93.26	End



mffr at bck crosection-1
7/31/03

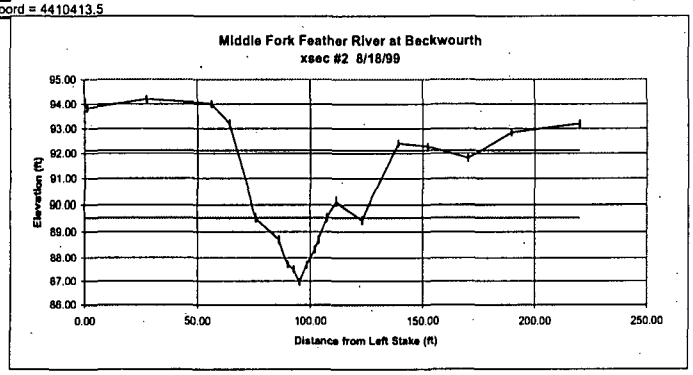
Dist from left stake	Total Depth	Bankfull depth	Total elevation	Bankfull elevation	2x bankfull elevation	Notes
0	9.37		90.63	86.64	89.17	tbml
48	9.7		90.3	86.64	89.17	
61.5	10.63		89.37	86.64	89.17	
78.5	12.04		87.96	86.64	89.17	
95	11.01		88.99	86.64	89.17	
124.6	10.77		89.23	86.64	89.17	tobl
143.5	13.36	0	86.64	86.64	89.17	bfl
148.8	14.4	1.04	85.6	86.64	89.17	
153.6	15.6	2.24	84.4	86.64	89.17	
159.4	15.64	2.28	84.36	86.64	89.17	
165.2	15.89	2.53	84.11	86.64	89.17	t
171	15.42	2.06	84.58	86.64	89.17	
176.6	15.25	1.89	84.75	86.64	89.17	
188.4	14.46	1.1	85.54	86.64	89.17	
191.2	13.36	0	86.64	86.64	89.17	bfr
192	13.08		86.92	86.64	89.17	
195	11.67		88.33	86.64	89.17	
198.1	10.82		89.18	86.64	89.17	
199.5	8.56		91.44	86.64	89.17	
209.9	6.91		93.09	86.64	89.17	tobr
216	6.27		93.73	86.64	89.17	endr

TOPipe=Top of pipe/bench mark
LEW=Left edge of water
REW=Right edge of water
MPD=Maximum pool depth
TBM=Temporary bench mark
PCT=Pool tail crest
TP=Turning point
TOPool=Top of pool
S-MAX=Max depth sediment lens
LB=Left bank
RB=Right bank
TOB=Top of bank
BF=Bankfull
T=Thalweg.

Three Year SUMMARY			Mean	Max	Width:	Flood-	Entrench
Year	Cross-section	Bankfull Width	Bankfull Depth	Bankfull Depth	Depth Ratio	prone width	ment Ratio
1999	1	32.70	0.92	1.20	35.72	46.55	1.42
2001	1	85.90	1.50	2.27	57.26	124.60	1.45
2003	1	47.70	1.64	2.53	29.04	138.70	2.91

UTM X-coord. = 722605.9
UTM Y-coord = 4410413.5

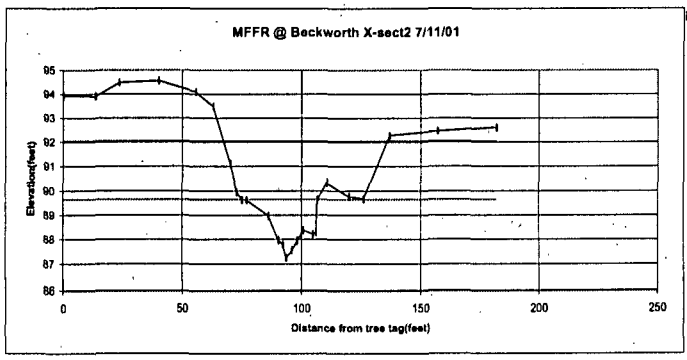
All measurements are in feet



Dist. From Left Stake	Total Elevation
0.00	94.15
1.00	93.84
27.50	94.21
56.00	94.02
64.00	93.23
75.70	89.54
86.00	88.74
89.80	87.73
92.50	87.51
95.20	86.96
98.30	87.71
101.80	88.36
103.50	88.74
107.20	89.54
111.50	90.13
123.00	89.46
139.00	92.42
152.00	92.28
170.00	91.81
189.50	92.86
220.00	93.20

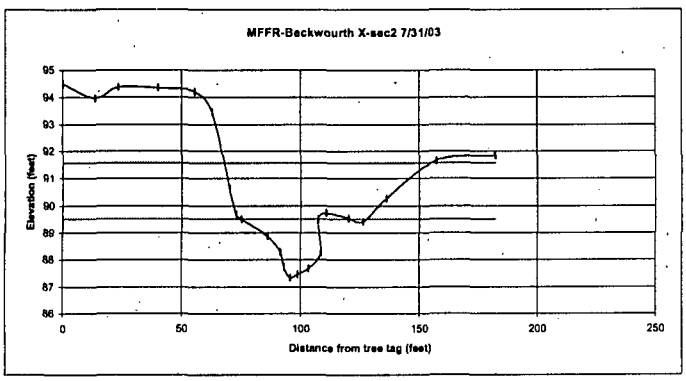
UTM X-coord. = 722605.10
UTM Y-coord = 4410413.6

Blue Line=2x Bankfull Elev **Red Line=Mean Bankfull Elev** **Dark Blue Line w/Markers=Basic Cross Section**



Middle Fork Feather at Beckworth 7/11/01

Dist. From left stake	Total depth	Total Elevation	Bankfull Elevation	2xBankfull Elevation	Notes
0	6.05	93.95	89.65	92.04	TBM-LB
13.5	6.09	93.91	89.65	92.04	
23.3	5.51	94.49	89.65	92.04	
40	5.43	94.57	89.65	92.04	
55.4	5.89	94.11	89.65	92.04	
62.8	6.5	93.5	89.65	92.04	TOBL
70	8.88	91.12	89.65	92.04	
72.7	10.04	89.96	89.65	92.04	
74.9	10.35	89.65	89.65	92.04	BFL
76.9	10.36	89.64	89.65	92.04	
86.1	11.01	88.99	89.65	92.04	
90.2	12.02	87.98	89.65	92.04	LEW
92	12.2	87.8	89.65	92.04	
93.4	12.74	87.26	89.65	92.04	T
95.8	12.44	87.56	89.65	92.04	
98	12.05	87.95	89.65	92.04	REW
100.6	11.61	88.39	89.65	92.04	
104.6	11.78	88.22	89.65	92.04	
106.1	11.68	88.32	89.65	92.04	
106.6	10.35	89.65	89.65	92.04	BFR
110.5	9.65	90.35	89.65	92.04	
120	10.23	89.77	89.65	92.04	
126	10.32	89.68	89.65	92.04	
136.8	7.72	92.28	89.65	92.04	TOBR
157	7.53	92.47	89.65	92.04	
182	7.38	92.62	89.65	92.04	TBM-RB



mffr at bck crosection-2
7/31/03

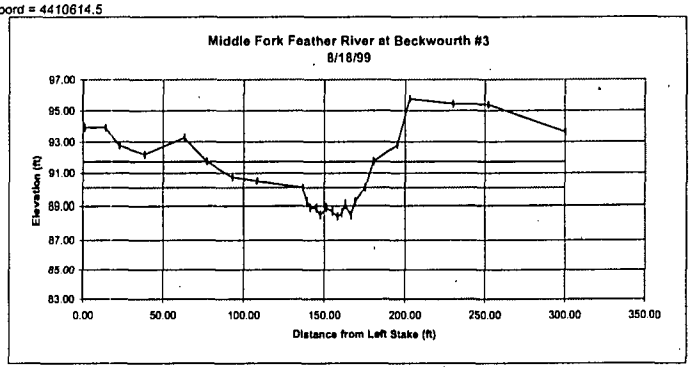
Dist from left stake	Total Depth	Bankfull depth	Total elevation	Bankfull elevation	2x Bankfull elevation	Notes
0	5.5		94.5	89.52	91.57	tbml
13.5	6.02		93.98	89.52	91.57	
23.3	5.62		94.38	89.52	91.57	
40	5.64		94.36	89.52	91.57	
55.4	5.78		94.22	89.52	91.57	
62.8	6.53		93.47	89.52	91.57	tobl
70	9.37		90.63	89.52	91.57	
72.7	10.31		89.69	89.52	91.57	
74.9	10.48	0	89.52	89.52	91.57	bfl
85.9	11.11	0.63	88.89	89.52	91.57	
91.4	11.71	1.23	88.29	89.52	91.57	wel
93	12.26	1.78	87.74	89.52	91.57	
95.4	12.65	2.17	87.35	89.52	91.57	
98.6	12.53	2.05	87.47	89.52	91.57	t
103.2	12.31	1.83	87.69	89.52	91.57	
108.4	11.72	1.24	88.28	89.52	91.57	wer
107.2	10.48	0	89.52	89.52	91.57	bfr
110.5	10.25		89.75	89.52	91.57	
120	10.44		89.56	89.52	91.57	
126	10.57		89.43	89.52	91.57	
136	9.72		90.28	89.52	91.57	
157	8.34		91.66	89.52	91.57	
182	8.15		91.85	89.52	91.57	endr

TOPipe=Top of pipe/bench mark
LEW=Left edge of water
REW=Right edge of water
MPD=Maximum pool depth
TBM=Temporary bench mark
PCT=Pool tail crest
TP=Turning point
TOPool=Top of pool
S-MAX=Max. depth sediment lense
LB=Left bank
RB=Right bank
TOB=Top of bank
BF=Bankfull
T=Thalweg

Three Year SUMMARY		Mean	Max	Width:	Flood-	Entrench
	Cross-	Bankfull	Bankfull	Depth	prone	ment
Year	section	Width	Depth	Depth	Ratio	width	Ratio
1999	2	31.50	1.58	2.58	19.99	108.24	3.44
2001	2	31.70	1.30	2.39	24.38	66.90	2.11
2003	2	32.30	1.37	2.05	23.64	54.10	1.67

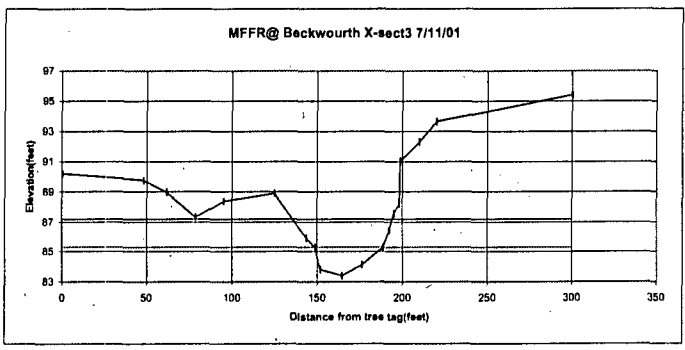
UTM X-coord = 722527.9
UTM Y-coord = 4410614.5

all measurements in feet



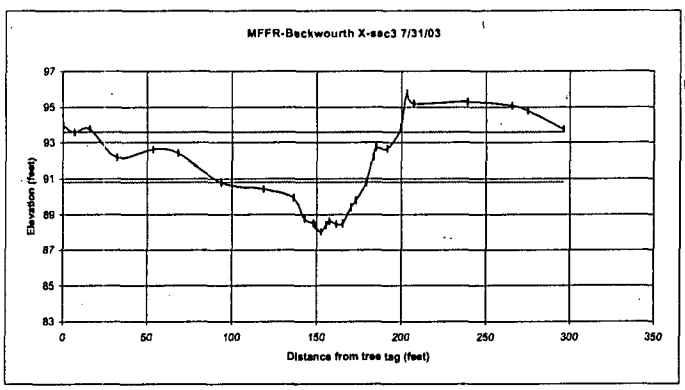
Blue Line=2x Bankfull Elev Red Line=Mean Bankfull Elev Dark Blue Line w/Markers=Basic Cross Section

Dist. From Left Stake	Total Elevation	Bankfull Elevation	2xBankfull Elevation
0.00	94.04	90.07	91.71
1.00	93.92	90.07	91.71
14.00	93.92	90.07	91.71
22.50	92.77	90.07	91.71
38.00	92.20	90.07	91.71
63.00	93.27	90.07	91.71
76.70	91.75	90.07	91.71
92.60	90.72	90.07	91.71
108.00	90.49	90.07	91.71
136.80	90.07	90.07	91.71
139.20	89.27	90.07	91.71
141.00	88.93	90.07	91.71
145.00	88.91	90.07	91.71
147.50	88.51	90.07	91.71
151.00	88.92	90.07	91.71
154.80	88.73	90.07	91.71
158.00	88.43	90.07	91.71
160.70	88.62	90.07	91.71
163.00	89.11	90.07	91.71
166.50	88.48	90.07	91.71
169.00	89.24	90.07	91.71
175.00	90.07	90.07	91.71
180.00	91.74	90.07	91.71
195.00	92.84	90.07	91.71
203.00	95.77	90.07	91.71
230.00	95.45	90.07	91.71
252.00	95.40	90.07	91.71
300.00	93.64	90.07	91.71



Middle Fork Feather at Beckworth 7/11/01

Dist. From left stake	Total depth	Total Elevation	Bankfull Elevation	2xBankfull Elevation	Notes
0	9.8	90.2	85.3	87.2	TBM
48	10.26	89.74	85.3	87.2	
61.5	11.03	88.97	85.3	87.2	
78.5	12.66	87.34	85.3	87.2	
95	11.63	88.37	85.3	87.2	
124.6	11.1	88.9	85.3	87.2	TOBL
143.5	14.06	85.94	85.3	87.2	
148.6	14.7	85.3	85.3	87.2	BFL
151.6	16.2	83.8	85.3	87.2	
164.3	16.6	83.4	85.3	87.2	T
176	15.87	84.13	85.3	87.2	
188.4	14.7	85.3	85.3	87.2	BFR
192	13.54	86.46	85.3	87.2	
195	12.41	87.59	85.3	87.2	
198.1	11.76	88.24	85.3	87.2	
198.4	8.93	91.07	85.3	87.2	
209.9	7.66	92.34	85.3	87.2	TOBR
220	6.35	93.65	85.3	87.2	
300	4.6	95.4	85.3	87.2	End



mffr at bck crosection-3
7/31/03

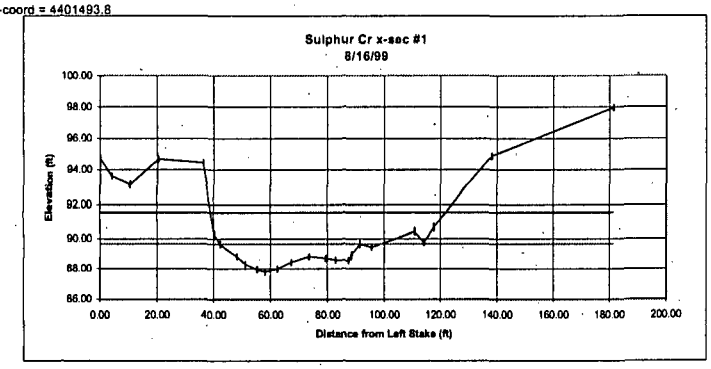
Dist from left stake	Total Depth	Bankfull depth	Total elevation	Bankfull elevation	2x Bankfull elevation	Notes
0	6.02		93.98	90.81	93.57	tbm
6.6	6.43		93.57	90.81	93.57	
15.8	6.23		93.77	90.81	93.57	
31.7	7.84		92.16	90.81	93.57	
53	7.38		92.62	90.81	93.57	
67.8	7.59		92.41	90.81	93.57	tobl
93.6	9.19	0	90.81	90.81	93.57	bfl
118.3	9.56	0.37	90.44	90.81	93.57	
136	10.05	0.86	89.95	90.81	93.57	
142.4	11.2	2.01	88.8	90.81	93.57	
147.8	11.46	2.27	88.54	90.81	93.57	
148.9	11.58	2.39	88.42	90.81	93.57	wel
152.2	11.95	2.76	88.05	90.81	93.57	t
155	11.57	2.38	88.43	90.81	93.57	wer
157.3	11.34	2.15	88.66	90.81	93.57	
161.1	11.52	2.33	88.48	90.81	93.57	
165	11.48	2.29	88.52	90.81	93.57	
169.8	10.57	1.38	89.43	90.81	93.57	
172.8	10.2	1.01	89.8	90.81	93.57	
179	9.19	0	90.81	90.81	93.57	bfr
183	7.8		92.2	90.81	93.57	
184.5	7.27		92.73	90.81	93.57	
191.2	7.33		92.67	90.81	93.57	
199.3	6.15		93.85	90.81	93.57	
203	4.2		95.8	90.81	93.57	tobr
207	4.8		95.2	90.81	93.57	
238.9	4.7		95.3	90.81	93.57	
265.4	4.92		95.08	90.81	93.57	
274.8	5.2		94.8	90.81	93.57	
296	6.25		93.75	90.81	93.57	endr

TOPipe=Top of pipe/bench mark
LEW=Left edge of water
REW=Right edge of water
MPD=Maximum pool depth
TBM=Temporary bench mark
PCT=Pool tail crest
TP=Turning point
TOPool=Top of pool
S-MAX=Max depth sediment lens
LB=Left bank
RB=Right bank
TOB=Top of bank
BF=Bankfull
T=Thalweg

Three Year SUMMARY			Mean	Max	Width:	Flood-	Entrench
Year	Cross-section	Bankfull Width	Bankfull Depth	Bankfull Depth	Depth Ratio	prone width	ment Ratio
1999	3	38.20	1.24	1.64	30.85	102.59	2.69
2001	3	39.80	1.14	1.90	34.91	139.50	3.57
2003	3	85.40	1.71	2.76	50.01	189.50	2.22

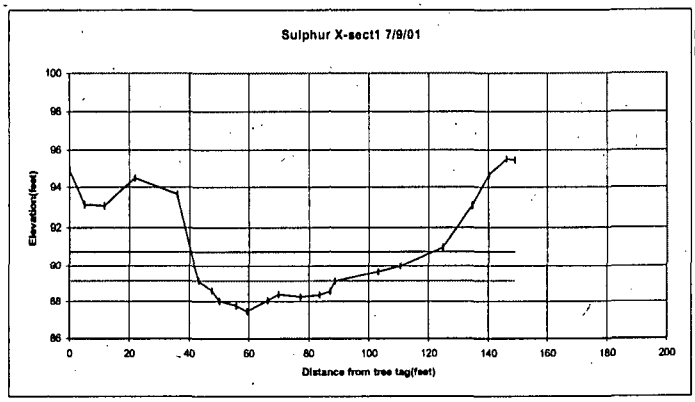
UTM X-coord = 707611.7
UTM Y-coord = 4401493.8

Sulphur x-sec 1

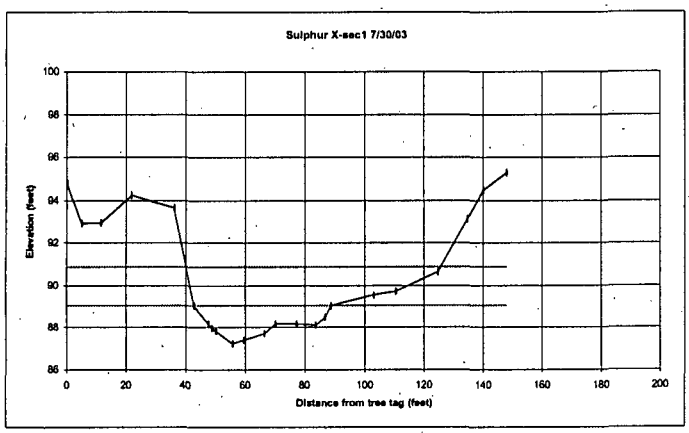


Blue Line=2x Bankfull Elev Red Line=Mean Bankfull Elev Dark Blue Line w/Markers=Basic Cross Section

Dist. From Left Stake	Total Elevation	Bankfull Elevation	2xBankfull Elevation
0.00	94.72	89.68	91.56
4.00	93.63	89.68	91.56
10.40	93.09	89.68	91.56
20.30	94.69	89.68	91.56
36.30	94.44	89.68	91.56
40.20	90.28	89.68	91.56
42.00	89.68	89.68	91.56
48.00	88.82	89.68	91.56
51.00	88.30	89.68	91.56
55.20	87.95	89.68	91.56
58.10	87.80	89.68	91.56
62.30	88.00	89.68	91.56
67.20	88.44	89.68	91.56
73.60	88.85	89.68	91.56
79.40	88.70	89.68	91.56
82.80	88.59	89.68	91.56
87.40	88.56	89.68	91.56
88.40	88.80	89.68	91.56
88.50	89.00	89.68	91.56
91.30	89.68	89.68	91.56
95.60	89.47	89.68	91.56
110.90	90.43	89.68	91.56
114.00	89.80	89.68	91.56
117.60	90.66	89.68	91.56
138.00	94.91	89.68	91.56
181.20	97.96	89.68	91.56



Dist. From left stake	Total depth	Total Elevation	Bankfull Elevation	2xBankfull Elevation	Notes
0	5.07	94.93	89.14	90.81	TBM-LB
5	6.86	93.14	89.14	90.81	
11.5	6.93	93.07	89.14	90.81	
21.7	5.5	94.5	89.14	90.81	
36	6.34	93.66	89.14	90.81	TOBL
43.2	10.86	89.14	89.14	90.81	BFL
47.5	11.4	88.6	89.14	90.81	
50	11.97	88.03	89.14	90.81	LEW
55.5	12.26	87.74	89.14	90.81	
59.3	12.53	87.47	89.14	90.81	T
66.2	11.96	88.04	89.14	90.81	
69.9	11.61	88.39	89.14	90.81	
77.1	11.75	88.25	89.14	90.81	
83.4	11.65	88.35	89.14	90.81	
86.9	11.45	88.55	89.14	90.81	REW
88.6	10.86	89.14	89.14	90.81	BFR
103	10.31	89.69	89.14	90.81	
110.6	10.01	89.99	89.14	90.81	
124.65	8.96	91.04	89.14	90.81	
134.6	6.91	93.09	89.14	90.81	
140.1	5.32	94.68	89.14	90.81	TOBR
146.1	4.48	95.52	89.14	90.81	
149	4.53	95.47	89.14	90.81	TBM-RB

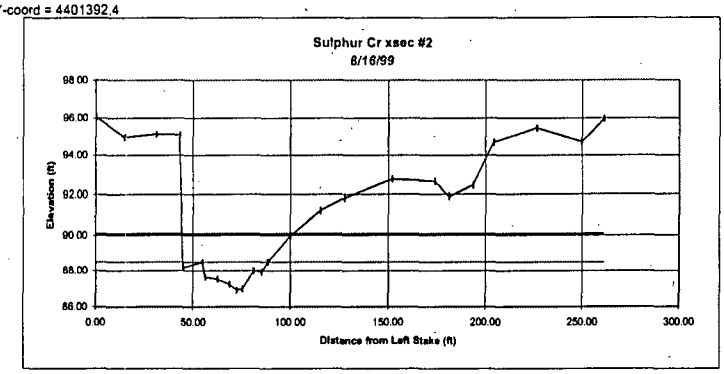


Dist from left stake	Total Depth	Bankfull depth	Total elevation	Bankfull elevation	2x Bankfull elevation	Notes
0	5.2		94.8	89.05	90.88	tbml
5	7.05		92.95	89.05	90.88	
11.5	7.02		92.98	89.05	90.88	
21.7	5.75		94.25	89.05	90.88	
36	6.34		93.66	89.05	90.88	tobl
42.8	10.95	0	89.05	89.05	90.88	bfl
47.5	11.81	0.86	88.19	89.05	90.88	
48.6	12.02	1.07	87.98	89.05	90.88	wel
50	12.16	1.21	87.84	89.05	90.88	
55.5	12.78	1.83	87.22	89.05	90.88	t
59.3	12.59	1.64	87.41	89.05	90.88	
66.2	12.28	1.33	87.72	89.05	90.88	
69.9	11.81	0.86	88.19	89.05	90.88	
77.1	11.82	0.87	88.18	89.05	90.88	
83.4	11.88	0.93	88.12	89.05	90.88	
86.5	11.49	0.54	88.51	89.05	90.88	wer
88.7	10.95	0	89.05	89.05	90.88	bfr
103	10.44		89.56	89.05	90.88	
110.6	10.26		89.74	89.05	90.88	
124.6	9.35		90.65	89.05	90.88	
134.6	6.85		93.15	89.05	90.88	
140.1	5.5		94.5	89.05	90.88	tobr
148	4.69		95.31	89.05	90.88	endr

TOPipe=Top of pipe/bench mark
LEW=Left edge of water
REW=Right edge of water
MPD=Maximum pool depth
TBM=Temporary bench mark
PCT=Pool tail crest
TP=Turning point
TOPool=Top of pool
S-MAX=Max depth sediment lens
LB=Left bank
RB=Right bank
TOB=Top of bank
BF=Bankfull
T=Thalweg
all measurements in feet

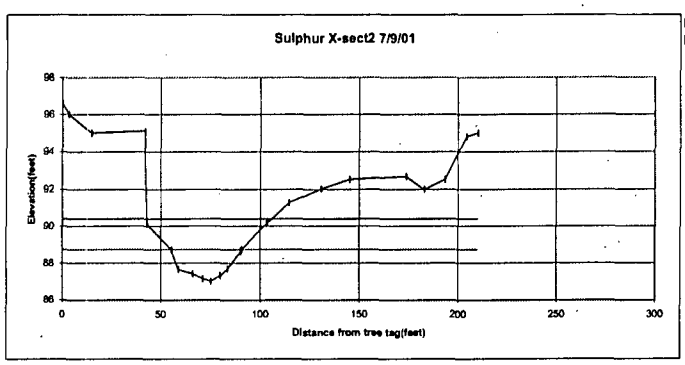
Three Year SUMMARY			Mean	Max	Width:	Flood-	Entrench-
	Cross-	Bankfull	Bankfull	Bankfull	Depth	prone	ment
Year	section	Width	Depth	Depth	Ratio	width	Ratio
1999	1	49.3	1.2	1.88	41.23	82.92	1.68
2001	1	45.40	0.88	1.67	51.60	84.40	1.86
2003	1	46.10	1.01	1.83	45.52	88.10	1.91

UTM X-coord = 707691.4
UTM Y-coord = 4401392.4

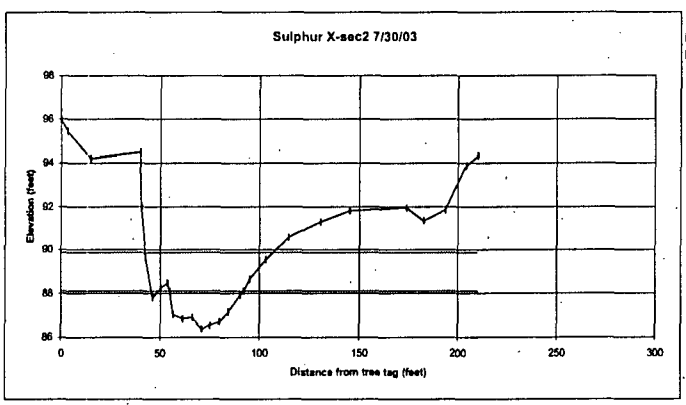


Dist. From Left Stake	Total Elevation	Bankfull Elevation	2xBankfull Elevation
0.00	96.08	88.5	90.1
15.00	94.95	88.5	90.1
31.00	95.12	88.5	90.1
43.00	95.10	88.5	90.1
45.00	88.17	88.5	90.1
54.90	88.50	88.5	90.1
58.00	87.64	88.5	90.1
62.50	87.55	88.5	90.1
68.50	87.24	88.5	90.1
72.20	86.90	88.5	90.1
75.00	86.95	88.5	90.1
80.90	87.99	88.5	90.1
85.00	87.92	88.5	90.1
88.30	88.50	88.5	90.1
100.00	89.99	88.5	90.1
115.00	91.23	88.5	90.1
127.50	91.85	88.5	90.1
152.00	92.75	88.5	90.1
173.70	92.63	88.50	90.1
181.00	91.91	88.5	90.1
193.50	92.42	88.5	90.1
204.30	94.69	88.5	90.1
226.00	95.47	88.5	90.1
249.70	94.72	88.5	90.1
281.00	95.95	88.5	90.1

Blue Line=2x Bankfull Elev **Red Line=Mean Bankfull Elev** **Dark Blue Line w/Markers=Basic Cross Section**



Dist. From left stake	Total depth	Total Elevation	Bankfull Elevation	2xBankfull Elevation	Notes
0	3.4	96.6	88.72	90.39	TBM-LB
3	3.95	96.05	88.72	90.39	
14.7	5	95	88.72	90.39	
42	4.9	95.1	88.72	90.39	TOBL
42.8	9.88	90.12	88.72	90.39	
55.4	11.28	88.72	88.72	90.39	BFL
58.8	12.34	87.66	88.72	90.39	LEW
65.9	12.57	87.43	88.72	90.39	
71	12.85	87.15	88.72	90.39	
75	12.95	87.05	88.72	90.39	T
79.7	12.65	87.35	88.72	90.39	
83.5	12.3	87.7	88.72	90.39	REW
89.9	11.36	88.64	88.72	90.39	
90.5	11.28	88.72	88.72	90.39	BFR
103	9.84	90.16	88.72	90.39	
114.4	8.71	91.29	88.72	90.39	
130.5	7.98	92.02	88.72	90.39	
145.1	7.46	92.54	88.72	90.39	
173.8	7.3	92.7	88.72	90.39	
182.7	8.01	91.99	88.72	90.39	
193.5	7.46	92.54	88.72	90.39	
204	5.19	94.81	88.72	90.39	TOBR
210	5	95	88.72	90.39	TBM-RB



Dist from left stake	Total Depth	Bankfull depth	Total elevation	Bankfull elevation	2x Bankfull elevation	Notes
0	4.02		95.98	88.12	89.87	tbml
3	4.56		95.44	88.12	89.87	
14.7	5.8		94.2	88.12	89.87	
40	5.53		94.47	88.12	89.87	tobl
40.6	7.99		92.01	88.12	89.87	
42.7	10.36		89.64	88.12	89.87	
46	12.17		87.83	88.12	89.87	
50	11.75		88.25	88.12	89.87	
53.6	11.52		88.48	88.12	89.87	
54.7	11.88	0	88.12	88.12	89.87	bfl
56.5	12.95	1.07	87.05	88.12	89.87	wel
61	13.14	1.26	86.86	88.12	89.87	
65.9	13.07	1.19	86.93	88.12	89.87	
71	13.63	1.75	86.37	88.12	89.87	t
75	13.46	1.58	86.54	88.12	89.87	
79.7	13.28	1.4	86.72	88.12	89.87	
84.2	12.83	0.95	87.17	88.12	89.87	wer
89.9	12.04	0.16	87.96	88.12	89.87	
91.9	11.88	0	88.12	88.12	89.87	bfr
95	11.34		88.66	88.12	89.87	
103	10.44		89.56	88.12	89.87	
114.4	9.41		90.59	88.12	89.87	
130.5	8.71		91.29	88.12	89.87	
145.1	8.2		91.8	88.12	89.87	
173.8	8.04		91.96	88.12	89.87	
182.7	8.64		91.36	88.12	89.87	
193.5	8.12		91.88	88.12	89.87	
204	6.11		93.89	88.12	89.87	tobr
210	5.68		94.32	88.12	89.87	endr

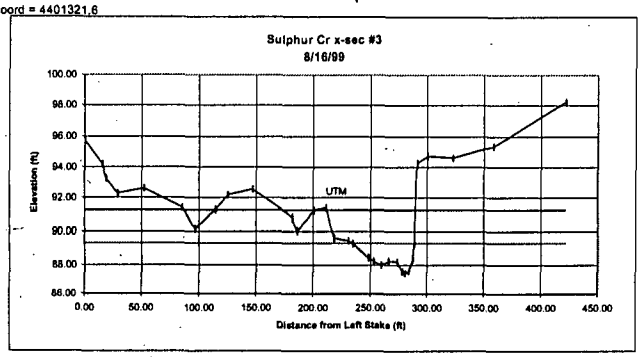
TOPipe=Top of pipe/bench mark
LEW=Left edge of water
REW=Right edge of water
MPD=Maximum pool depth
TBM=Temporary bench mark
PCT=Pool tail crest
TP=Turning point
TOPool=Top of pool
S-MAX=Max depth sediment lens
LB=Left bank
RB=Right bank
TOB=Top of bank
BF=Bankfull
T=Thalweg

Three Year SUMMARY

Year	Cross-section	Bankfull Width	Mean Bankfull Depth	Max Bankfull Depth	Width: Depth Ratio	Flood-prone width	Entrench-ment Ratio
1999	2	33.4	1.04	1.6	32.11	92.22	1.14
2001	2	35.10	1.00	1.67	35.10	59.90	1.70
2003	2	37.20	1.04	1.75	35.77	64.50	1.73

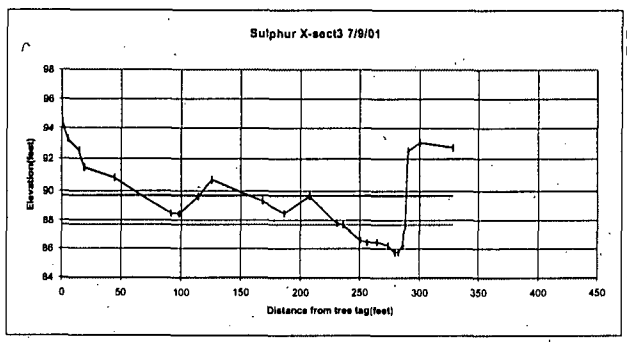
UTM X-coord = 707762.1
UTM Y-coord = 4401321.6

Sulphur Cr



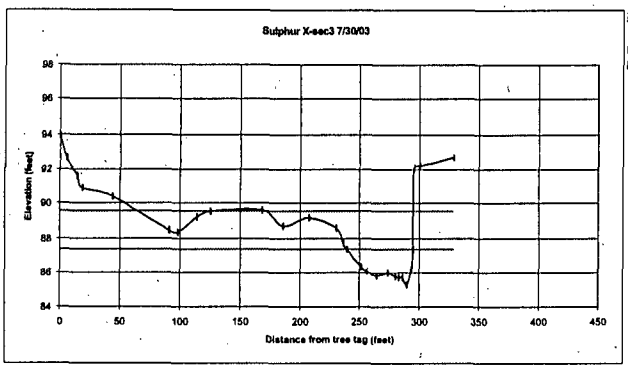
Dist. From Left Stake	Total Elevation	Bankfull Elevation	2xBankfull Elevation
0.00	95.75	89.32	91.21
15.00	94.19	89.32	91.21
19.00	93.25	89.32	91.21
28.80	92.30	89.32	91.21
52.00	92.63	89.32	91.21
85.00	91.39	89.32	91.21
96.30	90.19	89.32	91.21
114.00	91.27	89.32	91.21
125.00	92.23	89.32	91.21
147.00	92.58	89.32	91.21
181.50	90.82	89.32	91.21
186.00	90.06	89.32	91.21
200.50	91.22	89.32	91.21
211.00	91.40	89.32	91.21
218.20	89.64	89.32	91.21
230.80	89.46	89.32	91.21
234.70	89.32	89.32	91.21
248.00	88.46	89.32	91.21
253.00	88.24	89.32	91.21
259.30	87.97	89.32	91.21
265.70	88.23	89.32	91.21
273.60	88.19	89.32	91.21
277.90	87.59	89.32	91.21
280.60	87.43	89.32	91.21
284.00	87.61	89.32	91.21
287.00	88.37	89.32	91.21
288.50	89.32	89.32	91.21
291.00	94.27	89.32	91.21
300.00	94.76	89.32	91.21
322.00	94.60	89.32	91.21
358.00	95.35	89.32	91.21
422.00	98.28	89.32	91.21

Blue Line=2x Bankfull Elev **Red Line=Mean Bankfull Elev** **Dark Blue Line w/Markers=Basic Cross Section**
all measurements in feet



Sulphur 7/9/01

Dist. From left stake	Total depth	Total Elevation	Bankfull Elevation	2xBankfull Elevation	Notes
0	5.46	94.54	87.7	89.68	TBM-LB
5	6.71	93.29	87.7	89.68	
14.7	7.48	92.52	87.7	89.68	TOBL
18.6	8.52	91.48	87.7	89.68	
44	9.18	90.82	87.7	89.68	
91	11.5	88.5	87.7	89.68	
98	11.56	88.44	87.7	89.68	
114	10.36	89.64	87.7	89.68	
125.6	9.3	90.7	87.7	89.68	
168	10.64	89.36	87.7	89.68	
186	11.51	88.49	87.7	89.68	
207.6	10.31	89.69	87.7	89.68	
230	12.17	87.83	87.7	89.68	
235.6	12.3	87.7	87.7	89.68	BFL
250.5	13.41	86.59	87.7	89.68	LEW
256.2	13.57	86.43	87.7	89.68	
264.4	13.52	86.48	87.7	89.68	
273.7	13.81	86.19	87.7	89.68	
279.5	14.28	85.72	87.7	89.68	T
282.7	14.27	85.73	87.7	89.68	
286	13.71	86.29	87.7	89.68	REW
287.7	12.3	87.7	87.7	89.68	BFR
290.2	7.46	92.54	87.7	89.68	TOBR
300	6.92	93.08	87.7	89.68	
328	7.26	92.74	87.7	89.68	End



sulfur crosection-3 7/30/03

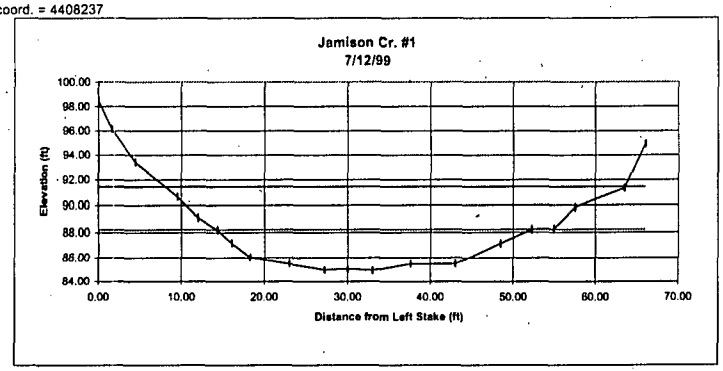
Dist from *left stake*	Total *Depth*	Bankfull *depth*	Total *elevation*	Bankfull *elevation*	2x Bankfull *elevation*	*Notes*
0	6.07		93.93	87.41	89.54	tbml
5	7.33		92.67	87.41	89.54	
14.7	8.39		91.61	87.41	89.54	tobl
18.6	9.12		90.88	87.41	89.54	
44	9.61		90.39	87.41	89.54	
91	11.52		88.48	87.41	89.54	
98	11.64		88.36	87.41	89.54	
114	10.77		89.23	87.41	89.54	
125.6	10.47		89.53	87.41	89.54	
168	10.41		89.59	87.41	89.54	
186	11.27		88.73	87.41	89.54	
207.6	10.82		89.18	87.41	89.54	
230	11.39		88.61	87.41	89.54	
235.6	12.24		87.76	87.41	89.54	
238.8	12.59	0	87.41	87.41	89.54	bfl
251	13.66	1.07	86.34	87.41	89.54	wel
256.2	13.92	1.33	86.08	87.41	89.54	
264.4	14.18	1.59	85.82	87.41	89.54	
273.7	13.99	1.4	86.01	87.41	89.54	
279.5	14.23	1.64	85.77	87.41	89.54	
282.7	14.28	1.69	85.72	87.41	89.54	
286	14.27	1.68	85.73	87.41	89.54	
289.3	14.72	2.13	85.28	87.41	89.54	t
293	13.71	1.12	86.29	87.41	89.54	wer
294	12.59	0	87.41	87.41	89.54	bfr
295	7.91		92.09	87.41	89.54	
300	7.8		92.2	87.41	89.54	
328	7.3		92.7	87.41	89.54	

TOPipe=Top of pipe/bench mark
LEW=Left edge of water
REW=Right edge of water
MPD=Maximum pool depth
TBM=Temporary bench mark
PCT=Pool tail crest
TP=Turning point
TOPool=Top of pool
S-MAX=Max depth sediment lens
LB=Left bank
RB=Right bank
TOB=Top of bank
BF=Bankfull
T=Thalweg

Three Year SUMMARY		Mean	Max	Width:	Flood-	Entrench
Year	Cross-section	Bankfull Width	Bankfull Depth	Bankfull Depth	Depth Ratio	prone width	ment Ratio
1999	3	53.8	1.31	1.89	41.07	202.76	3.77
2001	3	52.10	1.30	1.98	40.00	80.90	1.55
2003	3	55.20	1.37	2.13	40.44	218.60	3.96

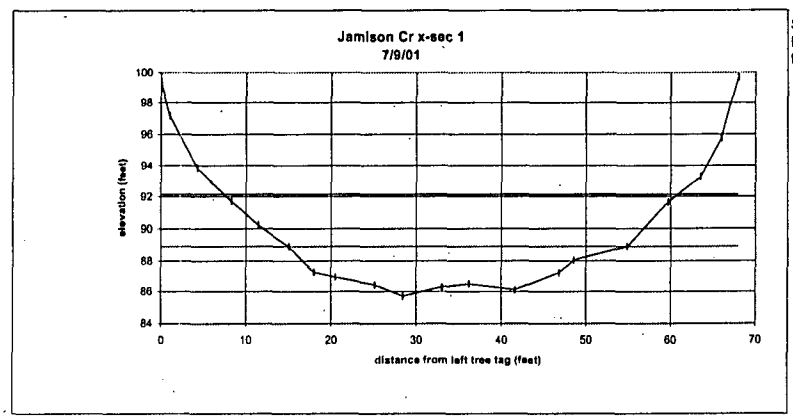
UTM X-coord.= 698556
UTM Y-coord. = 4408237

All measurements in feet



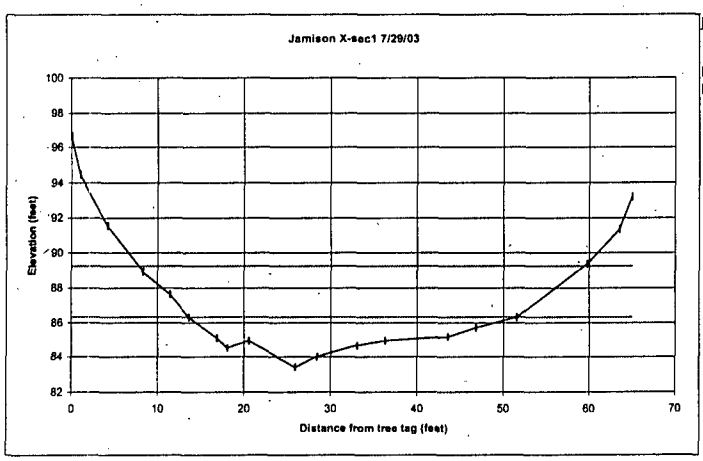
Dist. From Left Stake	Total Elevation	Bankfull Elevation	2xBankfull Elevation
0.00	98.53	88.19	91.43
1.60	96.18	88.19	91.43
4.40	93.45	88.19	91.43
9.50	90.66	88.19	91.43
12.00	89.10	88.19	91.43
14.30	88.19	88.19	91.43
16.00	87.19	88.19	91.43
18.30	86.05	88.19	91.43
23.00	85.51	88.19	91.43
27.20	85.00	88.19	91.43
30.00	85.07	88.19	91.43
33.00	84.95	88.19	91.43
37.60	85.52	88.19	91.43
43.00	85.52	88.19	91.43
48.40	87.15	88.19	91.43
52.20	88.19	88.19	91.43
54.90	88.26	88.19	91.43
57.50	89.80	88.19	91.43
63.50	91.31	88.19	91.43
66.00	94.95	88.19	91.43

Blue Line=2x Bankfull Elev **Red Line=Mean Bankfull Elev** **Dark Blue Line w/Markers=Basic Cross Section**



Survey 7/9/01

Dist. From left stake	Total depth	Total Elevation	Bankfull Elevation	2XBankfull Elevation	Notes
0	0.64	99.36	88.92	92.13	TBM-LB
1	2.82	97.18	88.92	92.13	
4.2	6.15	93.85	88.92	92.13	
8.3	8.31	91.69	88.92	92.13	
11.4	9.75	90.25	88.92	92.13	
15	11.08	88.92	88.92	92.13	BFL
18	12.74	87.26	88.92	92.13	LEW
20.5	13.05	86.95	88.92	92.13	
25.1	13.55	86.45	88.92	92.13	
28.4	14.29	85.71	88.92	92.13	T
33	13.71	86.29	88.92	92.13	
36.2	13.5	86.5	88.92	92.13	
41.6	13.89	86.11	88.92	92.13	
46.8	12.76	87.24	88.92	92.13	REW
48.5	11.94	88.06	88.92	92.13	
54.8	11.08	88.92	88.92	92.13	BFR
59.7	8.35	91.65	88.92	92.13	
63.5	6.71	93.29	88.92	92.13	
66	4.22	95.78	88.92	92.13	
68	0.3	99.7	88.92	92.13	End



jamison crosection-1
7/29/03

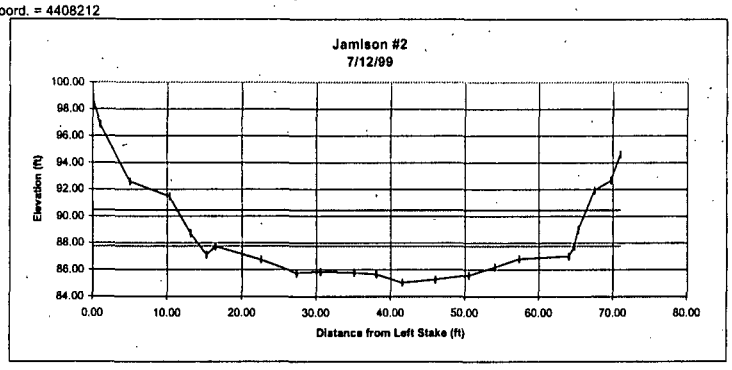
Dist from left stake	Total Depth	Bankfull depth	Total elevation	Bankfull elevation	2x Bankfull elevation	Notes
0	3.3		96.7	86.33	89.23	tbml
1	5.55		94.45	86.33	89.23	
4.2	8.44		91.56	86.33	89.23	
8.3	11.05		88.95	86.33	89.23	
11.4	12.33		87.67	86.33	89.23	
13.6	13.67	0	86.33	86.33	89.23	bfl
16.8	14.88	1.21	85.12	86.33	89.23	wel
18	15.46	1.79	84.54	86.33	89.23	
20.5	15.04	1.37	84.96	86.33	89.23	
25.9	16.57	2.9	83.43	86.33	89.23	t
28.4	15.97	2.3	84.03	86.33	89.23	
33	15.32	1.65	84.68	86.33	89.23	
36.2	15.04	1.37	84.96	86.33	89.23	
43.5	14.8	1.13	85.2	86.33	89.23	wer
46.8	14.26	0.59	85.74	86.33	89.23	
51.5	13.67	0	86.33	86.33	89.23	bfr
59.7	10.63		89.37	86.33	89.23	
63.5	8.64		91.36	86.33	89.23	
65	6.79		93.21	86.33	89.23	

TOPipe=Top of pipe/bench mark
LEW=Left edge of water
REW=Right edge of water
MPD=Maximum pool depth
TBM=Temporary bench mark
PCT=Pool tail crest
TP=Turning point
TOPool=Top of pool
S-MAX=Max. depth sediment lense
LB=Left bank
RB=Right bank
TOB=Top of bank
BF=Bankfull
T=Thalweg

Three Year SUMMARY			Mean	Max	Width:	Flood-	Entrench-
Year	Cross-section	Bankfull Width	Bankfull Depth	Bankfull Depth	Depth Ratio	prone width	ment Ratio
1999	1	37.90	2.42	3.24	15.68	55.49	1.46
2001	1	39.80	1.97	3.21	20.20	52.40	1.31
2003	1	37.90	1.43	2.90	26.50	50.80	1.34

UTM X-coord. = 698580
UTM Y-coord. = 4408212

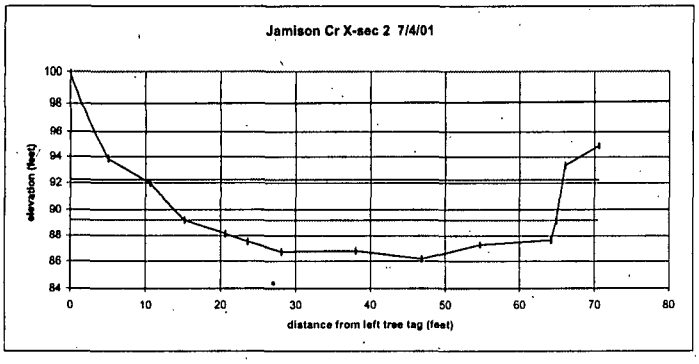
all measurements in feet



Dist. From Left Stake	Total Elevation	Bankfull Elevation	2xBankfull Elevation
0.00	98.76	87.75	90.46
1.00	96.87	87.75	90.46
5.00	92.60	87.75	90.46
10.30	91.47	87.75	90.46
13.10	88.72	87.75	90.46
15.20	87.12	87.75	90.46
16.40	87.75	87.75	90.46
22.50	86.75	87.75	90.46
27.30	85.76	87.75	90.46
30.50	85.86	87.75	90.46
35.00	85.78	87.75	90.46
38.00	85.66	87.75	90.46
41.50	85.04	87.75	90.46
46.00	85.28	87.75	90.46
50.50	85.60	87.75	90.46
54.00	86.20	87.75	90.46
57.30	86.81	87.75	90.46
64.00	87.01	87.75	90.46
64.70	87.75	87.75	90.46
65.30	88.99	87.75	90.46
67.50	91.92	87.75	90.46
69.70	92.70	87.75	90.46
71.00	94.63	87.75	90.46

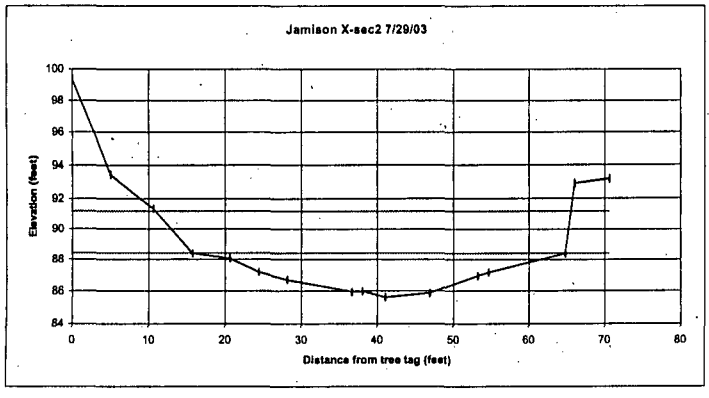
Blue Line=2x Bankfull Elev

Dark Blue Line w/Markers=Basic Cross Section



Jamison 7/9/01

Dist. From left stake	Total depth	Total Elevation	Bankfull Elevation	2xBankfull Elevation	Notes
0	0.14	99.86	89.21	92.23	TBM-LB
5	6.14	93.86	89.21	92.23	
10.6	8.02	91.98	89.21	92.23	
15.2	10.79	89.21	89.21	92.23	BFL
20.6	11.83	88.17	89.21	92.23	
23.6	12.45	87.55	89.21	92.23	LEW
28.1	13.25	86.75	89.21	92.23	
38	13.18	86.82	89.21	92.23	
46.85	13.81	86.19	89.21	92.23	T
54.65	12.7	87.3	89.21	92.23	REW
64.2	12.32	87.68	89.21	92.23	
64.9	10.79	89.21	89.21	92.23	BFR
66	6.66	93.34	89.21	92.23	
70.6	5.08	94.92	89.21	92.23	TBM-RB



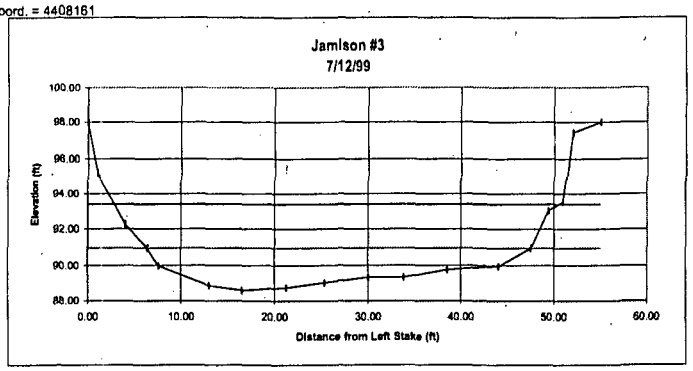
jamison crossection-2
7/29/03

Dist from left stake	Total Depth	Bankfull depth	Total elevation	Bankfull elevation	2x Bankfull elevation	Notes
0	0.6		99.4	88.42	91.21	tbml
5	6.52		93.48	88.42	91.21	
10.6	8.64		91.36	88.42	91.21	
15.7	11.58	0	88.42	88.42	91.21	bfl
20.6	11.92	0.34	88.08	88.42	91.21	
24.4	12.79	1.21	87.21	88.42	91.21	wel
28.1	13.28	1.7	86.72	88.42	91.21	
36.6	14.04	2.46	85.96	88.42	91.21	
38	13.99	2.41	86.01	88.42	91.21	
41	14.37	2.79	85.63	88.42	91.21	t
46.85	14.12	2.54	85.88	88.42	91.21	
53.2	13.03	1.45	86.97	88.42	91.21	wer
54.65	12.81	1.23	87.19	88.42	91.21	
64.8	11.58	0	88.42	88.42	91.21	bfr
66	7.09		92.91	88.42	91.21	
70.6	6.83		93.17	88.42	91.21	endr

TOPipe=Top of pipe/bench mark
LEW=Left edge of water
REW=Right edge of water
MPD=Maximum pool depth
TBM=Temporary bench mark
PCT=Pool tail crest
TP=Turning point
TOPool=Top of pool
S-MAX=Max. depth sediment lense
LB=Left bank
RB=Right bank
TOB=Top of bank
BF=Bankfull
T=Thalweg

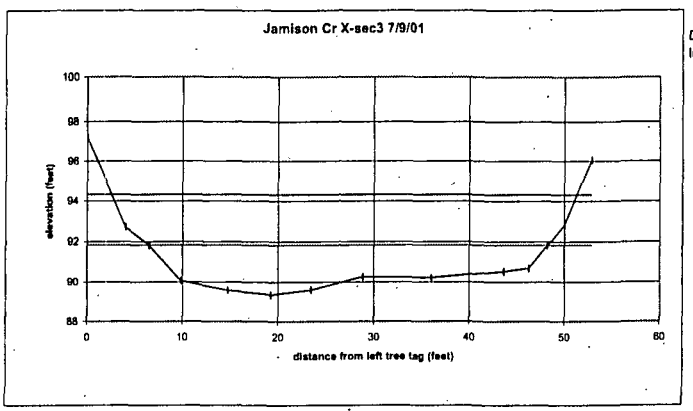
Three Year SUMMARY		Mean	Max	Width:	Flood-	Entrench-
	Cross-	Bankfull	Bankfull	Depth	prone	ment
Year	section	Width	Depth	Depth	Ratio	width	Ratio
1999	2	48.30	1.77	2.71	27.25	55.08	1.14
2001	2	49.70	1.75	3.02	28.40	54.85	1.10
2003	2	49.10	1.61	2.79	30.44	54.00	1.10

UTM X-coord. = 698613 all measurements in feet
UTM Y-coord. = 4408161



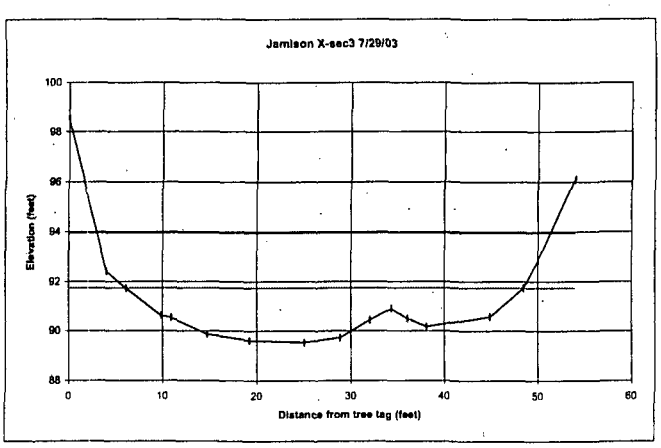
Dist. From Left Stake	Total Elevation	Bankfull Elevation	2xBankfull Elevation
0.00	98.00	90.98	93.37
1.00	95.20	90.98	93.37
4.00	92.26	90.98	93.37
6.40	90.98	90.98	93.37
7.80	89.98	90.98	93.37
13.00	88.85	90.98	93.37
16.50	88.59	90.98	93.37
21.20	88.75	90.98	93.37
25.30	89.03	90.98	93.37
30.00	89.33	90.98	93.37
33.80	89.33	90.98	93.37
38.50	89.76	90.98	93.37
44.00	89.97	90.98	93.37
47.50	90.98	90.98	93.37
49.40	93.01	90.98	93.37
51.00	93.55	90.98	93.37
52.00	97.39	90.98	93.37
55.00	98.00	90.98	93.37

Blue Line=2x Bankfull Elev **Red Line=Mean Bankfull Elev** **Dark Blue Line w/Markers=Basic Cross Section**



Jamison 7/9/01

Dist. From left stake	Total depth	Total Elevation	Bankfull Elevation	2xBankfull Elevation	Notes
0	2.76	97.24	91.83	94.31	TBM-LB
4	7.3	92.7	91.83	94.31	
6.5	8.17	91.83	91.83	94.31	BFL
9.85	9.94	90.06	91.83	94.31	LEW
14.7	10.42	89.58	91.83	94.31	
19.2	10.65	89.35	91.83	94.31	T
23.4	10.41	89.59	91.83	94.31	
28.8	9.75	90.25	91.83	94.31	
36	9.79	90.21	91.83	94.31	REW
43.6	9.47	90.53	91.83	94.31	
46.2	9.32	90.68	91.83	94.31	
48.2	8.17	91.83	91.83	94.31	BFR
50	7.16	92.84	91.83	94.31	
52.8	3.94	96.06	91.83	94.31	TBM-RB



jamison crosection-3
7/29/03

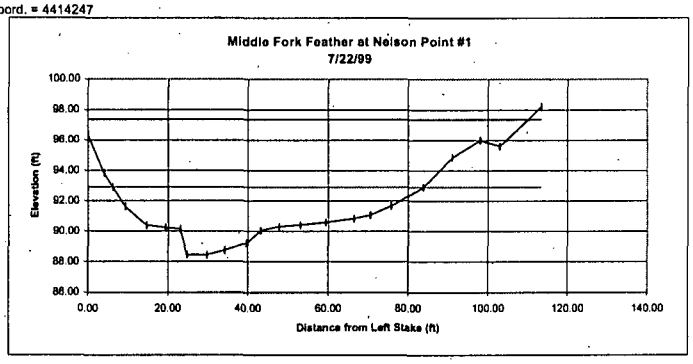
Dist from left stake	Total Depth	Bankfull depth	Total elevation	bankfull elevation	2x Bankfull elevation	Notes
0	1.46		98.54	91.74	93.95	tbml
4	7.57		92.43	91.74	93.95	
6.1	8.26	0	91.74	91.74	93.95	bfl
9.85	9.38	1.12	90.62	91.74	93.95	
10.9	9.47	1.21	90.53	91.74	93.95	wel
14.7	10.14	1.88	89.86	91.74	93.95	
19.2	10.39	2.13	89.61	91.74	93.95	
25	10.47	2.21	89.53	91.74	93.95	t
28.8	10.27	2.01	89.73	91.74	93.95	
32	9.57	1.31	90.43	91.74	93.95	gbr
34.3	9.1	0.84	90.9	91.74	93.95	gbr
36	9.5	1.24	90.5	91.74	93.95	gbr
38	9.84	1.58	90.16	91.74	93.95	
44.8	9.43	1.17	90.57	91.74	93.95	wer
48.4	8.26	0	91.74	91.74	93.95	bfr
50	7.13		92.87	91.74	93.95	
53.9	3.88		96.12	91.74	93.95	endr

TOPipe=Top of pipe/bench mark
LEW=Left edge of water
REW=Right edge of water
MPD=Maximum pool depth
TBM=Temporary bench mark
PCT=Pool tail crest
TP=Turning point
TOPool=Top of pool
S-MAX=Max. depth sediment lense
LB=Left bank
RB=Right bank
TOB=Top of bank
BF=Bankfull
T=Thalweg

Three Year SUMMARY			Mean	Max	Width:	Flood-	Entrench-
	Cross-	Bankfull	Bankfull	Bankfull	Depth	prone	ment
Year	section	Width	Depth	Depth	Ratio	width	Ratio
1999	3	41.10	1.69	2.39	24.29	47.60	1.16
2001	3	41.70	1.59	2.48	26.22	48.30	1.15
2003	3	42.30	1.39	2.21	30.40	47.90	1.13

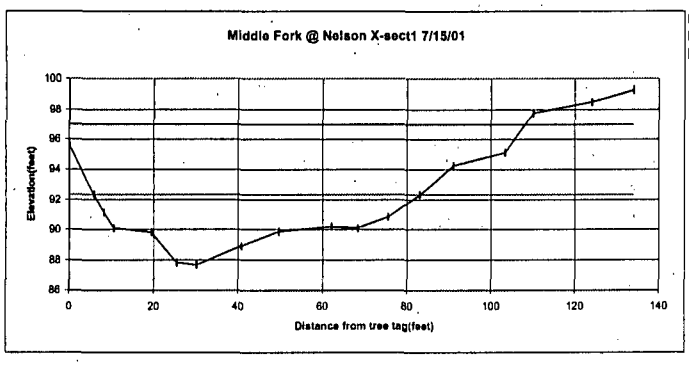
UTM X-coord. = 683463
UTM Y-coord. = 4414247

All measurements are in feet



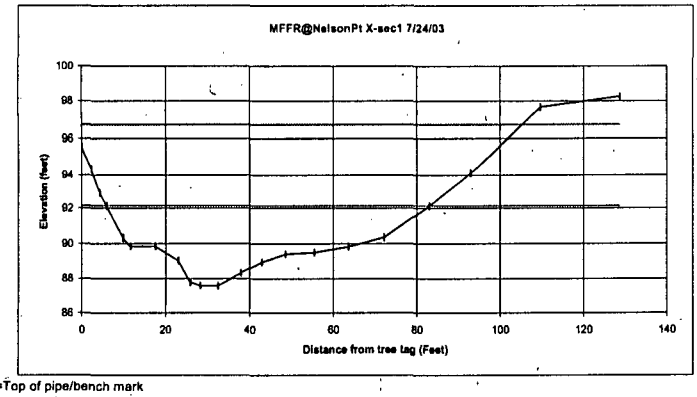
Dist. From Left Stake	Total Elevation	Bankfull Elevation	2xBankfull Elevation
0.00	96.36	92.91	97.37
4.00	93.82	92.91	97.37
6.20	92.91	92.91	97.37
9.30	91.66	92.91	97.37
14.60	90.41	92.91	97.37
19.30	90.25	92.91	97.37
23.00	90.16	92.91	97.37
24.70	88.48	92.91	97.37
29.70	88.45	92.91	97.37
34.20	88.76	92.91	97.37
39.40	89.22	92.91	97.37
43.00	90.07	92.91	97.37
47.60	90.34	92.91	97.37
52.90	90.44	92.91	97.37
59.20	90.62	92.91	97.37
66.30	90.86	92.91	97.37
70.40	91.09	92.91	97.37
75.70	91.70	92.91	97.37
83.70	92.91	92.91	97.37
91.00	94.88	92.91	97.37
98.00	96.00	92.91	97.37
103.00	95.60	92.91	97.37
113.40	98.22	92.91	97.37

Blue Line=2x Bankfull Elev **Red Line=Mean Bankfull Elev** **Dark Blue Line w/Markers=Basic Cross Section**



MFFR Nelson 7/15/01

Dist. From left stake	Total depth	Total Elevation	Bankfull Elevation	2xBankfull Elevation	Notes
0	4.38	95.62	92.34	96.99	TBM-LB
5.8	7.66	92.34	92.34	96.99	BFL
8.2	8.86	91.14	92.34	96.99	
10.5	9.89	90.11	92.34	96.99	LEW
19.4	10.19	89.81	92.34	96.99	
25.4	12.16	87.84	92.34	96.99	
30	12.31	87.69	92.34	96.99	T
40.6	11.08	88.92	92.34	96.99	
49.5	10.13	89.87	92.34	96.99	
62	9.8	90.2	92.34	96.99	
68.3	9.9	90.1	92.34	96.99	REW
75.5	9.14	90.86	92.34	96.99	
83	7.66	92.34	92.34	96.99	BFR
91	5.75	94.25	92.34	96.99	
103.4	4.89	95.11	92.34	96.99	
110	2.21	97.79	92.34	96.99	
124	1.45	98.55	92.34	96.99	
134	0.68	99.32	92.34	96.99	TBM-RB



mffr at nelson crossect-1
7/24/03

Dist from left stake	Total Depth	Bankfull depth	Total elevation	Bankfull elevation	2x Bankfull elevation	Notes
0	4.45		95.55	92.14	96.72	tbmi
2.3	5.64		94.36	92.14	96.72	
4.3	7.08		92.92	92.14	96.72	
5.9	7.86	0	92.14	92.14	96.72	bfl
9.8	9.68	1.82	90.32	92.14	96.72	wel
11.6	10.13	2.27	89.87	92.14	96.72	
17.5	10.13	2.27	89.87	92.14	96.72	
23	10.95	3.09	89.05	92.14	96.72	
25.8	12.21	4.35	87.79	92.14	96.72	
28.2	12.42	4.56	87.58	92.14	96.72	
32.4	12.44	4.58	87.56	92.14	96.72	t
37.9	11.66	3.8	88.34	92.14	96.72	
42.8	11.05	3.19	88.95	92.14	96.72	
48.5	10.58	2.72	89.42	92.14	96.72	
55.4	10.49	2.63	89.51	92.14	96.72	
63.5	10.16	2.3	89.84	92.14	96.72	
72.1	9.63	1.77	90.37	92.14	96.72	wer
82.9	7.86	0	92.14	92.14	96.72	bfr
92.8	5.87		94.13	92.14	96.72	
109.6	2.34		97.66	92.14	96.72	
128.7	1.74		98.26	92.14	96.72	endr

TOPipe=Top of pipe/bench mark
LEW=Left edge of water
REW=Right edge of water
MPD=Maximum pool depth
TBM=Temporary bench mark
PCT=Pool tail crest
TP=Turning point
TOPool=Top of pool
S-MAX=Max. depth sediment lense
LB=Left bank
RB=Right bank
TOB=Top of bank
BF=Bankfull
T=Thalweg

Three Year SUMMARY		Mean	Max	Width:	Flood-	Entrench-
	Cross-	Bankfull	Bankfull	Depth	prone	ment
Year	section	Width	Depth	Depth	Ratio	width	Ratio
1999	1	77.50	2.74	4.46	28.26	110.03	1.42
2001	1	77.20	2.44	4.65	31.63	108.00	1.40
2003	1	77.00	2.81	4.58	27.40	113.70	1.48

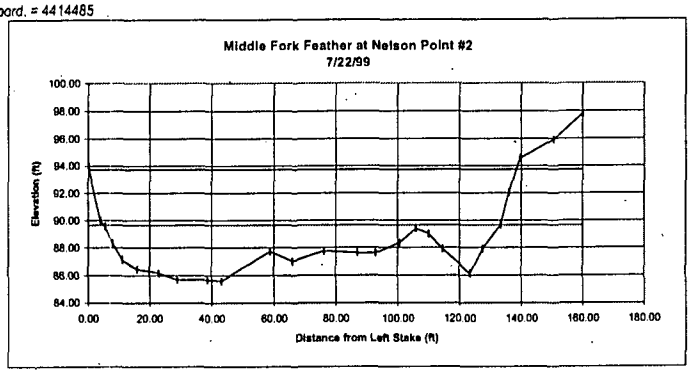
2003 ENTRENCHMENT

bankfull width	77		
max bankfull depth	4.58	floodprone width	
2x max bankfull depth	9.16	right bank	left bank
width at c	113.7	108.3	5.4
entrenchment ratio=D/	1.48		

2003 WIDTH TO DEPTH RATIO

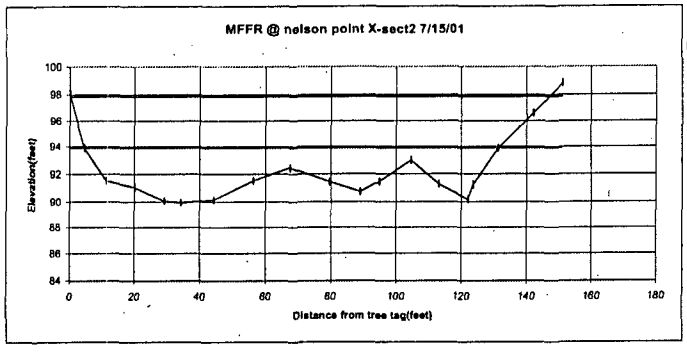
mean bank	2.81
width: dept	27.40

UTM X-coord. = 683461
UTM Y-coord. = 4414485



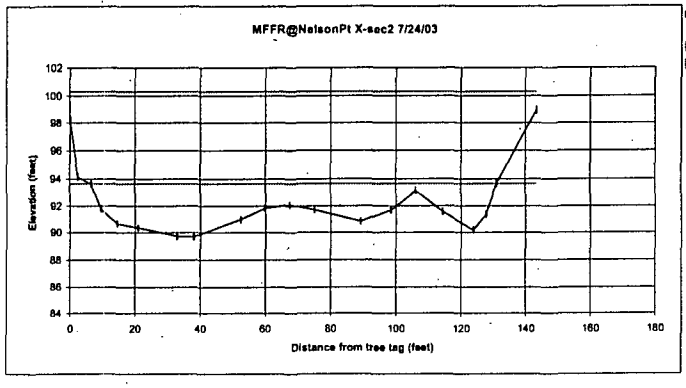
Blue Line=2x Bankfull Elev Red Line=Mean Bankfull Elev Dark Blue Line w/Markers=Basic Cross Section

Dist. From Left Stake	Total Elevation	Bankfull Elevation	2xBankfull Elevation
0.00	94.00	89.655	93.71
4.00	90.00	89.655	93.71
5.50	89.61	89.655	93.71
7.90	88.36	89.655	93.71
11.00	87.16	89.655	93.71
16.00	86.46	89.655	93.71
22.90	86.18	89.655	93.71
28.80	85.70	89.655	93.71
38.50	85.71	89.655	93.71
43.00	85.60	89.655	93.71
58.60	87.76	89.655	93.71
65.80	87.03	89.655	93.71
76.00	87.78	89.655	93.71
86.80	87.64	89.655	93.71
92.70	87.61	89.655	93.71
100.50	88.37	89.655	93.71
105.80	89.42	89.655	93.71
110.00	89.02	89.655	93.71
114.40	87.93	89.66	93.71
123.50	86.15	89.655	93.71
127.40	87.93	89.655	93.71
133.40	89.70	89.655	93.71
136.00	92.03	89.655	93.71
139.50	94.57	89.655	93.71
150.50	95.95	89.655	93.71
160.00	97.82	89.655	93.71



MFFR Nelson 7/15/01

Dist. From left stake	Total depth	Total Elevation	Bankfull Elevation	2xBankfull Elevation	Notes
0	1.91	98.09	93.89	97.85	TBM-LB
4.5	6.11	93.89	93.89	97.85	BFL
11.3	8.46	91.54	93.89	97.85	LEW
20	8.94	91.06	93.89	97.85	
29	9.93	90.07	93.89	97.85	
34	10.07	89.93	93.89	97.85	T
44.1	9.84	90.16	93.89	97.85	
56.2	8.45	91.55	93.89	97.85	REW
67.4	7.53	92.47	93.89	97.85	
79.4	8.56	91.44	93.89	97.85	LEW
88.8	9.27	90.73	93.89	97.85	
94.8	8.52	91.48	93.89	97.85	REW
104.5	6.98	93.02	93.89	97.85	
113	8.71	91.29	93.89	97.85	LEW
122	9.81	90.19	93.89	97.85	
123.5	8.75	91.25	93.89	97.85	REW
131.3	6.11	93.89	93.89	97.85	BFR
142	3.37	96.63	93.89	97.85	
151	1.18	98.82	93.89	97.85	



mffr at nelson crossect-2 7/24/03

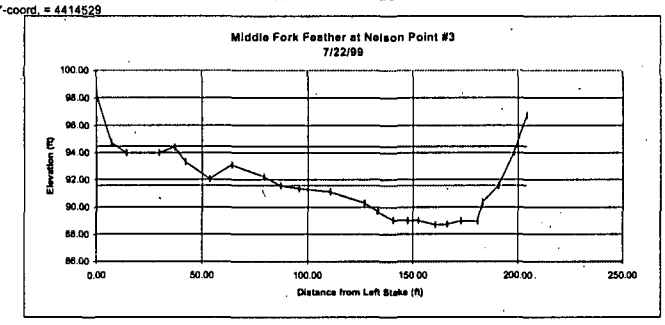
Dist from left stake	Total Depth	Bankfull depth	Total elevation	Bankfull elevation	2x Bankfull elevation	Notes
0	1.7		98.3	93.64	100.3	tbml
2.5	5.85		94.15	93.64	100.3	
6.5	6.36	0	93.64	93.64	100.3	bfl
9.5	8.2	1.84	91.8	93.64	100.3	wel
14.4	9.33	2.97	90.67	93.64	100.3	
20.8	9.63	3.27	90.37	93.64	100.3	
32.7	10.26	3.9	89.74	93.64	100.3	
37.9	10.32	3.96	89.68	93.64	100.3	t
52.3	9.02	2.66	90.98	93.64	100.3	
59.7	8.16	1.8	91.84	93.64	100.3	wel mid ch bar
67.3	7.91	1.55	92.09	93.64	100.3	
74.9	8.26	1.9	91.74	93.64	100.3	wer mid ch bar
89	9.17	2.81	90.83	93.64	100.3	
98.3	8.29	1.93	91.71	93.64	100.3	wel mid ch bar
106	6.85	0.49	93.15	93.64	100.3	
114.2	8.4	2.04	91.6	93.64	100.3	wer mid ch bar
123.7	9.82	3.46	90.18	93.64	100.3	
127.8	8.6	2.24	91.4	93.64	100.3	wer
130.9	6.36	0	93.64	93.64	100.3	bfr
143.3	1.02		98.98	93.64	100.3	endr

TOPipe=Top of pipe/bench mark
LEW=Left edge of water
REW=Right edge of water
MPD=Maximum pool depth
TBM=Temporary bench mark
PCT=Pool tail crest
TP=Turning point
TOPool=Top of pool
S-MAX=Max depth sediment lens
LB=Left bank
RB=Right bank
TOB=Top of bank
BF=Bankfull
T=Thalweg

Three Year SUMMARY		Mean	Max	Width:	Flood-	Entrench-	
	Cross-	Bankfull	Bankfull	Depth	prone	ment	
Year	section	Width	Depth	Depth	Ratio	width	Ratio
1999	2	127.90	2.28	4.01	55.99	138.02	1.08
2001	2	126.80	2.55	3.96	49.70	145.00	1.14
2003	2	124.40	2.30	3.96	54.06	138.60	1.11

UTM X-coord. = 683697
UTM Y-coord. = 4414529

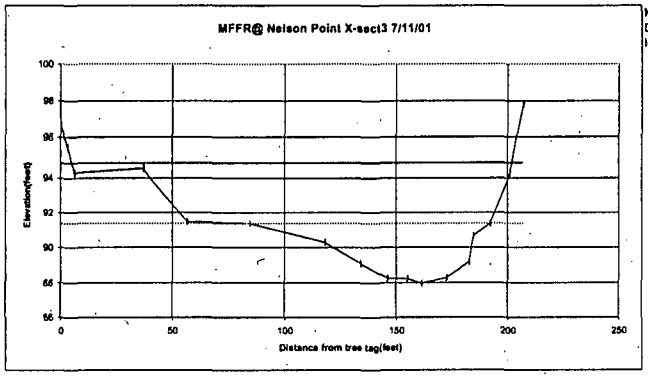
All measurements are in feet



Dist. From Left Stake	Total Elevation
0.00	98.26
7.00	94.75
14.00	94.00
29.40	93.98
37.00	94.41
42.00	93.32
53.40	92.08
64.00	93.10
79.00	92.26
87.00	91.57
95.60	91.38
110.40	91.14
126.70	90.32
133.00	89.71
140.50	89.07
147.30	89.02
152.50	89.03
160.50	88.70
166.20	88.75
172.70	89.00
180.60	88.95
182.90	90.36
190.50	91.57

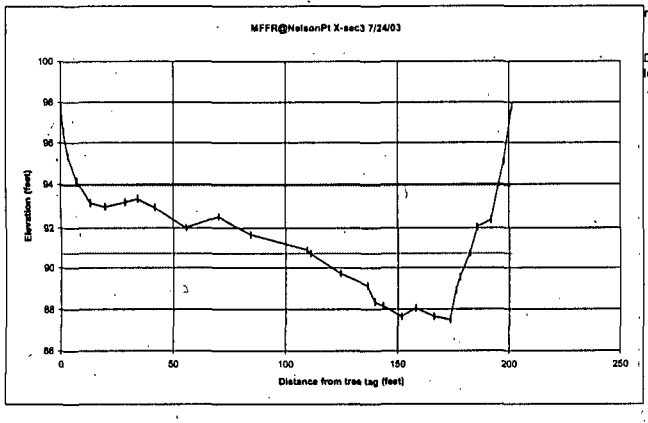
UTM X-coord. = 683698
UTM Y-coord. = 4414530

Blue Line=2x Bankfull Elev Red Line=Mean Bankfull Elev Dark Blue Line w/Markers=Basic Cross Section



MFFR Nelson 7/15/01

Dist. From left stake	Total depth	Total Elevation	Bankfull Elevation	2xBankfull Elevation	Notes
0	3.35	96.65	91.38	94.78	TBM-LB
3	4.46	95.54	91.38	94.78	
6.1	5.74	94.26	91.38	94.78	
37	5.5	94.5	91.38	94.78	
56.4	8.52	91.48	91.38	94.78	
64.4	8.62	91.38	91.38	94.78	BFL
118	9.7	90.3	91.38	94.78	
133.9	10.9	89.1	91.38	94.78	LEW
146	11.72	88.28	91.38	94.78	
154.9	11.74	88.26	91.38	94.78	
161.5	12.02	87.98	91.38	94.78	T
172.4	11.69	88.31	91.38	94.78	
182.6	10.8	89.2	91.38	94.78	REW
184.5	9.34	90.66	91.38	94.78	
192.15	8.62	91.38	91.38	94.78	BFR
201	5.74	94.26	91.38	94.78	
207	2.16	97.84	91.38	94.78	TBM-RB



mffr at nelson crossection-3
7/24/03

Dist from left stake	Total Depth	Bankfull depth	Total elevation	Bankfull elevation	2x Bankfull elevation	Notes	
0	2.21		97.79	90.74	93.96	tbml	
0.9	3.36		96.64	90.74	93.96		
3	4.64		95.36	90.74	93.96		
7	5.82		94.18	90.74	93.96	tobl	
13	6.84		93.16	90.74	93.96		
19.6	7		93	90.74	93.96		
28.5	6.81		93.19	90.74	93.96		
34	6.65		93.35	90.74	93.96		
41.7	7.04		92.96	90.74	93.96		
55.5	7.97		92.03	90.74	93.96		
70	7.46		92.54	90.74	93.96		A
84	8.32		91.68	90.74	93.96		B
109.3	9.09		90.91	90.74	93.96		C
110.8	9.26	0	90.74	90.74	93.96	bfl	D
124.2	10.28	1.02	89.72	90.74	93.96		
136.2	10.86	1.6	89.14	90.74	93.96	wel	
139.5	11.63	2.37	88.37	90.74	93.96		
143.2	11.83	2.57	88.17	90.74	93.96		A
151.5	12.32	3.06	87.68	90.74	93.96		B
157.8	11.94	2.68	88.06	90.74	93.96		
166	12.33	3.07	87.67	90.74	93.96		
173.3	12.48	3.22	87.52	90.74	93.96	t	
176	11.09	1.83	88.91	90.74	93.96	wer	
177.8	10.45	1.19	89.55	90.74	93.96		
182	9.26	0	90.74	90.74	93.96	bfr	
185.5	7.94		92.06	90.74	93.96		
191.8	7.62		92.38	90.74	93.96		
197.5	4.92		95.08	90.74	93.96		
201.2	2.16		97.84	90.74	93.96	endr	

TOPipe=Top of pipe/bench mark
LEW=Left edge of water
REW=Right edge of water
MPD=Maximum pool depth
TBM=Temporary bench mark
PCT=Pool tail crest
TP=Turning point
TOPool=Top of pool
S-MAX=Max depth sediment lens
LB=Left bank
RB=Right bank
TOB=Top of bank
BF=Bankfull
T=Thalweg

Three Year SUMMARY			Mean	Max	Width:	Flood-	Entrench-
Year	Cross-section	Bankfull Width	Bankfull Depth	Bankfull Depth	Depth Ratio	prone width	ment Ratio
1999	3	103.50	1.95	2.87	53.05	189.01	1.83
2001	3	107.75	2.10	3.40	51.30	197.90	1.83
2003	3	71.20	2.06	3.22	34.64	185.10	2.60

2003 ENTRENCHMENT

bankfull width	71.2		
max bankfull depth	3.22	floodprone width	
2x max bankfull depth	*6.44*	*right bank*	*left bank*
width at c	185.1	195.1	10
entrenchment ratio=D/.	2.60		

2003 WIDTH TO DEPTH RATIO

Bankfull width	71.2
mean bankfull depth	2.06
width: depthratio=A/B	34.64

APPENDIX D – PEBBLE COUNT ANALYSIS
Stream Condition Inventory
Sediment Data Analysis
12/8/03

Background:

The Feather River Coordinated Resource Management (FRCRM) group, under a variety of funding programs, has been conducting watershed trend monitoring since 1999. This monitoring has utilized a variety of metrics at multiple spatial and temporal scales. The purpose of this monitoring is to ascertain change (trends) in watershed function. Utilization of multiple metrics over a range of time and space scales allows for analyses that incorporate both qualitative and quantitative data and observations. The following is a draft analysis of quantified sediment data buttressed with qualitative observation of sediment related inputs (discharge and sediment supply) at the watershed (spatial) scale over the previous decade (temporal) scale.

Flow Regime/Sediment Input Discussion:

The Feather River watershed has experienced two (2) distinct climatic regimes over the last decade. Water year (WY) 1992-3 was the first year of a six-year period (WY92-WY98) of much above normal precipitation. WY93-4 was the only dry year in the period. This period was characterized by frequent moderate to large flood events culminating in the 1997 flood of record.
WY1999-0 ushered in a four-year period (WY99-0 to present) of below normal precipitation with no flood* events. WY 2002-3 was the only year with normal precipitation, largely due to a very wet spring, which maintained an extended period of elevated in-channel flows.
Significant Flood Dates: Jan. '93, Jan. '95, Mar. '95, May '95, Jan. '97

Table #1- Total Annual Precipitation (inches of water); (Wilcox data, 1995-03, Genesee, Ca.).

WY 95-96	WY 96-97	WY 97-98	WY 98-99	WY 99-00	WY 00-01	WY 01-02	WY 02-03	WY Ave.
54.55	58.90	60.70	47.80	43.65	23.60	33.60	49.60	46.55

Typically, large floods deliver significant sediment and debris inputs to the channel system throughout the watershed. Depending on magnitude and frequency these inputs result in a dynamic channel response of interrelated processes. The 1997 flood of record (~48,000 cfs./Indian Cr. @ Crescent Mills) affected each subwatershed differently. However, the net result was locally catastrophic delivery of sediments and debris from tributaries to the mainstem channels (Indian Creek, Spanish Creek, NFFR and MFFR). The more frequent, longer duration low flows begin a process of re-working the deposited materials concurrent with ongoing vegetation recovery.

*Flood as used in this context means no flows exceeding a 2-year event at the watershed scale.

Sampling Methodologies:

The FRCRM has used two (2) distinct methodologies to sample sediment composition. The first is bulk sampling of bar and bed materials using a sieve analysis to derive compositional attributes of fully mobilized sediments by size/weight. The second is to conduct pebble counts to derive compositional attributes of channel bed surfaces by size (median diameter). The initial sampling conducted in 1999 collected bulk samples, still being analyzed. The 2001 and 2003 sampling consisted of pebble counts.

The above differentiation is done for two (2) reasons. Bulk sampling is very expensive. While the data derived is detailed and accurate, subsequent sampling is only useful if the intervening flow regime has resulted in significant mobilization of the bed and substrate. Significant bed mobilizing flows have not occurred since 1998.

Pebble counts are inherently skewed toward the larger particles that resist movement at flows less than bankfull. However, as the watershed responds to, and processes, the inputs from the preceding wet period trends in the distribution of sediments on the surface can be discerned in the ongoing below normal flow regime.

Analysis Methodology:

Sediment analyses typically use metrics that represent median particle sizes by size class and annotated as D_*. D_* expresses the percent of particles in the sample that are less than D value (i.e. D_{35} expresses that 35% of the particles are finer than this size or size class. Stream Condition Inventory protocols have typically looked at D_{50} value as the analysis metric. This value is also used frequently in stream classification systems to characterize the physical bed surface (e.g. sand, gravel, cobble, etc.). While the D_{50} absolute value may change slightly (e.g. 39 mm to 48 mm) it is still a gravel bed channel. A D_{50} change that reflects a gross bed character change (e.g., from a gravel bed to sand bed channel) indicates a major perturbation in watershed condition. A change on this scale would likely be detected with other monitoring metrics.

When analyzing trend changes in watershed condition and its effects on water quality and biological processes other size thresholds are more sensitive indicators of condition change. This analysis explores the changes represented by three size thresholds: D_{35}, D_{50}, D_{84}. The D_{35} values characterize the response of the finer sediments that can be mobilized at most elevated flows. High percentages of fine sediments have been linked to watershed disturbance as a source and as a biological stressor in the aquatic environment.

The D_{84} threshold has been determined to be the portion of the bed mobilized most frequently at the bankfull discharge. These are the materials that determine channel bed form. The frequency of mobilization also determines the optimum habitat opportunities of a particular channel reach (i.e., macro-invertebrates, spawning, etc.).

Analysis Summary:

The purpose of this analysis is to tentatively posit which stream reaches are improving, static or declining based on sediment size. Alternatively, these data should still be considered as baseline conditions. The data sets are limited (2 samples) over a three-year period 2000-2003. The criteria used to evaluate the data sets compared three size thresholds (D_{35}, D_{50}, D_{84}) between the 2001 and 2003 samples. The underlying inferences are: 1.) a coarsening of fine sediments indicate a reduction in supply/deposition of damaging silts and sands; 2.) a static trend in the median sizes indicates no major perturbations in the watershed; and, 3.) a fining of the coarser sediments would indicate effective re-working of bed pavements deposited by the previous floods, which provides cleansing and aeration for aquatic organisms.

The composite trend that would indicate improvement would be a coarsening of the fine sediments, static or coarsening of median size and a fining of the larger particles. If the data showed improvement in 2 of 3 threshold values, the channel was improving. If there was improvement in only one threshold and no significant decline in the others the trend was considered static. If there was

decline in 2 or more thresholds the reach is in decline. The following Table #2 gives the threshold values for each reach and the trend determination.

Table #2- D_* Values for Analysis (in millimeters)

Reach Name	Data Year- 2001			Data Year- 2003			Trend
	D_{35}	D_{50}	D_{84}	D_{35}	D_{50}	D_{84}	
Last Chance below Murdoch	8.3	18	38	15.5	20	35	+
Indian Cr. @ Flournoy Br.	24	30	53	21	27	45	=
Indian Cr. below T-ville	22.5	35	69	31	36	60	+
Lights Creek	15	18	33	14.5	16	26	=
Wolf Creek	9.8	15.5	32	16.5	18.5	33	+
Indian Cr. above Spanish Cr.**	42	102	330	62	104	270	+
Rock Creek @ Spanish Cr.	19	22	79	27	37	100	+
Spanish Cr. above Greenhorn	7.8	11	23	14	17	28	+
Greenhorn Cr. above Spanish	17	21.5	37	15	18	29.5	-
Spanish Cr. above Indian	20	29.5	73	18.5	28.5	73	=
EBNFFR above NFFR**	74	102	110	53	95	105	+
NFFR above Lk. Almanor**	14	60	220	16	110	340	-
Butt Creek	18	29	75	22	27	52	+
NFFR above EBNFFR	41	55	93	19.5	30	130	-
MFFR @ Beckwourth	3.4	4.9	14	13	15	22	+
Sulphur Creek	19.5	31	73	25	39	92	+
Jamison Creek @ MFFR	21.5	34	75	23	32	75	=
MFFR @ Nelson Creek**	70	92	160	55	73	150	+
	Data Year- 1995			Data Year- 2003			
	D_{35}	D_{50}	D_{84}	D_{35}	D_{50}	D_{84}	
Red Clover below Chase Br.	4.7	15	74	17	22.5	560	+
Hungry Creek	24	46	165	15	19.5	46	-

The comparison indicates that 12 reaches are in an improving trend, 4 reaches are static and four reaches are showing decline (Greenhorn abv Spanish, NFFR abv Almanor, NFFR abv EBNFFR, and Hungry Creek). It must be noted that some of the improvements may be attributable to several low flow years followed by a sustained spring flushing flow just before 2003 sampling.

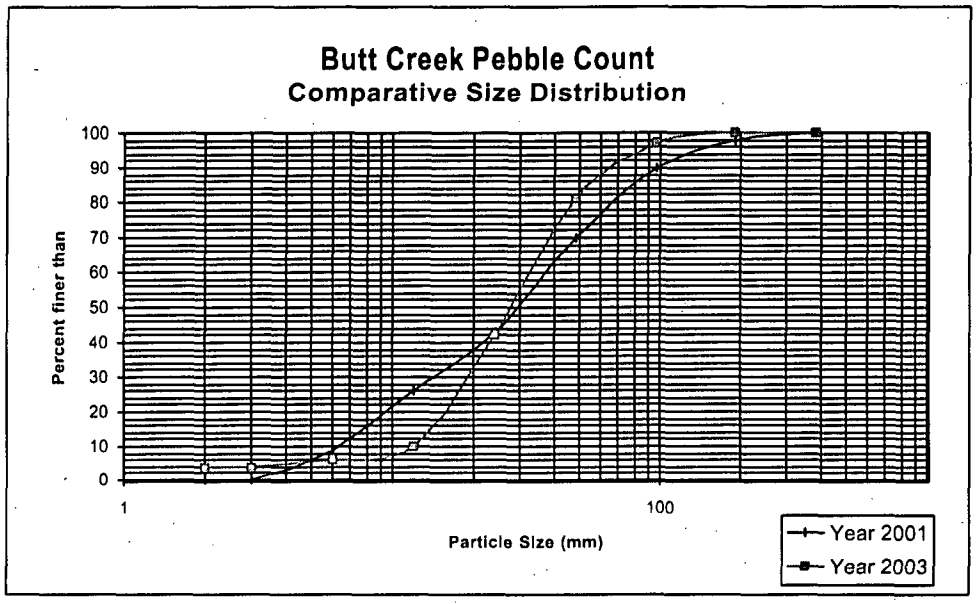
BUTT CREEK

Pebble Count Comparative Particle Size Distributions-- Yr 01-03

SIZE CLASSES	**SIZE(mm)	PERCENT, 2001	PERCENT, 2003	SIZE CT., 2001	SIZE CT., 2003
<2mm	2	0	4	0	4
2-4mm	3	0	4	0	0
4-8mm	6	9	6	9	2
8-16mm	12	26	10	17	4
16-32mm	24	43	42	17	32
32-64mm	48	70	81	27	39
64-128mm	96	90	97	20	16
128-256mm	192	98	100	8	3
256-512mm	384	100	100	2	0
512-1024mm	768	100	100	0	0
				100	100

**NOTE: The above values are the median size for the sampled size classess.

All samples were derived from riffles closest to the cross-sections.



YEAR	D_{50} (mm)
2001	29.5
2003	27

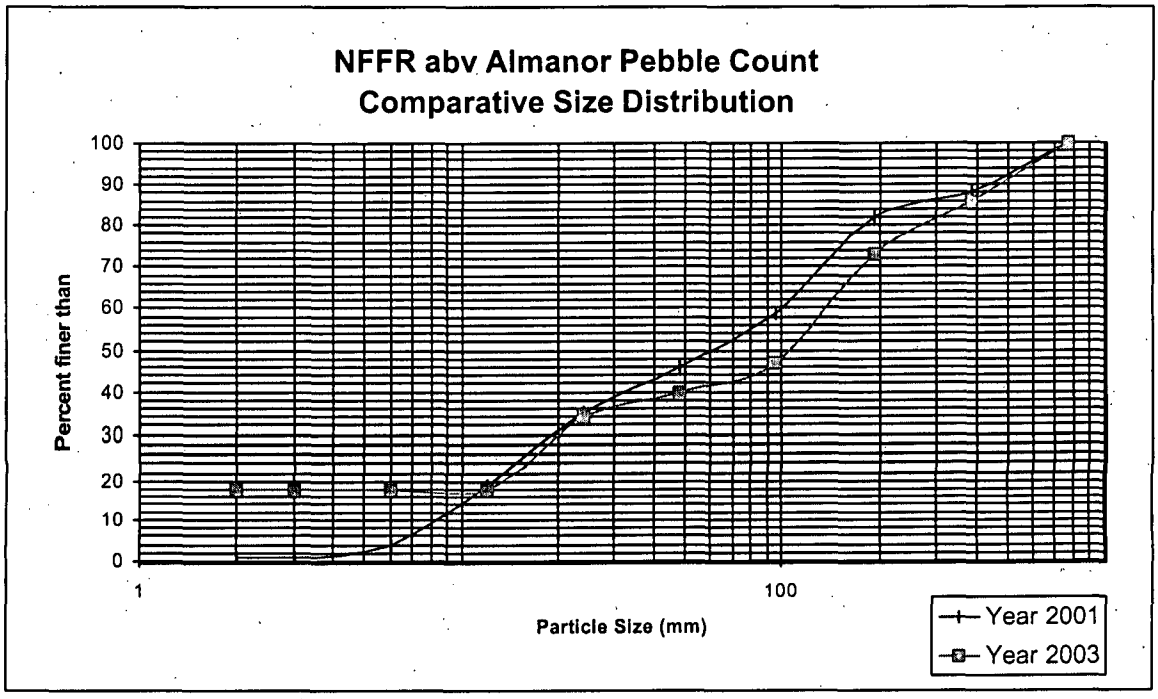
NFFR abv Almanor

Pebble Count Comparative Particle Size Distributions-- Yr 01-03

SIZE CLASSES	**SIZE(mm)	PERCENT, 2001	PERCENT, 2003	SIZE CT., 2001	SIZE CT., 2003
<2mm	2	1	18	1	18
2-4mm	3	1	18	0	0
4-8mm	6	4	18	3	0
8-16mm	12	19	18	15	0
16-32mm	24	35	34	16	16
32-64mm	48	46	40	11	6
64-128mm	96	59	47	13	7
128-256mm	192	82	73	23	26
256-512mm	384	88	86	6	13
512-1024mm	768	100	100	12	14
				100	100

**NOTE: The above values are the median size for the sampled size classess.

All samples were derived from riffles closest to the cross-sections.



YEAR	D_{50} (mm)
2001	50
2003	103

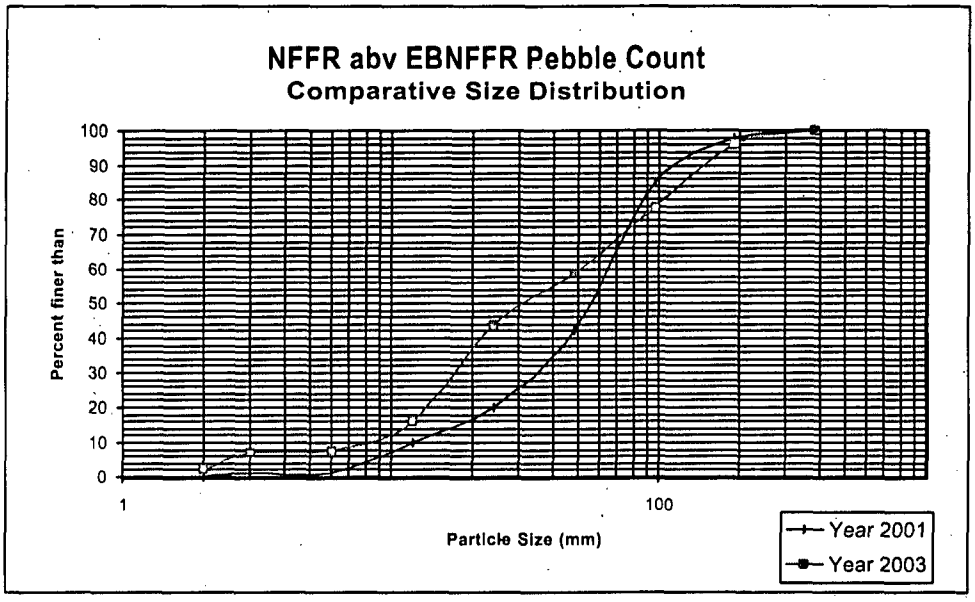
NFFR abv EBNFFR

Pebble Count Comparative Particle Size Distributions-- Yr 01-03

SIZE CLASSES	**SIZE(mm)	PERCENT, 2001	PERCENT, 2003	SIZE CT., 2001	SIZE CT., 2003
<2mm	2	0	2	0	2
2-4mm	3	1	7	1	5
4-8mm	6	1	8	0	1
8-16mm	12	10	16	9	8
16-32mm	24	20	44	10	28
32-64mm	48	42	59	22	15
64-128mm	96	85	78	43	19
128-256mm	192	98	96	13	18
256-512mm	384	100	100	2	4
512-1024mm	768	100	100	0	0
				100	100

**NOTE: The above values are the median size for the sampled size classess.

All samples were derived from riffles closest to the cross-sections.



YEAR	D_{50} (mm)
2001	55
2003	30

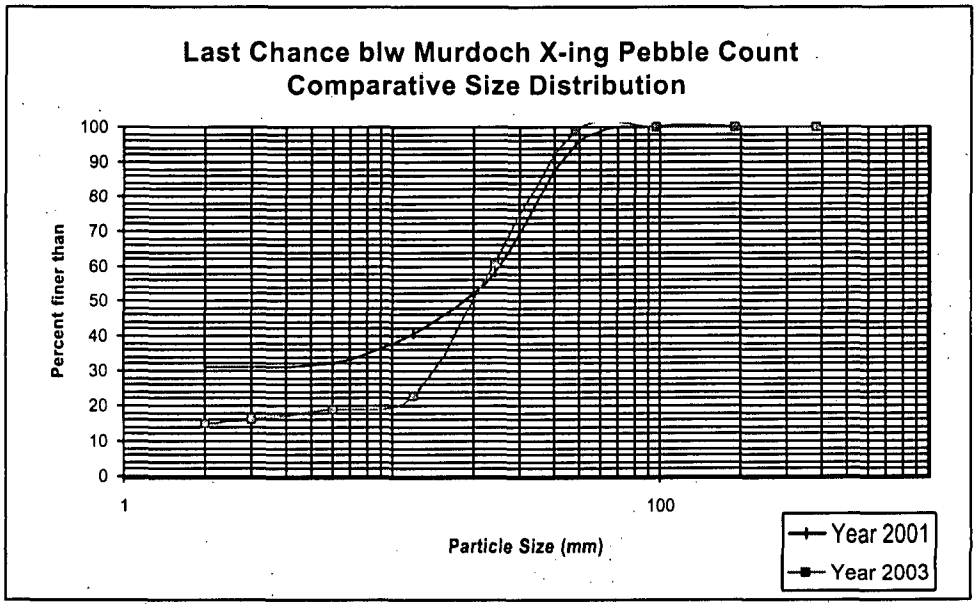
Last Chance blw Murdoch X-ing

Pebble Count Comparative Particle Size Distributions-- Yr 01-03

SIZE CLASSES	**SIZE(mm)	PERCENT, 2001	PERCENT, 2003	SIZE CT., 2001	SIZE CT., 2003
<2mm	2	31	15	32	15
2-4mm	3	31	16	0	1
4-8mm	6	32	19	1	3
8-16mm	12	41	23	9	4
16-32mm	24	58	61	18	38
32-64mm	48	95	99	38	38
64-128mm	96	100	100	5	1
128-256mm	192	100	100	0	0
256-512mm	384	100	100	0	0
512-1024mm	768	100	100	0	0
				103	100

**NOTE: The above values are the median size for the sampled size classess.

All samples were derived from riffles closest to the cross-sections.



YEAR	D_{50} (mm)
2001	18
2003	21

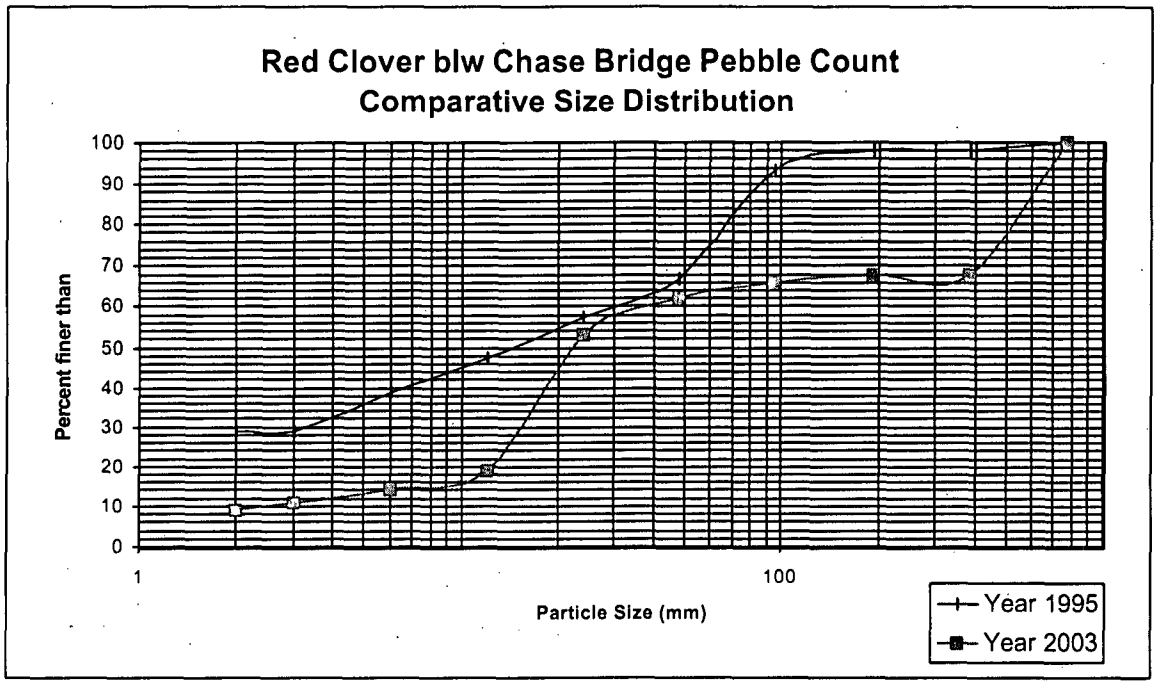
Red Clover blw Chase Bridge

Pebble Count Comparative Particle Size Distributions-- Yr 01-03

SIZE CLASSES	**SIZE(mm)	PERCENT, 1995	PERCENT, 2003	SIZE CT., 1995	SIZE CT., 2003
<2mm	2	29	9	30	9
2-4mm	3	29	11	0	2
4-8mm	6	39	14	10	3
8-16mm	12	48	19	9	5
16-32mm	24	57	53	10	34
32-64mm	48	67	62	10	9
64-128mm	96	93	66	27	4
128-256mm	192	98	68	5	2
256-512mm	384	98	68	0	0
512-1024mm	768	100	100	2	32
				103	100

**NOTE: The above values are the median size for the sampled size classess.

All samples were derived from riffles closest to the cross-sections.



YEAR	D_{50} (mm)
1995	15
2001	23

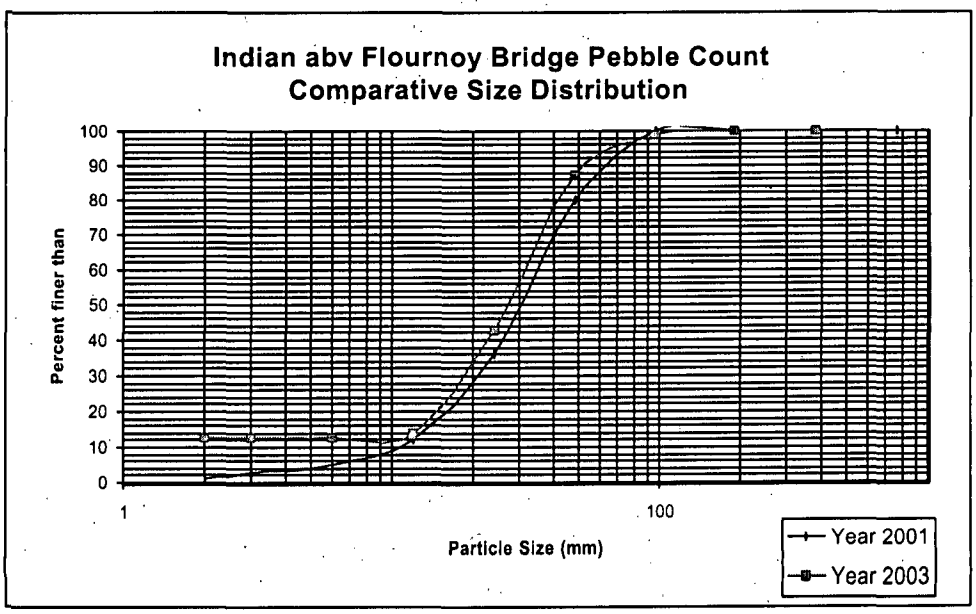
Indian Creek abv Flournoy Bridge

Pebble Count Comparative Particle Size Distributions-- Yr 01-03

SIZE CLASSES	**SIZE(mm)	PERCENT, 2001	PERCENT, 2003	SIZE CT., 2001	SIZE CT., 2003
<2mm	2	1	13	1	13
2-4mm	3	3	13	2	0
4-8mm	6	5	13	2	0
8-16mm	12	12	14	7	1
16-32mm	24	36	43	24	29
32-64mm	48	80	87	44	44
64-128mm	96	100	99	20	12
128-256mm	192	100	100	0	1
256-512mm	384	100	100	0	0
512-1024mm	768	100	100	0	0
				100	100

**NOTE: The above values are the median size for the sampled size classess.

All samples were derived from riffles closest to the cross-sections.



YEAR	D_{50} (mm)
2001	30
2003	27

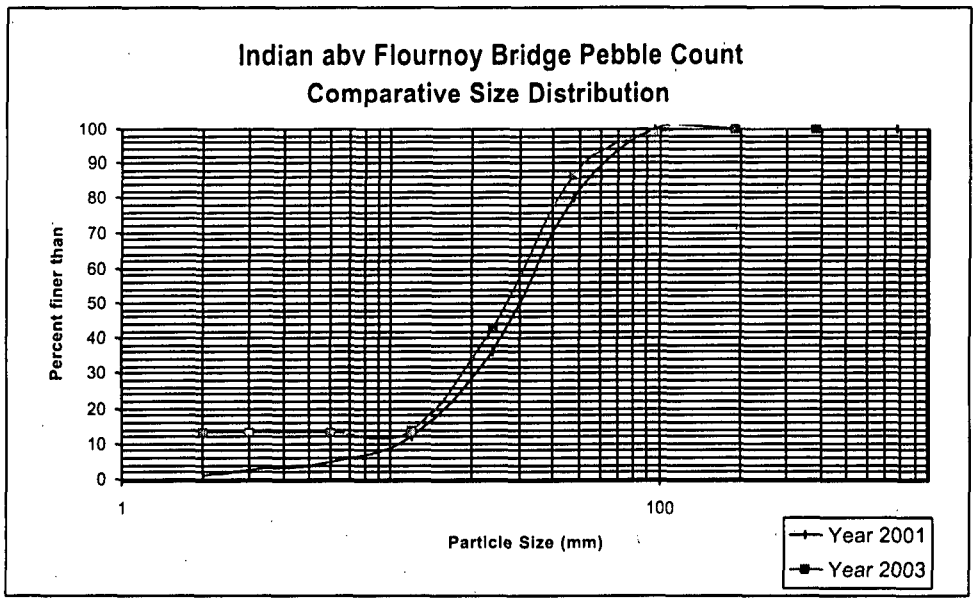
Indian Creek abv Flournoy Bridge

Pebble Count Comparative Particle Size Distributions-- Yr 01-03

SIZE CLASSES	**SIZE(mm)	PERCENT, 2001	PERCENT, 2003	SIZE CT., 2001	SIZE CT., 2003
<2mm	2	1	13	1	13
2-4mm	3	3	13	2	0
4-8mm	6	5	13	2	0
8-16mm	12	12	14	7	1
16-32mm	24	36	43	24	29
32-64mm	48	80	87	44	44
64-128mm	96	100	99	20	12
128-256mm	192	100	100	0	1
256-512mm	384	100	100	0	0
512-1024mm	768	100	100	0	0
				100	100

**NOTE: The above values are the median size for the sampled size classess.

All samples were derived from riffles closest to the cross-sections.



YEAR	D_{50} (mm)
2001	30
2003	27

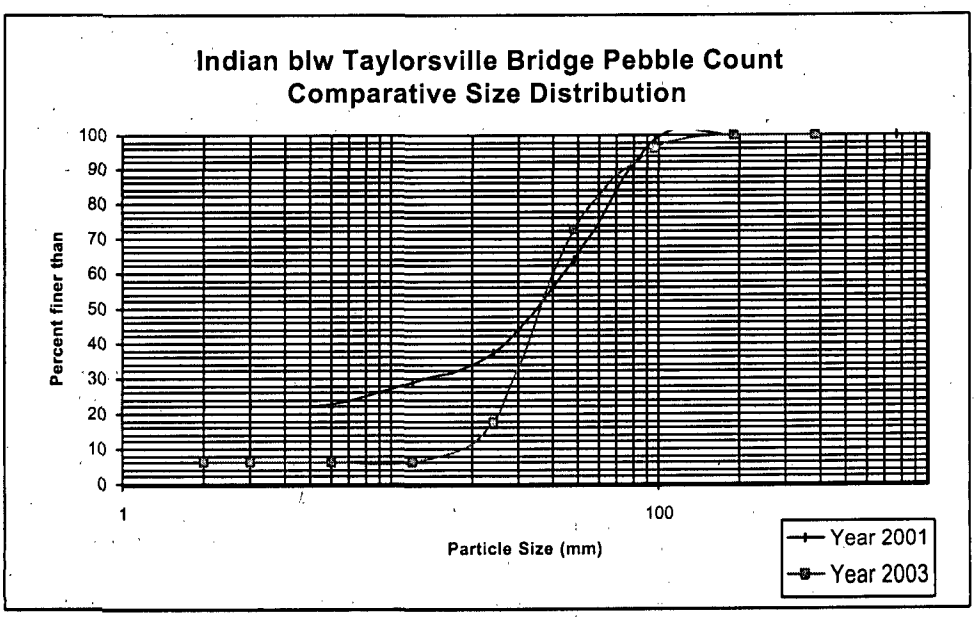
Indian Creek blw Taylorsville Bridge

Pebble Count Comparative Particle Size Distributions-- Yr 01-03

SIZE CLASSES	**SIZE(mm)	PERCENT, 2001	PERCENT, 2003	SIZE CT., 2001	SIZE CT., 2003
<2mm	2	22	6	22	6
2-4mm	3	22	6	0	0
4-8mm	6	23	6	1	0
8-16mm	12	29	6	6	0
16-32mm	24	37	18	8	12
32-64mm	48	64	73	27	55
64-128mm	96	99	96	35	23
128-256mm	192	100	100	1	4
256-512mm	384	100	100	0	0
512-1024mm	768	100	100	0	0
				100	100

**NOTE: The above values are the median size for the sampled size classess.

All samples were derived from riffles closest to the cross-sections.



YEAR	D_{50} (mm)
2001	35
2003	36

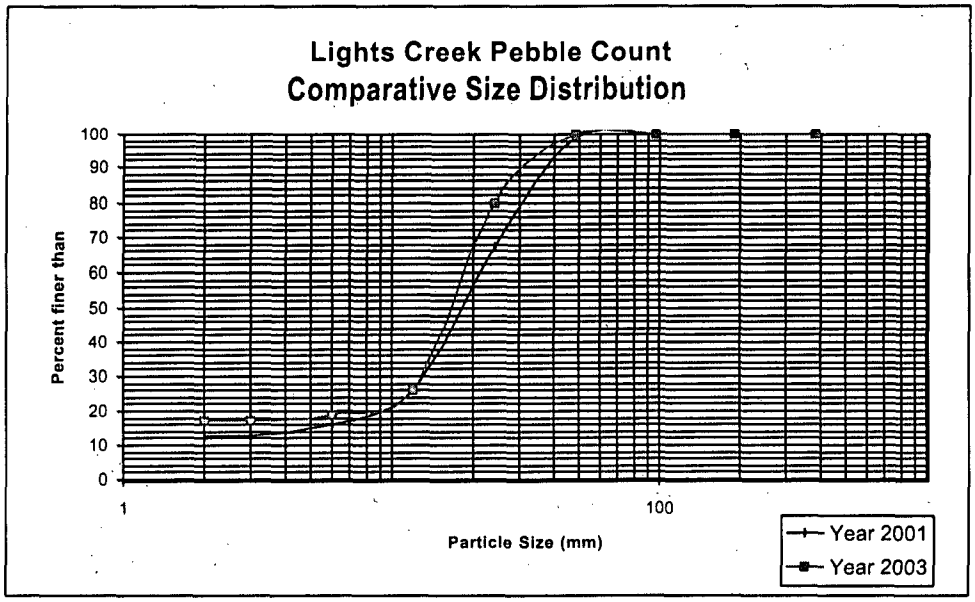
Lights Creek

Pebble Count Comparative Particle Size Distributions-- Yr 01-03

SIZE CLASSES	**SIZE(mm)	PERCENT, 2001	PERCENT, 2003	SIZE CT., 2001	SIZE CT., 2003
<2mm	2	13	17	13	17
2-4mm	3	13	17	0	0
4-8mm	6	16	19	3	2
8-16mm	12	26	26	10	7
16-32mm	24	67	80	41	54
32-64mm	48	99	100	32	20
64-128mm	96	100	100	1	0
128-256mm	192	100	100	0	0
256-512mm	384	100	100	0	0
512-1024mm	768	100	100	0	0
				100	100

**NOTE: The above values are the median size for the sampled size classess.

All samples were derived from riffles closest to the cross-sections.



YEAR	D_{50} (mm)
2001	18
2003	16.5

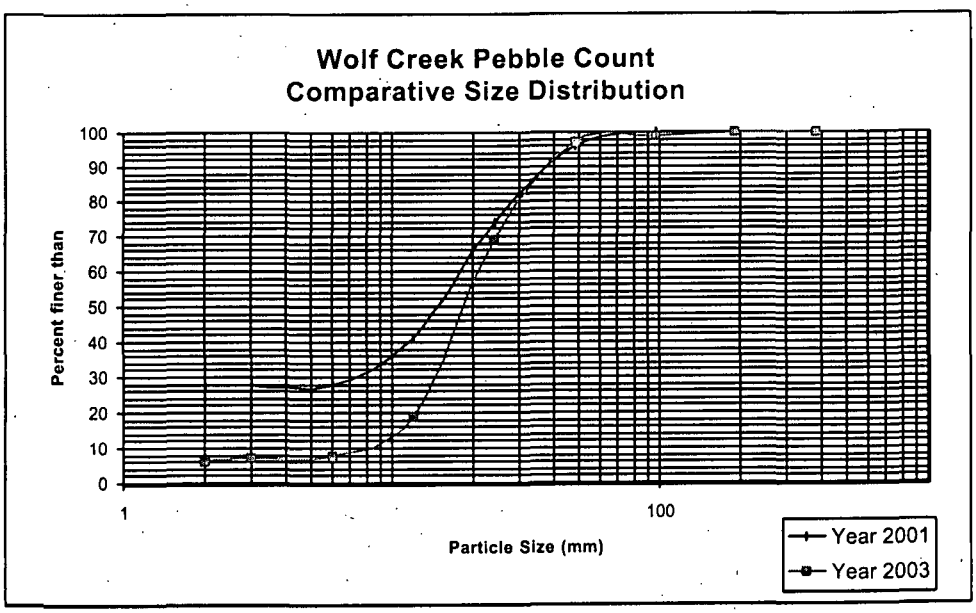
WOLF CREEK

Pebble Count Comparative Particle Size Distributions-- Yr 01-03

SIZE CLASSES	**SIZE(mm)	PERCENT, 2001	PERCENT, 2003	SIZE CT., 2001	SIZE CT., 2003
<2mm	2	28	6	28	6
2-4mm	3	28	7	0	1
4-8mm	6	28	8	0	1
8-16mm	12	41	19	13	11
16-32mm	24	74	69	33	50
32-64mm	48	96	97	22	28
64-128mm	96	100	99	4	2
128-256mm	192	100	100	0	1
256-512mm	384	100	100	0	0
512-1024mm	768	100	100	0	0
				100	100

**NOTE: The above values are the median size for the sampled size classess.

All samples were derived from riffles closest to the cross-sections.



YEAR	D_{50} (mm)
2001	15.5
2003	18.5

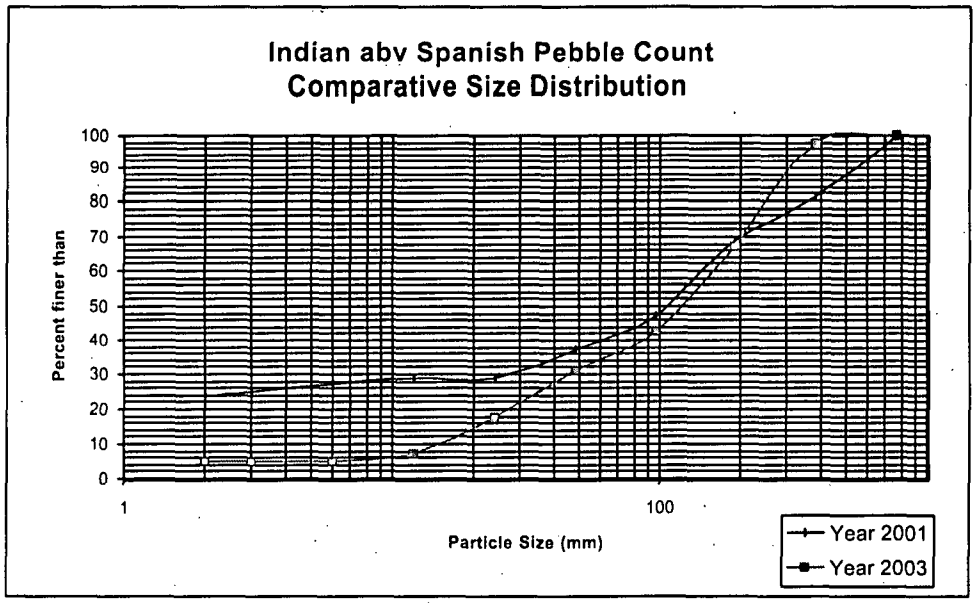
Indian Creek abv Spanish

Pebble Count Comparative Particle Size Distributions-- Yr 01-03

SIZE CLASSES	**SIZE(mm)	PERCENT, 2001	PERCENT, 2003	SIZE CT., 2001	SIZE CT., 2003
<2mm	2	24	5	24	5
2-4mm	3	25	5	1	0
4-8mm	6	27	5	2	0
8-16mm	12	29	7	2	2
16-32mm	24	29	18	0	11
32-64mm	48	37	31	8	13
64-128mm	96	47	43	10	12
128-256mm	192	69	67	22	24
256-512mm	384	81	98	12	31
512-1024mm	768	100	100	19	2
				100	100

**NOTE: The above values are the median size for the sampled size classess.

All samples were derived from riffles closest to the cross-sections.



YEAR	D_{50} (mm)
2001	102
2003	104

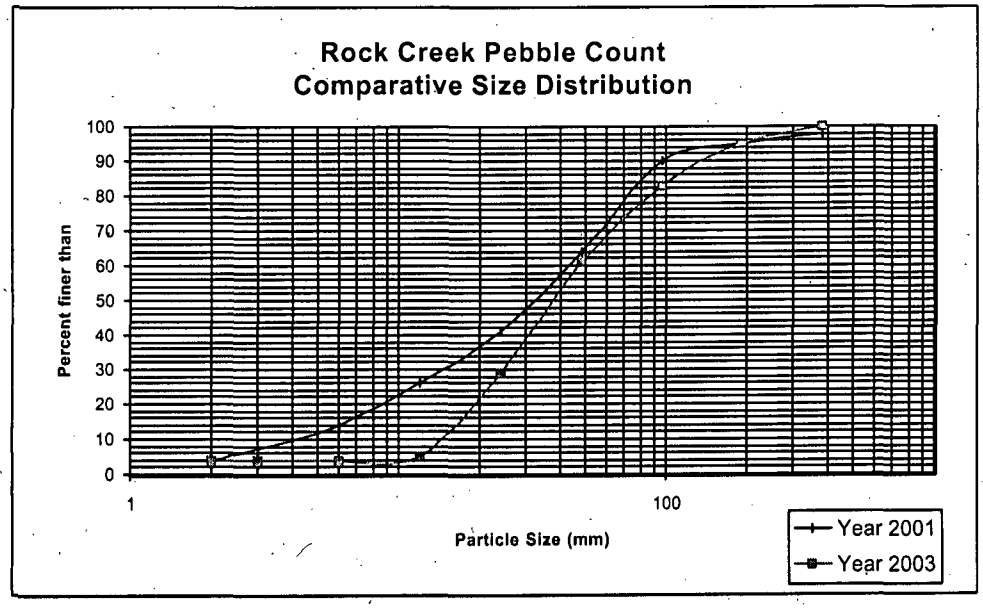
ROCK CREEK

Pebble Count Comparative Particle Size Distributions-- Yr 01-03

SIZE CLASSES	**SIZE(mm)	PERCENT, 2001	PERCENT, 2003	SIZE CT., 2001	SIZE CT., 2003
<2mm	2	4	4	4	4
2-4mm	3	7	4	3	0
4-8mm	6	14	4	7	0
8-16mm	12	26	5	12	1
16-32mm	24	41	29	15	24
32-64mm	48	64	61	23	32
64-128mm	96	90	83	26	22
128-256mm	192	95	95	5	12
256-512mm	384	98	100	3	5
512-1024mm	768	100	100	2	0
				100	100

**NOTE: The above values are the median size for the sampled size classess.

All samples were derived from riffles closest to the cross-sections.



YEAR	D_{50} (mm)
2001	33
2003	38

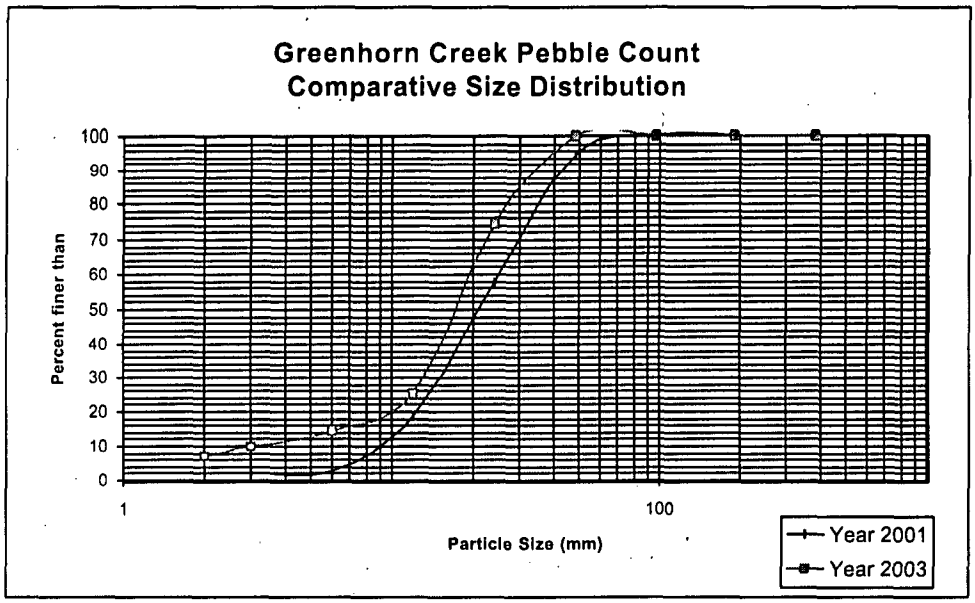
GREENHORN CREEK

Pebble Count Comparative Particle Size Distributions-- Yr 01-03

SIZE CLASSES	**SIZE(mm)	PERCENT, 2001	PERCENT, 2003	SIZE CT., 2001	SIZE CT., 2003
<2mm	2	2	7	2	7
2-4mm	3	2	10	0	3
4-8mm	6	3	14	1	4
8-16mm	12	19	26	16	11
16-32mm	24	58	74	39	48
32-64mm	48	95	100	37	25
64-128mm	96	100	100	5	0
128-256mm	192	100	100	0	0
256-512mm	384	100	100	0	0
512-1024mm	768	100	100	0	0
				100	98

**NOTE: The above values are the median size for the sampled size classess.

All samples were derived from riffles closest to the cross-sections.



YEAR	D_{50} (mm)
2001	17.5
2003	22

SPANISH abv GREENHORN

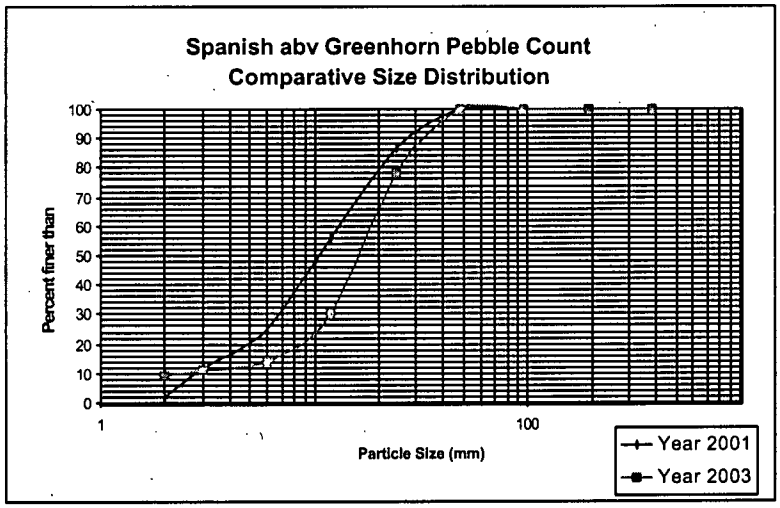
Pebble Count Comparative Particle Size Distributions-- Yr 01-03

SIZE CLASSES	**SIZE(mm)	PERCENT, 2001	PERCENT, 2003	SIZE CT., 2001	SIZE CT., 2003
<2mm	2	2	9	2	9
2-4mm	3	12	11	10	2
4-8mm	6	25	14	13	3
8-16mm	12	56	30	31	16
16-32mm	24	87	78	31	48
32-64mm	48	100	100	13	22
64-128mm	96	100	100	0	0
128-256mm	192	100	100	0	0
256-512mm	384	100	100	0	0
512-1024mm	768	100	100	0	0
				100	100

	Cobbles		Boulders	Bedrock
64 to 128	128 to 256	>256		
Class 7	Class 8	Class 9	Class 10	
0	0	0	0	
0	0	0	0	
0	0	0	0	
0	0	0	0	
0	0	0	0	

**NOTE: The above values are the median size for the sampled size classess.

All samples were derived from riffles closest to the cross-sections.



YEAR	D_{50} (mm)
2001	11
2003	16.5

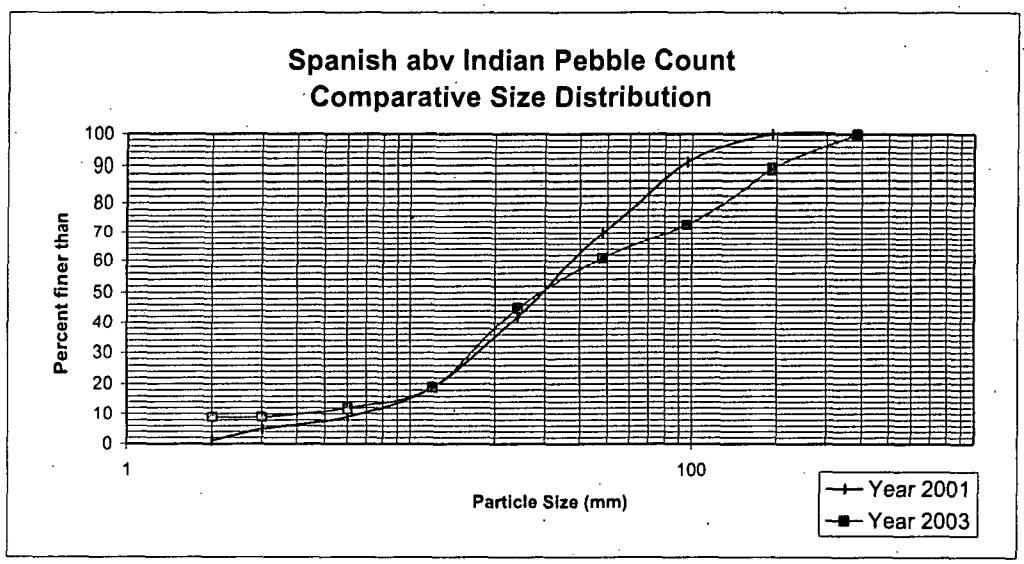
SPANISH abv INDIAN

Pebble Count Comparative Particle Size Distributions-- Yr 01-03

SIZE CLASSES	**SIZE(mm)	PERCENT, 2001	PERCENT, 2003	SIZE CT., 2001	SIZE CT., 2003
<2mm	2	1	9	1	9
2-4mm	3	5	9	4	0
4-8mm	6	9	12	4	3
8-16mm	12	19	19	10	7
16-32mm	24	42	45	23	26
32-64mm	48	70	61	28	16
64-128mm	96	91	73	21	12
128-256mm	192	100	89	9	16
256-512mm	384	100	100	0	11
512-1024mm	768	100	100	0	0
				100	100

**NOTE: The above values are the median size for the sampled size classess.

All samples were derived from riffles closest to the cross-sections.



YEAR	D_{50} (mm)
2001	29
2003	28.5

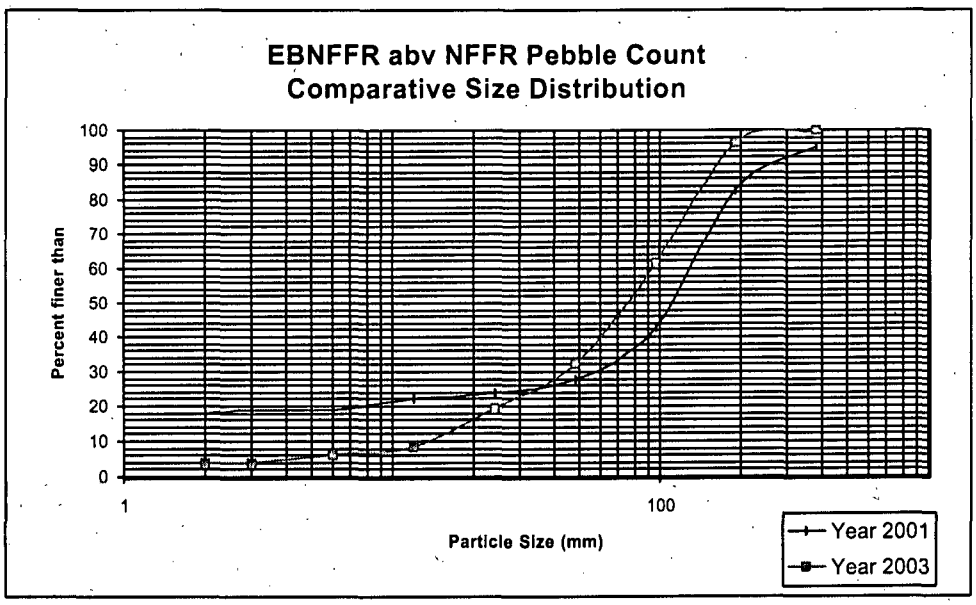
EBNFFR abv NFFR

Pebble Count Comparative Particle Size Distributions-- Yr 01-03

SIZE CLASSES	**SIZE(mm)	PERCENT, 2001	PERCENT, 2003	SIZE CT., 2001	SIZE CT., 2003
<2mm	2	18	4	18	4
2-4mm	3	19	4	1	0
4-8mm	6	19	6	0	2
8-16mm	12	22	8	3	2
16-32mm	24	24	19	2	11
32-64mm	48	28	32	4	13
64-128mm	96	43	62	15	29
128-256mm	192	83	96	40	34
256-512mm	384	95	100	12	4
512-1024mm	768	100	100	5	0
				100	99

**NOTE: The above values are the median size for the sampled size classess.

All samples were derived from riffles closest to the cross-sections.



YEAR	D_{50} (mm)
2001	102
2003	74

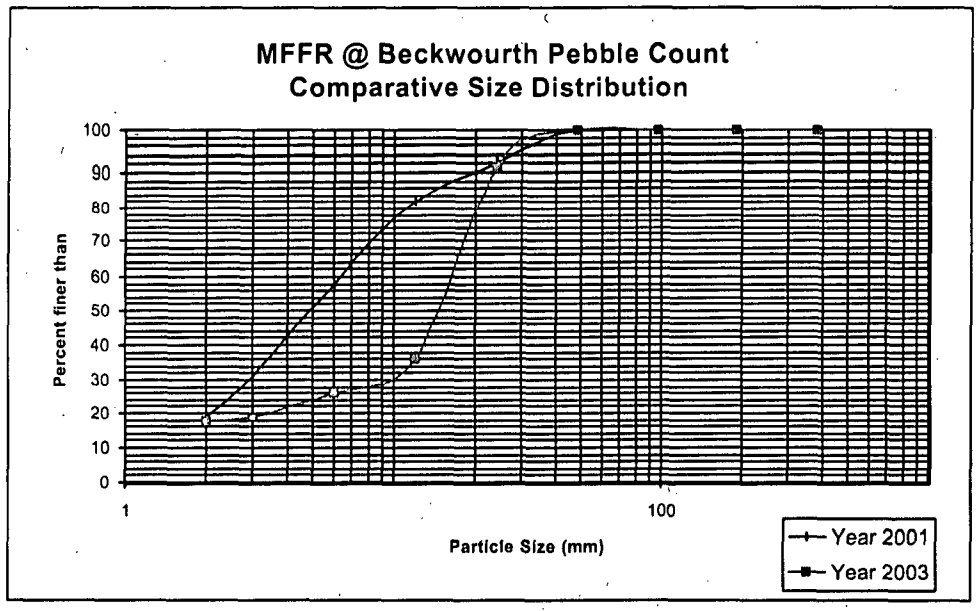
MFFR @ Beckwourth

Pebble Count Comparative Particle Size Distributions-- Yr 01-03

SIZE CLASSES	**SIZE(mm)	PERCENT, 2001	PERCENT, 2003	SIZE CT., 2001	SIZE CT., 2003
<2mm	2	19	18	19	18
2-4mm	3	31	19	12	1
4-8mm	6	58	26	27	7
8-16mm	12	82	36	24	10
16-32mm	24	92	91	10	55
32-64mm	48	100	100	8	9
64-128mm	96	100	100	0	0
128-256mm	192	100	100	0	0
256-512mm	384	100	100	0	0
512-1024mm	768	100	100	0	0
				100	*100*

**NOTE: The above values are the median size for the sampled size classess.

All samples were derived from riffles closest to the cross-sections.



YEAR	D_{50} (mm)
2001	5
2003	15

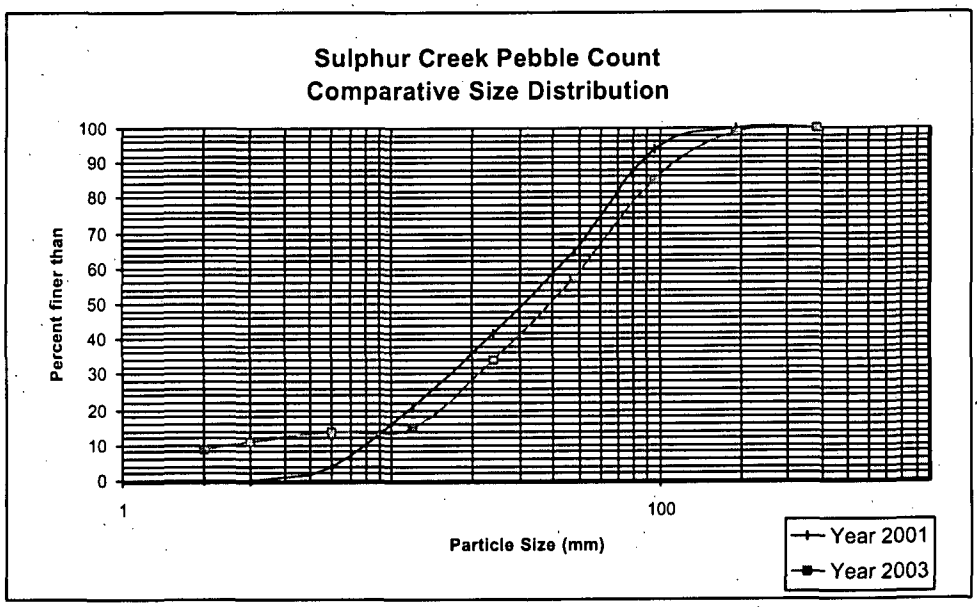
Sulphur Creek

Pebble Count Comparative Particle Size Distributions-- Yr 01-03

SIZE CLASSES	**SIZE(mm)	PERCENT, 2001	PERCENT, 2003	SIZE CT., 2001	SIZE CT., 2003
<2mm	2	0	9	0	9
2-4mm	3	0	11	0	2
4-8mm	6	4	14	4	3
8-16mm	12	21	15	17	1
16-32mm	24	42	34	21	19
32-64mm	48	65	57	23	23
64-128mm	96	94	85	29	28
128-256mm	192	100	99	6	14
256-512mm	384	100	100	0	1
512-1024mm	768	100	100	0	0
				100	100

**NOTE: The above values are the median size for the sampled size classess.

All samples were derived from riffles closest to the cross-sections.



YEAR	D_{50} (mm)
2001	30
2003	40

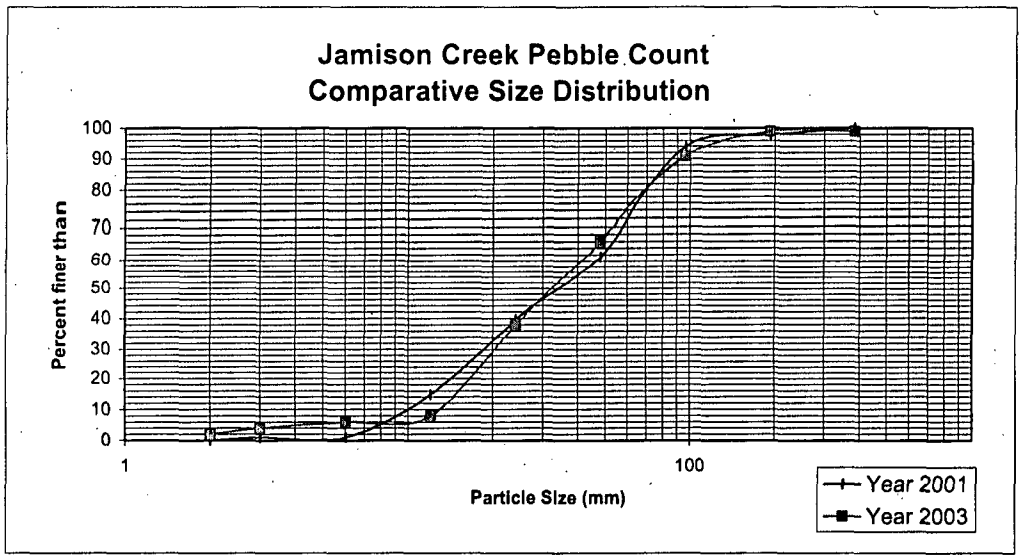
JAMISON CREEK

Pebble Count Comparative Particle Size Distributions-- Yr 01-03

SIZE CLASSES	**SIZE(mm)	PERCENT, 2001	PERCENT, 2003	SIZE CT., 2001	SIZE CT., 2003
<2mm	2	0	2	0	2
2-4mm	3	1	4	1	2
4-8mm	6	1	6	0	2
8-16mm	12	15	8	14	2
16-32mm	24	40	38	25	30
32-64mm	48	61	66	22	28
64-128mm	96	94	91	33	25
128-256mm	192	98	99	4	8
256-512mm	384	100	99	2	0
512-1024mm	768	100	100	0	1
				101	100

**NOTE: *The above values are the median size for the sampled size classess.*

All samples were derived from riffles closest to the cross-sections.



YEAR	D_{50} (mm)
2001	34
2003	32

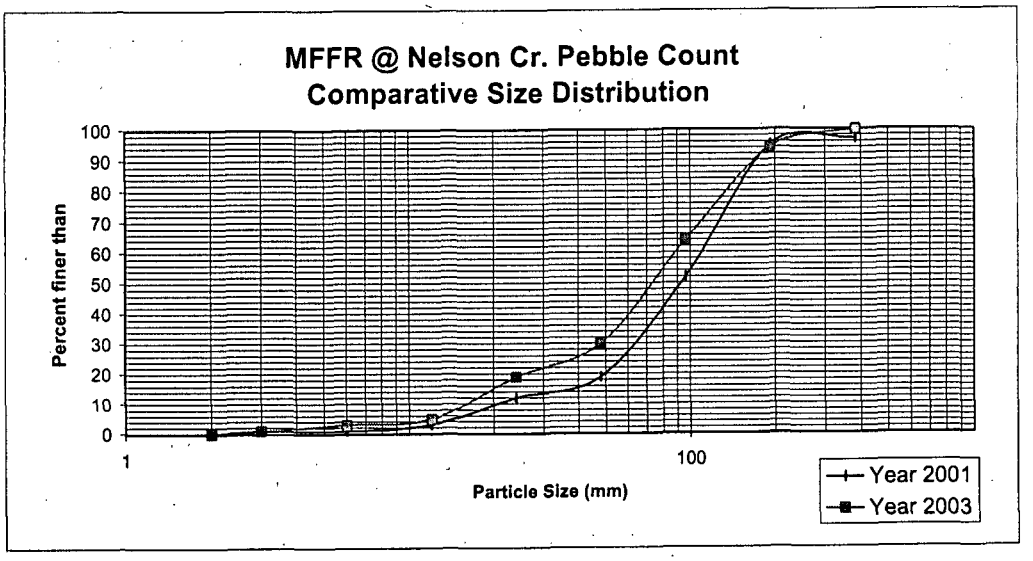
MFFR @ Nelson Cr.

Pebble Count Comparative Particle Size Distributions-- Yr 01-03

SIZE CLASSES	**SIZE(mm)	PERCENT, 2001	PERCENT, 2003	SIZE CT., 2001	SIZE CT., 2003
<2mm	2	0	0	0	0
2-4mm	3	1	1	1	1
4-8mm	6	1	3	0	2
8-16mm	12	3	5	2	2
16-32mm	24	12	19	9	14
32-64mm	48	19	30	7	11
64-128mm	96	52	64	33	34
128-256mm	192	95	94	43	30
256-512mm	384	97	100	2	6
512-1024mm	768	100	100	3	0
				100	100

****NOTE: The above values are the median size for the sampled size classess.**

All samples were derived from riffles closest to the cross-sections.



YEAR	D_{50} (mm)
2001	93
2003	74

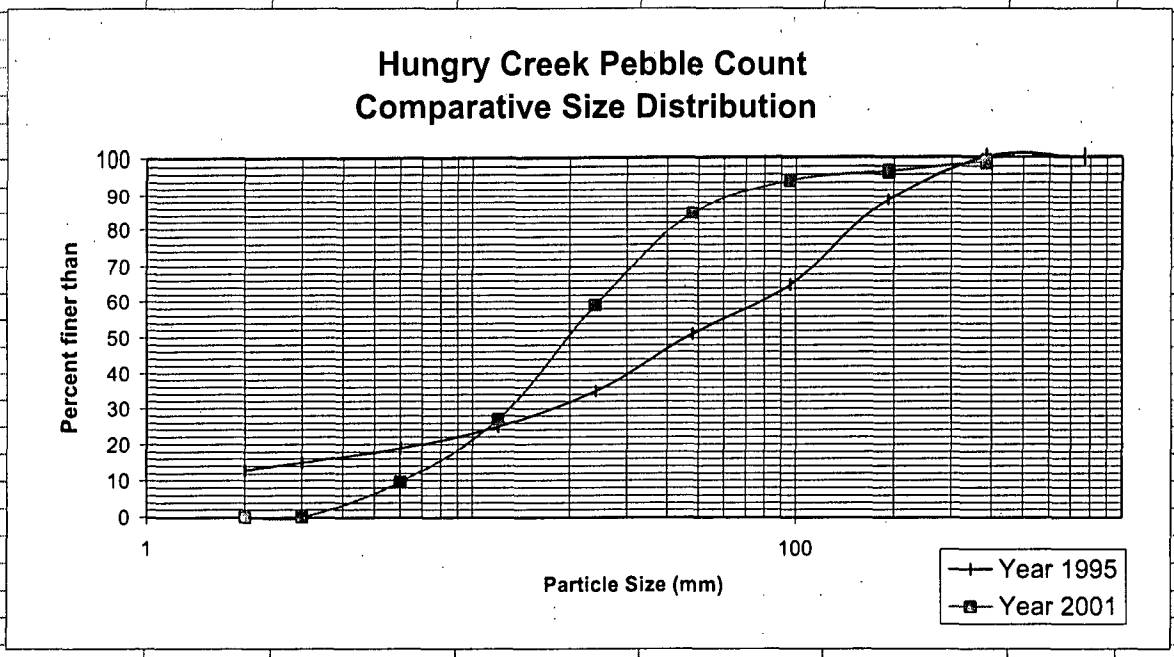
Hungry Creek

Pebble Count Comparative Particle Size Distributions-- Yr 01-03

SIZE CLASSES	**SIZE(mm)	PERCENT, 1995	PERCENT, 2001	SIZE CT., 1995	SIZE CT., 2001
<2mm	2	13	0	13	0
2-4mm	3	15	0	2	0
4-8mm	6	19	10	4	9
8-16mm	12	25	27	6	16
16-32mm	24	35	59	10	30
32-64mm	48	51	85	16	24
64-128mm	96	65	95	14	9
128-256mm	192	89	97	24	2
256-512mm	384	100	99	11	2
512-1024mm	768	100	100	0	1
				100	93

**NOTE: The above values are the median size for the sampled size classess.

All samples were derived from riffles closest to the cross-sections.



YEAR	D_{50} (mm)
1995	46
2001	19.5

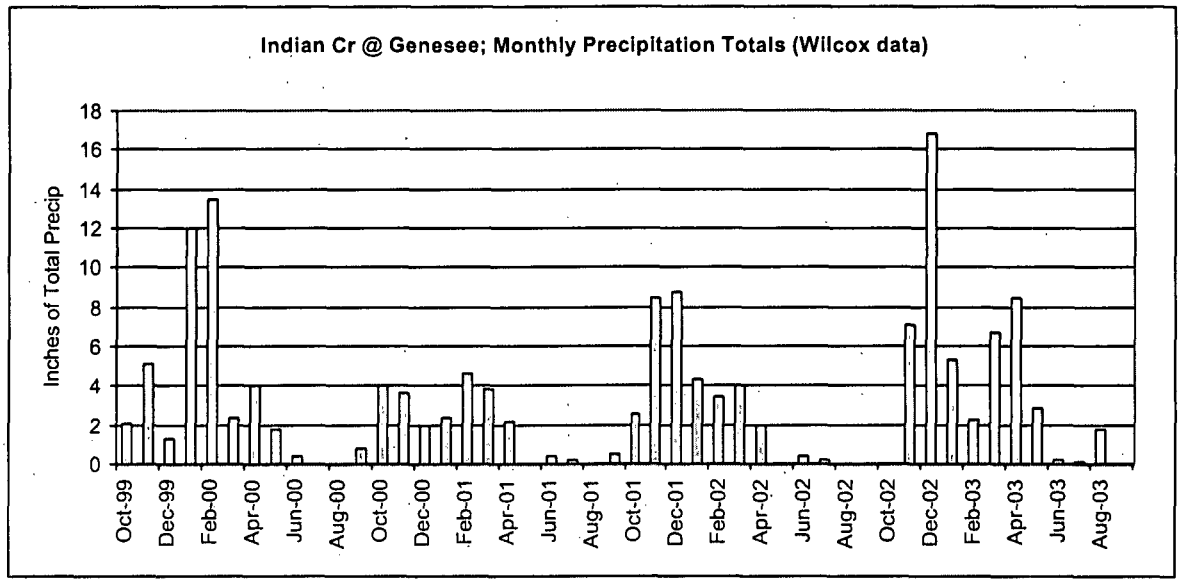
APPENDIX F

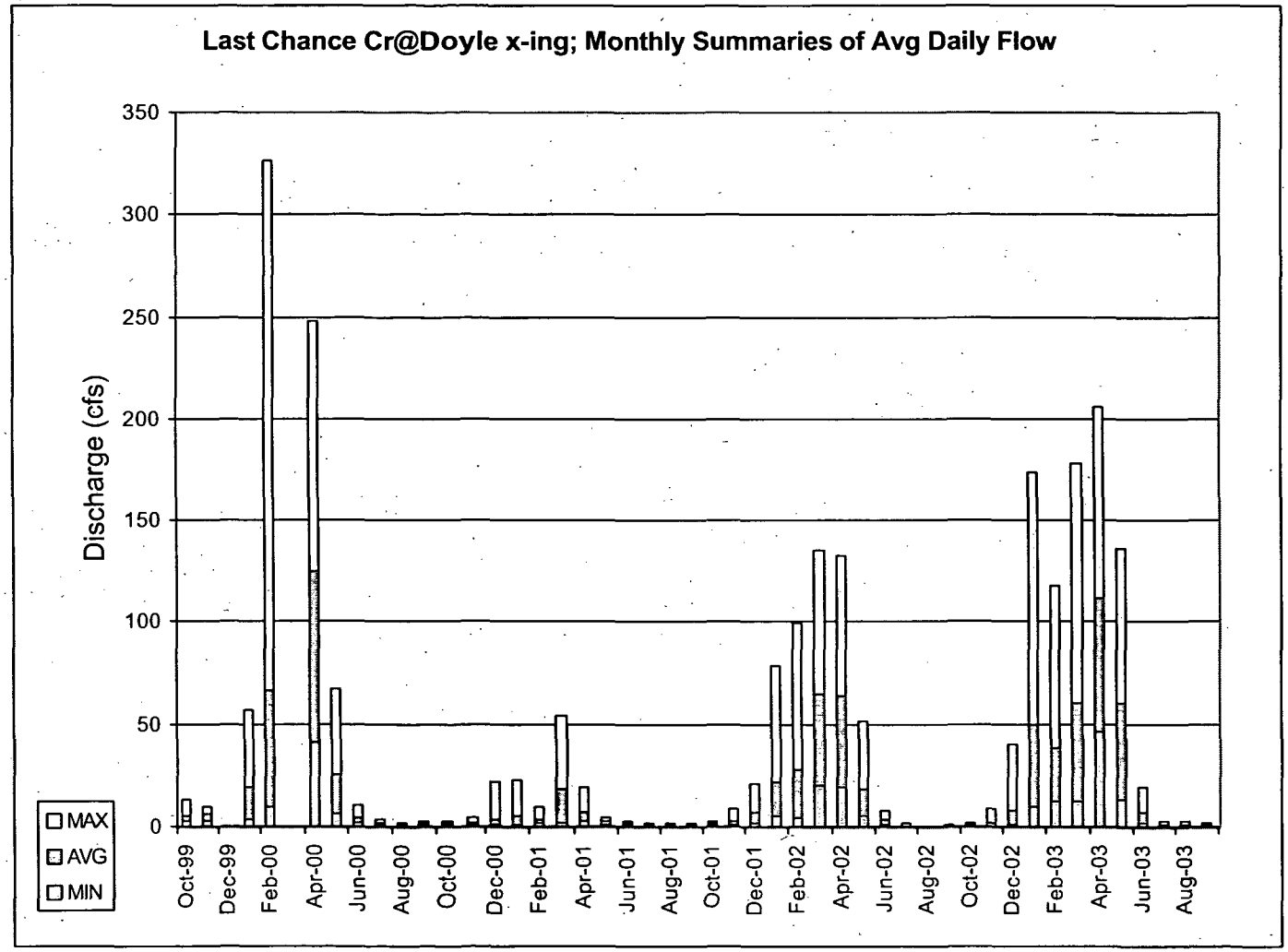
DISCHARGE

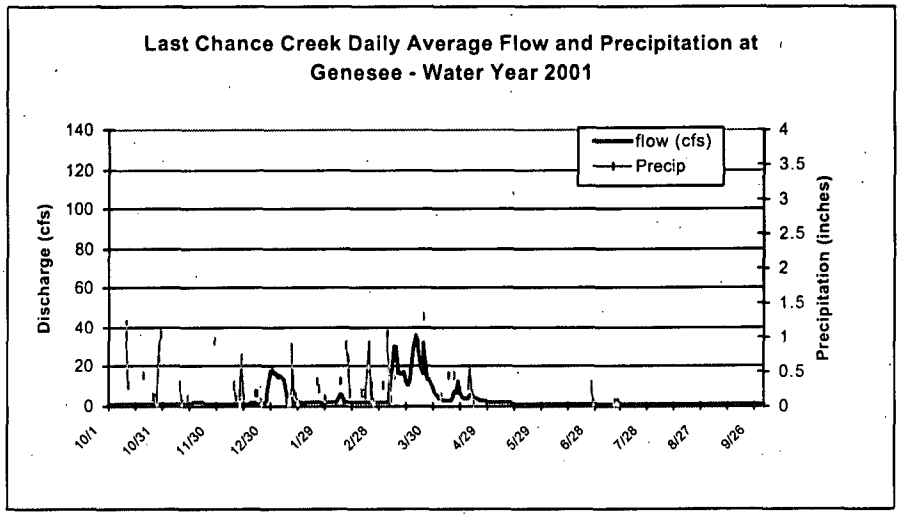
AND

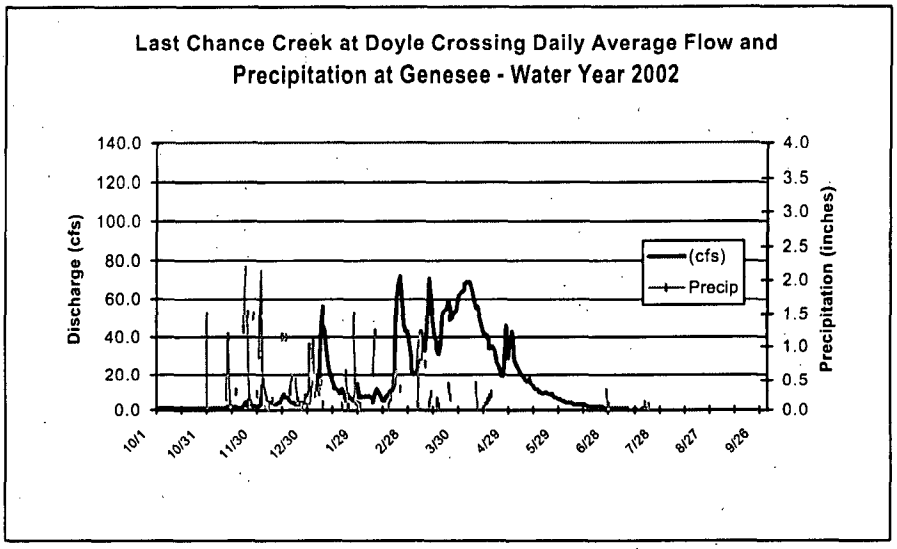
PRECIPITATION

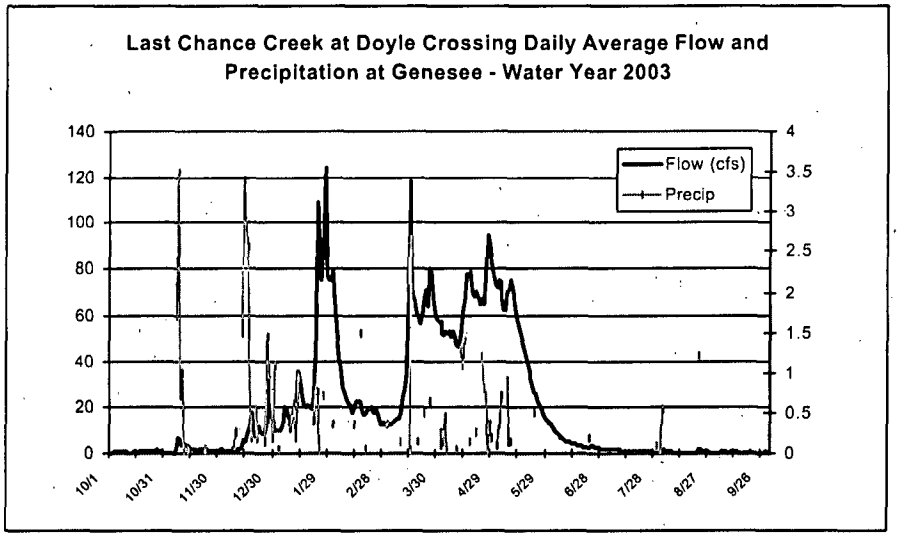
GRAPHS

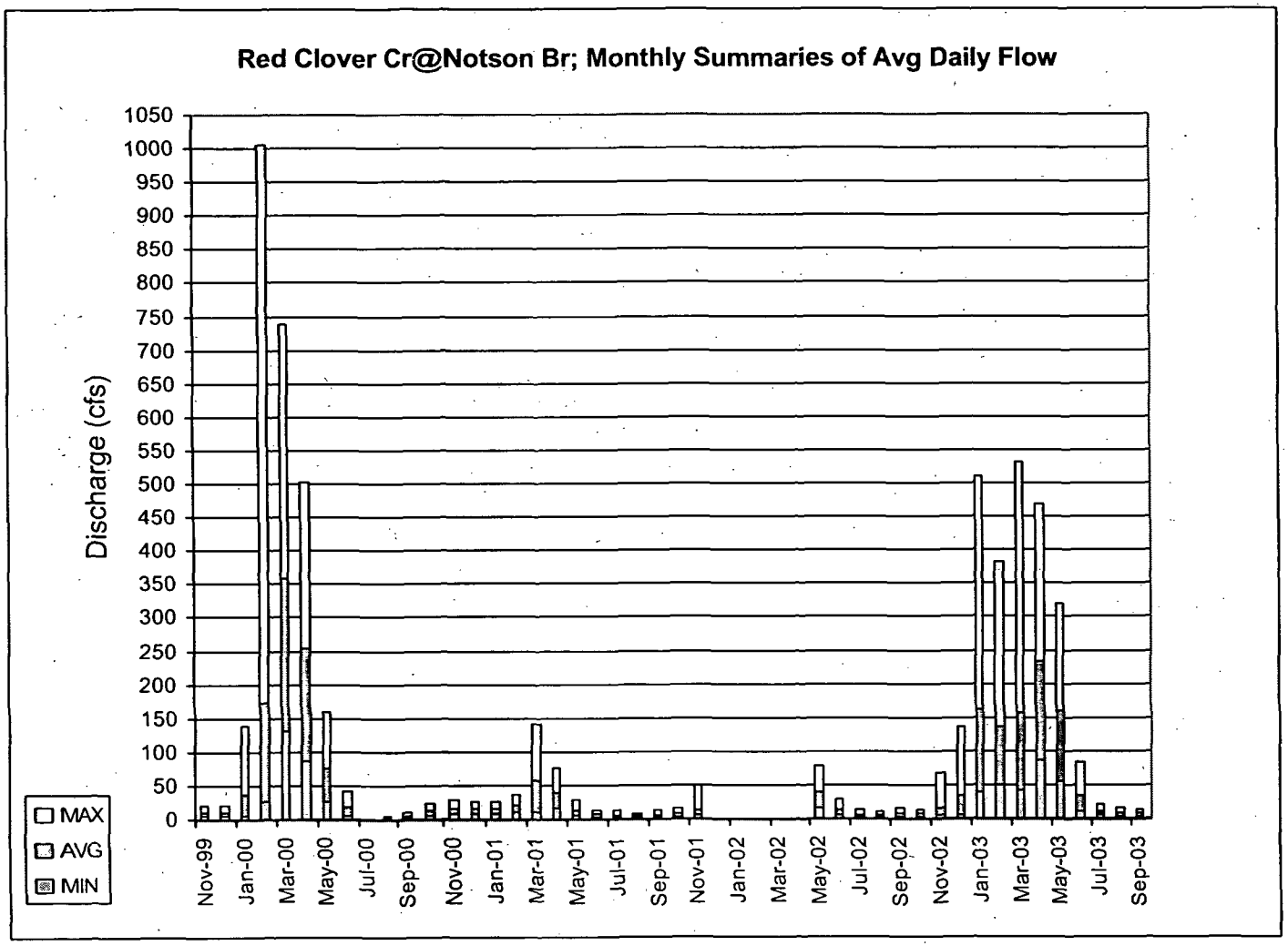

Indian Cr @ Genesee; Monthly Precipitation Totals (Wilcox data)
Inches of Total Precip
18
16
14
12
10
8
6
4
2
0
Oct-99
Dec-99
Feb-00
Apr-00
Jun-00
Aug-00
Oct-00
Dec-00
Feb-01
Apr-01
Jun-01
Aug-01
Oct-01
Dec-01
Feb-02
Apr-02
Jun-02
Aug-02
Oct-02
Dec-02
Feb-03
Apr-03
Jun-03
Aug-03

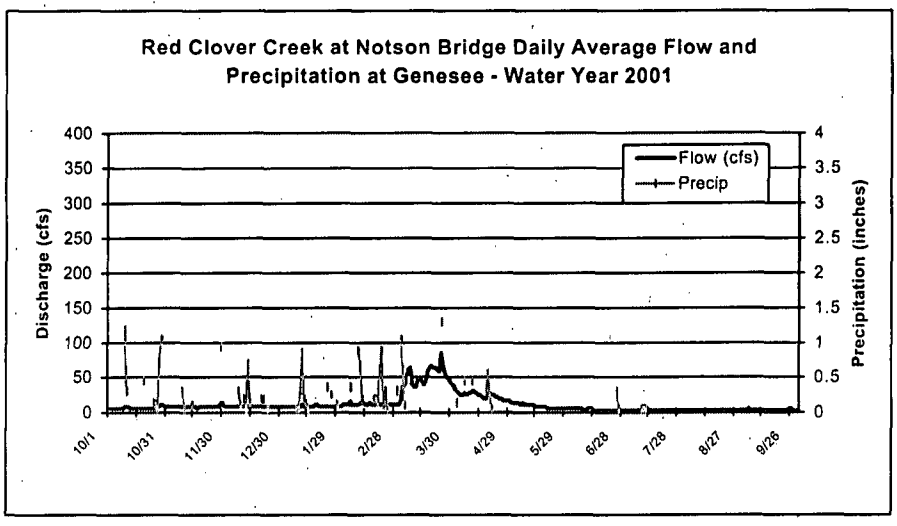

Last Chance Cr@Doyle x-ing; Monthly Summaries of Avg Daily Flow
Discharge (cfs)
350
300
250
200
150
100
50
0
MAX
AVG
MIN
Oct-99
Dec-99
Feb-00
Apr-00
Jun-00
Aug-00
Oct-00
Dec-00
Feb-01
Apr-01
Jun-01
Aug-01
Oct-01
Dec-01
Feb-02
Apr-02
Jun-02
Aug-02
Oct-02
Dec-02
Feb-03
Apr-03
Jun-03
Aug-03

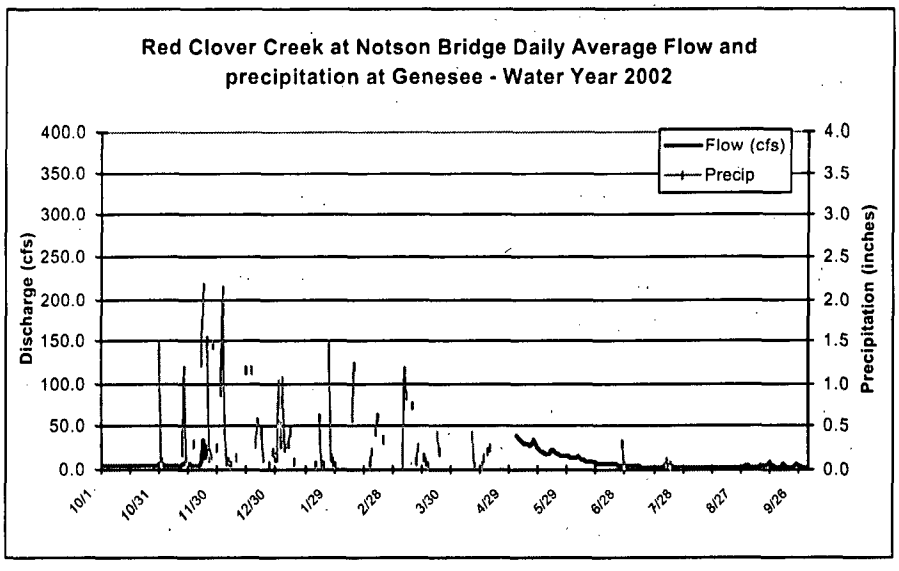

Last Chance Creek Daily Average Flow and Precipitation at Genesee - Water Year 2001
Discharge (cfs)
Precipitation (inches)
flow (cfs)
Precip
140
120
100
80
60
40
20
0
4
3.5
3
2.5
2
1.5
1
0.5
0
10/1
10/31
11/30
12/30
1/29
2/28
3/30
4/29
5/29
6/28
7/28
8/27
9/26

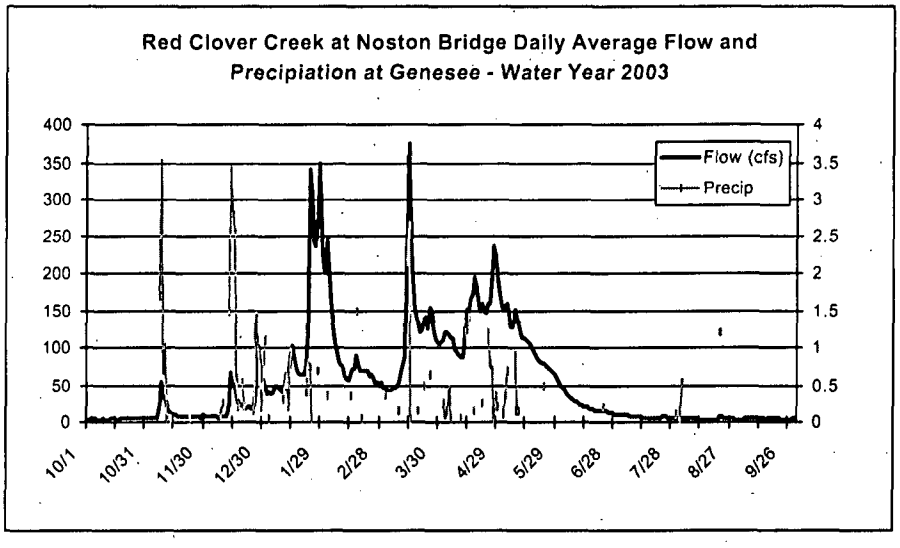

Last Chance Creek at Doyle Crossing Daily Average Flow and Precipitation at Genesee - Water Year 2002
Discharge (cfs)
Precipitation (inches)
(cfs)
Precip
140.0
120.0
100.0
80.0
60.0
40.0
20.0
0.0
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
10/1
10/31
11/30
12/30
1/29
2/28
3/30
4/29
5/29
6/28
7/28
8/27
9/26

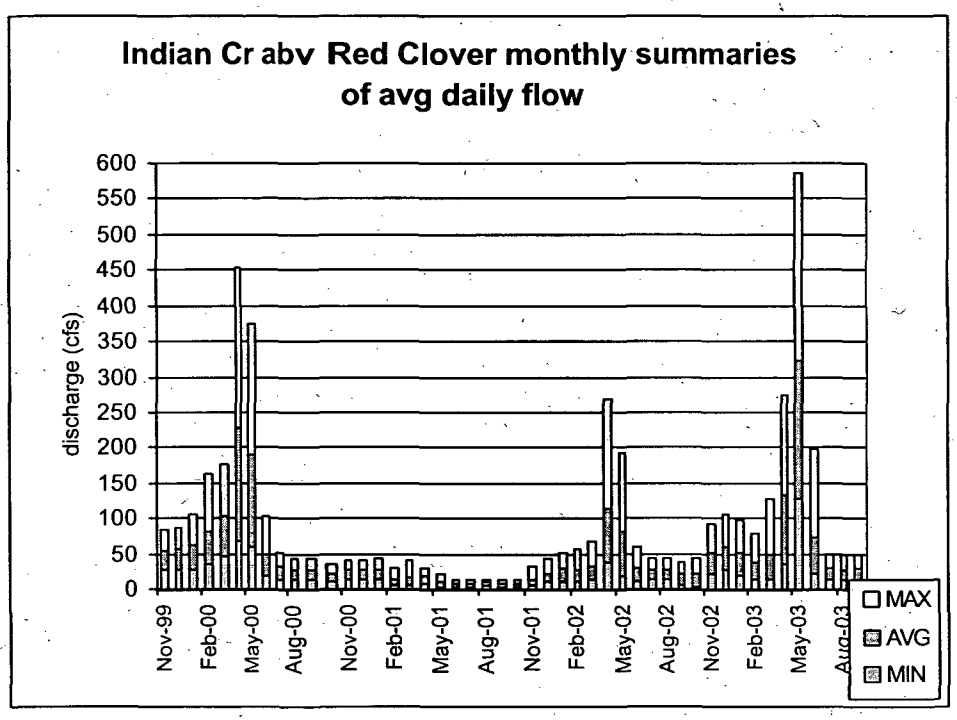

Last Chance Creek at Doyle Crossing Daily Average Flow and Precipitation at Genesee - Water Year 2003
Flow (cfs)
Precip
140
120
100
80
60
40
20
0
4
3.5
3
2.5
2
1.5
1
0.5
0
10/1
10/31
11/30
12/30
1/29
2/28
3/30
4/29
5/29
6/28
7/28
8/27
9/26

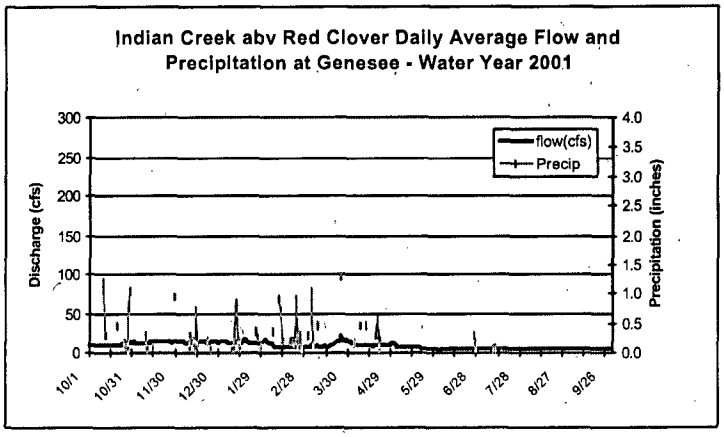

Red Clover Cr@Notson Br; Monthly Summaries of Avg Daily Flow
Discharge (cfs)
1050
1000
950
900
850
800
750
700
650
600
550
500
450
400
350
300
250
200
150
100
50
0
MAX
AVG
MIN
Nov-99
Jan-00
Mar-00
May-00
Jul-00
Sep-00
Nov-00
Jan-01
Mar-01
May-01
Jul-01
Sep-01
Nov-01
Jan-02
Mar-02
May-02
Jul-02
Sep-02
Nov-02
Jan-03
Mar-03
May-03
Jul-03
Sep-03

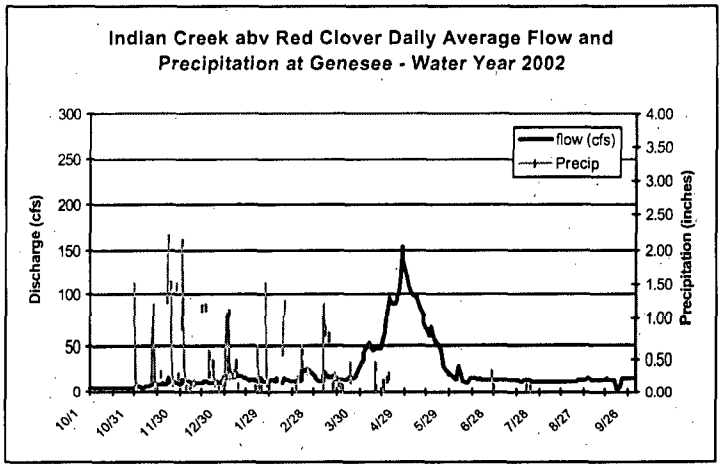

Red Clover Creek at Notson Bridge Daily Average Flow and Precipitation at Genesee - Water Year 2001
Flow (cfs)
Precip
Discharge (cfs)
Precipitation (inches)
400
350
300
250
200
150
100
50
0
4
3.5
3
2.5
2
1.5
1
0.5
0
10/1
10/31
11/30
12/30
1/29
2/28
3/30
4/29
5/29
6/28
7/28
8/27
9/26

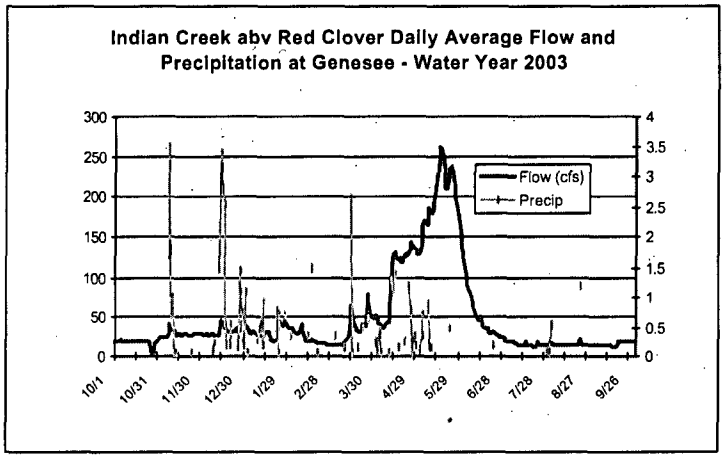

Red Clover Creek at Notson Bridge Daily Average Flow and precipitation at Genesee - Water Year 2002
Flow (cfs)
Precip
Discharge (cfs)
Precipitation (inches)
400.0
350.0
300.0
250.0
200.0
150.0
100.0
50.0
0.0
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
10/1
10/31
11/30
12/30
1/29
2/28
3/30
4/29
5/29
6/28
7/28
8/27
9/26


Red Clover Creek at Noston Bridge Daily Average Flow and Precipiation at Genesee - Water Year 2003
Flow (cfs)
Precip
400
350
300
250
200
150
100
50
0
4
3.5
3
2.5
2
1.5
1
0.5
0
10/1
10/31
11/30
12/30
1/29
2/28
3/30
4/29
5/29
6/28
7/28
8/27
9/26

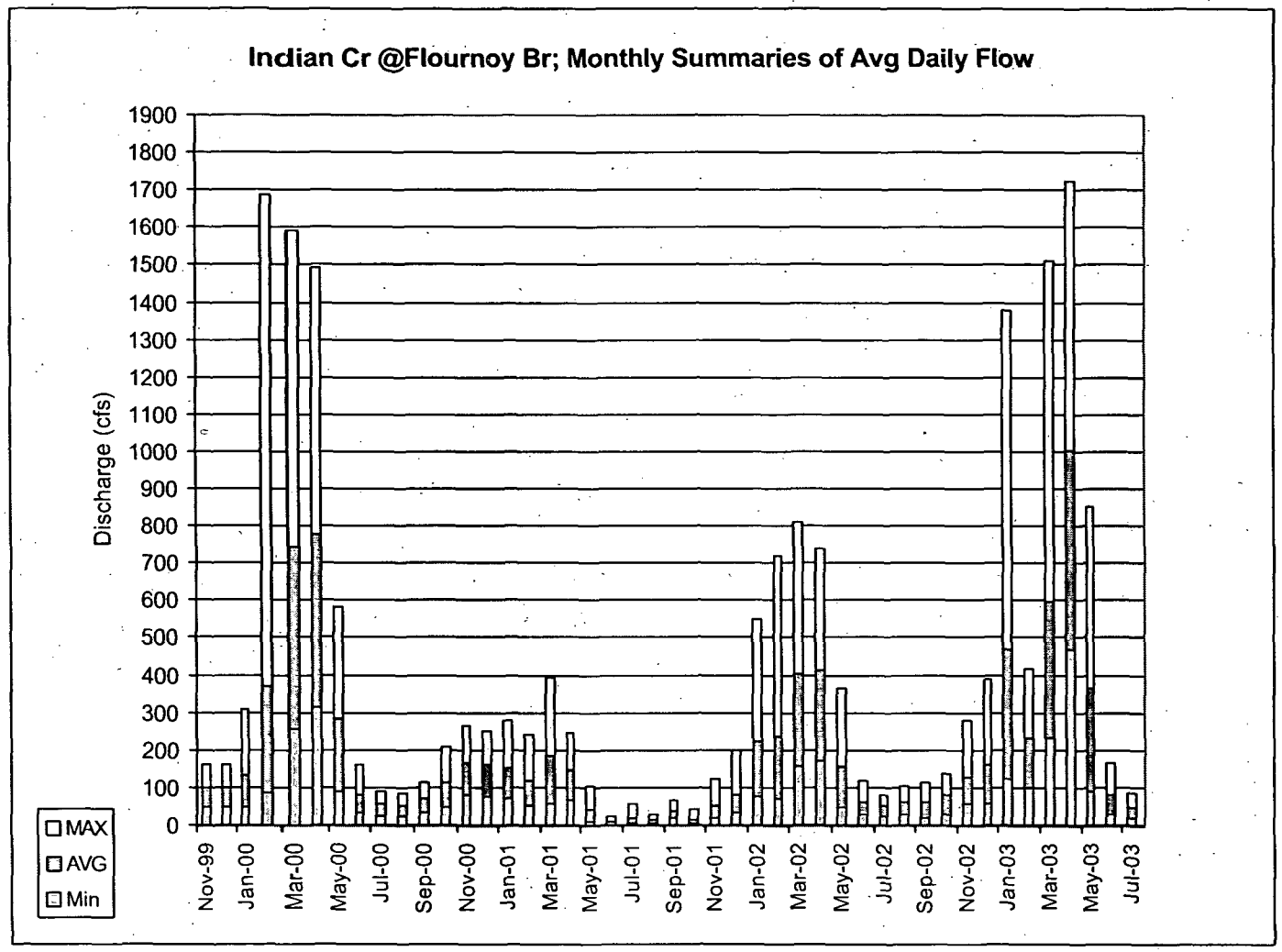

Indian Cr abv Red Clover monthly summaries of avg daily flow
discharge (cfs)
600
550
500
450
400
350
300
250
200
150
100
50
0
Nov-99
Feb-00
May-00
Aug-00
Nov-00
Feb-01
May-01
Aug-01
Nov-01
Feb-02
May-02
Aug-02
Nov-02
Feb-03
May-03
MAX
AVG
MIN

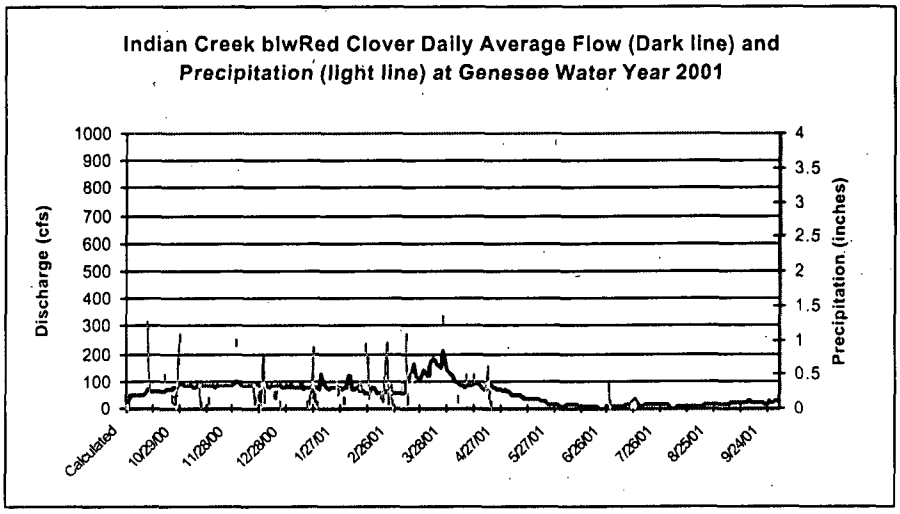


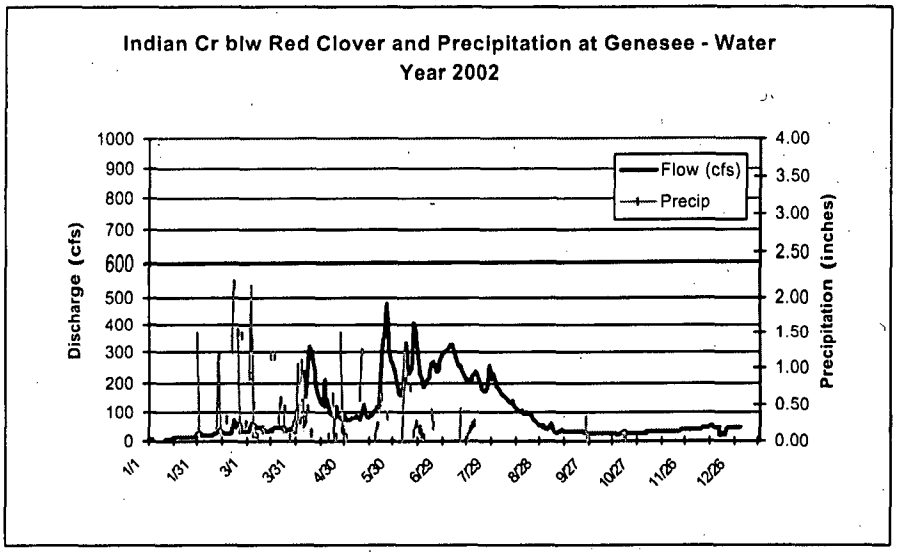


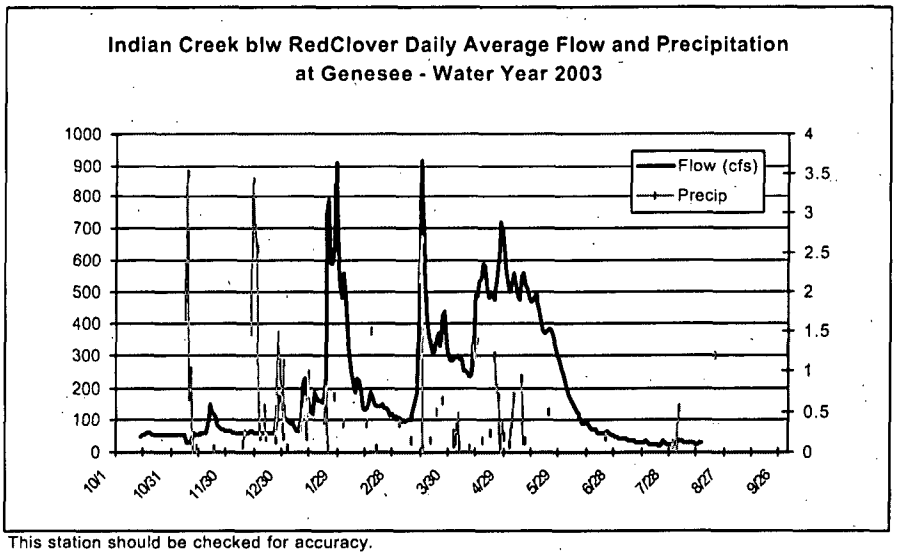


Note: Winter flows may appear higher than actual due to ice build-up on weir.
This station, more than any other is affected by operations at Antelope dam.

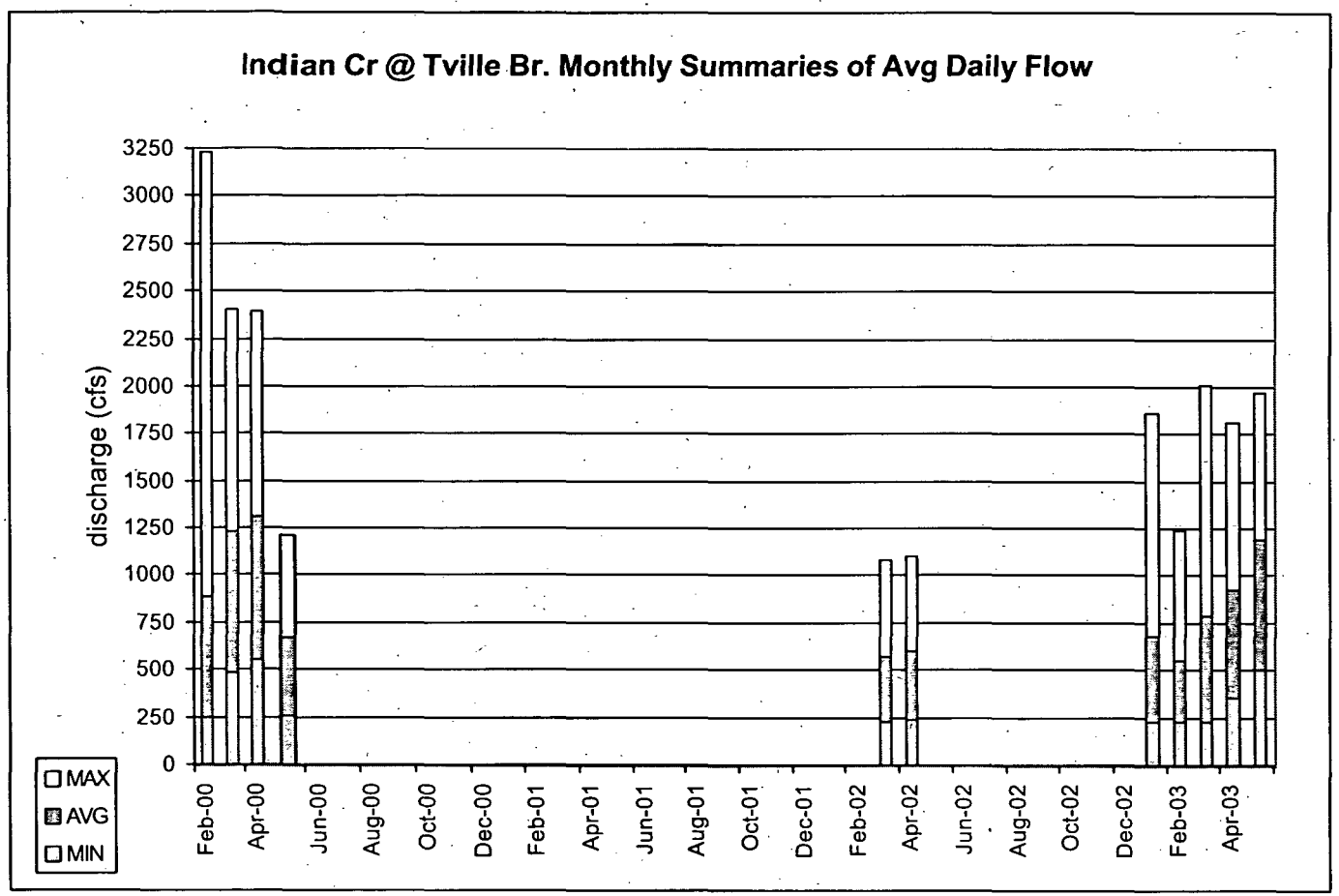

Indian Cr @Flournoy Br; Monthly Summaries of Avg Daily Flow
Discharge (cfs)
1900
1800
1700
1600
1500
1400
1300
1200
1100
1000
900
800
700
600
500
400
300
200
100
0
MAX
AVG
Min
Nov-99
Jan-00
Mar-00
May-00
Jul-00
Sep-00
Nov-00
Jan-01
Mar-01
May-01
Jul-01
Sep-01
Nov-01
Jan-02
Mar-02
May-02
Jul-02
Sep-02
Nov-02
Jan-03
Mar-03
May-03
Jul-03

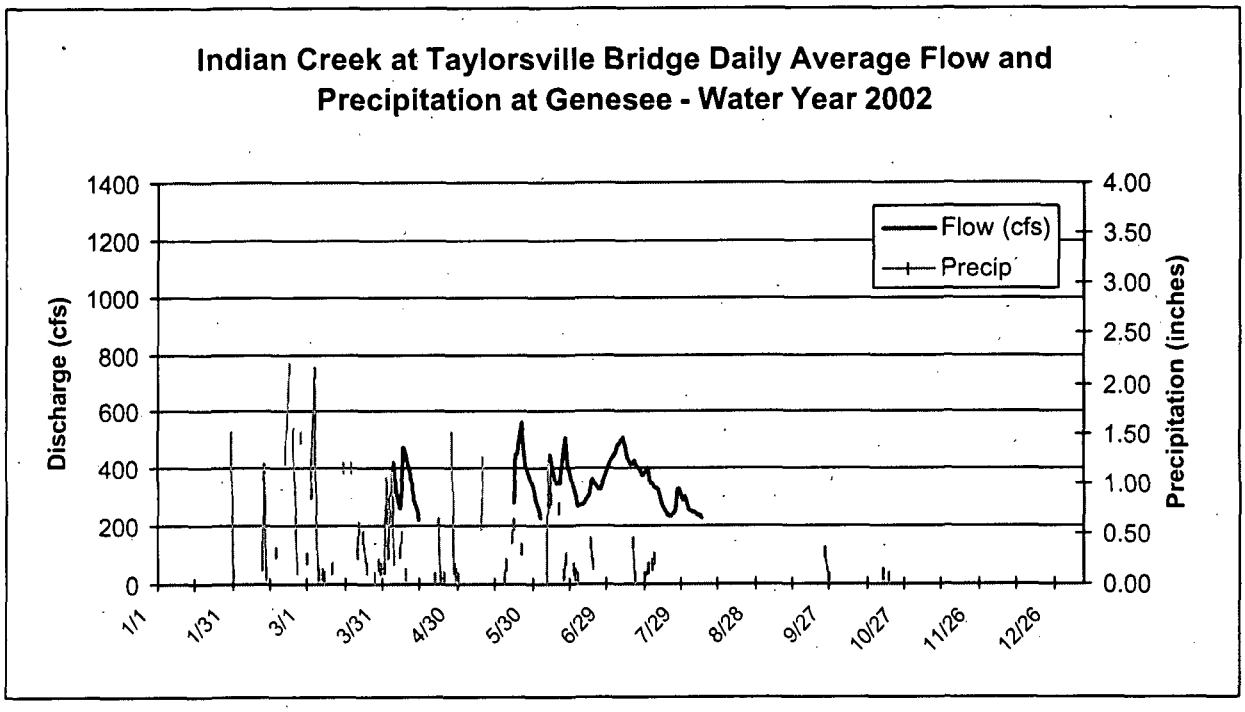


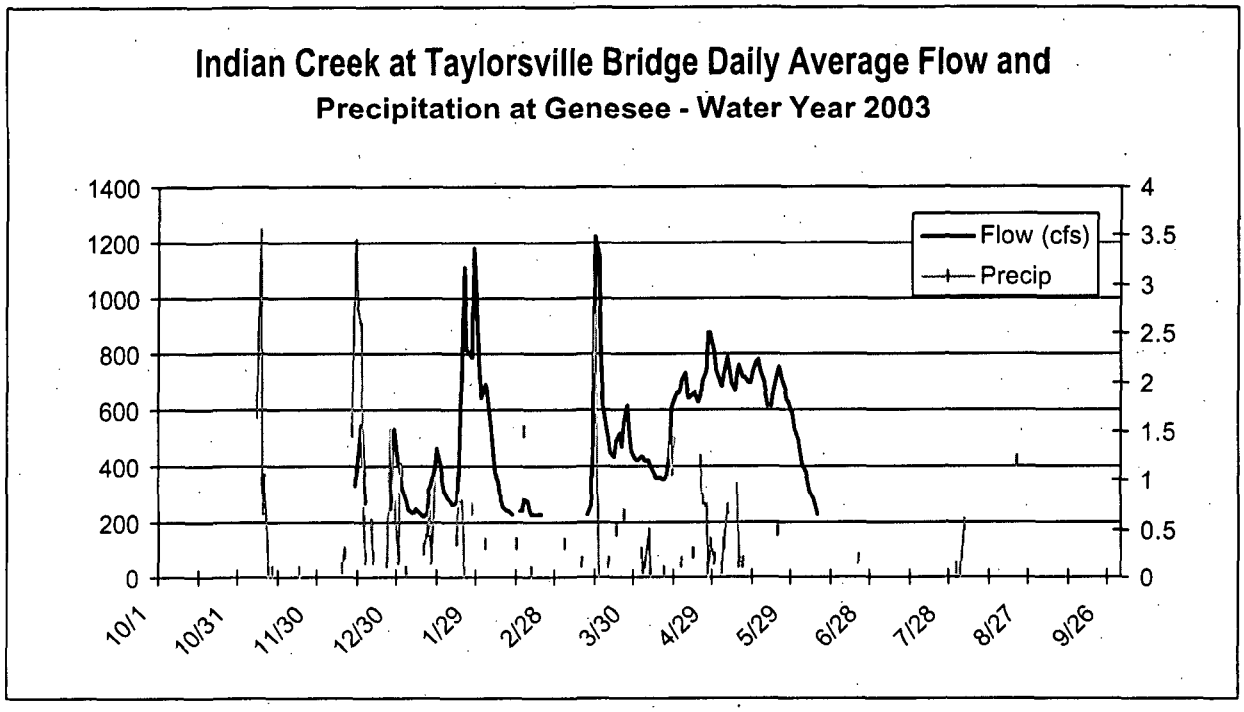


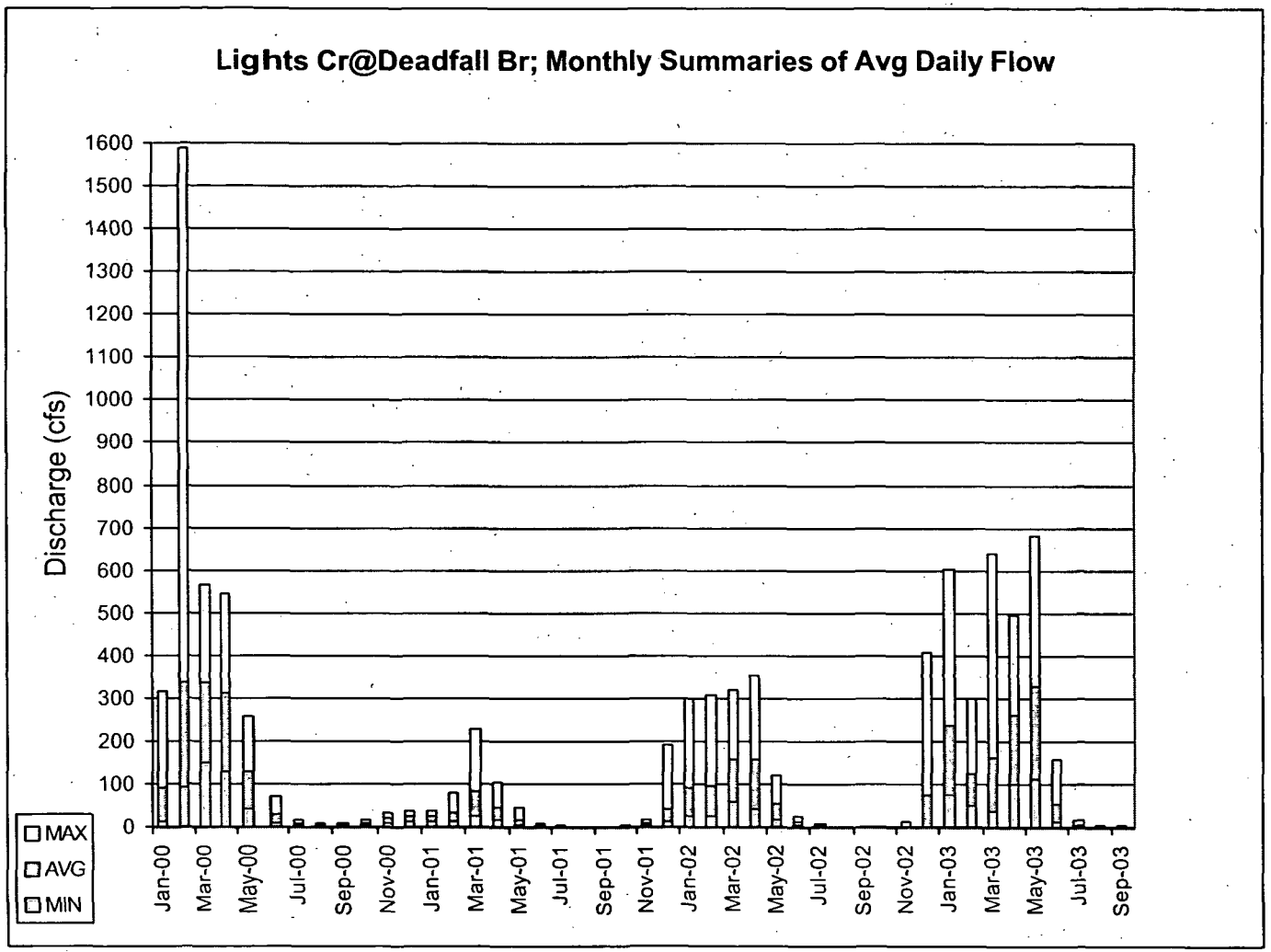


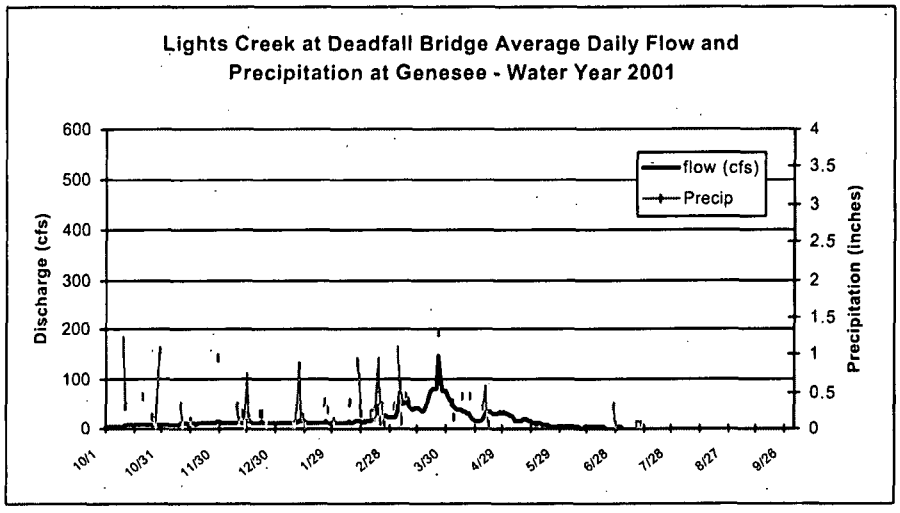
This station should be checked for accuracy.

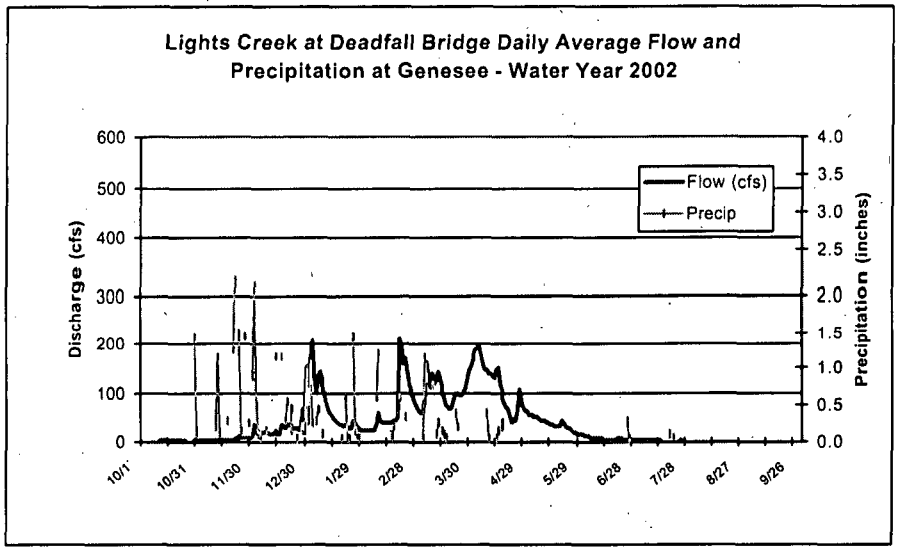

Indian Cr @ Tville Br. Monthly Summaries of Avg Daily Flow
discharge (cfs)
3250
3000
2750
2500
2250
2000
1750
1500
1250
1000
750
500
250
0
MAX
AVG
MIN
Feb-00
Apr-00
Jun-00
Aug-00
Oct-00
Dec-00
Feb-01
Apr-01
Jun-01
Aug-01
Oct-01
Dec-01
Feb-02
Apr-02
Jun-02
Aug-02
Oct-02
Dec-02
Feb-03
Apr-03

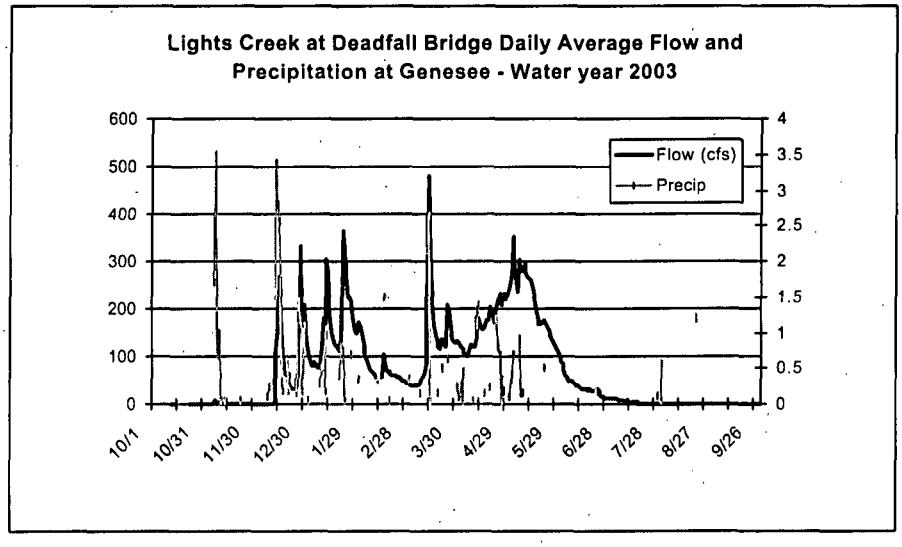

Indian Creek at Taylorsville Bridge Daily Average Flow and Precipitation at Genesee - Water Year 2002
Discharge (cfs)
Precipitation (inches)
Flow (cfs)
Precip
1400
1200
1000
800
600
400
200
0
4.00
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
1/1
1/31
3/1
3/31
4/30
5/30
6/29
7/29
8/28
9/27
10/27
11/26
12/26

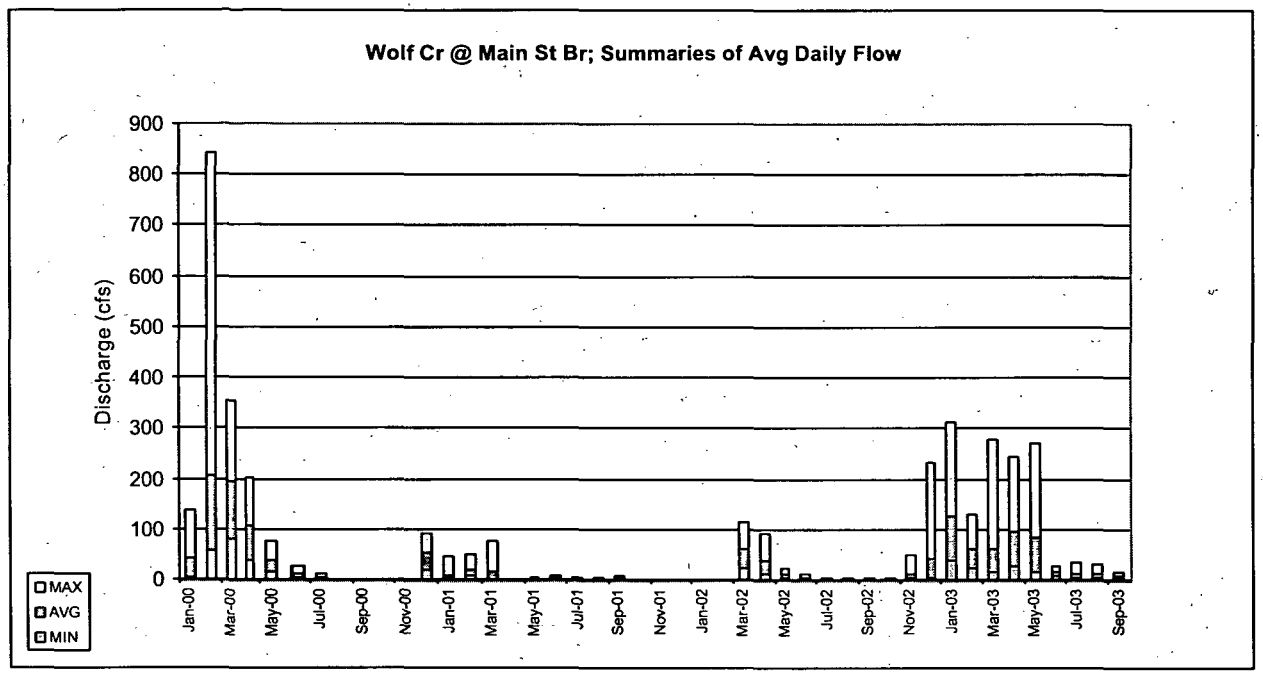

Indian Creek at Taylorsville Bridge Daily Average Flow and Precipitation at Genesee - Water Year 2003
Flow (cfs)
Precip
1400
1200
1000
800
600
400
200
0
4
3.5
3
2.5
2
1.5
1
0.5
0
10/1
10/31
11/30
12/30
1/29
2/28
3/30
4/29
5/29
6/28
7/28
8/27
9/26

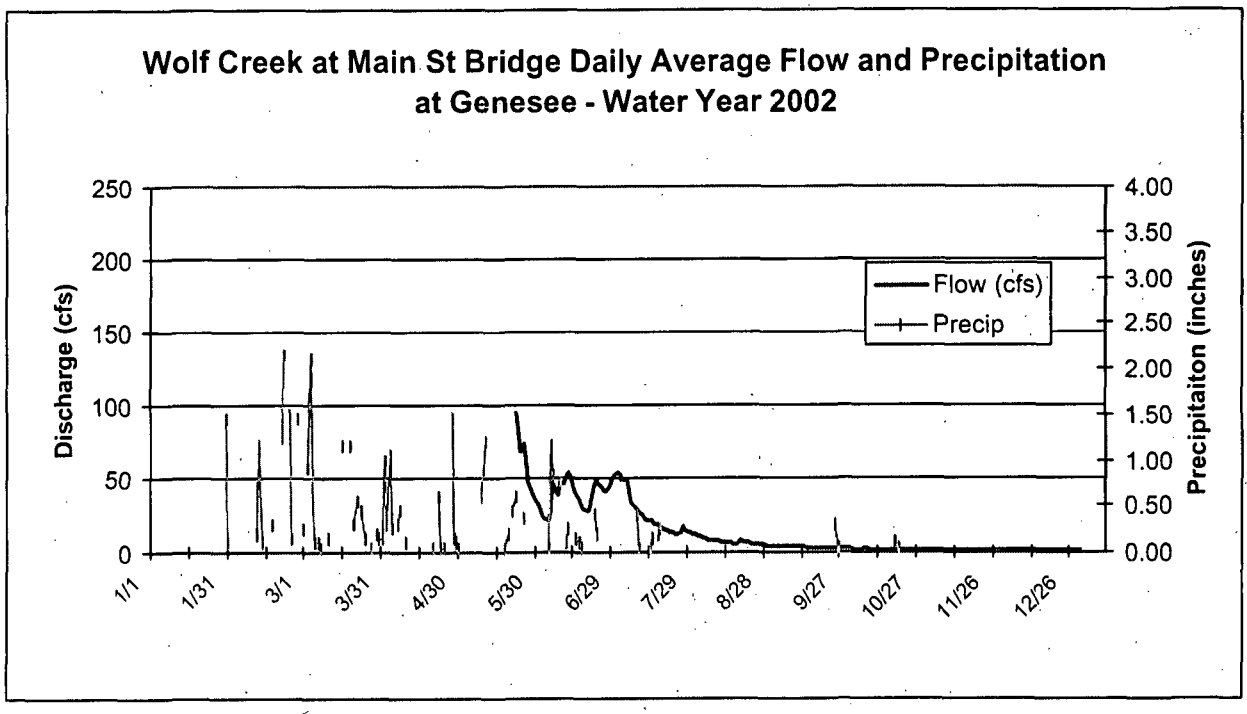

Lights Cr@Deadfall Br; Monthly Summaries of Avg Daily Flow
Discharge (cfs)
1600
1500
1400
1300
1200
1100
1000
900
800
700
600
500
400
300
200
100
0
MAX
AVG
MIN
Jan-00
Mar-00
May-00
Jul-00
Sep-00
Nov-00
Jan-01
Mar-01
May-01
Jul-01
Sep-01
Nov-01
Jan-02
Mar-02
May-02
Jul-02
Sep-02
Nov-02
Jan-03
Mar-03
May-03
Jul-03
Sep-03

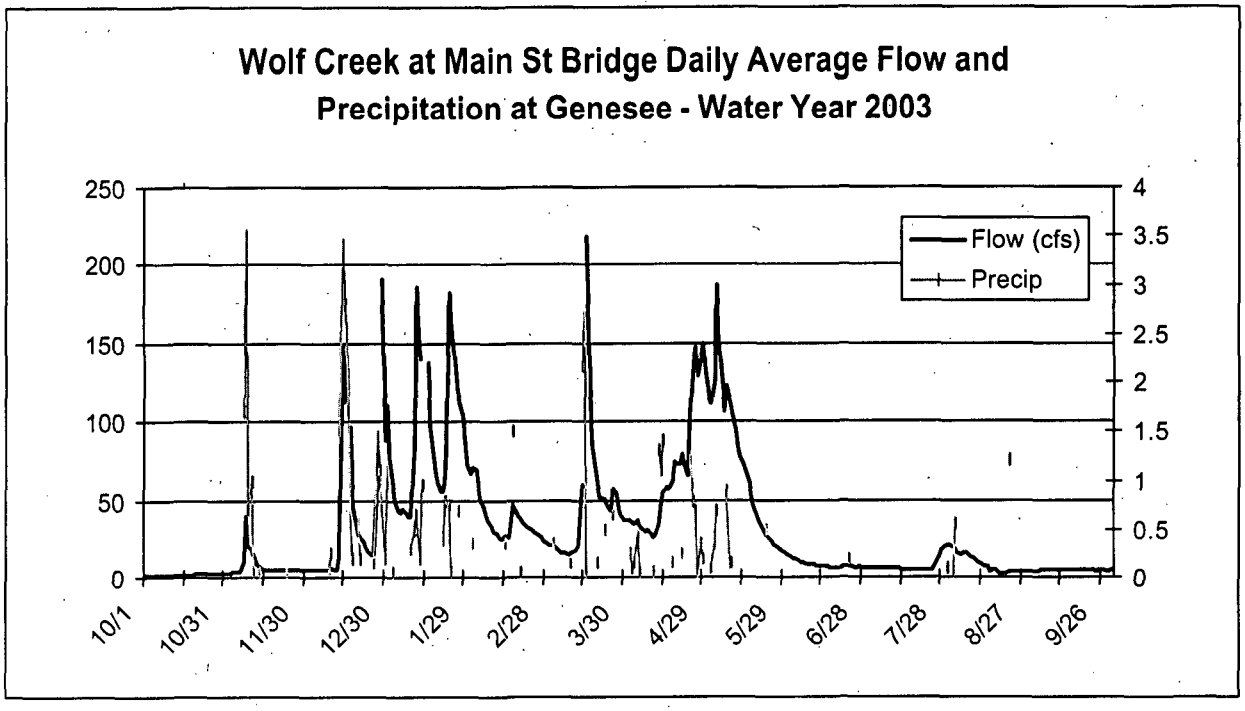

Lights Creek at Deadfall Bridge Average Daily Flow and Precipitation at Genesee - Water Year 2001
Discharge (cfs)
Precipitation (inches)
flow (cfs)
Precip
600
500
400
300
200
100
0
4
3.5
3
2.5
2
1.5
1
0.5
0
10/1
10/31
11/30
12/30
1/29
2/28
3/30
4/29
5/29
6/28
7/28
8/27
9/28

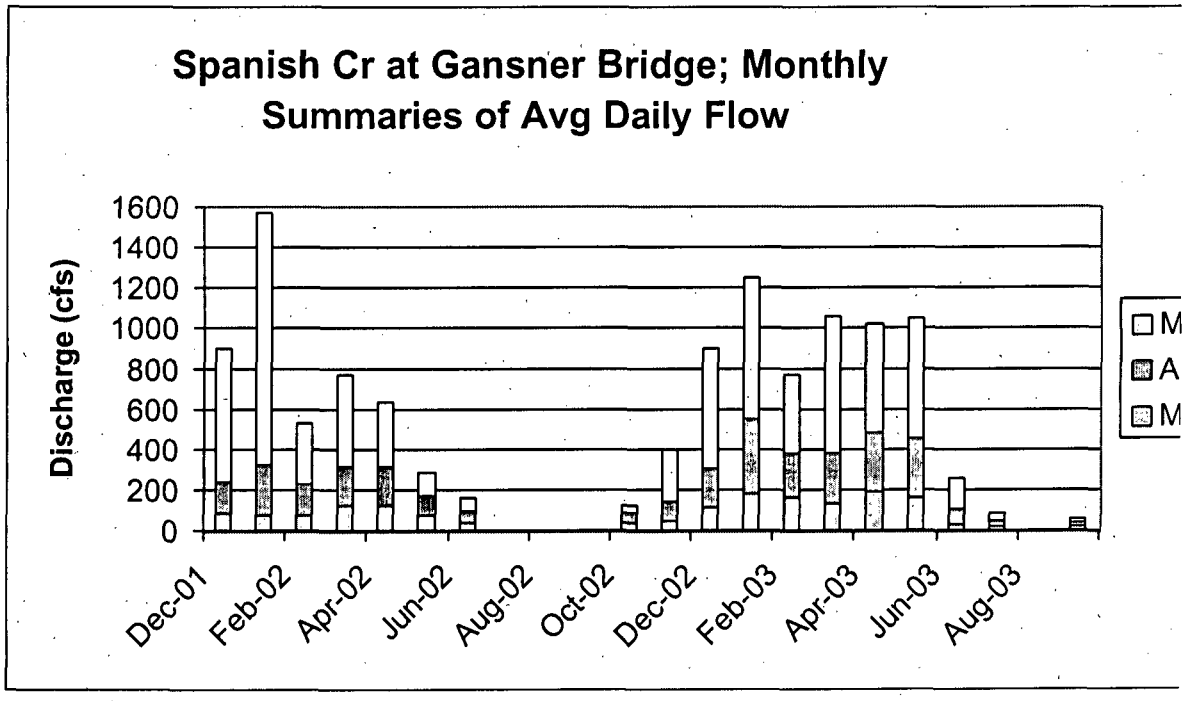

Lights Creek at Deadfall Bridge Daily Average Flow and Precipitation at Genesee - Water Year 2002
Discharge (cfs)
Precipitation (inches)
Flow (cfs)
Precip
600
500
400
300
200
100
0
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
10/1
10/31
11/30
12/30
1/29
2/28
3/30
4/28
5/29
6/28
7/28
8/27
9/26

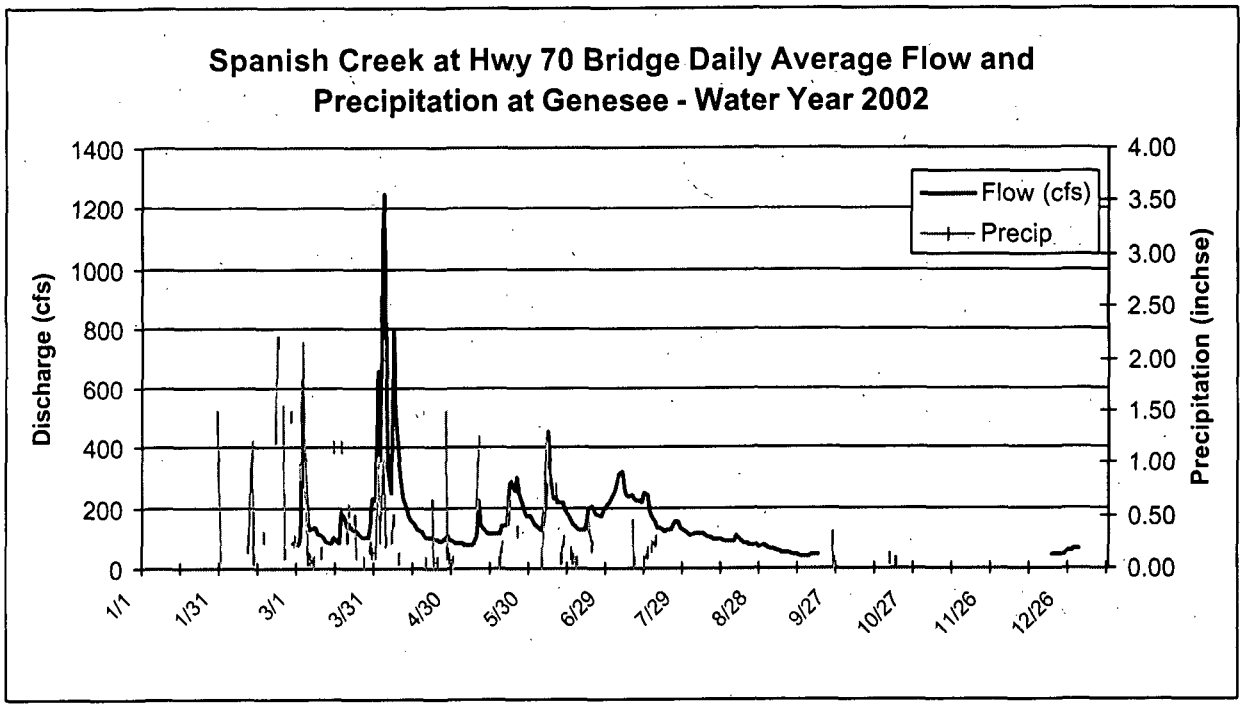

Lights Creek at Deadfall Bridge Daily Average Flow and Precipitation at Genesee - Water year 2003
Flow (cfs)
Precip
600
500
400
300
200
100
0
4
3.5
3
2.5
2
1.5
1
0.5
0
10/1
10/31
11/30
12/30
1/29
2/28
3/30
4/29
5/29
6/28
7/28
8/27
9/26

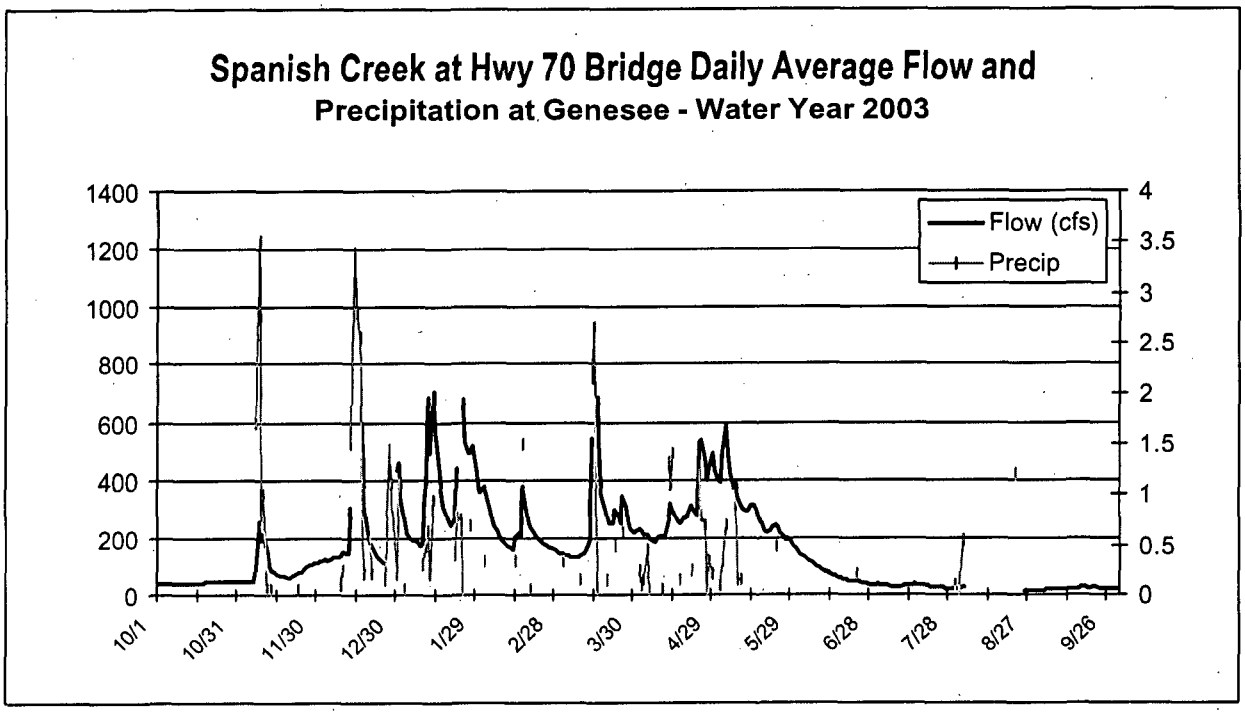

Wolf Cr @ Main St Br; Summaries of Avg Daily Flow
Discharge (cfs)
900
800
700
600
500
400
300
200
100
0
MAX
AVG
MIN
Jan-00
Mar-00
May-00
Jul-00
Sep-00
Nov-00
Jan-01
Mar-01
May-01
Jul-01
Sep-01
Nov-01
Jan-02
Mar-02
May-02
Jul-02
Sep-02
Nov-02
Jan-03
Mar-03
May-03
Jul-03
Sep-03


Wolf Creek at Main St Bridge Daily Average Flow and Precipitation at Genesee - Water Year 2002
Discharge (cfs)
Precipitaiton (inches)
Flow (cfs)
Precip
250
200
150
100
50
0
4.00
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
1/1
1/31
3/1
3/31
4/30
5/30
6/29
7/29
8/28
9/27
10/27
11/26
12/26


Wolf Creek at Main St Bridge Daily Average Flow and Precipitation at Genesee - Water Year 2003
Flow (cfs)
Precip
250
200
150
100
50
0
4
3.5
3
2.5
2
1.5
1
0.5
0
10/1
10/31
11/30
12/30
1/29
2/28
3/30
4/29
5/29
6/28
7/28
8/27
9/26


Spanish Cr at Gansner Bridge; Monthly Summaries of Avg Daily Flow
Discharge (cfs)
1600
1400
1200
1000
800
600
400
200
0
Dec-01
Feb-02
Apr-02
Jun-02
Aug-02
Oct-02
Dec-02
Feb-03
Apr-03
Jun-03
Aug-03
M
A
M


Spanish Creek at Hwy 70 Bridge Daily Average Flow and Precipitation at Genesee - Water Year 2002
Discharge (cfs)
Precipitation (inchse)
Flow (cfs)
Precip
1400
1200
1000
800
600
400
200
0
4.00
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
1/1
1/31
3/1
3/31
4/30
5/30
6/29
7/29
8/28
9/27
10/27
11/26
12/26


Spanish Creek at Hwy 70 Bridge Daily Average Flow and Precipitation at Genesee - Water Year 2003
Flow (cfs)
Precip
1400
1200
1000
800
600
400
200
0
4
3.5
3
2.5
2
1.5
1
0.5
0
10/1
10/31
11/30
12/30
1/29
2/28
3/30
4/29
5/29
6/28
7/28
8/27
9/26

☐ MAX
☒ AVG
☐ MIN