98-319h-02

Final Report

Implementing Water Quality Restoration Measures, Restoration Project Monitoring, and Project Monitoring Information Management for the Shasta Sub-basin

Great Northern Corp.
December, 1999

Cooperative Agreement 14-48-11333-98-J263
Project Number 98-319(h)-02

Contents

Abstract:

This Clean Water Act section 319(h) grant funded a variety of restoration works intended to improve water quality in the Shasta River. Projects included irrigation tailwater capture on the Meamber Ranch, off-stream livestock watering also on the Meamber Ranch, protection of large existing trees from beaver damage on the Webb Property, and livestock exclusion fencing on the Koon Ranch. Additional work consisted of monitoring restoration project effectiveness via stream cross section measurement on the Meamber, Dutra and Fiock Ranches; analyzing samples of aquatic invertebrate data from 5 sites, and working with Kier and Assoc. on the further development, expansion and maintenance of the Klamath Resources Information System.

Introduction:

This report describes the water quality improvement work completed under a grant from the California Water Quality Control Board under section 319(h) of the Federal Clean Water Act of 1972. All work was done on private lands in the Shasta Valley in Siskiyou County, California (see figures 1, 2, and 3) during 1999.

Description of Study Area:

The Shasta River and its major tributaries total approximately 110 miles in length, and drain an area of approximately 800 square miles. It flows almost entirely through relatively small parcels of private ranch land. To be effective, any activity aimed at improving water quality for fish or human needs must be done with the active help and participation of a large number of individual owners whose needs, desires and financial conditions vary greatly.

Each of these ranchers has long-standing cultural practices, many of which depend on the river, including irrigation of pasture and hay fields, and grazing of riparian areas. All of these activities can have a substantial impact on water quantity and quality.

Historically the Shasta River was an important spawning and rearing area for Chinook and Coho Salmon, and Steelhead. Records of Fall Chinook spawners kept since the 1930's show a long decline, from over 80,000 in 1931 to as few as 530 in 1992. Steelhead and Coho are likewise no longer present in significant numbers, although actual counts are not available.

Over the last ten years there has been an extensive program of water testing in the Shasta. Results indicate significant problems for cold water fish resulting from high water temperatures and low levels of dissolved oxygen. Additional fieldwork indicates severe problems of fine sedimentation. Other observed but less well documented problems include: blockage of coarse sediment by dams, groundwater withdrawals capable of affecting surface flows, high nutrient levels and consequent turbidity caused by free-floating algae.

The Shasta CRMP has developed a variety of responses to these problems.

In the long run, it is essential to restore the functioning of the riparian zone. We are approaching this through a program of fencing to create non-grazed buffer strips the length of the river. We have replanted those protected areas with native riparian trees, which should both provide shade to help

maintain lower water temperatures, and also reduce sedimentation from eroding banks. In addition, we are maximizing the longevity of the existing large trees along the river by wrapping them with 2" x 4" fencing to minimize losses to beavers.

We are also working on measures to capture and re-use irrigation tailwater, in order to reduce thermal and nutrient loading, and/or reduce water withdrawals from the river.

We also have ongoing programs including field projects with students, public presentations, newsletters, public meetings, and cooperative efforts with local organizations involved with farming and ranching.

This complex and varied program to reverse the fishery and water quality trends in the Shasta is all being done in the context of voluntary cooperation.

This 319(h) grant allowed us to make progress in several of those areas including:

- the construction of an irrigation tailwater capture and pump-back system on the Meamber Ranch,
- off stream livestock watering also on the Meamber Ranch,
- protection of existing large riparian trees on the Webb property,
- livestock exclusion fencing on the Koon Ranch,
- the analysis of aquatic invertebrates from five sites in the Shasta Valley
- Stream cross-section measurements from the Fiock, Dutra and Meamber Ranches
- Work with the KRIS system.

Methods and Materials:

1. Meamber Ranch Tailwater capture system:

The Meamber Ranch north of the town of Montague straddles several small drainages that accumulate irrigation tailwater from both the Meambers and their uphill neighbors (see figure 4). That tailwater flows into the Oregon Slough, (a small stream that is a tributary to the Shasta River) as it flows through the Meamber ranch.

Using funds provided through this grant, coupled with donated labor and equipment of the Meambers' we were able to move an existing dam forming a sump and place it where it would capture a portion of the tailwater originating on the Meamber Ranch, along with tailwater from a number of their upstream neighbors.

The attached illustration (figure 5) will show where the berm forming an existing sump wasremoved and replaced in such a way as to form a barrier to the overland flow of irrigation water into the Oregon Slough. The existing sump and pump can now capture all that water to be re-used for meeting existing irrigation needs, rather than relying on new water from either the Shasta River or the Oregon Slough.

This project will correct a problem of irrigation tailwater return to the Oregon Slough that was observed and remarked upon by members of the North Coast Water Quality Control Board on a public tour of the area several years ago.

Figure 1

Study Area--Siskiyou County, Calif.

Figure 2

Study Area--Shasta River Watershed

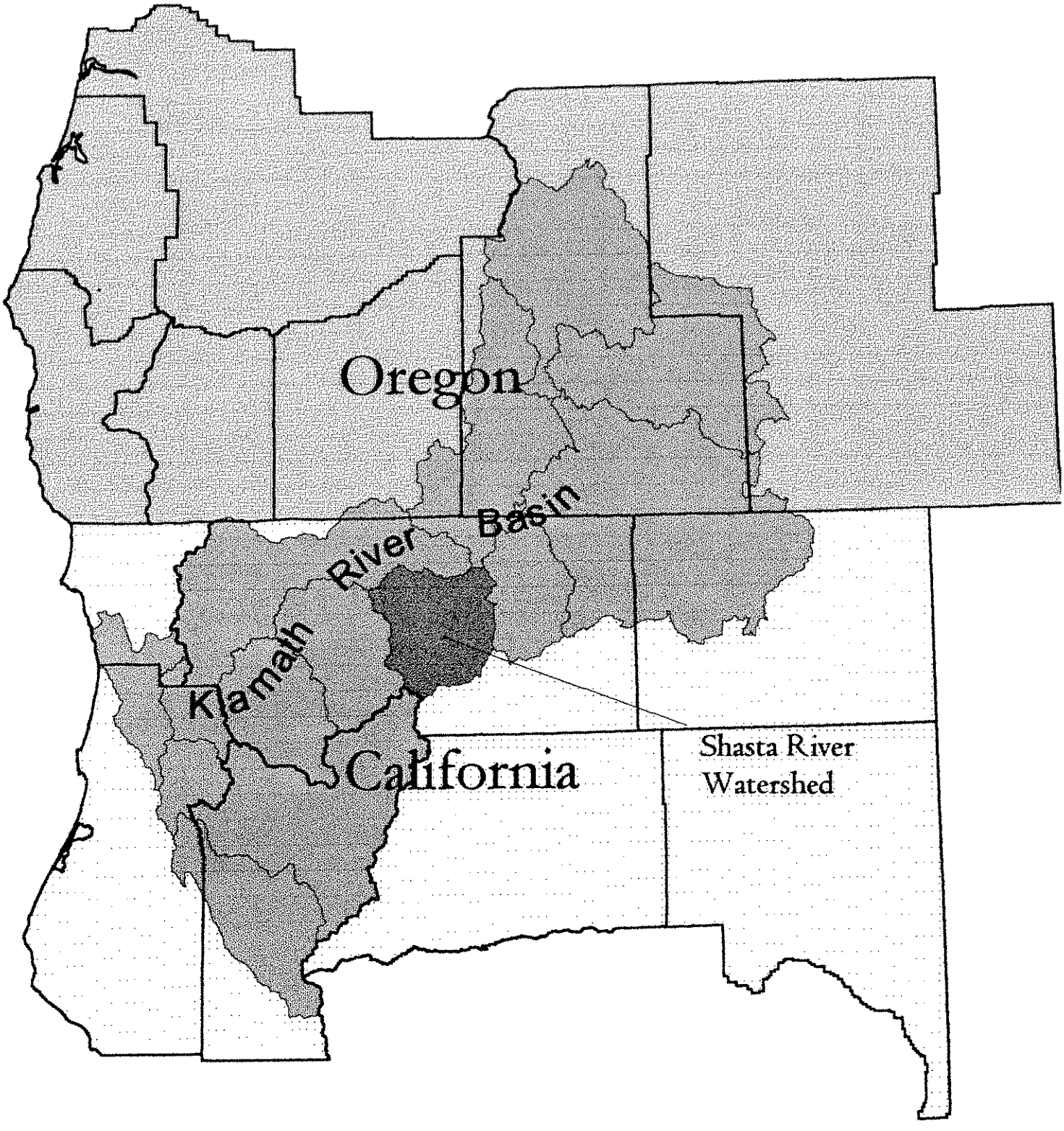


Figure 3

Shasta Watershed showing public (dark) and private (white) lands.

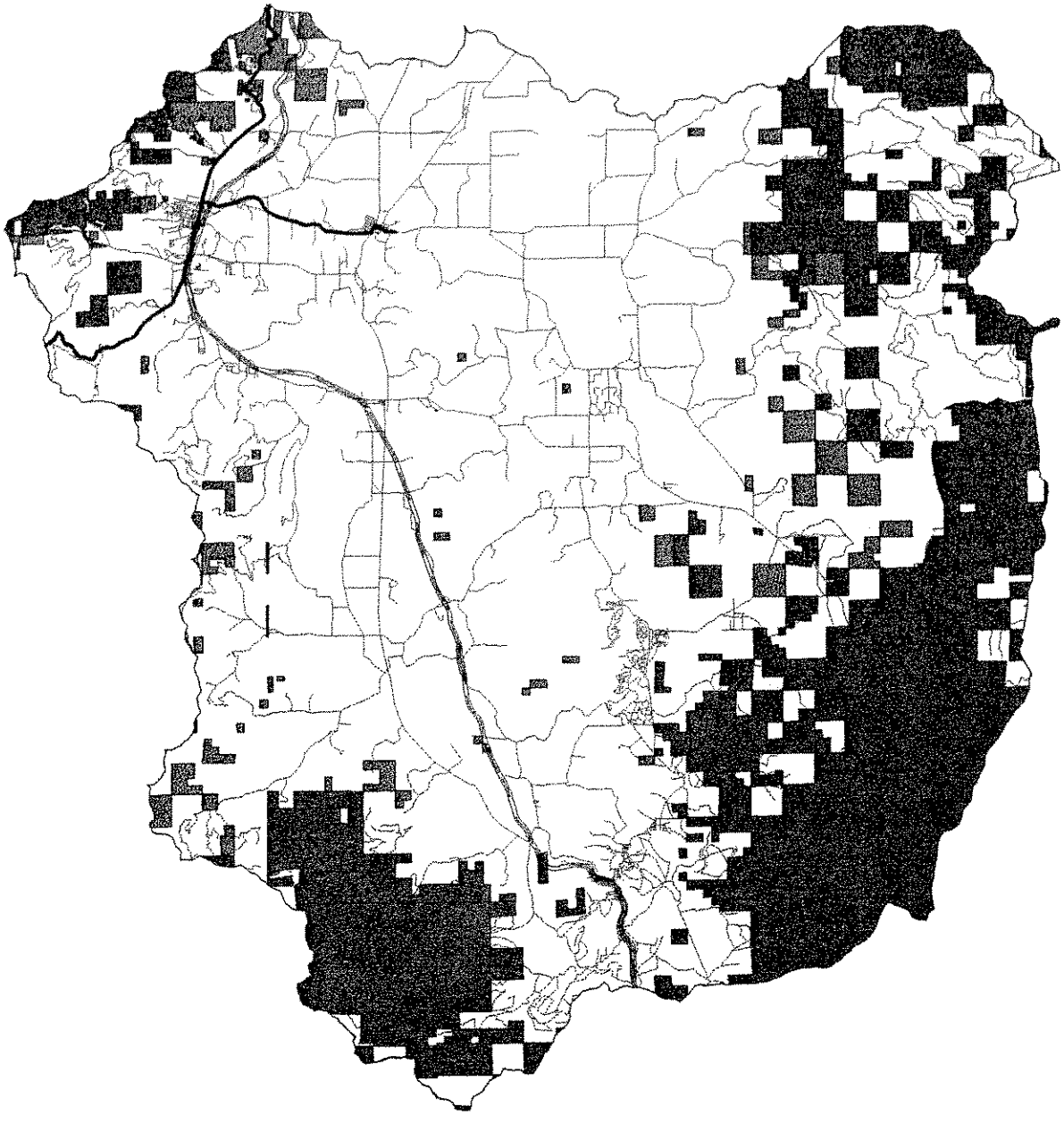


Figure 4

Meamber Ranch 319(h) Phase 5 Related Projects

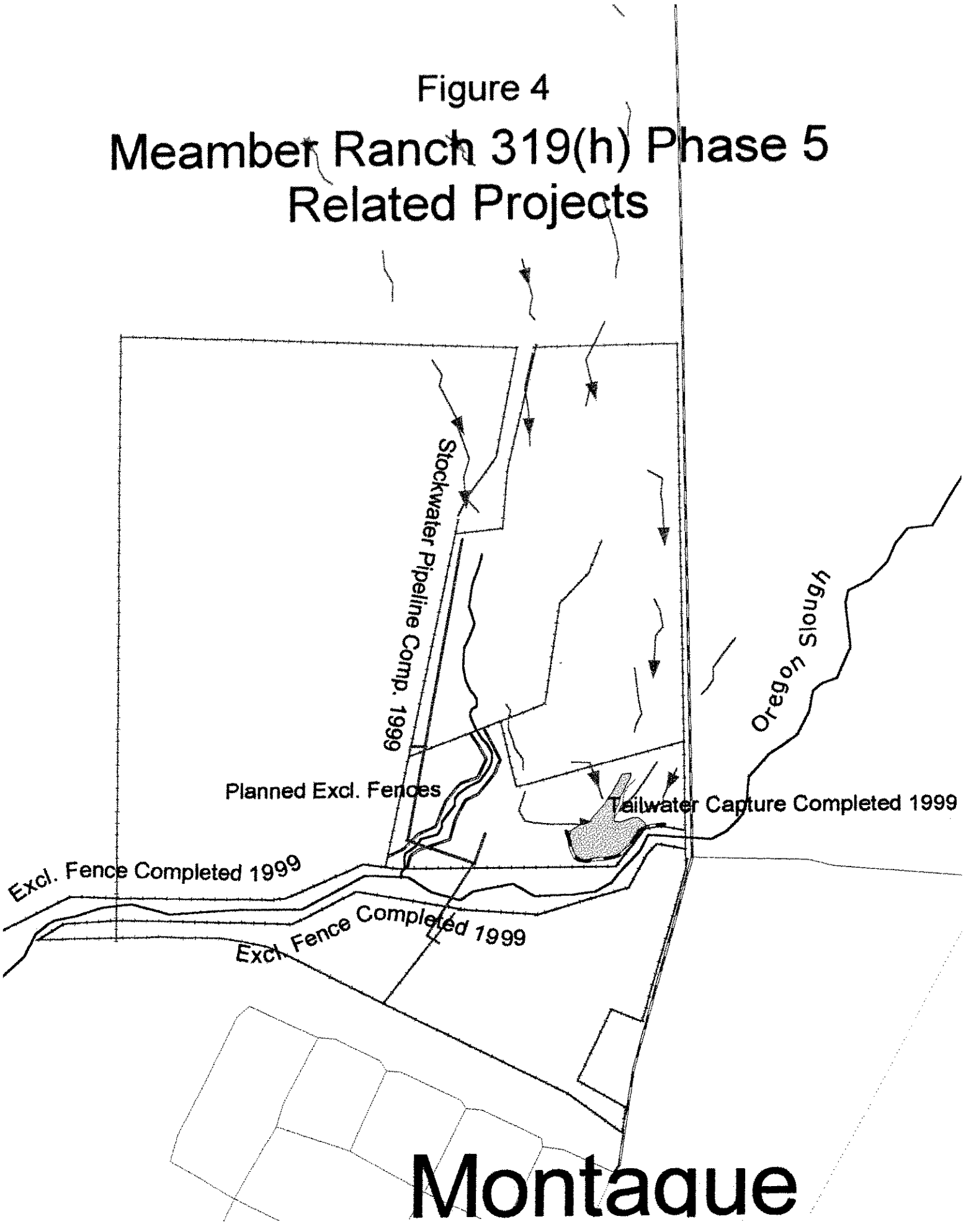
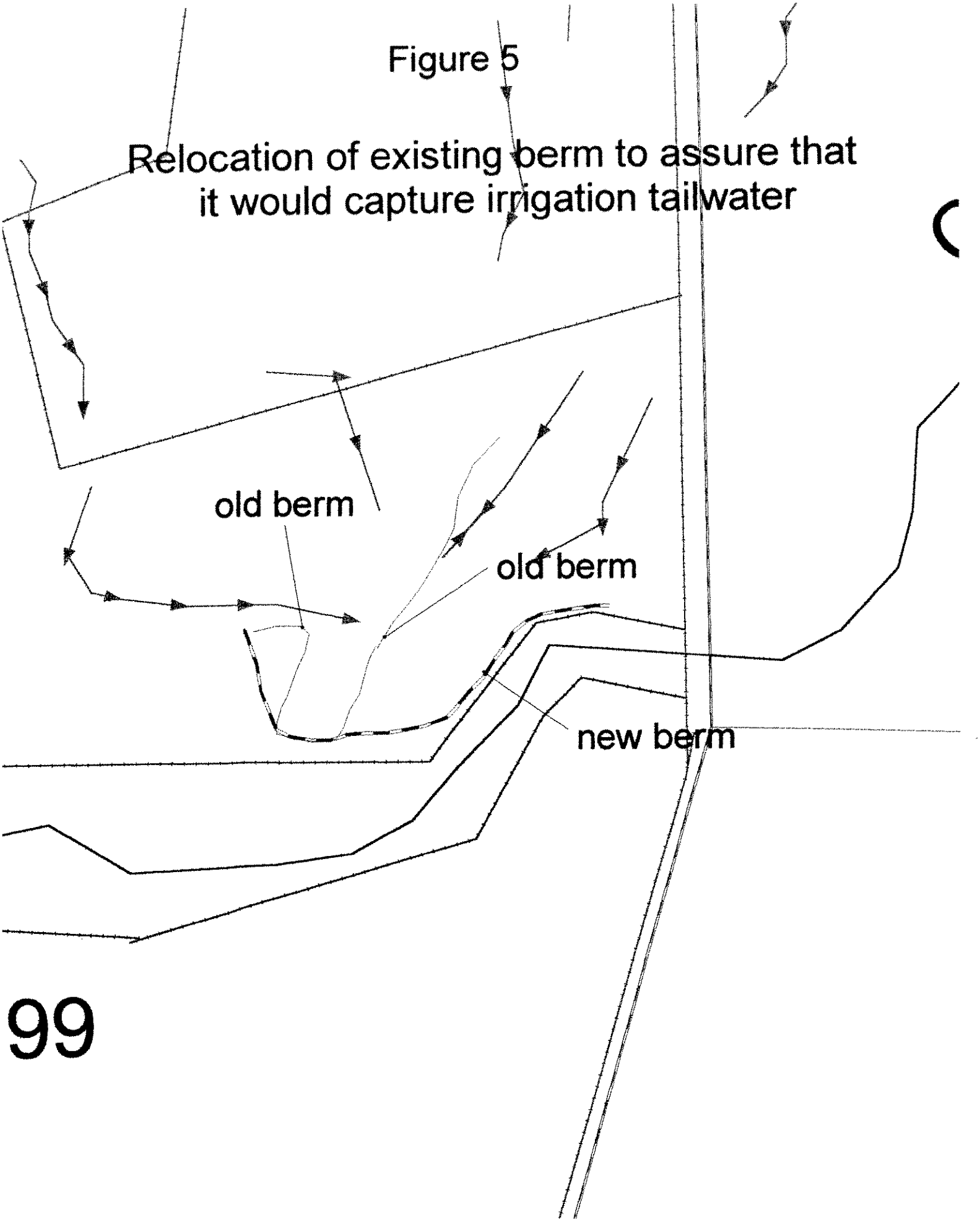


Figure 5

Relocation of existing berm to assure that it would capture irrigation tailwater



The measures taken consisted of scarifying the pasture surface where the dam was to be placed using an excavator, then using a scraper pulled by a caterpillar tractor to dig up the old dam and place it in its new location. Compaction was accomplished by the many passes of the equipment over the fill material as it was placed. Where the ground was too wet to allow use of a scraper, an excavator was used to remove the existing fill material and place it into the scraper for transport.

The Meamber Ranch donated final grading, pumpback system, and ongoing operating expenses and repairs. They plan to fence the majority of the impoundment to encourage the growth of emergent plants for wildlife habitat.

2. Off-stream livestock watering:

As part of their overall ranch plans to minimize possible adverse environmental impacts of their livestock operations, the Meambers have chosen to exclude livestock from the streams passing through their property. This year they have focused on the Oregon Slough, having previously addressed the same needs along the Shasta River. The Meambers provided all labor to construct over 4,000 feet of exclusion fencing along the Oregon Slough, and the Shasta CRMP and Great Northern Corp provided all materials through a grant from the USFWS.

In the past, the cattle grazing there used to drink from the Oregon Slough. In order exclude them from the Oregon Slough, we have shared costs for labor and materials to trench in 2500 feet of 2" pipe with periodic watering troughs using these 319(h) funds for portions of labor and all the materials. That pipeline will serve the needs of cows as they are rotated through several pastures that previously relied on water from the Oregon Slough. See figure 4.

Trenching for the pipeline was done with an excavator using a two-foot wide bucket. All pipe was placed a minimum of 18 inches deep to avoid possible frost damage. Assembling of the pipe, placing it in the trench, back-filling, final grading, stock tank installation and all other hand labor was donated by the Meamber Ranch

3. Livestock control fencing:

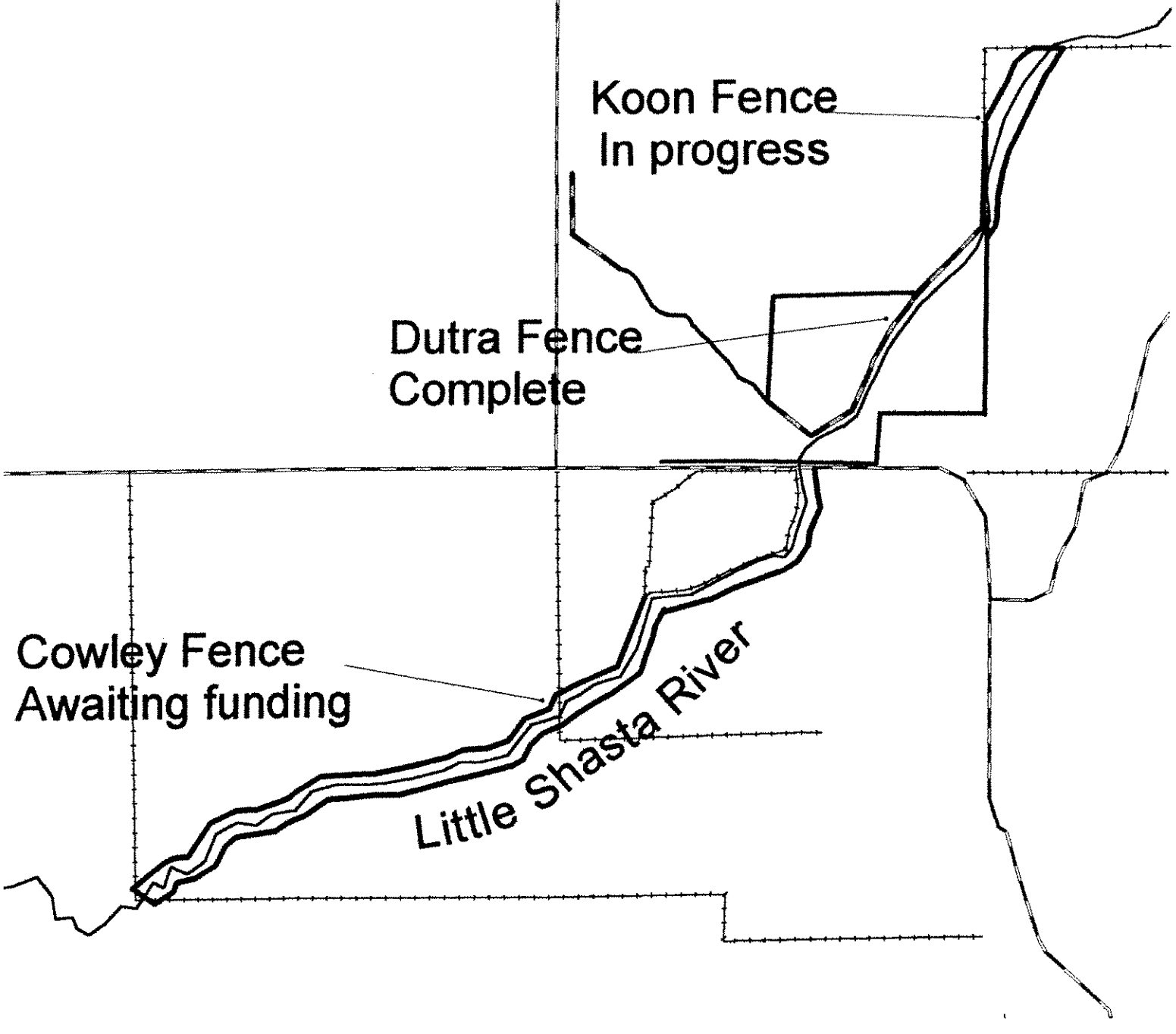
The owners of the Koon Ranch were willing to allow livestock exclusion fencing to be built along the portion of the Little Shasta River where it flowed through their property. 319(h) funds were matched with other funds to complete .25 miles of this fence. Other funds were used to complete that project (see figure 6).

The fence constructed utilized 8.5-foot railroad ties for all corners and line posts. All posts were set four feet into the ground. Line posts were placed a maximum of every 72 feet. Six-foot heavy-duty steel fence posts (1.25 lbs./foot) were used throughout, with five strands of four point barbed wire. One crossing lane was provided to allow moving livestock from one side of the stream to the other.

This fence is in an area that has shown good natural recruitment of trees in some past years. With livestock excluded for a minimum of ten years, we expect natural tree recruitment to result in substantial stabilization of the soil and banks, along with shading of the Little Shasta River.

Figure 6

Koon, Dutra and Cowley adjoining livestock exclusion fences



This portion of the river has been used as a school study site by students at the one-room Little Shasta School (K-8), where Mrs. Koon is a teacher. We plan to increase our help and suggestions to her classes in the future to help increase that usage.

4. Protect existing trees:

While it is uncertain just what the original riparian zone looked like along the Shasta River, there is no doubt that many areas that once had large trees shading the river have lost those trees through the combined effects of beaver, cattle and time. In addition, recruitment of new trees seems to be severely limited by changes to the natural hydrograph resulting from irrigation need for water. In this environment, it is essential to retain the large trees that are still alive (while at the same time supplementing natural recruitment with plantings of local native stock). As part of this ongoing effort, 30-60 foot tall willows, alders, and Oregon Ash trees along a 1/4 mile stretch of the Webb property on the Shasta were loosely wrapped with 2" x 4" fencing to a height of three to four feet to prevent loss to gnawing by beavers. This work was coordinated by paid staff, with much of the labor provided by volunteers.

Approximately 75 trees were wrapped, assuring that this portion of the Shasta will remain shaded, and that the aquatic community will continue to be fed by the annual leaf fall. Beavers were actively working in the area where the trees were being protected.

5. Work with schools to monitor project effectiveness:

The Shasta CRMP has an ongoing working relationship with several schools to measure stream cross section profiles at several locations throughout the Shasta Valley. This year cross section work was done at the Fiock Ranch by Yreka High School, and at the Meamber Ranch by Discovery High School (see figure 7). Additional cross sections were set up and/or measured on the Dutra Ranch and Fiock Ranch by CRMP staff. Those sites will be available in the future for ongoing monitoring either by students or CRMP staff if students are unable to do the actual monitoring.

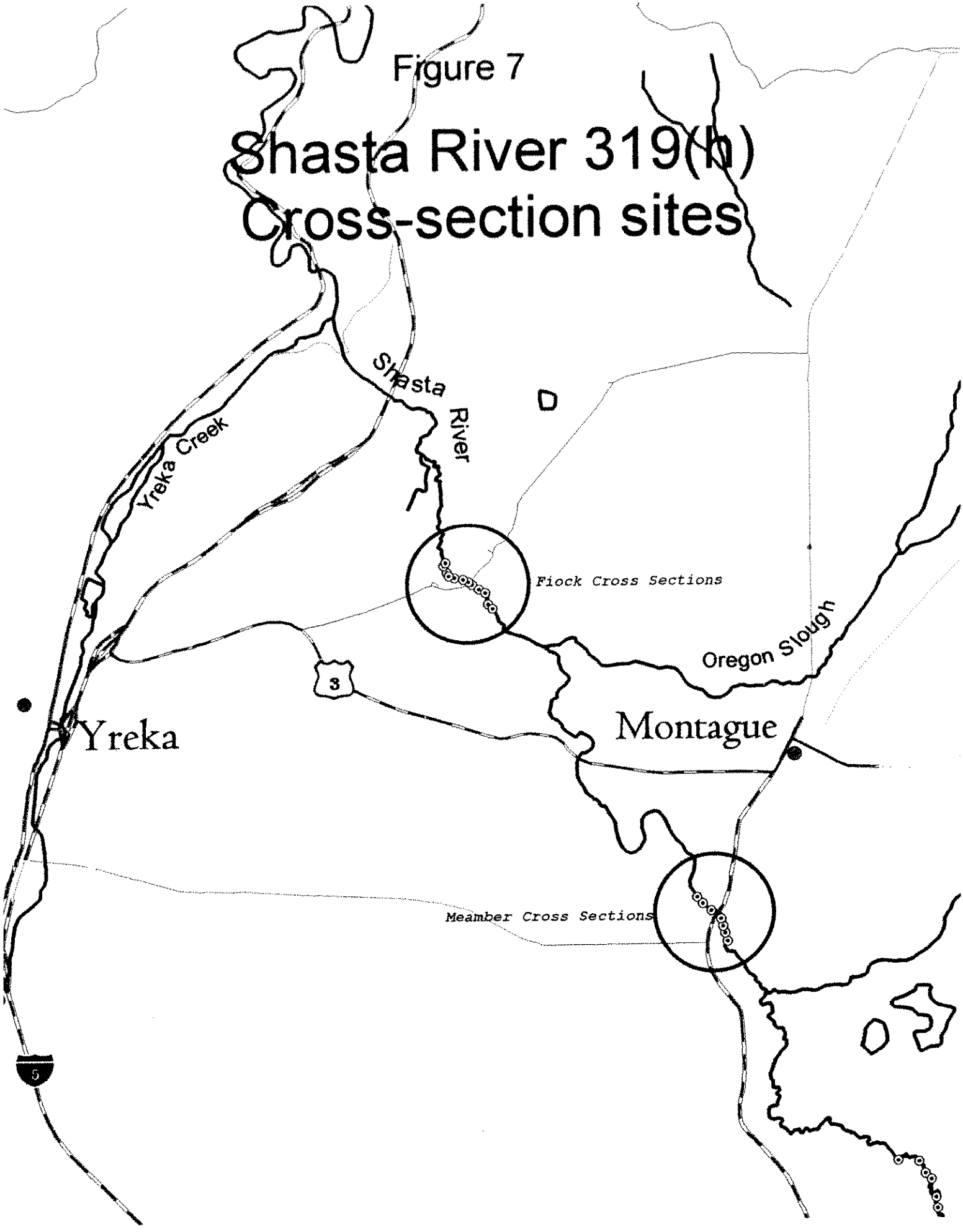
Setting up new cross sections is a multi step process. It is begun by selecting several sites in the excluded area that are typical of the area fenced, or will be likely to show measurable change. Heavy-duty T posts are driven upside down at the starting and ending point of each cross-section. By placing them upside down they stand out as unusual, reducing the likelihood that they will be inadvertently removed for use elsewhere. It is our standard practice to denote monitoring sites with upside down T posts.

Once the starting and ending points are marked, reference stakes are driven into the ground about 1.5 feet away from each end point stake and in line with the cross section to be measured. Those stakes are 2-3 foot long pieces of heavy-duty T posts that are driven nearly flush with the ground. In that position they are extremely unlikely to be removed, and even if lost can often be relocated with a metal detector.

A preliminary stringline height is selected at one end of the cross section, and marked on the upside down T post with a felt pen. An engineering autolevel is set up and used to establish an identical horizontal height on the upside down T post at the opposite end of the cross section. Once a

Figure 7

Shasta River 319(h) Cross-section sites



reasonable height is established on both ends, a hacksaw is used to notch the upside down T posts at identical heights. Once cut, the heights are re-checked, and if necessary adjusted by additional driving of the posts.

At that point, a string line can be tied to one upside down T post, then pulled tightly to the opposite T post. Braided nylon line works best for this purpose. It is attached at each end in the newly cut notch in the upside down T post, assuring that each end is on a perfectly level plane.

Next a fiberglass tape measure is stretched below the string line, and also tied off to the upside down T posts. Measurements are then made from the string to the top of the reference stake, and then periodically from the string to the ground. The horizontal distance (which can be read from the tape), and the height of the string above the ground are both recorded. In addition, notes are made of vegetation characteristics, stream substrate, and any other observations deemed important.

Once all field data is collected, the horizontal and vertical dimensions can be entered into a spreadsheet, then depicted in a standard Cartesian graph. Similar data from this site for multiple years can be entered on one graph, showing change over time.

Cross Section work with Discovery High School

Discovery High School is a small alternative high school (associated with Yreka High School) for those students who for various reasons aren't able to fit in well in an ordinary high school environment. In addition to other water quality monitoring work they do independently, students from Discovery HS have helped with gathering stream cross section data on the Meamber Ranch on the Shasta River since 1996. This year they continued that program, taking measurements at all seven cross sections on that property over the course of two field days. Supervision was provided by their teacher, Kevin Velarde, and CRMP staff members Dave Webb and Angel Gomez (see appendix A).

Procedures in the field involved dividing into two teams of three to four students and one adult. String lines and tapes were deployed as described above, and students rotated through each aspect of the work--field measurements, data recording, and field quality control. Adults avoided undue influence on the proceedings in order to allow the students to gain experience at carrying out a detailed process.

At times in the past students at Discovery HS have done data entry, and other times the CRMP Coordinator has performed that function. This year one student who was unable to participate in the work in the field chose to make cross section data entry and presentation his required senior project.

He has entered values from the field data sheets, adjusted for the offset resulting from tying off the tape measure, and is preparing to produce graphs comparing this years data to previous years data. Two CRMP employees have met with him for interviews, helped him to more effectively utilize the time saving aspects of Excel, produced one preliminary graph, worked with him to identify apparent problems with data, and separate data entry problems from field data collection problems. That process has now reached the stage where the student needs to decide if he wants to try to sort out the remaining discrepancies identified, or bring his senior project to a close with the work done to date.

It was our hope that he will try to resolve the data problems, since that will almost certainly require he confer with the field data collectors. Were that to occur, a group of high school students would have to work together to try to maximize the value of something they had all participated in, where any sloppiness in field procedures were now clearly making things difficult and confusing for one of their peers who somehow had to make sense of things.

We are waiting to see what he will choose to do, fully realizing that it will be very difficult for him, as he is very shy. It seems like a good opportunity for personal growth for several of the students.

Should he choose not to proceed in this direction, we will be able to work with Kevin Velarde and the field data sheets to resolve any data problems.

Cross section work with Yreka High School

Yreka High School has been measuring five stream cross section profiles on the Fiock Ranch upstream of the Yreka Ager Rd. since the spring of 1997. This year, one student, Adam Cates, chose to make the measuring and consolidation of cross section data his required senior project. He organized other students into a field crew, located the existing cross section sites on the Fiock Ranch, then provided oversight and quality control of all fieldwork(see Appendix B).

Once the field data was collected, he did all required data entry, and produced preliminary graphs. Those graphs are attached as he has refined them to date. In addition to spreadsheet data entry, Adam is using his interest in this process as a reason to familiarize himself with AutoCAD, and plans to attempt to produce 3-D views of the cross sections using that program.

Adam is also working on assembling past cross section data, photographs, and other details on the cross section work done since 1977 on the Fiock Ranch. He has converted all field measurements from feet to meters. He plans to consolidate all cross section information into a single presentation which he plans to eventually save on a CD for easy distribution. He is currently looking into using GPS to help in producing a map of the cross section locations, in conjunction with the ArcView and the ortho photoquads provided to the high school by the CRMP Coordinator.

The CRMP Coordinator met with Adam to discuss the cross section work, the uses of the KRIS and methods of presenting the data collected, and also in the field on the Fiock Ranch to re-establish one stream cross section whose end post could not be found. That allowed Adam to see all phases of the work, and exposed him to rudimentary uses of the autolevel.

At the time of this writing, Adam plans to spend several more months working on his project. During that time, the Shasta CRMP Coordinator will meet with him to discuss trouble shooting several years field data, and provide any other help he needs to finalize his work.

Further processing of the Yreka High School data will remain in Adam's hands until his project is complete.

6. Additional work on Fiock Ranch:

In the fall of 1998 the Shasta CRMP staff established 7 additional profile locations downstream of the Yreka Ager Rd, and made preliminary measurements of the stream. Several months later livestock exclusion fencing was built downstream of the Yreka Ager Road.

In 1999, Shasta CRMP staff returned to those seven cross sections to begin re-measuring them using a transit and stadia rod, as was done originally, and at the same time, set up and measure each of them using a string line and stadia rod. The string-line method has proven much more do-able for students, is quicker, and doesn't rely on the use of instruments whose accurate functioning is hard for students to verify in the field. By making measurements by both methods this year, we will be able to convert the prior data to what would have been found with the string line method so it will be comparable to future results. (Profile measurements made using a transit have a reference line that is perfectly straight, while those made with a string line have a reference line that is curved due to sag in the string. Either is sufficiently accurate for our monitoring needs, but the results vary slightly). See Appendix C.

At the present time, 3 of these 7 cross sections have been re-measured. The remainder will be done in the next year.

7. Dutra Ranch Cross Sections:

Three cross sections (see Appendix D) were set up and measured using the string-line method on the Dutra Ranch on the Little Shasta River following the installation of a livestock exclusion fence there. We anticipate that the Little Shasta School (k-8) will take over the measurement at this site in future years now that it is set up. They are less than a mile away, the stream is small, and they are planning to do tree planting and aquatic invertebrate collection there also (see Figure 8)

8. KRIS development and implementation:

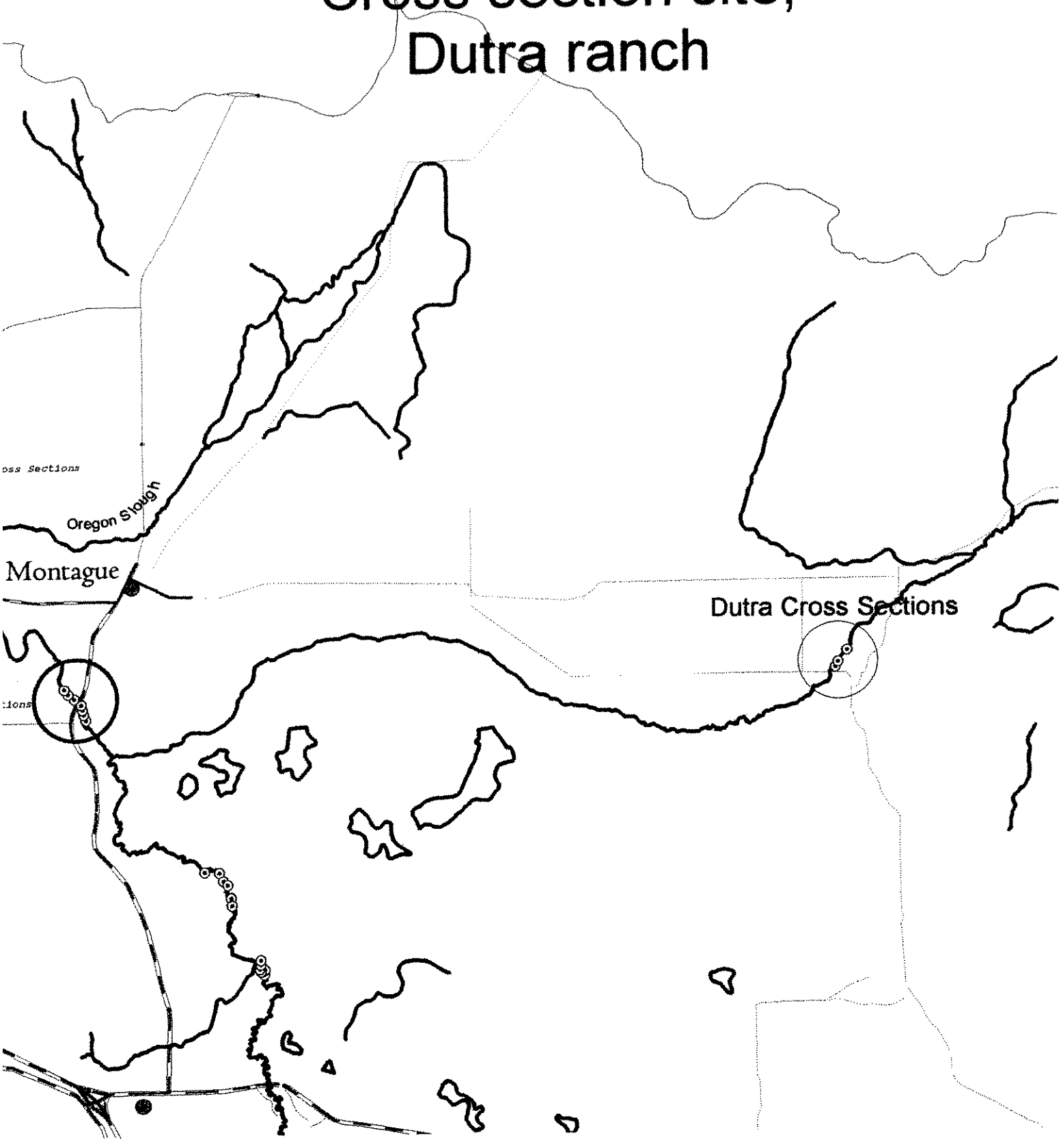
The Shasta CRMP has been a strong proponent of the Klamath Resources Information System since its inception. We were able to provide the photographic images and project data that were the core of its early development, and information from the Shasta River is also a significant part of the web site for KRIS.

KRIS development has been a long process, much longer than was originally envisioned. Until it reached a public release stage it could not be readily used as envisioned for restoration planing, documentation and dissemination. The production release of the first KRIS CD in 1998 marked a major milestone in reaching those goals. Since that time, we have distributed numerous copies of it to interested individuals, government officials and landowners. By so doing, we have been able to create a shared database that can be referred to when discussing historic trends, project proposals, restoration needs, etc.

With the listing of Coho, and the designation of critical habitat, the easy ability to refer to data and documents has been especially helpful when working with the newly hired Siskiyou County Natural Resources Planner. We frequently find ourselves planning and discussing fisheries issues by phone,

Figure 8

Shasta River 319(h) Cross section site, Dutra ranch



With the listing of Coho, and the designation of critical habitat, the easy ability to refer to data and documents has been especially helpful when working with the newly hired Siskiyou County Natural Resources Planner. We frequently find ourselves planning and discussing fisheries issues by phone, and I regularly refer to the KRIS CD for background data and supporting documentation. Were it not available I would be spending an inordinate amount of time making and mailing copies of difficult to secure documents, or trying to describe locations or process much easier understood via a photograph. I expect this usage will continue to expand in the future, and as a result we are devoting additional staff time to updating and expanding the KRIS coverage available for the Shasta Valley.

Specific collaboration this year included providing additional photographs, extensive review and editing of all Shasta Valley related KRIS coverages, and suggestions for changes. This is an ongoing process.

The KRIS was not intended to be limited to the KRIS dB release. A second project called KRIS Maps has also been released. Part of the ongoing 319(h) grant series to this area included hardware and software intended to facilitate the development and use of water quality, fisheries and restoration data in a comprehensive GIS database via ArcView software. This goal was an extremely important component of the KRIS as a restoration-planning tool.

Until last year, the Shasta Valley had no accurate electronic map base to form the foundation necessary for any GIS system, and so GIS development was blocked. This situation changed with the release by USGS of ortho photoquads for the Shasta Valley. We are now using them as the map base for all restoration project planning and documentation. We are gradually entering data and documentation of past restoration work, with the goal of creating a comprehensive record of what has been done to improve water quality and fish survival.

The software and training provided as part of this ongoing 319(h) process has been key to allowing this to happen, and has enhanced our capability substantially.

All maps included with this report were produced using software provided by past 319(h) grants, with the USGS ortho photoquads as a base to assure spatial accuracy.

9. KRIS Computer:

The KRIS dB portion of KRIS was released to the public in 1998. The Shasta CRMP transferred the computer originally provided for use with the KRIS to the office of the Shasta Valley Resources Conservation District (RCD) in Yreka in 1998 so that the public could more easily access it, with assistance planned to be provided by the RCD staff. It remained there for most of 1999. Among the people given training in the use of KRIS, were Andy Eagan, Nancy Salluci (both RCD employees), Jim DePree, Siskiyou County Natural Resources Planner, and Angel Gomez and Peter Townley, CRMP employees.

Throughout most of 1999, all KRIS related fine-tuning and development has been done on computers privately owned by the Shasta CRMP Coordinator. Near the end 1999 the RCD staff person resigned, and the KRIS computer was unused. The Shasta CRMP took advantage of that opportunity to temporarily re-locate it for the training of new staff and to begin preparing new material for

inclusion in the next KRIS release. Once the RCD has new staff, the computer will be returned to their office, and a new computer put into service for the restoration and KRIS work done by the Shasta CRMP.

10. Bank Protection measures:

This task has proven problematic. In the past we have utilized a willow mattress technique with good results to create "temporary rip-rap" with a 10-year design life. This allows us to stabilize rapidly eroding banks long enough to re-establish vegetation, without incurring the undesirable consequences of permanent riprap. Past projects of this sort have been funded via 319(h), USFWS, and DFG.

For reasons that are not entirely clear, the DFG is no longer comfortable with the use of steel "T" posts as anchoring devices. Rather than circumvent their concerns, we have been searching independently and with the DFG for alternate anchoring methods that will be functionally equivalent, so far without success. As a consequence, two DFG funded projects have had to be abandoned and the funds returned, and these 319(h) funds re-directed for use for the livestock exclusion fencing on the Koon Ranch.

11. Aquatic Invertebrates

Monitoring of aquatic invertebrates for diversity is recognized widely as an appropriate way to gauge ongoing stream health and change over time. Since invertebrates have limited mobility, they are necessarily exposed to all instream conditions, and cannot escape relatively transient water quality problems that more mobile organisms such as fish might avoid.

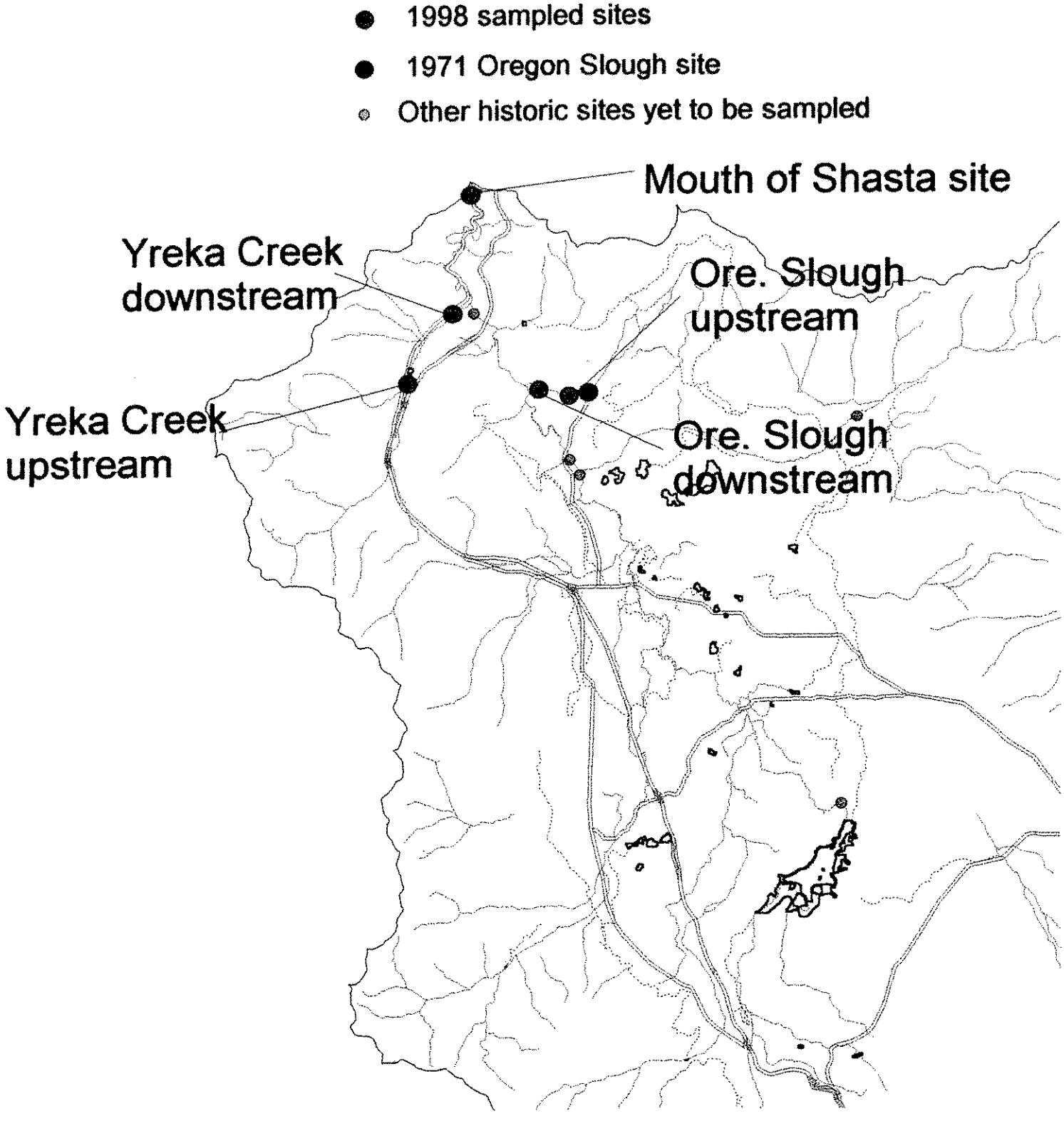
The Shasta River is bordered by a variety of restoration projects, no one of which is capable of single-handedly restoring the river. Since our goal is the restoration of the entire river, it is appropriate to use a monitoring method that will provide an indication of the cumulative changes over many miles of stream. The Shasta is known to have problems of high temperatures, low levels of dissolved oxygen, and fine sediment, all of which affect the invertebrate community.

The field techniques consisted of placing a D net in a riffle immediately downstream of a one foot by two foot sampling area, then disrupting the entire area by hand for a total of one minute. Essentially all material floating downstream was caught in the net, and preserved in alcohol. At each site three one foot by two foot areas were sampled, then combined into a composite sample. The samples were collected in 1998 at five sites including one near the mouth of the Shasta, two on Yreka Creek, and two on the Oregon Slough. Historic sample data was available for the site near the mouth of the Shasta, one of the sites on Yreka Creek, and one site on the Oregon Slough (see figure 9).

Because of funding limitations, those samples had to be stored until 1999 before they could be sub-sampled and the invertebrates identified.

Laboratory procedures consisted of placing the entire sample in a large pan divided into 24 numbered squares, then using a random number table to identify several of squares to form sub-samples. One square at a time is then removed in the order dictated by the random number table, and all of its contents are transferred to a petri dish. It can then be placed under a dissecting microscope, and all aquatic invertebrates present removed for identification. That process is repeated until 300

Figure 9. Aquatic Invertebrates



invertebrates are found, or the entire field sample is exhausted. All of our samples greatly exceeded 300 invertebrates

At that point the invertebrates are keyed out to order, then family, and the numbers of each recorded (See Appendix E, F, and G).

This laboratory work was done using space and equipment loaned to the Shasta CRMP by the College of the Sisikyous in Weed, California.

Field conditions:

Restoration work in Yreka Creek includes extensive work along the "Yreka Greenway", and student-led efforts to minimize contaminants entering the stream via storm drains. In addition, students have an ongoing program of water quality monitoring in Yreka Creek.

The city of Yreka also has a sewage treatment plant immediately adjacent to Yreka Creek. One sample was taken from downstream of the Greenway, but upstream of the sewage treatment plant, and the other was from a site downstream of both. Future sampling is planned upstream of the Greenway.

Restoration work in the Oregon Slough includes newly constructed livestock exclusion fencing and tailwater capture. The city of Montague has a sewage treatment plant immediately adjacent to the Oregon Slough. Samples were taken near the upstream end of the area to be fenced, and downstream of both the fenced area and the sewage treatment ponds.

The sampling site near the mouth of the Shasta was selected to give an index of overall stream health, particularly in comparison to historic data. Future sampling is planned intermittently upstream to bracket any problem areas that may exist, allowing restoration work to be focused in those problem areas.

Results and discussion of accomplishments:

Grant related work can be divided into three categories--project work, monitoring and KRIS efforts.

Project Work

Project work included the construction of a tailwater capture pond and stockwater pipelines and troughs to protect water quality in the Oregon Slough, and livestock exclusion fencing along the Little Shasta River. Additional exclusion fencing along the Oregon Slough was made possible by the availability of money for the above mentioned stockwater pipeline which was an essential complement to that fence project.

The tailwater and stockwater work had to be done after the end of the summer irrigation season, when the ground was dryer and the ranch owner had more time. Work went quickly without unexpected problems. Both systems are in readiness for next spring when cattle will be moved to pastures adjacent to the Oregon Slough and irrigation will resume. Both have been completed successfully.

The livestock exclusion fencing on the Koon Ranch is nearly completed. The work there exceeded the funds remaining in the 319(h) grant, so completion of the fence is being paid for from other funds. This project was initiated as a substitute for proposed bank protective measures, and was only started once it became clear that the bank protection work planned would not occur.

On the Koon ranch we are constructing about .5 miles of exclusion fence along the Little Shasta River, adjacent to an existing exclusion fence of about .5 miles. Future fencing will adjoin these two projects and run downstream for an additional mile if funds can be found. The Little Shasta River was once extremely important for steelhead spawning, and is sorely in need of this protection.

In the category of monitoring, both the aquatic invertebrate data and cross section data was collected successfully. Both need further processing and analysis, which will occur both in the near future, and as comparable field data is collected in future years.

The cross section data in particular is still being processed by high school students as part of their senior projects, a effort that we felt shouldn't be undermined by parallel processing on our part. Once the students have finished their work we will do whatever additional work on the data is necessary. We had hoped that the student projects would be completed by the due date of this report, but they have multiple demands on their time, and need to allocate their efforts in a way consistent with their educational needs first.

Monitoring

Aquatic Invertebrates-- Historic Data

The historic invertebrate data is both intriguing and disappointing. It seems to indicate a river in a slowly improving trend overall in terms of instream water quality, which is definitely good news, and consistent with our more qualitative field observations. It is disappointing in the very spotty nature of the samples (both recent and historic) available. We are extremely fortunate that in years past the California DWR had the vision to collect what historic data is available. The huge time gap from the last of their samples (1983) and the first of ours (1998) can only leave one wondering what instream conditions were like during the periods of both good and bad water years in between. See table 1 below.

There are four of the historic samples are interesting: the 4/27/82 sample from Yreka Creek, and the 9/71, 9/15/71 and 8/26/81 samples from the mouth of the Shasta. At both locations the distribution of organisms as divided into functional feeding groups is greatly skewed from other samples at those locations.

In the case of the 4/27/82 Yreka Creek sample, possibly this was a very wet year in the hills around Yreka, and the Creek was still under the influence of very high spring run-off. Since rainfall data for Yreka is available we will look into that possibility. On the other hand, that sample has the highest index of tolerant taxa, and by far the lowest taxa richness, both suggestive of some sort of poor water quality conditions that had a devastating effect on aquatic life. Other indices seem to support that supposition.

Location	Date collected	Taxa Richnes	EPT Taxa	EPT Index	% Dominanc	Tolerant Taxa Index	FFG-CG Colector-gathere	FFG-FC ollector-Filtere	FFG-F Predato	FFG-P Piercer	FG-S Scrapers	FFG-SH Shredders
)r Sl Above Pon	05/17/73	11	3	0.03	49.4	7.1	67.8	3.7	19.1	1.1	8.3	0.0
)r Sl Above Pon	5/17/73	9 orders		0.54	17.1	5.0	55.5	37.2	4.3	0.0	3.0	0.0
)r. Sl Below Por	09/13/98	8 orders		0.34	42.4	5.4	82.4	12.6	2.3	0.0	2.7	0.0
;. Riv. nr Mouth	Sep-71	19	5	0.78	62.7	3.9	5.1	14.8	0.3	0.1	79.1	0.7
;. Riv. nr Mouth	09/15/71	8	1	0.41	40.6	5.7	93.8	1.6	0.0	1.6	3.1	0.0
;. Riv. nr Mouth	08/26/81	23	9	0.87	85.1	3.3	7.6	1.4	2.2	0.0	88.7	0.1
;. Riv. nr Mouth	07/28/82	25	11	0.49	29.6	4.7	61.0	33.6	1.2	0.1	4.1	0.0
;. Riv. nr Mouth	09/13/98	26	13	0.52	28.9	4.7	47.1	36.4	5.7	3.4	6.5	0.8
' Cr. @ Hy3	09/13/98	25	13	0.48	16.3	4.1	21.4	22.4	10.0	6.8	20.6	18.9
'. Cr. @ And. Gr	09/06/73	17	8	0.46	39.7	5.1	13.0	77.5	5.1	0.1	4.1	0.2
'. Cr. @ And. Gr	08/26/81	23	9	0.28	33.0	5.3	38.6	10.6	6.2	0.0	43.2	1.4
'. Cr. @ And. Gr	07/27/82	20	7	0.18	79.0	5.6	86.9	12.0	0.1	0.2	0.6	0.2
'. Cr. @ And. Gr	09/13/98	20	10	0.55	38.1	4.3	18.5	49.8	13.8	1.7	13.8	2.4

Table 1. Summary statistics of aquatic invertebrates from the Shasta River in 1998 and historic data from those same sites.

In the case of the 4/27/82 Yreka Creek sample, possibly this was a very wet year in the hills around Yreka, and the Creek was still under the influence of very high spring run-off. Since rainfall data for Yreka is available we will look into that possibility. On the other hand, that sample has the highest index of tolerant taxa, and by far the lowest taxa richness, both suggestive of some sort of poor water quality conditions that had a devastating effect on aquatic life. Other indices seem to support that supposition.

The 8/26/81data from the mouth of the Shasta presents a more complex picture. While the population is similarly skewed, the taxa richness is quite good. On the other hand, the percent dominance suggests an environment where one family of organisms was either able to survive in an otherwise inhospitable environment, or able to rapidly colonize an empty one. In either case it suggests some event that again devastated aquatic life. Presumably there was time for drift from upstream, rapid reproduction and/or survival of tolerant organisms to partially re-populate the site.

Interestingly, flow data at this site (available on KRIS) indicates that the river was essentially dried up several times in July and August, 1981, something which would indeed be disastrous. Presumably the low flows would have been accompanied by prolonged periods of low D.O. and high temperatures all of which stress aquatic organisms..

In this instance, aquatic invertebrate data clearly indicated a lethal event that could be easily (if unhappily) explained even long after the fact. It also points out the possibilities of ongoing invertebrate monitoring to provide an index of transient events not so obvious as a lack of water, which would then lead to more focused investigation. Inadvertent contamination of the river by herbicides, pesticides or other chemicals comes immediately to mind. Testing for contaminants can be extremely expensive, and the samples must be collected during the brief time when the contaminant is present in substantial quantity. On the other hand, ongoing monitoring of the aquatic community is relatively cheap, and can reach back over weeks or months to indicate either the presence or absence of problems. Should a problem be indicated, more expensive testing could be initiated.

The 1971 Shasta River data seems to be contradictory. No field notes were available, and no explanation was included on the lab sheet to indicate why two samples from the same site were collected at essentially the same time. The 9/15/71 sample was marked "gravel", while the 9/71 sample was unidentified other than as to location. Given the uncertainty little can be said about those two samples at this time. Contact has been made with DWR, and possibly additional information will be available later.

Aquatic Invertebrates, current data:

Oregon Slough

In the Oregon Slough, the upstream sample differs markedly from the downstream sample. Unfortunately the long storage period prior to sorting was hard on the ephemeroptera, most of whom lost their cerci which are customarily used to identify them to family. Never the less, a great deal can be learned. Since the samples were collected within an hour of each other, and less than 1,000 feet apart in similar areas of the stream, they should have been essentially identical. What we saw instead was that the upstream sample was much more diverse, with the dominant taxa representing 17% of the organisms sampled, while downstream a single taxon was over 42% of those sampled. Likewise, the downstream sample was more heavily weighted towards organisms tolerant of contamination of one sort or another. In terms of the make-up of the community, the upstream community was composed primarily by collector gatherers and collector filterers, while downstream it was mainly collector gatherers with a smaller assemblage of filter feeders. In both cases (as in the case of the single historic sample) there were no shredders found, a finding presumably consistent with the fact that there are essentially no trees along the Oregon Slough, hence no leaves to shred.

Qualitatively, the upstream sample proved to have a much greater abundance of everything present. The sample from downstream indicated a much more difficult environment, and a much larger percentage of the field sample had to be used to find the required 300 invertebrates needed.

We were able to locate only a single historic sample from the Oregon Slough, from 5/73. Presumably the difference in time of year would have some effect on the nature of the findings, making direct comparisons questionable. In more general terms, the historic sample shows the highest percent dominance of the three samples, the highest tolerant taxa index, and an extremely low index of sensitive species (EPT Index). On the other hand, the community, as defined by functional feeding

groups is much more diverse. Overall, it appears that the water quality in the fall of 1998 was far better than in the early summer of 1973.

The differences from the upstream and downstream samples of 1998 did not appear to be due to agricultural land use practices on the site, since livestock had free access to the watercourse from well above to well below the sampling sites. Little or no irrigation tailwater appeared to enter the watercourse between the two sampling sites. The obvious and most logical influence on water quality was the sewage treatment ponds for the City of Montague, which was bracketed by the sampling sites. Despite the fact that this was the end of the summer (i.e. no recent storm events to overwhelm the system), and the treatment plant appeared to be functioning as designed, it appears as if there may be enough sub-surface leakage to affect aquatic life and water quality downstream.

Overall the Oregon Slough appears to be substantially impacted by conditions upstream of both sampling sites, with additional stress imparted by the sewage treatment ponds.

Yreka Creek

Yreka Creek was also sampled in two locations. In the case of the upstream site, immediately downstream of the HY 3 bridge at the north end of town, no previous data could be found. The downstream site above the Anderson Grade Road had comparison samples from the fall of 1973 and 1981

The upstream site on Yreka Creek presented a picture of a much more healthy and robust stream than the Oregon Slough, or any other site sampled. Taxa richness was the second highest observed in 1998, and percent dominance was the lowest, as was the tolerant species index. All indicating a stream with the best aquatic conditions (and hence presumably water quality) of all the sites tested in 1998. Corroborating this observation is the fact that the aquatic invertebrate community was the most balanced and diverse of any sampled in 1998, with no functional feeding group dominating the population present, and all feeding lifestyles well represented.

It is worth noting that Yreka Creek at the point sampled was at the downstream end of several miles of creek being developed as the city sponsored Yreka Greenway. It is well shaded, gets periodic care from interested individuals, organizations and student groups and clearly shows the results.

At the downstream site, Yreka Creek still presents a good picture, but not nearly as healthy a system as it is approximately 3 miles upstream. Taxa richness has dropped from 25 to 20, percent dominance by a single taxa has jumped from 16% to 38%, and the index of contaminant tolerant organisms has increased. While all the functional feeding groups are still present, filter collectors clearly dominate, indicating an increase in primary productivity. Normally this would be expected to be an indication of nutrient enrichment with resultant increases in algal and other growth.

Like the sites on the Oregon Slough, there is also a sewage treatment plant adjacent to Yreka Creek between these two sampling sites. While it is the most likely source of added nutrients, there is also a former log storage area , along with a number of houses, and a small community near-by not served by centralized sewage treatment facilities all of which may also be contributing via sub-surface flow. There was little or no livestock usage in the vicinity, which is slowly becoming urbanized.

Mouth of the Shasta

The picture presented at the mouth of the Shasta in 1998 is one of extremely high primary productivity, yet not one of a system overwhelmed. Taxa richness at this site was the highest for both all the 1998 samples, and for all sites discussed in this report for the entire period of record. While the percent dominance by a single taxon at 29% was relatively good, it was not as good as the Yreka Creek upstream site. The index of tolerant organisms was second highest of the sites observed in 1998, indicating a community under stress. While all functional feeding groups were present, the community was distinctly dominated by collector gathers and filter collectors, both indicating abundance of organic materials available.

While comparisons to the historic data are desirable, the uncertain nature of the 1971 data, and the apparent drying up of the river in July and August of 1981 leaves only data from July of 1982 anywhere near the same season of the year. As compared to that year, all indices are equal or better in 1998. Taxa richness, EPT Taxa and the EPT index were all slightly higher, while the percent Dominance was lower. The Tolerant Taxa index was the same. The composition of the aquatic community in terms of functional feeding groups was better distributed in 1998, with all groups represented

The Shasta near the mouth gives a picture of a river where the aquatic community is struggling somewhat, but not devastated as the samples from 1981 found. What stresses are pushing the community towards more tolerant organisms isn't clear from the invertebrate testing and identification so far, but given that there is great diversity present, it appears to a low level ongoing factor. Given the water year we experienced in 1998, it would seem most likely to be fine sediment problem, although low dissolved oxygen may also have played a part. This site needs more extensive sampling over the course of a single summer to better understand the population dynamics, and help sort out the various possible stressors present.

Stream Cross Sections:

Cross section data is gathered to document changes in stream channel morphology over time. Ordinarily in a stream subjected to long periods of destabilization by loss of the riparian plant community, hoof impact from livestock, or other heavy uses, there is a trend towards a channel that is both wider and less deep. A successful restoration program will either reverse these trends if present, or prevent them from manifesting themselves if the stream is still functioning fairly well. Any conclusions must be couched in the fact that any system changes somewhat from year to year, depending on the nature of the runoff experienced in the most recent winter and spring. Proper interpretation of cross section data is therefore necessarily a long-term endeavor.

Several sites (three on Dutra, and four of seven sites at Fiock's downstream of Yreka Ager Rd.) have only a single year's data, hence no trend interpretation is possible. What the available data shows at the Dutra site is a stream channel with a berm created from streambed material along side it. Little more can be said of the channel shape, other than that over time the berm can be expected to

disappear from periodic high flows and consequent erosion. The berm is made up of unconsolidated sand and gravel.

The fact that previous landowners felt the need to do this sort of "channel improvements" is actually the more interesting factor at this site. The vast majority of the central portion of the Shasta Valley is a gigantic volcanic debris flow, now lying at its angle of repose. This ranch is located right where the Little Shasta leaves the relatively step hills to the east, and encounters the flat land formed by that debris flow. The eroded materials from the steeper hillsides are rapidly dropped out of the water column as it looses velocity on the flat land, creating a constantly aggrading channel. Over time the Little Shasta apparently fills itself up, then during some storm event, it jumps out of its channel, and moves a substantial distance away to what has become lower ground as land around the existing channel aggraded. Apparently these changes were bothersome enough to previous owners to warrant channel-cleaning operations in the past.

At the Fiock property, we see a different situation. Here the channel is far wider than anywhere else in the lower 40 miles of Shasta River. This is the result of gravel mining begun in the 1930's, and not ceased until the 1950's or early 60's. That mining left a wide channel, unable to correct itself due to the lack of gravel recruitment from upstream and to the ongoing impacts of summer grazing, which preventing the establishment of emergent and riparian plants that might have trapped finer materials.

This area was fenced to exclude livestock in 1998, and we hope to see some changes fairly soon as the channel begins to grow up to emergent vegetation, and trap fine sediment from upstream, resulting eventually in a river that's 25-30 feet wide, rather than the current 100+.

We will be tracking this change via the cross sections upstream of the mined area (done by Yreka High School for the last two years) and by the cross sections in the mined area, done by CRMP staff.

In addition to the above, we placed one cross-section (XS 0) directly below the Yreka Ager Rd. Bridge over the Shasta. At this site, the entire flood plain is constricted by the road, and all water flowinf across the flood plain must pass through the relatively narrow channel below the bridge. Here we expect to see evidence of down cutting during high water years, and refilling with gravel during low or normal water years. The significance of this is that here, as throughout the Shasta Valley, the entire flood plain and bed of the river is underlain by a silica cemented hardpan, related to the volcanic debris flow which defines the landform in the Shasta Valley. That hardpan varies from one to three feet thick, and has roughly the erosional resistance of an asphalt road.

That hardpan prevents downcutting, and is normally protected by the somewhat mobile coarse sediments on the bottom of the river. Here under the bridge, the force of the concentrated water is sufficient to strip off the protective bed layer, and is now chiseling up pieces of hard pan and depositing them downstream at the location of XS 1. What will happen once the hardpan is penetrated is uncertain, but much more rapid erosion and head cutting may be experienced, undermimg the bridge, and in the distant future potentially causing major hydraulic changes throughout the Shasta Valley.

When we look at the three cross sections, XS 0, 1 and 2, we see a transition from a channel with a wetted width of roughly 80 feet, to 95 feet to 115 feet, the consequences of the gravel mining. When we look from 1998 to 1999, we see a deposition of bed materials under the bridge, as was anticipated

for this water year, while at XS 1 we see a substantial increase of large rocks in the center of the channel, with the consequent formation of two thalwegs. Those large rocks are the deposited hard pan chunks, dropped by the water as it was able to leave the channel constricted by the roadway, and re-occupy the flood plain. As we move further downstream, we see the river re-consolidating into a single thalweg.

At XS one the partial channel blockage resulting from the deposit of coarse material in the center of the channel is forcing the river to the edges, eliminating the opportunity for narrowing from the edges. During low water there is now a very low island in the center of the river. On the other hand, at XS 2 we can see a very substantial build-up of fine materials on the edges of the channel where they are being consolidated by tules. Unfortunately this site was too deep to measure completely in 1998. In 1999 we used a float tube to make measurements full width.

On both XS 1 and XS 2 the ground is noticeably lower at the right hand side of the graph in 1999. This was a result of livestock using the XS anchor posts on this side of the river to rub on for six months prior to the construction of the exclusion fence.

Discussion of the Fiock XS material upstream of this point awaits completion of its processing by the student volunteer at Yreka High School.

Discussion of this year's XS data from the Meamber Ranch awaits completion of its processing by the student volunteer at Discovery High School.

KRIS activities:

A substantial amount of effort was spent in helping to refine the KRIS material in the existing release version. A large number of additional Shasta valley photographs, both current and historical were scanned, annotated and included in the materials being prepared for the next CD release. The text of the existing materials was re-worked, and any minor discrepancies corrected. Work is underway with ArcView mapped materials showing restoration project locations, Shasta Valley details, and details of current and future individual projects. Over the course of the next year we plan to consolidate much of this material into additional presentation grade material. At present it is a matter of using the KRIS as it was intended--as a tool for restoration planning. Documentation of the added materials can be seen by comparing the current KRIS version for the Shasta Valley, and the next release version which is now being tested in beta form.

As an aside, the Shasta CRMP has voluntarily chosen to invest substantial amounts of time and effort to help make the KRIS meet its full potential. It has been a long path. We have found the current beta-testing version is truly impressive in its improved workability, features and utility, and would like to thank the RWQCB for its continued support of KRIS development. It is a product that is now ready to be sustained by its users, and one that would never have happened without your vision.

Summary and Conclusions:

Restoration work takes many varied forms. The work done with funds provided for use in the Shasta Valley through the 319(h) grant process reflect that fact.

The physical projects--irrigation tailwater capture, off stream stock water, and livestock exclusion fencing--speak well for themselves. The need they address is clear-cut, and the results begin to accrue immediately.

The value and importance of ongoing monitoring is less apparent, but no less important. Invertebrate monitoring especially is a way to continue to empower the local community with a way to track the overall health of their river without the insurmountable costs associated with chemical testing.

There are eight other sites not yet sampled for comparison to the historic data available, and a need that is clearly apparent to us for an ongoing program of sampling key index sites several times per year from here onwards. We will do everything possible to continue this program. With recent and historic data now in hand, data that has been collected and interpreted with a methodology used throughout the US (EPA Rapid Bio-Assessment Protocol) we can take advantage of a growing body of persons linked via the Internet who are sharing their observations, interpretations and findings on streams across the country.

The KRIS is now a product ready to take on a life of its own. The USFWS will act as the caretaker of the system, assembling data, suggesting protocols and making future releases. The programming that underlies it has been refined, re-refined and re-refined further. It is now up to those of us who need common access to restoration critical data, and who need a vehicle to distribute that information to add to and improve it.

Summary of Expenditures

Matching and in-kind donations:

The Meamber Ranch donated $2,160 in labor and equipment usage on the Tailwater Capture Pond.

The Meamber Ranch donated $5,320 in labor and equipment usage in installing the alternative stock-watering system.

The Meamber Ranch donated approximately $8,000 in labor on exclusion fencing along the Oregon Slough.

Yreka High School Students donated approximately 109 hours to date, valued at $5.00/hour = $545

Discovery High School Students and teachers donated 84 hours of student labor valued at $5.00/hour = $420, plus 16 hours of teacher time valued at $30/hour = $480.

Adult volunteers donated 32 hours wrapping large trees valued at $10/hour = $320

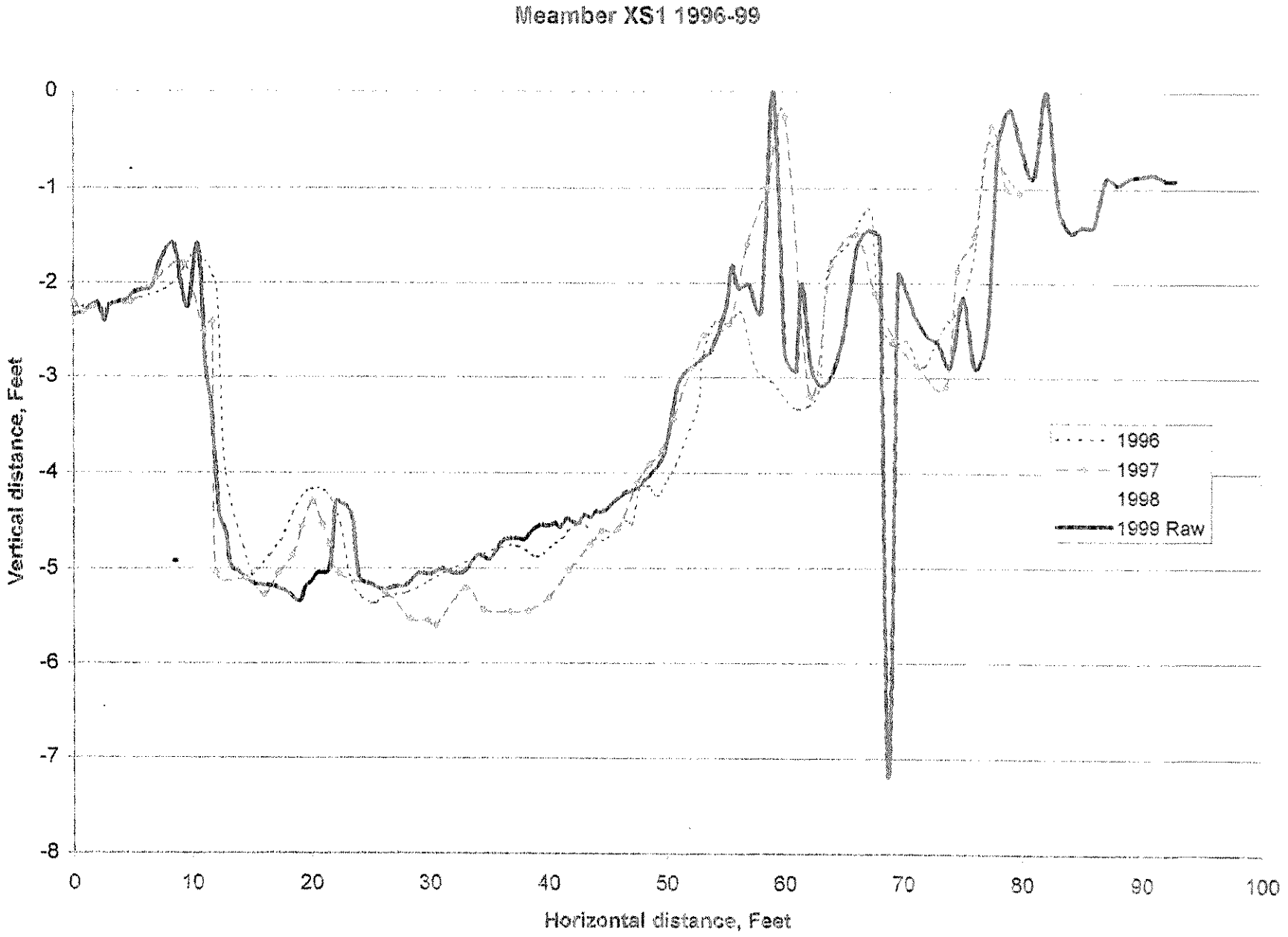
Shasta CRMP donated 30 hours on expanded report writing valued at $20/hour = $600

California DWR provided aquatic invertebrate data gathering and Identification conservatively estimated at $3,000

Total In Kind: $20, 845

Appendix A

Meamber Ranch Cross Section Raw Data and Preliminary Graphs


Meamber XS1 1996-99
0
-1
-2
-3
-4
-5
-6
-7
-8
Vertical distance, Feet
0
10
20
30
40
50
60
70
80
90
100
Horizontal distance, Feet
1996
1997
1998
1999 Raw

Meamber xs1 1996

HORZDIST 1996	
0	-1.97
0.09	-2.25
7.63	-2.07
10.28	-1.69
11.96	-1.99
12.31	-2.46
12.81	-4.01
14.98	-5.07
14.98	-5.07
17.4	-4.71
18.68	-4.34
19.94	-4.17
21.26	-4.21
22.46	-4.55
23.37	-5.14
25.05	-5.36
26.29	-5.29
28.07	-5.25
29.95	-5.13
31.59	-5.02
36.6	-4.76
39	-4.88
40.6	-4.74
42.6	-4.54
44.51	-4.71
46.49	-4.51
47.09	-4.54
47.61	-4.17
48.34	-4.13
49.22	-4.24
50.06	-4.06
50.76	-3.91
52.63	-3.3
52.99	-2.83
53.98	-2.42
55.27	-2.42
56.27	-2.3
56.96	-2.63
57.59	-2.92
58.93	-3.05
60.97	-3.33
62.8	-3.16
63.61	-1.87
65.28	-1.6
66.6	-1.27
67.33	-1.22
67.78	-2.16
68.88	-2.63
70.32	-2.61
71.22	-2.85
71.9	-2.87
73.41	-2.47
75.01	-2.17
76.07	-1.59
77.05	-0.54
78.48	-0.82
79.47	-1

Meamber xs1, 1997

horiz-ft 1997	
0	-2.19
0.9	-2.3
1.65	-2.25
4.8	-2.2
7	-1.95
9.4	-1.8
11	-2.5
11.75	-2.4
12	-5.04
14.5	-5.1
16	-5.27
17.2	-5.05
18.4	-4.86
19.2	-4.56
20.1	-4.3
20.9	-4.54
21.5	-4.75
22.3	-5.05
26.2	-5.24
28.3	-5.53
29.8	-5.55
30.5	-5.6
33	-5.2
34.5	-5.43
36.75	-5.45
38.3	-5.44
40.05	-5.3
41.72	-5.02
43.5	-4.75
44.5	-4.61
45.8	-4.6
47.5	-4.1
48.55	-3.9
49.6	-3.76
50.6	-3.43
52.1	-2.9
53.2	-2.55
55.3	-2.43
56.8	-1.59
58.5	-0.99
60	-0.26
62.1	-3.19
63.9	-1.81
66	-1.48
67.6	-2.1
69.3	-2.6
71.1	-2.86
73.6	-3.09
74.55	-1.87
76	-1.5
77.45	-0.35
78.7	-1
79.8	-1.05

Meamber xs-1 group B

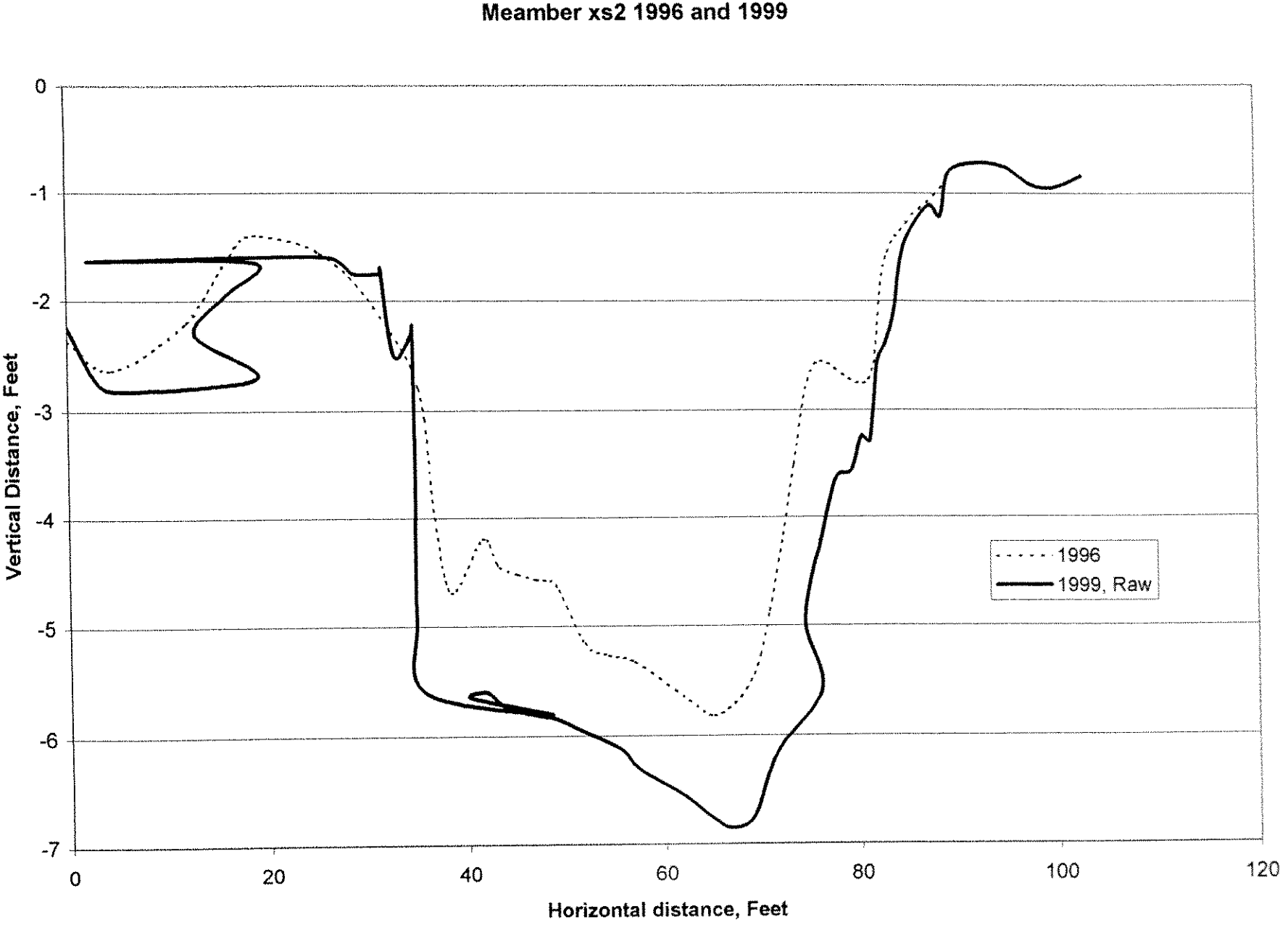
1998 horiz- dist	
0	-2.475
1	-2.35
2	-2.225
3	-2.275
4	-2.175
5	-2.1
6	-2.1
7	-1.85
7.5	-1.725
8	-1.575
8.5	-1.45
9	-1.475
9.5	-1.5
10	-1.475
10.5	-1.6
11	-1.725
11.5	-2.15
12	-2.2
12.5	-2.175
13	-2.4
13.5	-2.825
14	-4.575
14.5	-4.475
15	-5.25
16	-5.1
17	-5.125
18	-5.75
19	-5.125
19.5	-5.1
20	-5
20.5	-4.95
21	-4.9
21.5	-4.2
22	-4.1
22.5	-4.2
23	-4.4
23.5	-5.05
24	-5.1
25	-5.175
26	-5.125
27	-5
28	-5.05
29	-5.175
30	-5.075
31	-5.05
32	-5.2
33	-5.2
34	-5.1
35	-5.025
36	-5.025
37	-5
38	-5.075
39	-5.075
40	-4.85
41	-4.775
42	-4.675
43	-4.7
44	-4.525
45	-4.025

Meamber xs-1

1999 horiz-dist	
0	-2.34
1	-2.29
2	-2.2
2.6	-2.4
3	-2.24
4	-2.19
4.6	-2.17
5	-2.1
5.7	-2.07
6.6	-2.04
7.5	-1.71
8.5	-1.6
9.6	-2.25
10.5	-1.6
11.15	-2.88
11.6	-3.26
12.25	-4.41
12.8	-4.62
13.2	-4.96
14	-5.04
15	-5.15
16	-5.17
17	-5.19
18	-5.25
19	-5.34
19.5	-5.19
20	-5.13
20.5	-5.04
21.5	-5.01
22	-4.3
22.5	-4.32
23	-4.36
23.5	-4.51
24	-5.08
25	-5.16
26	-5.22
27	-5.19
28	-5.17
29	-5.05
30	-5.06
31	-5
32	-5.05
33	-5.02
34	-4.86
35	-4.9
36	-4.72
36.5	-4.69
37	-4.69
37.5	-4.69
38	-4.7
38.5	-4.62
39	-4.57
39.5	-4.55
40	-4.56
40.5	-4.53
41	-4.57
41.5	-4.48
42	-4.52
42.5	-4.53

46	-4.175
47	-3.95
48	-3.8
49	-3.75
49.5	-3.675
50	-3.425
50.5	-3.325
51	-3.175
51.5	-3.05
52	-2.9
52.5	-2.8
53	-2.9
53.5	-2.775
54	-2.725
55	-2.475
56	-2.075
57	-2.025
58	-2.15
59	-2.45
60	-2.75
61	-2.925
62	-2.85
63	-3.05
64	-2.875
65	-2.825
66	-1.65
67	-1.275
68	-1.15
68.5	-0.925
69	-0.95
69.5	-1.425
70	-1.65
70.5	-1.775
71	-2
72	-2.25
73	-2.375
74	-2.85
75	-2.925
76	-2.9
77	-2.7
77.5	-2.4
78	-0.5
79	-0.2
79.5	-0.4
80	-0.575
80.3	-0.8
81	-0.825
82	-0.85
82.5	-1.05
83	-1.15
84	-1.3
85	-1.35
86	-1.25
86.5	-1.1
87	-0.925
88	-0.975
89	-0.85
90	-0.9
91	-0.9
92	-0.925
92.8	-0.925

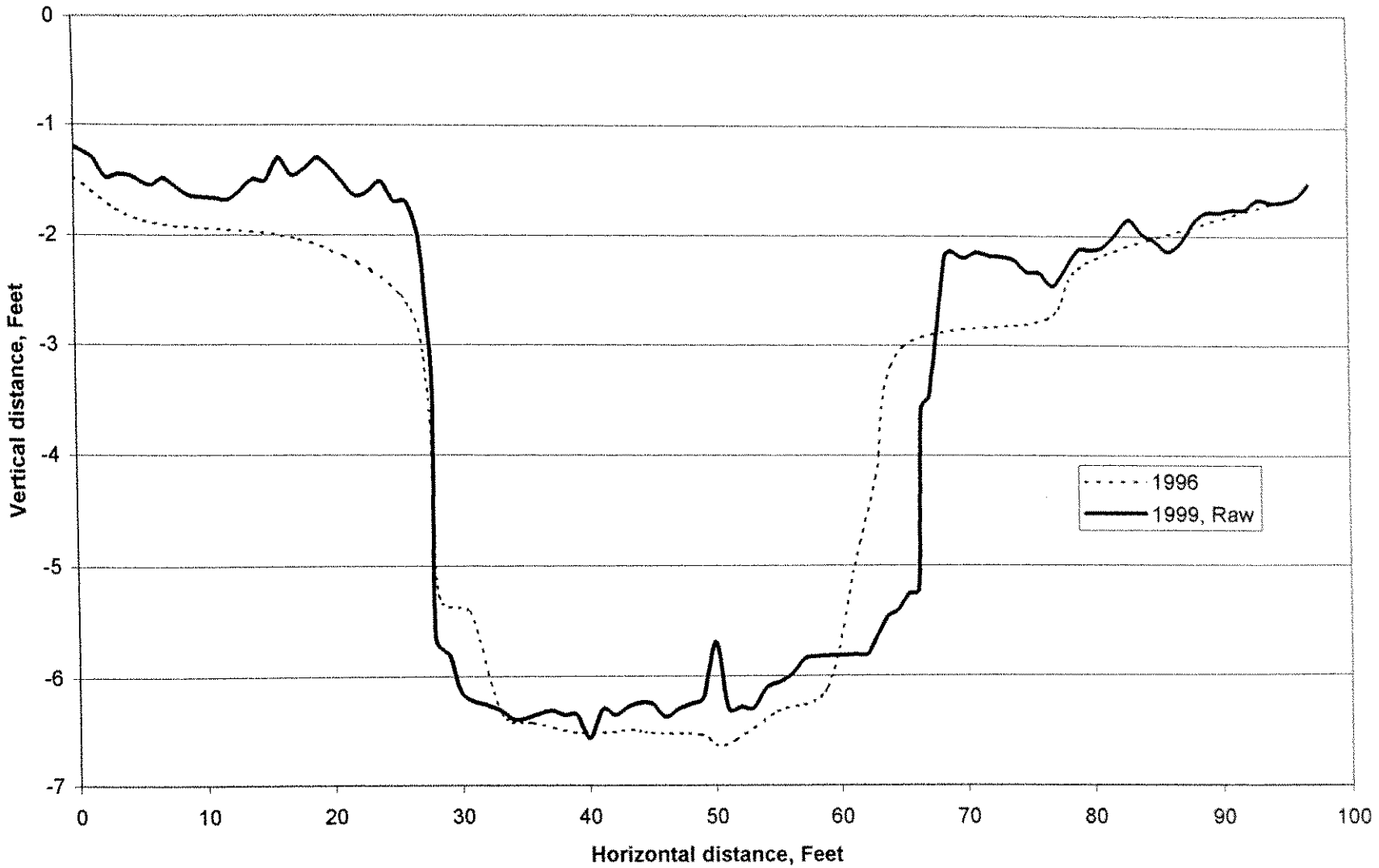
43	-4.44
43.5	-4.47
44	-4.4
44.5	-4.41
45	-4.37
45.5	-4.3
46	-4.25
46.5	-4.2
47	-4.19
48	-4.09
49.1	-3.94
49.9	-3.75
50.5	-3.34
51	-3.06
51.7	-2.93
52.3	-2.88
53	-2.79
53.8	-2.71
55	-2.25
55.5	-1.82
56	-2.05
57	-2.02
58	-2.3
59	0
60	-2.74
60.9	-2.94
61.4	-2
62.2	-2.9
63	-3.09
64	-2.96
65	-2.49
66	-1.66
66.95	-1.44
68	-1.53
68.7	-7.2
69.55	-1.9
70	-2
70.7	-2.23
71	-2.34
72	-2.55
73	-2.65
74	-2.88
75	-2.15
76	-2.9
77	-2.59
77.5	-1.67
78	-0.54
79	-0.18
80	-0.62
81	-0.87
82	0
83	-1.19
84	-1.46
85	-1.4
86	-1.39
87	-0.9
88	-0.96
89	-0.88
90	-0.87
91	-0.85
92	-0.91
92.8	-0.91


Meamber xs2 1996 and 1999
0
-1
-2
-3
-4
-5
-6
-7
Vertical Distance, Feet
0
20
40
60
80
100
120
Horizontal distance, Feet
1996
1999, Raw

Meamber xs-2 1996 horiz-ft 1996	
0	-2.36
4.4	-2.63
11.95	-2.2
16.44	-1.58
18.9	-1.4
25.57	-1.56
30.84	-2.06
35.34	-2.8
36.84	-4
38.45	-4.7
41.7	-4.2
43.37	-4.46
47.04	-4.58
49.04	-4.63
51.92	-5.16
54.38	-5.27
57.01	-5.33
62.5	-5.68
65.02	-5.82
67.7	-5.65
69.45	-5.37
70.81	-4.87
72.3	-4.17
73.45	-3.5
75.67	-2.58
81.1	-2.72
83.15	-1.55
89	-0.92

Meamber xs-2 1999 horiz-dist	
0	-2.24
3.16	-2.76
6	-2.82
19.1	-2.7
12.8	-2.31
15.95	-1.95
19	-1.65
2.15	-1.64
26.2	-1.6
28.8	-1.75
31.6	-1.75
31.6	-1.7
32.85	-2.5
34.7	-2.3
34.75	-2.23
34.9	-3.57
34.9	-4.9
35.7	-5.6
48.5	-5.8
40.25	-5.65
41.85	-5.6
44	-5.75
46.56	-5.8
49.1	-5.85
51.5	-5.95
55.41	-6.12
57.3	-6.3
61.82	-6.55
64.63	-6.75
66.65	-6.85
68.95	-6.75
70.5	-6.34
71.95	-6.08
76.05	-5.58
74.4	-5
75.24	-4.5
76	-4.25
76.92	-3.87
77.8	-3.61
79.27	-3.56
80.3	-3.24
81.19	-3.29
82	-2.57
82.83	-2.39
83.75	-2.1
84.82	-1.49
87.31	-1.12
88.64	-1.21
89.46	-0.81
92.18	-0.72
95.13	-0.76
97.65	-0.92
99.96	-0.95
102.72	-0.84

Meamber XS3 1996 and 1999



Meamber xs3 1996

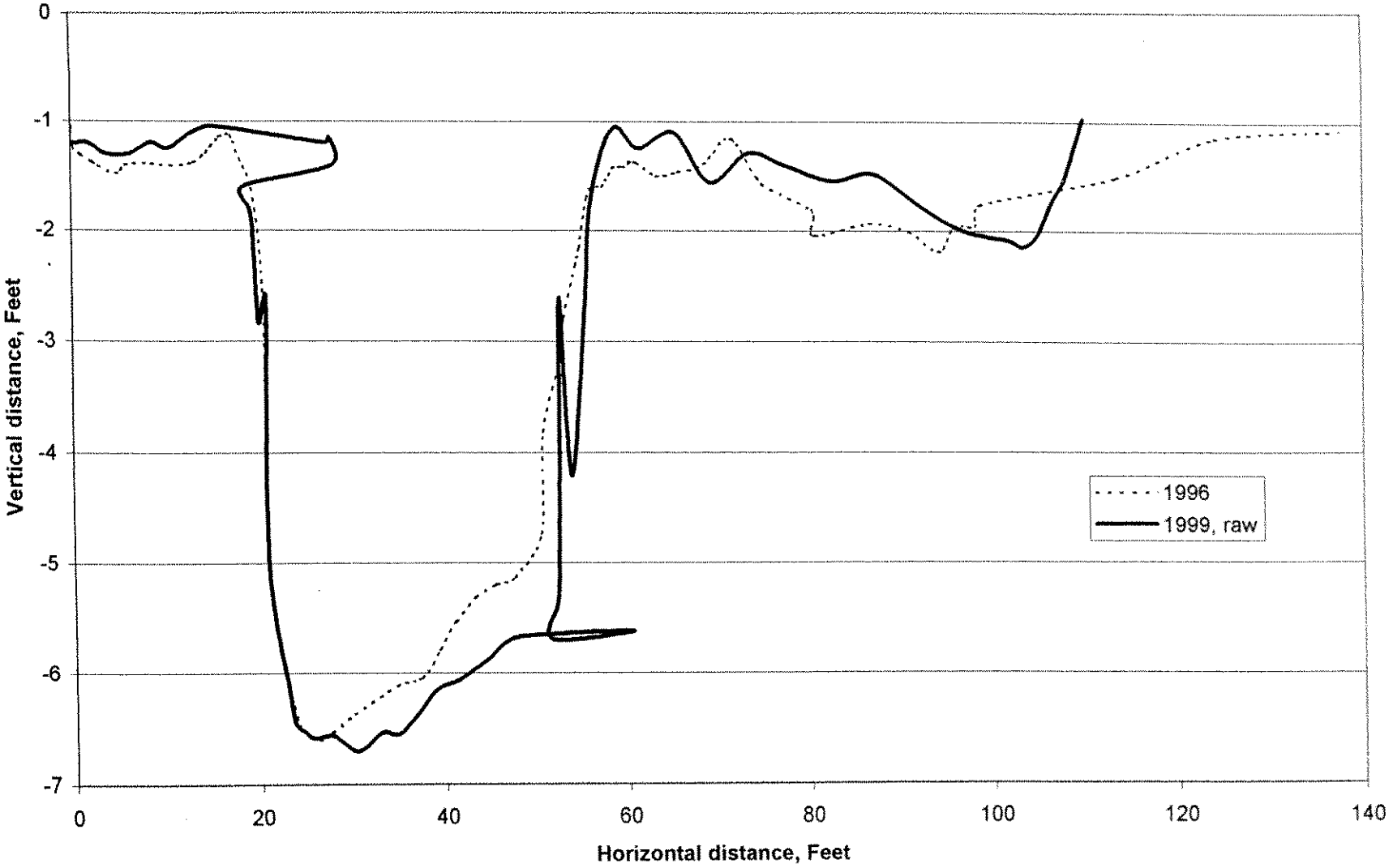
horiz-ft 1996	
0	-1.47
5.45	-1.87
17.6	-2.04
25.53	-2.55
27.52	-3.41
28.22	-5.27
30.65	-5.41
33.1	-6.34
35.53	-6.42
39.45	-6.52
43.33	-6.49
44.9	-6.52
48.79	-6.53
50.67	-6.63
54.94	-6.32
58.85	-6.1
61.1	-5
62.83	-4.2
65.13	-3.02
76.5	-2.76
79.64	-2.25
95.11	-1.66

Meamber xs-3 1999

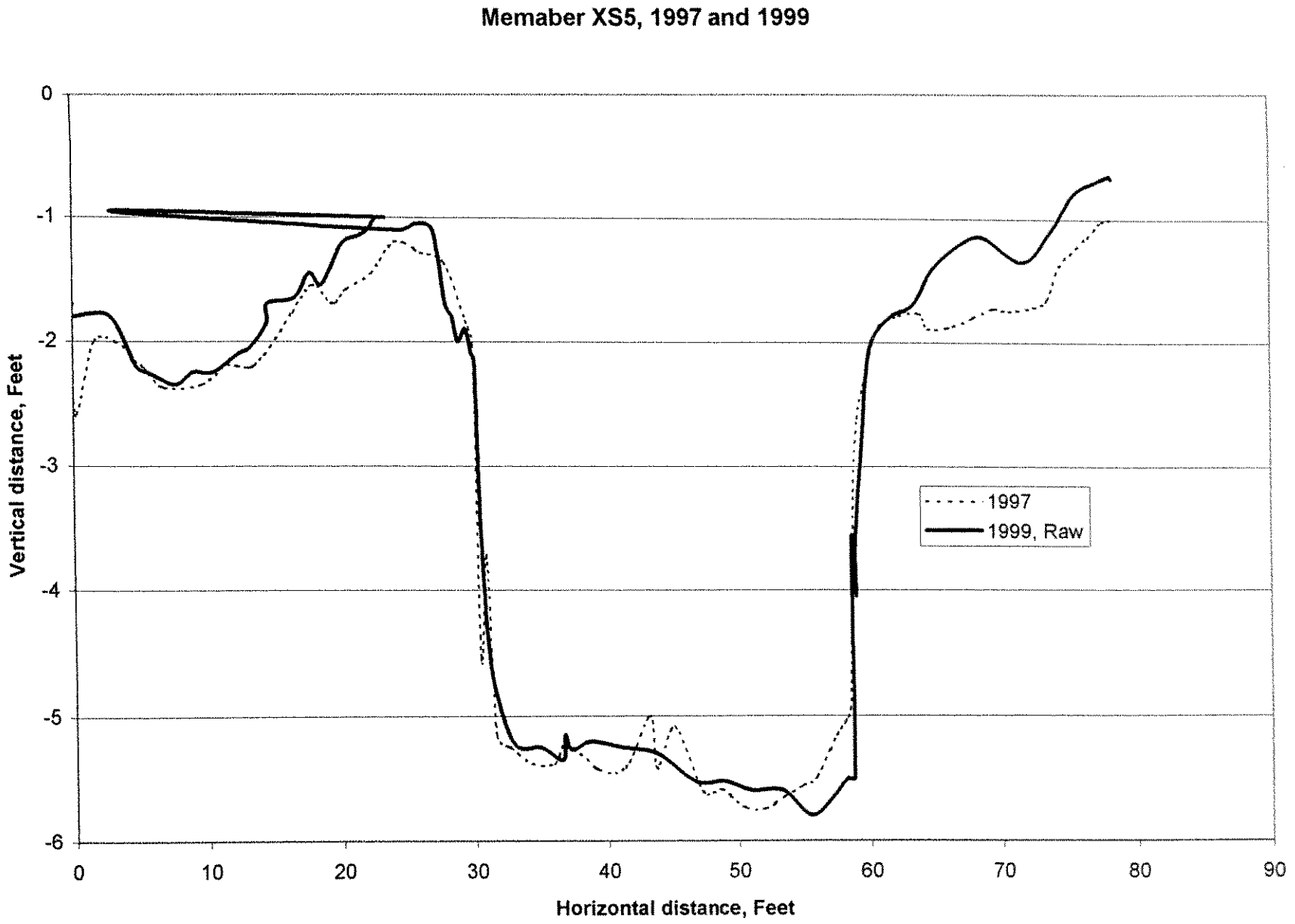
horiz-dist	
0	-1.2
1.5	-1.3
2.5	-1.47
3.5	-1.44
4.5	-1.46
6	-1.54
7	-1.48
8	-1.56
9	-1.64
10	-1.65
11	-1.66
12	-1.68
13	-1.6
14	-1.49
15	-1.5
16	-1.3
17	-1.45
18	-1.4
19	-1.3
20	-1.38
21	-1.51
22	-1.64
23	-1.6
24	-1.51
25	-1.69
26	-1.7
27	-2.08
27.5	-2.76
27.9	-3.5
27.9	-5.64
29	-5.8
30	-6.16
32	-6.26
33	-6.31
34	-6.39
35	-6.38
36	-6.34
37	-6.31
38	-6.35
39	-6.35
40	-6.56
41	-6.3
42	-6.35
43	-6.28
44	-6.24
45	-6.25
46	-6.37
47	-6.3

48	-6.25
49	-6.19
50	-5.69
51	-6.3
52	-6.28
53	-6.29
54	-6.11
55	-6.06
56	-5.99
57	-5.85
58	-5.83
59	-5.82
60	-5.82
61	-5.81
62	-5.81
62.5	-5.72
63	-5.6
63.7	-5.46
64.5	-5.4
65.4	-5.25
66.2	-5.22
66.5	-3.59
67.2	-3.45
68.5	-2.18
69	-2.14
70	-2.2
71	-2.15
72	-2.18
73	-2.19
74	-2.22
75	-2.33
76	-2.34
77	-2.46
78	-2.3
79	-2.13
80	-2.13
81	-2.1
82	-1.98
83	-1.85
84	-1.98
85	-2.05
86	-2.14
87	-2.06
88	-1.87
89	-1.78
90	-1.78
91	-1.75
92	-1.75
93	-1.66
94	-1.69
95	-1.68
96	-1.64
96.9	-1.52

Meamber XS4 1996 and 1999



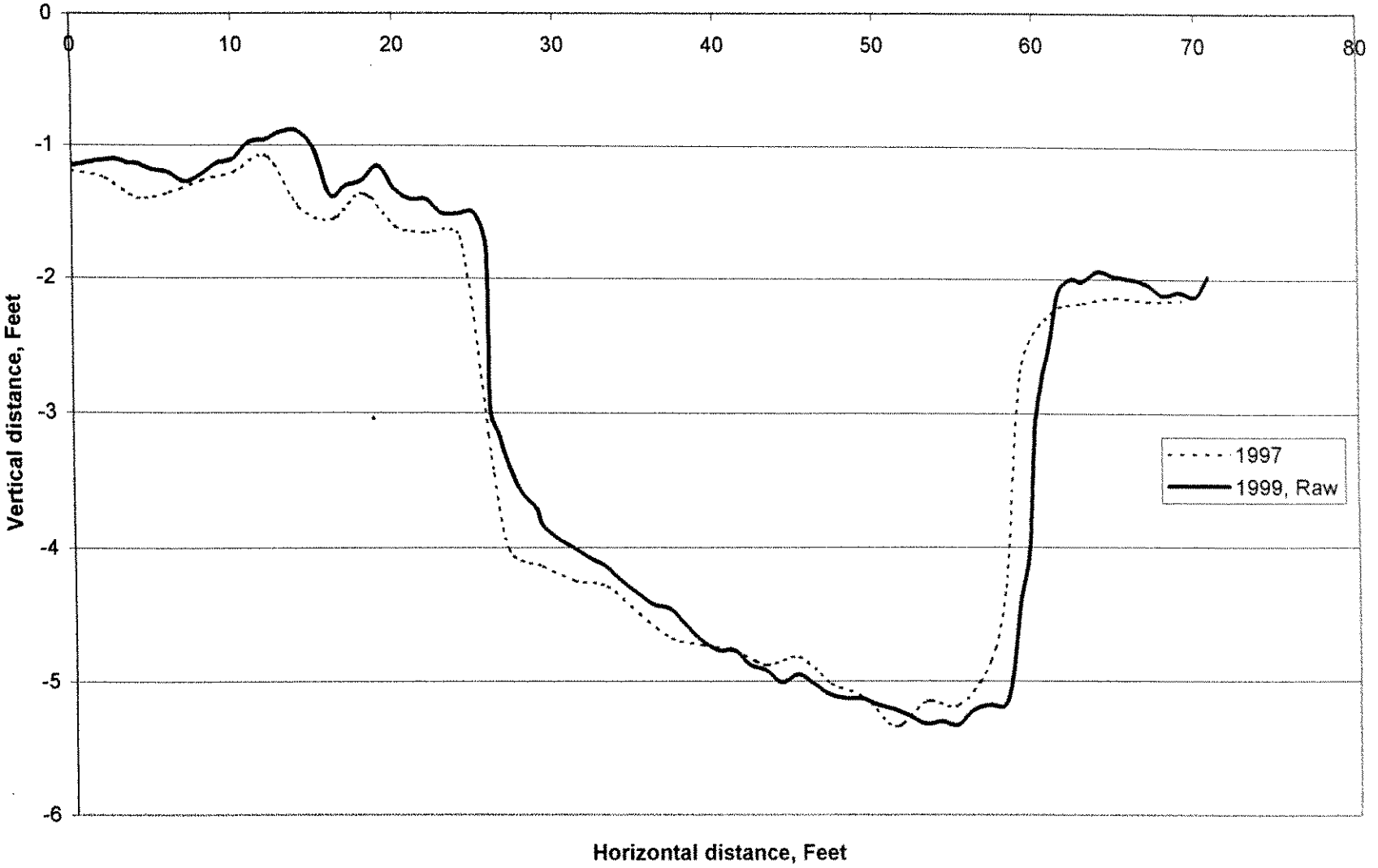
Meamber Ranch xs-4 1996 1996 horiz 1996	1996 vert	Meamber xs-4 1999 horiz-dist	
0	-1.06	0	-1.05
0.23	-1.25	0	-1.2
3.02	-1.41	1.85	-1.2
4.93	-1.48	3.8	-1.3
5.93	-1.4	6.4	-1.3
8.73	-1.39	8.6	-1.2
10.73	-1.41	10.6	-1.25
13.23	-1.38	13.1	-1.1
14.54	-1.29	15.5	-1.05
16.02	-1.15	27.5	-1.2
17.18	-1.14	27.85	-1.15
18.18	-1.35	28.2	-1.4
19.47	-1.62	18.55	-1.6
20.57	-2.54	19.2	-1.8
20.89	-4.5	19.5	-1.95
21.41	-5.41	20.1	-2.85
22.79	-6.07	20.9	-2.6
23.46	-6.3	21	-5.02
24.38	-6.53	23	-6.18
26.18	-6.61	23.6	-6.45
27.61	-6.54	24.7	-6.54
30.03	-6.37	25.54	-6.59
34.68	-6.12	26.77	-6.57
37.37	-6.04	27.8	-6.57
39.33	-5.79	29.85	-6.7
41.07	-5.54	30.96	-6.68
43.36	-5.32	32.95	-6.54
45.46	-5.21	34.75	-6.55
47.61	-5.13	36.55	-6.4
50.61	-4.73	38.98	-6.15
50.86	-3.81	41.57	-6.05
52.73	-3.18	44.7	-5.87
53.23	-2.79	47.87	-5.68
54.48	-2.32	60.51	-5.63
54.87	-2.18	51.65	-5.7
55.79	-1.71	52.2	-5.39
56.56	-1.58	52.46	-5.23
57.53	-1.6	52.69	-3.99
58.73	-1.43	52.7	-2.61
59.87	-1.42	54	-4.21
61.11	-1.37	55.5	-2.73
63.5	-1.5	56.1	-1.82
65.85	-1.47	57.71	-1.24
68.73	-1.39	59.2	-1.05
71.57	-1.16	61.55	-1.25
75.01	-1.57	65.45	-1.1
80.36	-1.82	69.3	-1.56
80.58	-2.05	73.5	-1.29
86.73	-1.94	77.45	-1.4
91.03	-2.01	82.6	-1.55
94.28	-2.19	87.2	-1.48
95.98	-1.97	92.3	-1.78
98.23	-1.96	97	-2
98.79	-1.77	102	-2.09
113.67	-1.51	103.4	-2.15
124.23	-1.15	104.95	-2.05
137.48	-1.07	106.6	-1.74
		108	-1.52
		110	-0.97


Memaber XS5, 1997 and 1999
Vertical distance, Feet
0
-1
-2
-3
-4
-5
-6
0
10
20
30
40
50
60
70
80
90
Horizontal distance, Feet
1997
1999, Raw

Meamber xs5 1997	
horiz-ft	1997
0	-1.73
0.15	-2.6
1.6	-2
3.2	-2
5.3	-2.22
6.9	-2.38
9.7	-2.35
11.6	-2.19
13.6	-2.19
16.5	-1.77
18	-1.55
19.5	-1.7
20.6	-1.58
22.45	-1.45
24.2	-1.19
26.2	-1.28
27.9	-1.37
29.5	-1.84
30	-2.03
30.4	-4.54
30.9	-3.73
31.5	-5.16
32.6	-5.25
34.2	-5.38
35.9	-5.38
36.8	-5.22
39.25	-5.43
41.25	-5.41
43.1	-5
43.6	-5.42
45	-5.09
47.15	-5.61
48.7	-5.59
50.5	-5.74
52	-5.75
53.4	-5.65
54.85	-5.56
55.85	-5.5
57.4	-5.15
58.1	-5.04
58.45	-4.95
58.8	-3.13
59.15	-2.62
59.6	-2.35
60.15	-2.1
60.9	-1.87
62.4	-1.79
63.9	-1.77
64.6	-1.89
66.5	-1.87
68	-1.8
69.5	-1.73
70.7	-1.75
72.5	-1.72
73.5	-1.65
74.4	-1.38
76.5	-1.14
77.6	-1.02
78.5	-1

Meamber xs-5 1999	
horiz-dist	
0	-1.7
0	-1.8
2.85	-1.8
4.75	-2.2
5.55	-2.25
6.5	-2.3
7.75	-2.35
9	-2.25
10.5	-2.25
12.4	-2.1
13.3	-2.05
14.55	-1.85
14.6	-1.7
16.65	-1.65
17.75	-1.45
18.6	-1.55
19.4	-1.4
20.3	-1.2
21.4	-1.15
22.15	-1.1
22.8	-1
23.4	-1
2.85	-0.95
24.5	-1.1
25.7	-1.05
27.1	-1.1
28	-1.7
28.5	-1.8
28.9	-2
29.45	-1.9
29.9	-2.1
30.1	-2.15
30.5	-3.55
31	-4.45
31.6	-4.85
32.95	-5.23
34.9	-5.25
36.55	-5.35
36.7	-5.15
37.2	-5.27
38.65	-5.2
41	-5.25
43.7	-5.3
46.6	-5.53
48.9	-5.525
50.9	-5.6
53.3	-5.6
55.6	-5.8
58.2	-5.5
58.75	-5.5
58.65	-3.6
59	-4.05
58.95	-3.6
59.5	-2.8
60.15	-2.05
61.7	-1.8
63.45	-1.7
65	-1.4
67.1	-1.2
68.8	-1.15
71.7	-1.35
73.75	-1.1
75.5	-0.8
77.1	-0.7
78.1	-0.65
78.3	-0.67

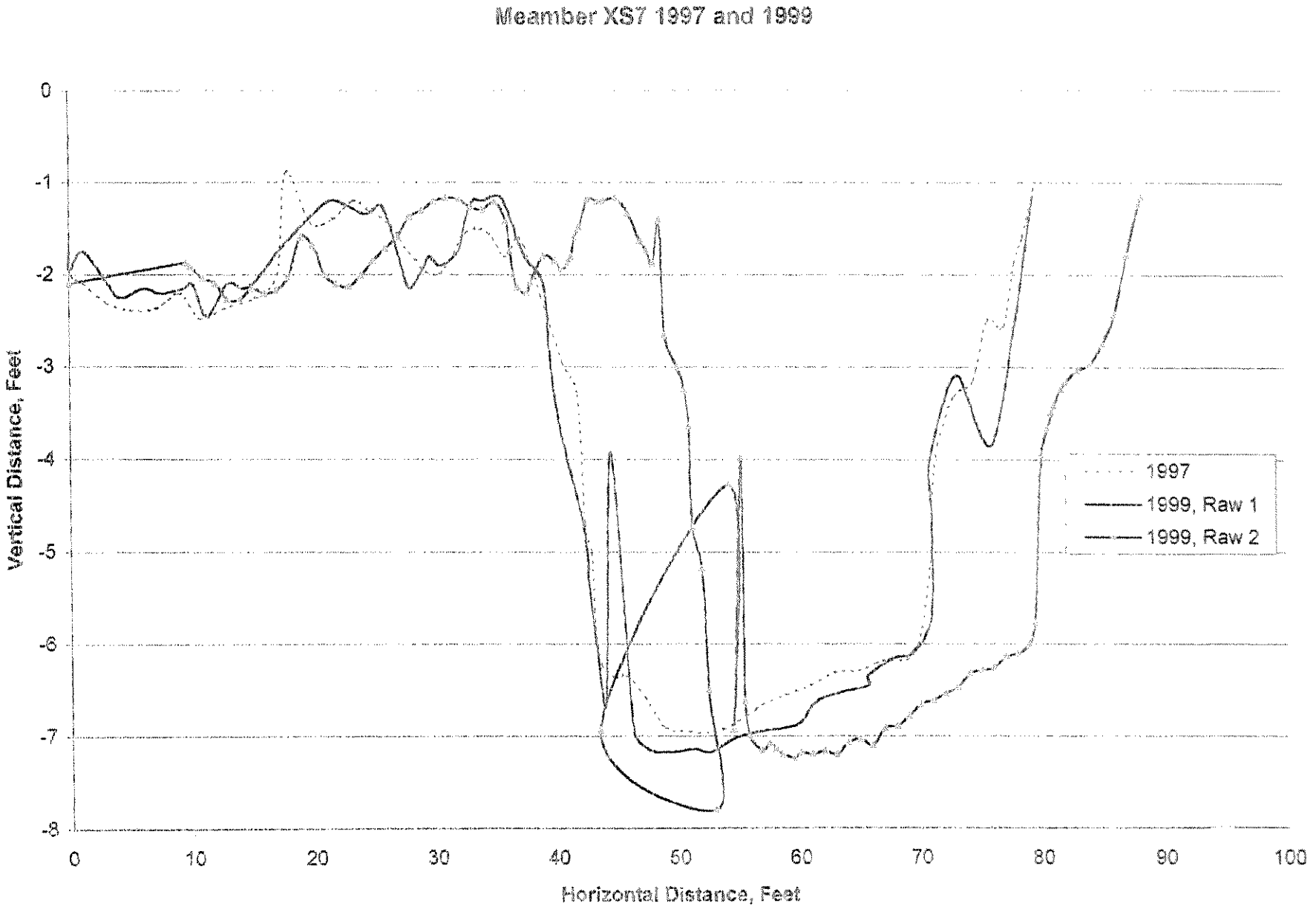
Meamber XS6, 1997 and 1999



Meamber xs6 1997 horiz. Ft 1997	Vert. Ft
0	-1.19
2.1	-1.24
4.1	-1.39
6.1	-1.35
8.1	-1.26
10.1	-1.2
12.1	-1.08
14.1	-1.46
16.1	-1.56
18.1	-1.36
20.1	-1.61
22.1	-1.66
24.1	-1.69
26.1	-3.45
27	-4.02
29.1	-4.14
31.1	-4.25
33.1	-4.29
35.1	-4.49
37.1	-4.68
39.1	-4.73
41.1	-4.78
43.1	-4.88
45.1	-4.82
47.1	-5.02
49.1	-5.12
51.1	-5.34
53.1	-5.15
55.1	-5.18
57.1	-4.85
58.1	-4.3
59.2	-2.63
61.1	-2.25
63.1	-2.18
65.1	-2.14
67.1	-2.17
69.1	-2.16

Meamber xs-6 1999 horitz-dist	
0	-1.15
2.5	-1.1
3.5	-1.13
4	-1.13
5	-1.18
6	-1.2
7	-1.27
8	-1.22
9	-1.13
10	-1.1
11	-0.98
12	-0.96
13	-0.9
14	-0.89
15	-1.03
16	-1.37
17	-1.3
18	-1.26
19	-1.15
20	-1.32
21	-1.4
22	-1.4
23	-1.51
24	-1.51
25	-1.51
25.7	-1.78
25.9	-2.98
26.4	-3.15
27	-3.37
27.8	-3.58
28.7	-3.7
29.1	-3.83
30	-3.93
31	-4
32	-4.08
33	-4.14
34	-4.25
35	-4.34
36	-4.43
37	-4.46
38	-4.58
39	-4.7
40	-4.77
41	-4.77
42	-4.88
43	-4.92
44	-5.01
45	-4.95
46	-5.02
47	-5.1
48	-5.13
49	-5.13

50	-5.18
51	-5.21
52	-5.26
53	-5.32
54	-5.3
55	-5.33
56	-5.22
57	-5.18
58	-5.18
58.5	-4.96
59	-4.42
59.6	-4.01
60	-3.12
60.4	-2.77
61	-2.45
61.5	-2.1
62	-2.02
62.5	-2
63	-2.02
64	-1.94
65	-1.98
66	-2
67	-2.04
68	-2.12
69	-2.1
70	-2.13
70.75	-1.98


Meamber XS7 1997 and 1999
Vertical Distance, Feet
0
-1
-2
-3
-4
-5
-6
-7
-8
0
10
20
30
40
50
60
70
80
90
100
Horizontal Distance, Feet
1997
1999, Raw 1
1999, Raw 2

Meamber xs7 1997 horiz. ft 1997	
0	-1.67
0.1	-2
1.15	-2.09
3.05	-2.3
5.05	-2.39
7.15	-2.37
9.05	-2.2
10.75	-2.47
12.7	-2.37
15.25	-2.25
17.1	-2
17.85	-0.89
19.85	-1.44
21.75	-1.4
23.45	-1.2
24.85	-1.32
26.55	-1.48
28.4	-1.83
30.45	-1.99
32.7	-1.54
34.45	-1.54
35.85	-1.8
37.05	-1.6
38.3	-2.02
40.55	-2.95
41.75	-3.3
42.35	-4.7
42.9	-5.02
43.15	-5.83
43.65	-6.23
44.85	-6.36
45.7	-6.34
47.15	-6.58
48.85	-6.9
50.85	-6.95
52.85	-6.96
54.85	-6.84
56.85	-6.66
58.85	-6.55
60.85	-6.45
62.85	-6.31
64.85	-6.29
66.85	-6.18
68.85	-6.17
69.85	-6
70.85	-5.11
71.05	-4.37
71.5	-3.84
72.85	-3.31
74.45	-3.14

Meamber xs-7 1999 horitz-dist	
0	-1.7
0	-1.95
1.1	-1.75
2.95	-2.05
4.15	-2.25
6.15	-2.15
7.5	-2.2
9.4	-2.15
10.15	-2.1
11.35	-2.45
13	-2.1
14.3	-2.15
15.4	-2.05
17.15	-1.75
18.4	-1.57
19.7	-1.4
21.5	-1.2
22.75	-1.25
24.4	-1.35
25.5	-1.25
25.95	-1.3
26.7	-1.6
27.6	-2.05
28.05	-2.15
29.05	-1.95
29.6	-1.8
30.5	-1.9
32	-1.75
32.55	-1.45
33.2	-1.2
34	-1.2
35.45	-1.15
36.3	-1.37
37.5	-1.8
39	-2.1
39.5	-2.85
40.3	-3.65
42.1	-4.65
42.6	-5.2
42.5	-5.15
43.45	-6.3
44	-6.65
44.5	-3.92
46.25	-6.95
47.55	-7.15
49.6	-7.17
51.2	-7.14
52.6	-7.17
54.65	-7.02
56.8	-6.95
59.8	-6.87

Meamber xs-7 1999 horitz-dist	
0	-2.1
9.6	-1.87
10	-1.91
11	-2.04
12	-2.09
13	-2.27
14	-2.27
15	-2.15
16	-2.2
17	-2.17
18	-2.02
19	-1.6
20	-1.68
21	-2
22	-2.1
23	-2.13
24	-2.01
25	-1.85
26	-1.72
27	-1.59
28	-1.38
29	-1.31
30	-1.21
31	-1.17
32	-1.18
33	-1.27
34	-1.3
35	-1.22
36	-1.42
36.3	-1.74
36.6	-2
36.9	-2.14
37.6	-2.2
38	-2.08
39	-1.8
40	-1.85
40.5	-1.94
41	-1.88
41.3	-1.8
41.6	-1.59
42	-1.49
42.7	-1.18
43.5	-1.21
44	-1.2
45	-1.17
46	-1.34
47	-1.63
47.5	-1.73
48	-1.88
48.6	-1.41
49	-2.65

75.6	-2.49
76.95	-2.56
77.85	-1.86
78.55	-1.58
79.5	-1.05

61.6	-6.6
65.65	-6.45
65.55	-6.35
67.7	-6.15
69.25	-6.1
70.9	-5.72
70.95	-4.6
70.8	-4.05
72.3	-3.25
73.3	-3.1
75.85	-3.85
77.8	-2.6
79.35	-1.15

50	-3
50.6	-3.25
51	-3.64
51.2	-4.73
52	-5.18
52.5	-6.5
53	-7.8
43.5	-6.94
54.2	-4.28
54.5	-6.92
55.2	-3.98
55.4	-6.62
55.8	-7
56.8	-7.15
57.5	-7.08
58	-7.14
58.5	-7.2
59.5	-7.24
60	-7.18
61	-7.2
62	-7.16
63	-7.2
64	-7.07
65	-7.03
66	-7.1
67	-6.91
68	-6.89
69	-6.78
70	-6.65
71	-6.61
72	-6.54
73	-6.47
74	-6.32
75	-6.28
76	-6.25
77	-6.13
78	-6.1
79	-6
79.4	-5.78
80	-3.94
80.5	-3.66
80.8	-3.49
81	-3.41
81.6	-3.24
82	-3.16
83	-3.03
84	-2.96
85	-2.75
86	-2.42
87	-1.78
88	-1.24
88.25	-1.15

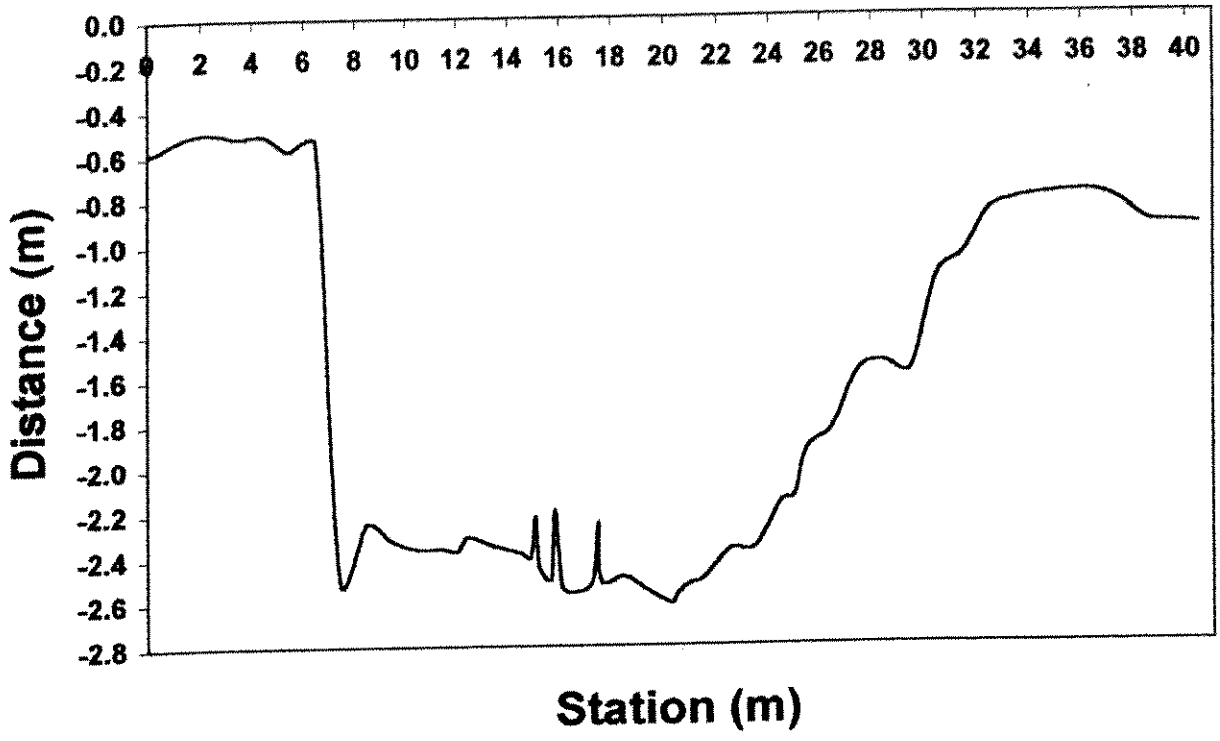
Appendix B

Yreka High School Cross Section Raw Data and Preliminary Graphs

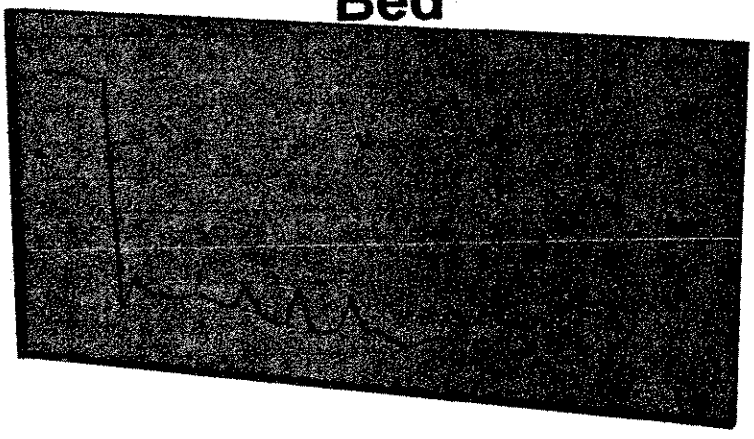
Cross-section 1, Shasta River, Flok Ranch (Ager Rd. bridge to Yreka Western RR
Yreka High School KRIS Project, 5 May 1999, M. O'Connor - instructor
Crew: A. Ives, A. Tweedy, P. Winter, J. Flores

RAW DATA		CORRECTED DATA	
station (m)	dist. To ground (m)	station (m)	dist. To grour
0.00	0.59 notched post	0.00	-0.59
1.00	0.57 grasses	0.47	-0.57
2.00	0.51	1.47	-0.51
3.00	0.50	2.47	-0.50
4.00	0.52	3.47	-0.52
5.00	0.51	4.47	-0.51
6.00	0.58	5.47	-0.58
7.00	0.54 edge of bank	6.47	-0.54
8.00	2.50 waters edge	7.47	-2.50
9.00	2.25	8.47	-2.25
10.00	2.32 in stream	9.47	-2.32
11.00	2.36	10.47	-2.36
12.00	2.36 flat spot	11.47	-2.36
12.60	2.37 before rock	12.07	-2.37
13.00	2.31 on rock	12.47	-2.31
14.00	2.35 after rock	13.47	-2.35
15.00	2.38	14.47	-2.38
15.40	2.40 before rock	14.87	-2.40
15.60	2.22 on rock	15.07	-2.22
15.70	2.43 after rock	15.17	-2.43
16.00	2.50 center of stream	15.47	-2.50
16.20	2.50 before rock	15.67	-2.50
16.35	2.19 on rock	15.82	-2.19
16.60	2.53 after rock	16.07	-2.53
17.00	2.56	16.47	-2.56
17.77	2.51 before rock	17.24	-2.51
18.00	2.25 on rock	17.47	-2.25
18.10	2.51 after rock	17.57	-2.51
19.00	2.49	18.47	-2.49
20.00	2.56	19.47	-2.56
20.80	2.61 before rock	20.27	-2.61
21.00	2.57 on rock	20.47	-2.57
21.50	2.52 after rock	20.97	-2.52
22.00	2.50	21.47	-2.50
23.00	2.37	22.47	-2.37
24.00	2.36	23.47	-2.36
25.00	2.16 edge of stream	24.47	-2.16
25.50	2.14	24.97	-2.14
26.00	1.93 in mudd	25.47	-1.93
27.00	1.83	26.47	-1.83
28.00	1.58	27.47	-1.58
29.00	1.54	28.47	-1.54
30.00	1.57 tules	29.47	-1.57
31.00	1.16 grasses	30.47	-1.16
32.00	1.06	31.47	-1.06
33.00	0.87	32.47	-0.87
34.00	0.82	33.47	-0.82
35.00	0.80	34.47	-0.80
36.00	0.79	35.47	-0.79
37.00	0.79	36.47	-0.79
38.00	0.83	37.47	-0.83
39.00	0.92	38.47	-0.92
40.00	0.93	39.47	-0.93
41.00	0.94 stake	40.47	-0.94

Cross Section

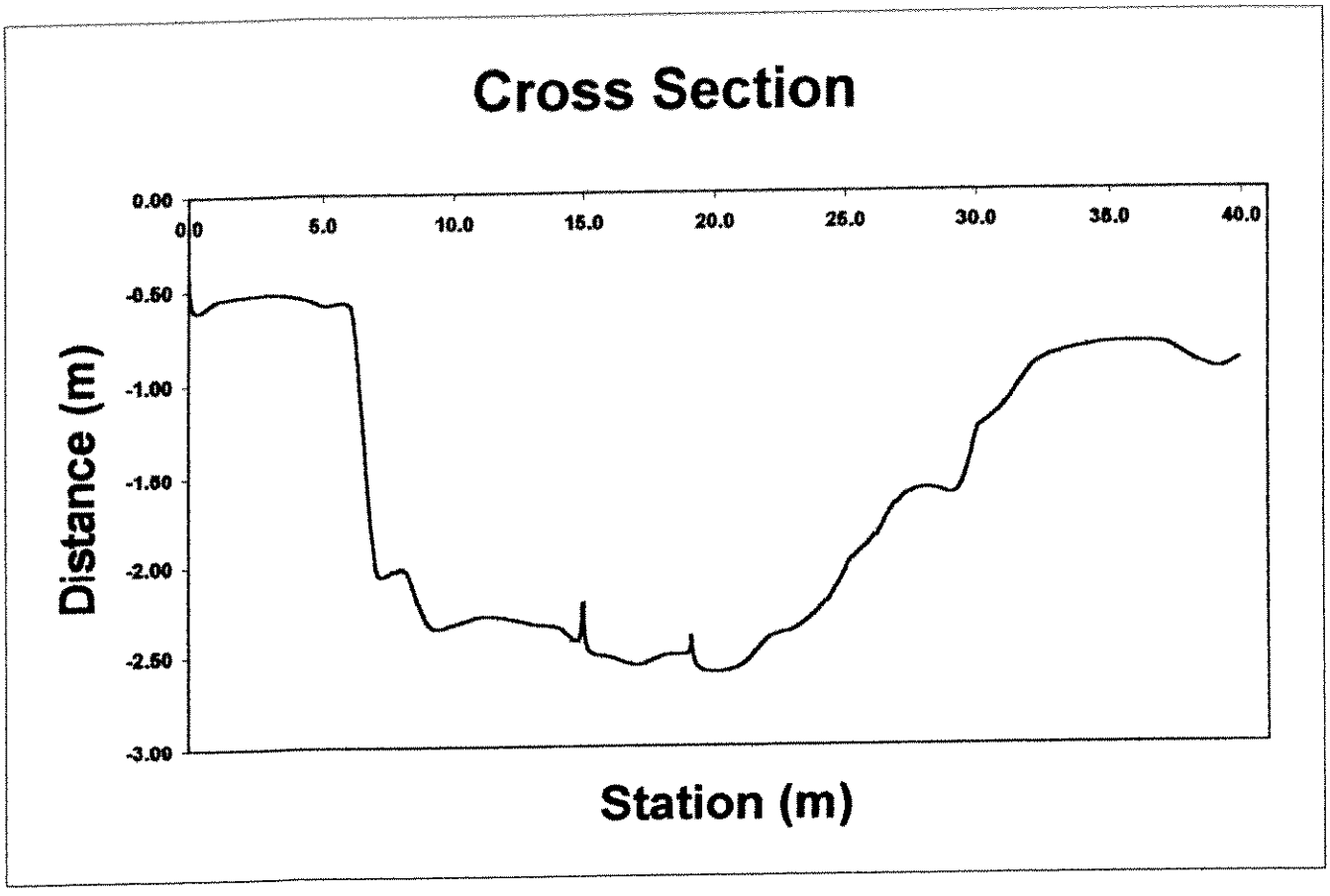


Graphical Represetation of the River Bed

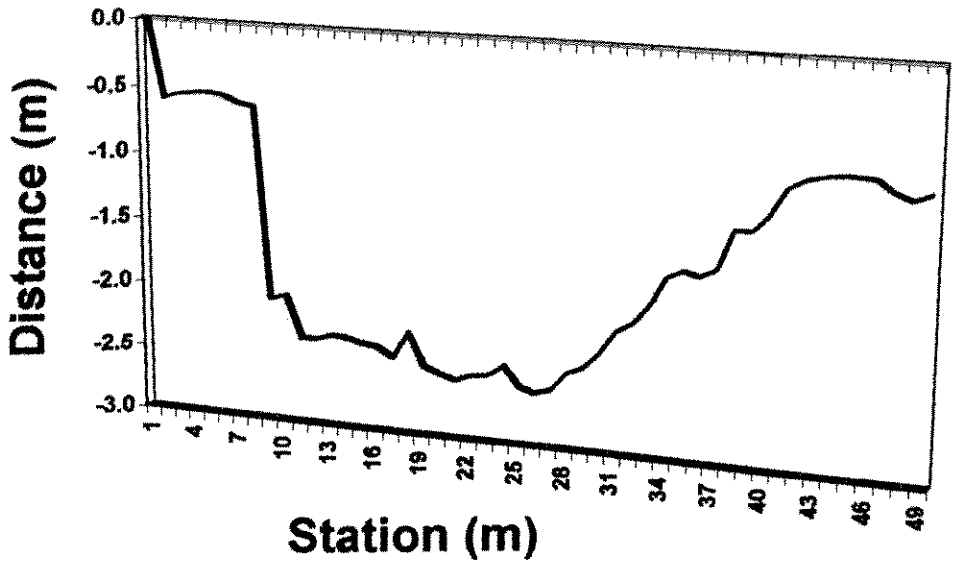


Cross-section 1, Shasta River, Fiok Ranch (Ager Rd. bridge to Yreka Western RR bridge)
Yreka High School KRIS Project, 15 Sep 1999, M. O'Connor - instructor
Crew: A. Cates, J. Whisnant, B. Dooley, B. Bogardus

RAW DATA		CORRECTED DATA	
station (m)	dist. To ground (m)	station (m)	dist. To ground (m)
0.00	0.55 Reff. Stake	0.00	0.00
1.00	0.59 Grass	0.12	-0.59
2.00	0.55	1.12	-0.55
3.00	0.53	2.12	-0.53
4.00	0.52	3.12	-0.52
5.00	0.54	4.12	-0.54
6.00	0.59	5.12	-0.59
7.00	0.61 Bank Edge	6.12	-0.61
8.07	2.06 Waters Edge	7.19	-2.06
9.00	2.02 Water Moss	8.12	-2.02
10.00	2.34	9.12	-2.34
11.00	2.34	10.12	-2.34
12.00	2.30	11.12	-2.30
13.00	2.31	12.12	-2.31
14.00	2.34	13.12	-2.34
15.00	2.36	14.12	-2.36
15.75	2.43 Before Rock	14.87	-2.43
15.94	2.22 On Rock	15.06	-2.22
16.10	2.47 After Rock	15.22	-2.47
17.00	2.52 Gravel	16.12	-2.52
18.00	2.56	17.12	-2.56
19.00	2.51	18.12	-2.51
19.90	2.50 Before Rock	19.02	-2.50
20.00	2.41 On Rock	19.12	-2.41
20.20	2.56 After Rock	19.32	-2.56
21.00	2.60 Gravel	20.12	-2.60
22.00	2.56	21.12	-2.56
23.00	2.42 Sand	22.12	-2.42
24.00	2.37 Gravel	23.12	-2.37
25.00	2.25	24.12	-2.25
25.84	2.07 Waters Edge	24.96	-2.07
26.00	2.00 Tules	25.12	-2.00
27.00	1.86	26.12	-1.86
28.00	1.64	27.12	-1.64
29.00	1.58	28.12	-1.58
30.00	1.61	29.12	-1.61
30.35	1.55 Before Slope	29.47	-1.55
30.95	1.25 Top Slope	30.07	-1.25
31.00	1.25 Grass	30.12	-1.25
32.00	1.13	31.12	-1.13
33.00	0.93	32.12	-0.93
34.00	0.86	33.12	-0.86
35.00	0.83	34.12	-0.83
36.00	0.81	35.12	-0.81
37.00	0.81	36.12	-0.81
38.00	0.82	37.12	-0.82
39.00	0.90	38.12	-0.90
40.00	0.95	39.12	-0.95
40.78	0.90 Reff. Stake	39.90	-0.90


Cross Section
0.00
-0.50
-1.00
-1.50
-2.00
-2.50
-3.00
0.0
5.0
10.0
15.0
20.0
25.0
30.0
35.0
40.0
Distance (m)
Station (m)

Graphical Representation of the River Bed



Cross-section 1, Shasta River, Fiock Ranch (Ager Rd. bridge to Yreka Western RR bridge)
Yreka High School KRIS Project, 12 May 1999, M. O'Connor - instructor
Crew: A. Ives, A. Tweedy, P. Winter, A. Cates

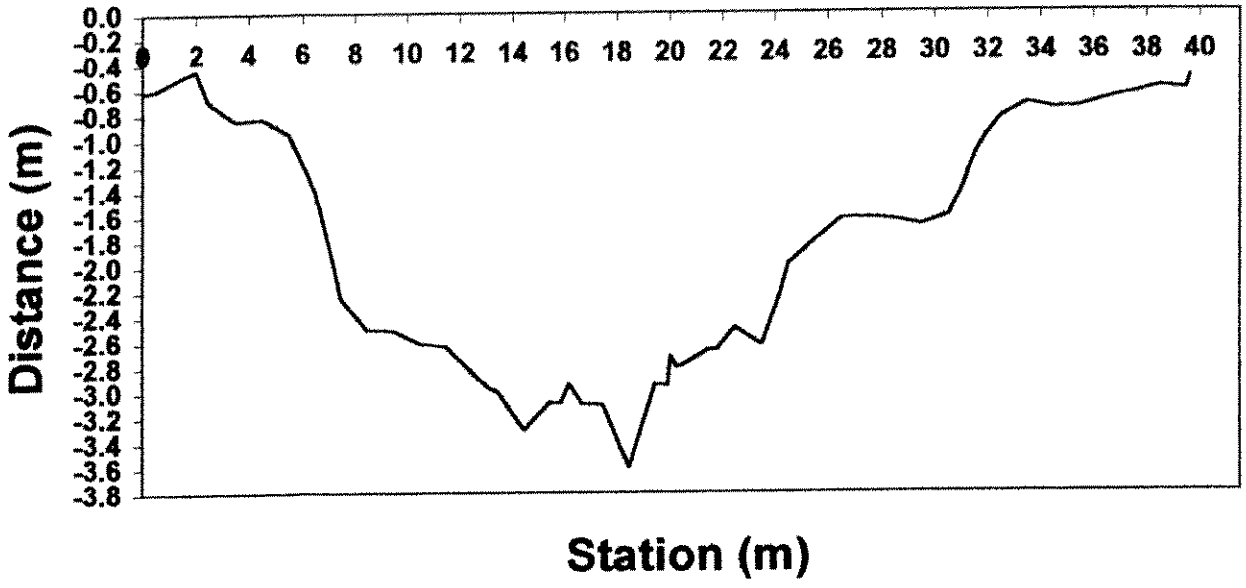
RAW DATA

station (m)	dist. To ground (m)	
0.00	0.62	grasses
2.00	0.60	star thistle
3.00	0.49	
3.50	0.45	
4.00	0.70	
5.00	0.85	grasses
6.00	0.83	
7.00	0.95	
8.00	1.40	bank edge
8.80	2.06	waters edge
9.00	2.25	in water
10.00	2.50	
11.00	2.51	
12.00	2.61	
13.00	2.64	
14.00	2.84	
14.60	2.96	before drop off
15.00	3.00	
16.00	3.30	
17.00	3.08	
17.40	3.09	before rock
17.70	2.94	on rock
18.20	3.09	after rock
19.00	3.10	
20.00	3.60	
21.00	2.94	
21.45	2.95	before rock
21.55	2.72	on rock
21.80	2.80	after rock
22.00	2.79	
23.00	2.67	
23.35	2.66	mudd
24.00	2.49	mudd
25.00	2.63	mudd
25.70	2.24	waters edge
26.00	1.99	tules
27.00	1.80	weeds
28.00	1.63	
29.00	1.62	
30.00	1.64	tules
31.00	1.68	
32.00	1.61	
32.50	1.41	bottom of slope
33.00	1.13	on slope
33.40	0.99	top of slope
34.00	0.84	grasses
35.00	0.73	
36.00	0.77	
37.00	0.76	
38.00	0.70	
39.00	0.65	
40.00	0.60	
41.00	0.62	
41.15	0.52	on stake

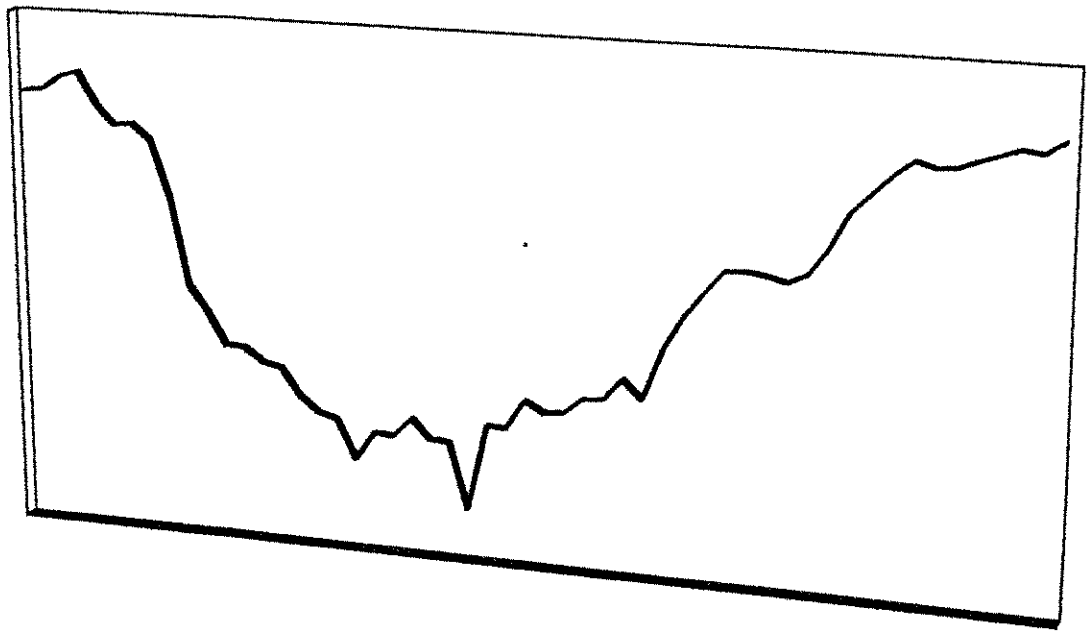
CORRECTED DATA

station (m)	dist. To ground (m)
0.00	-0.62
0.50	-0.60
1.50	-0.49
2.00	-0.45
2.50	-0.70
3.50	-0.85
4.50	-0.83
5.50	-0.95
6.50	-1.40
7.30	-2.06
7.50	-2.25
8.50	-2.50
9.50	-2.51
10.50	-2.61
11.50	-2.64
12.50	-2.84
13.10	-2.96
13.50	-3.00
14.50	-3.30
15.50	-3.08
15.90	-3.09
16.20	-2.94
16.70	-3.09
17.50	-3.10
18.50	-3.60
19.50	-2.94
19.95	-2.95
20.05	-2.72
20.30	-2.80
20.50	-2.79
21.50	-2.67
21.85	-2.66
22.50	-2.49
23.50	-2.63
24.20	-2.24
24.50	-1.99
25.50	-1.80
26.50	-1.63
27.50	-1.62
28.50	-1.64
29.50	-1.68
30.50	-1.61
31.00	-1.41
31.50	-1.13
31.90	-0.99
32.50	-0.84
33.50	-0.73
34.50	-0.77
35.50	-0.76
36.50	-0.70
37.50	-0.65
38.50	-0.60
39.50	-0.62
39.65	-0.52

Cross Section 2



Graphical Representation of the River Bed



Cross-section 2, Shasta River, Fiok Ranch (Ager Rd. bridge to Yreka Western RR bridge)
Yreka High School KRIS Project, 15 Sep 1999, M. O'Connor - instructor
Crew: A. Cates, J. Whisnant, B. Dooley, B. Bogardus

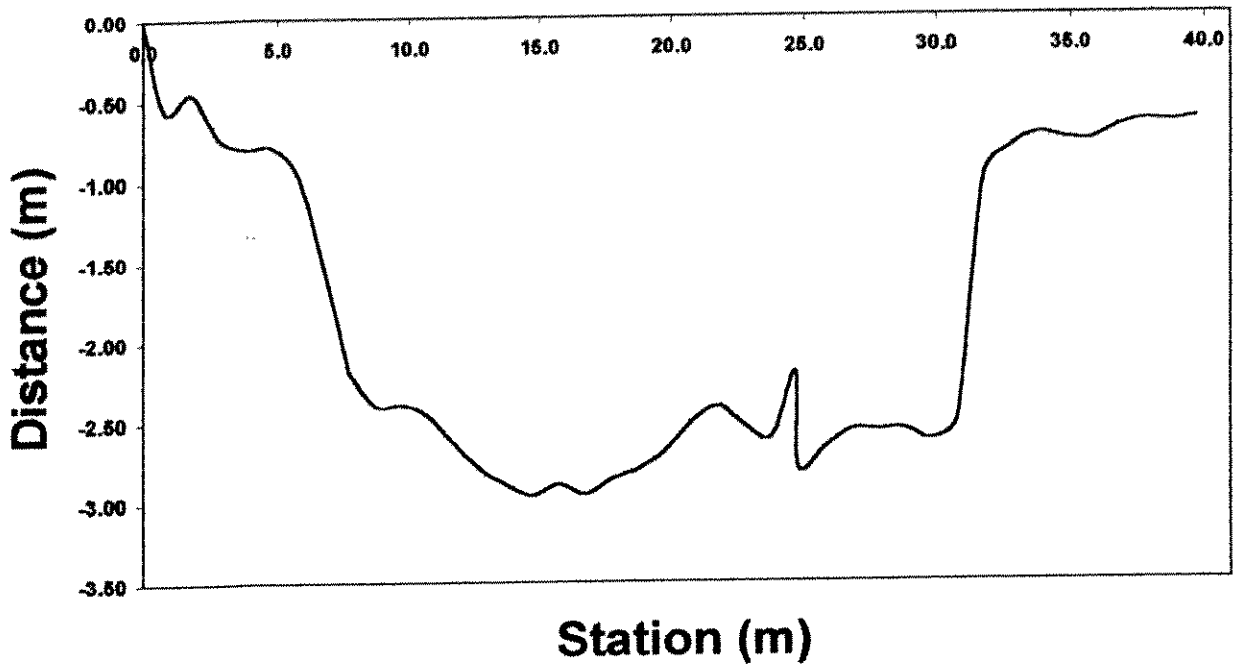
RAW DATA

station (m)	dist. To ground (m)	
0.00	0.61	Reff. Stake
2.00	0.56	dead thistle
3.00	0.46	
4.00	0.73	
5.00	0.80	
6.00	0.79	
7.00	0.96	
8.00	1.53	banks edge
8.90	2.13	waters edge
9.00	2.19	mud
10.00	2.40	moss
11.00	2.39	
12.00	2.46	
13.00	2.63	
14.00	2.79	
15.00	2.89	
16.00	2.96	
17.00	2.89	gravel
18.00	2.95	mud
19.00	2.86	
20.00	2.80	
21.00	2.69	
22.00	2.51	
23.00	2.41	
24.00	2.53	
25.00	2.60	
25.90	2.20	waters edge
26.00	2.80	banks edge
27.00	2.67	grass
28.00	2.56	
29.00	2.56	
30.00	2.55	
31.00	2.62	
32.00	2.50	before rise
33.00	0.99	top of rise
34.00	0.81	dead thistle
35.00	0.73	
36.00	0.76	
37.00	0.77	
38.00	0.69	
39.00	0.65	
40.00	0.66	
40.90	0.64	reff. stake

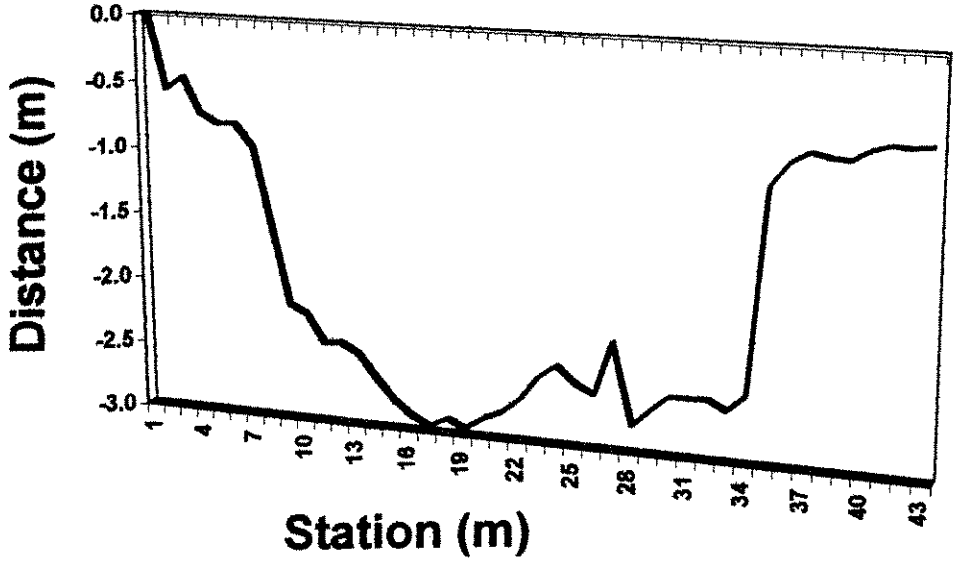
CORRECTED DATA

station (m)	dist. To ground (m)
0.00	0.00
0.78	-0.56
1.78	-0.46
2.78	-0.73
3.78	-0.80
4.78	-0.79
5.78	-0.96
6.78	-1.53
7.68	-2.13
7.78	-2.19
8.78	-2.40
9.78	-2.39
10.78	-2.46
11.78	-2.63
12.78	-2.79
13.78	-2.89
14.78	-2.96
15.78	-2.89
16.78	-2.95
17.78	-2.86
18.78	-2.80
19.78	-2.69
20.78	-2.51
21.78	-2.41
22.78	-2.53
23.78	-2.60
24.68	-2.20
24.78	-2.80
25.78	-2.67
26.78	-2.56
27.78	-2.56
28.78	-2.55
29.78	-2.62
30.78	-2.50
31.78	-0.99
32.78	-0.81
33.78	-0.73
34.78	-0.76
35.78	-0.77
36.78	-0.69
37.78	-0.65
38.78	-0.66
39.68	-0.64

Cross Section



Graphical Representation of the River Bed



Cross-section 3, Shasta River, Flock Ranch (Ager Rd. bridge to Yreka Western RR bridge)
Yreka High School KRIS Project, 12 May 1999, M. O'C nor - instructor
Crew: A. Ives, A. Tweedy, P. Winter, A. Cates

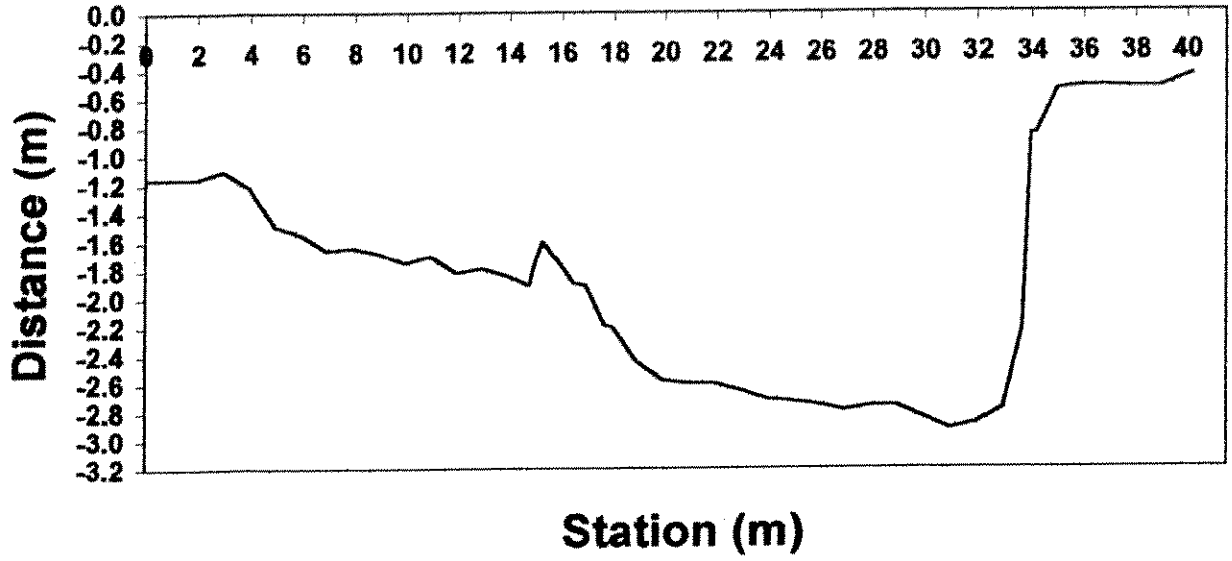
RAW DATA

station (m)	dist. To ground (m)	
0.00	1.16	
3.00	1.16	
4.00	1.10	
5.00	1.22	
6.00	1.49	
7.00	1.55	
8.00	1.66	
9.00	1.64	
10.00	1.68	
11.00	1.75	
12.00	1.70	
13.00	1.82	
14.00	1.79	
15.00	1.84	
15.80	1.91	
16.00	1.76	
16.30	1.60	
17.00	1.76	
17.50	1.89	
18.00	1.91	
18.70	2.19	
19.00	2.20	
20.00	2.45	
21.00	2.58	
22.00	2.60	
23.00	2.60	
24.00	2.65	
25.00	2.71	
26.00	2.73	
27.00	2.75	
28.00	2.79	
29.00	2.76	
30.00	2.76	
31.00	2.84	
32.00	2.92	
33.00	2.88	
34.00	2.78	
34.70	2.21	
35.00	0.85	
35.20	0.85	bank edge
36.00	0.54	grass
37.00	0.52	
38.00	0.52	
39.00	0.53	
40.00	0.53	
41.25	0.44	

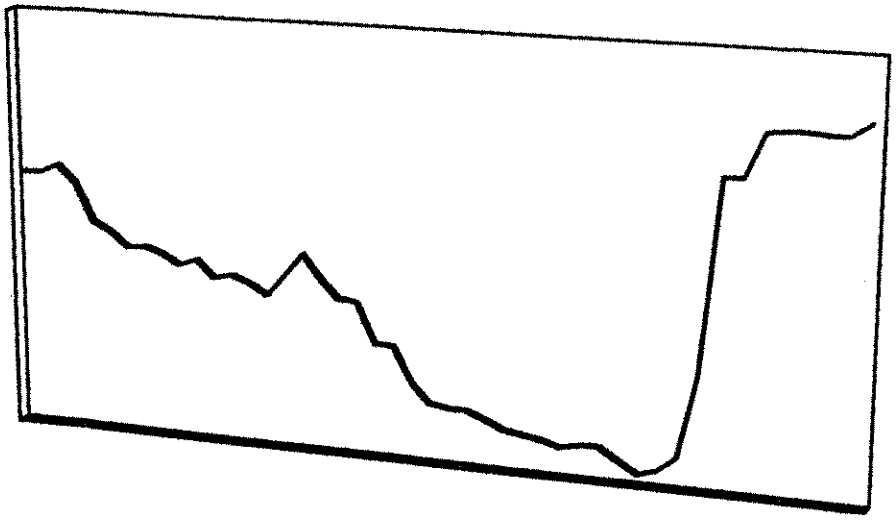
CORRECTED DATA

station (m)	dist. To ground (m)
0.00	-1.16
1.95	-1.16
2.95	-1.10
3.95	-1.22
4.95	-1.49
5.95	-1.55
6.95	-1.66
7.95	-1.64
8.95	-1.68
9.95	-1.75
10.95	-1.70
11.95	-1.82
12.95	-1.79
13.95	-1.84
14.75	-1.91
14.95	-1.76
15.25	-1.60
15.95	-1.76
16.45	-1.89
16.95	-1.91
17.65	-2.19
17.95	-2.20
18.95	-2.45
19.95	-2.58
20.95	-2.60
21.95	-2.60
22.95	-2.65
23.95	-2.71
24.95	-2.73
25.95	-2.75
26.95	-2.79
27.95	-2.76
28.95	-2.76
29.95	-2.84
30.95	-2.92
31.95	-2.88
32.95	-2.78
33.65	-2.21
33.95	-0.85
34.15	-0.85
34.95	-0.54
35.95	-0.52
36.95	-0.52
37.95	-0.53
38.95	-0.53
40.20	-0.44

Cross Section 3



Grphical Representation of the River Bed



Cross-section 3, Shasta River, Fiok Ranch (Ager Rd. bridge to Yreka Western RR bridge)
Yreka High School KRIS Project, 15 Sep 1999, M. O'Connor - instructor
Crew: A. Cates, B. Dooley, B. Bogardus

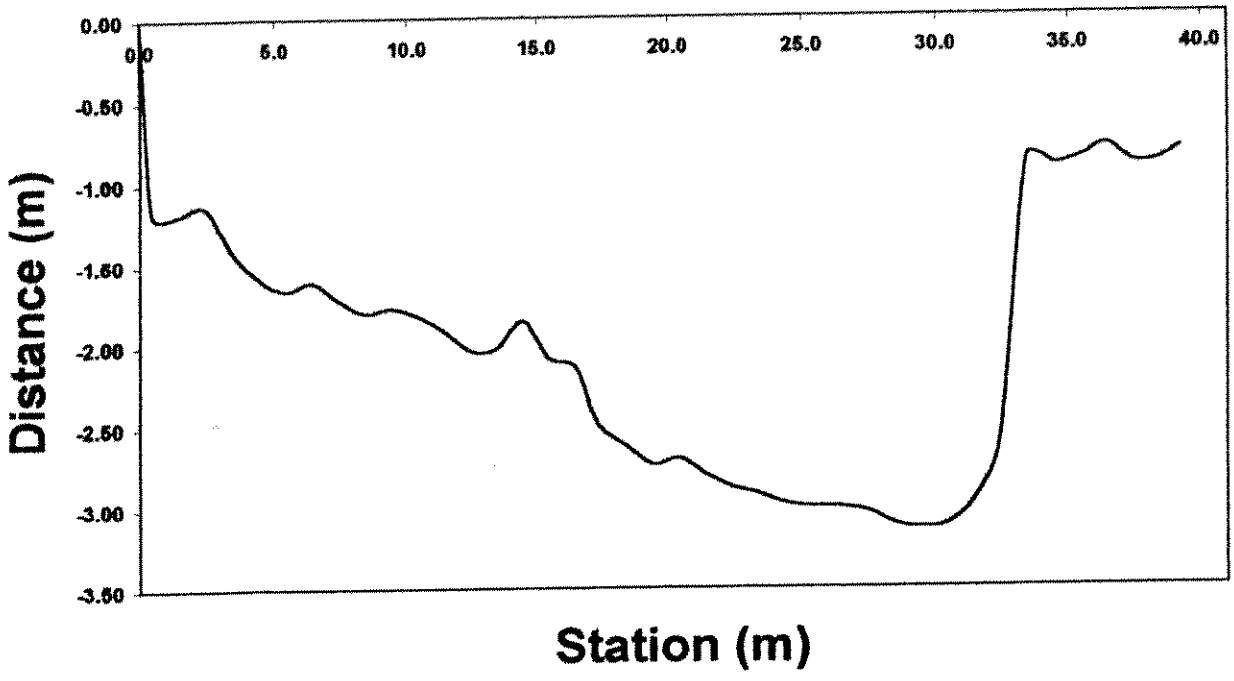
RAW DATA

station (m)	dist. To ground (m)	
0.00	1.06	reff. Stake
2.00	1.18	grass
3.00	1.19	
4.00	1.15	
5.00	1.42	
6.00	1.59	
7.00	1.66	
8.00	1.61	
9.00	1.72	
10.00	1.80	
11.00	1.77	
12.00	1.82	
13.00	1.91	
14.00	2.03	
15.00	2.02	
16.00	1.85	
17.00	2.08	
18.00	2.13	
18.65	2.40	waters edge
19.00	2.51	moss
20.00	2.63	
21.00	2.74	
22.00	2.70	
23.00	2.80	gravel
24.00	2.88	
25.00	2.92	
26.00	2.98	
27.00	3.00	
28.00	3.00	
29.00	3.03	
30.00	3.11	
31.00	3.13	
32.00	3.11	
33.00	2.96	moss
33.93	2.61	waters edge
34.95	0.87	top of bank
36.00	0.91	grass
37.00	0.87	
38.00	0.79	
39.00	0.90	
40.00	0.89	
40.76	0.81	reff. stake

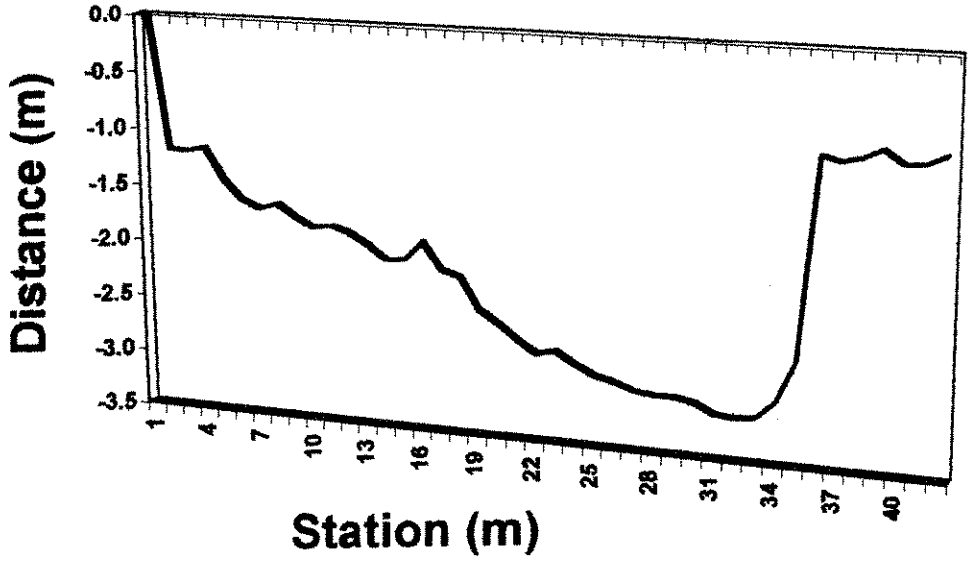
CORRECTED DATA

station (m)	dist. To ground (m)
0.00	0.00
0.45	-1.18
1.45	-1.19
2.45	-1.15
3.45	-1.42
4.45	-1.59
5.45	-1.66
6.45	-1.61
7.45	-1.72
8.45	-1.80
9.45	-1.77
10.45	-1.82
11.45	-1.91
12.45	-2.03
13.45	-2.02
14.45	-1.85
15.45	-2.08
16.45	-2.13
17.10	-2.40
17.45	-2.51
18.45	-2.63
19.45	-2.74
20.45	-2.70
21.45	-2.80
22.45	-2.88
23.45	-2.92
24.45	-2.98
25.45	-3.00
26.45	-3.00
27.45	-3.03
28.45	-3.11
29.45	-3.13
30.45	-3.11
31.45	-2.96
32.38	-2.61
33.40	-0.87
34.45	-0.91
35.45	-0.87
36.45	-0.79
37.45	-0.90
38.45	-0.89
39.21	-0.81

Cross Section



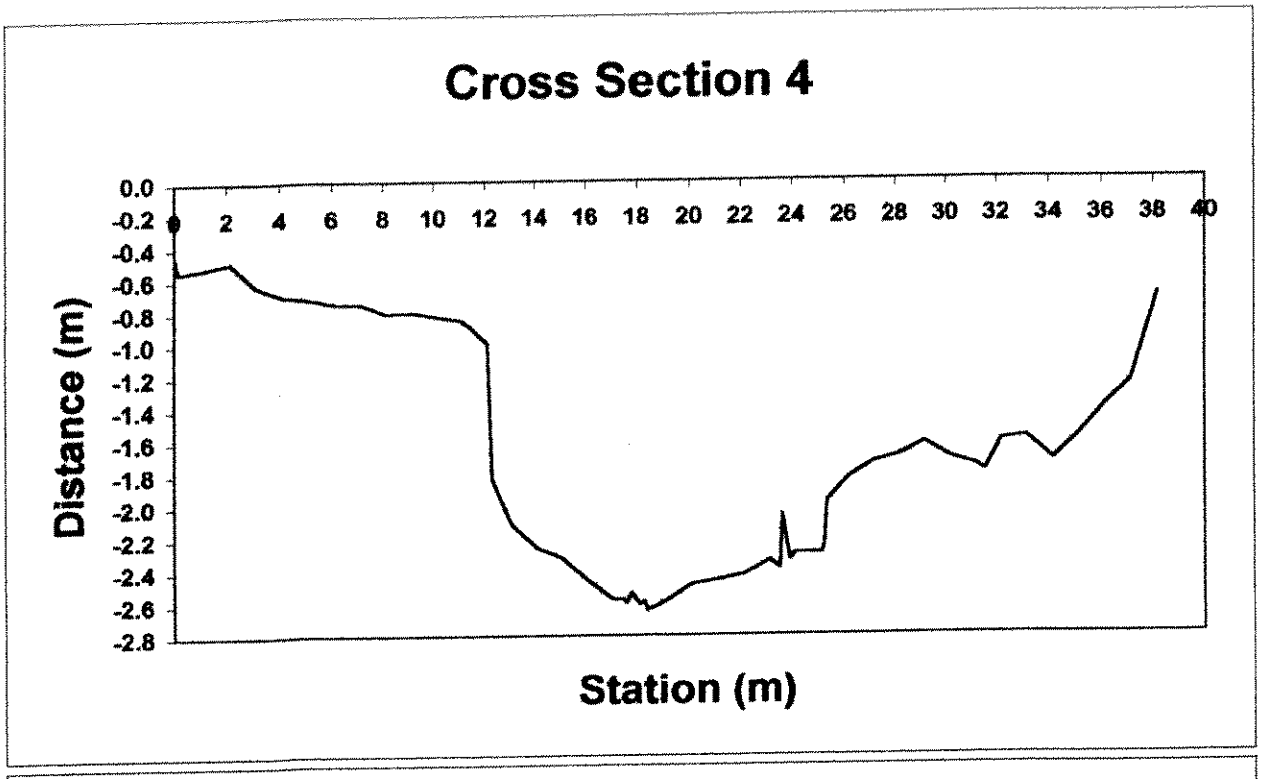
Graphical Representation of the River Bed

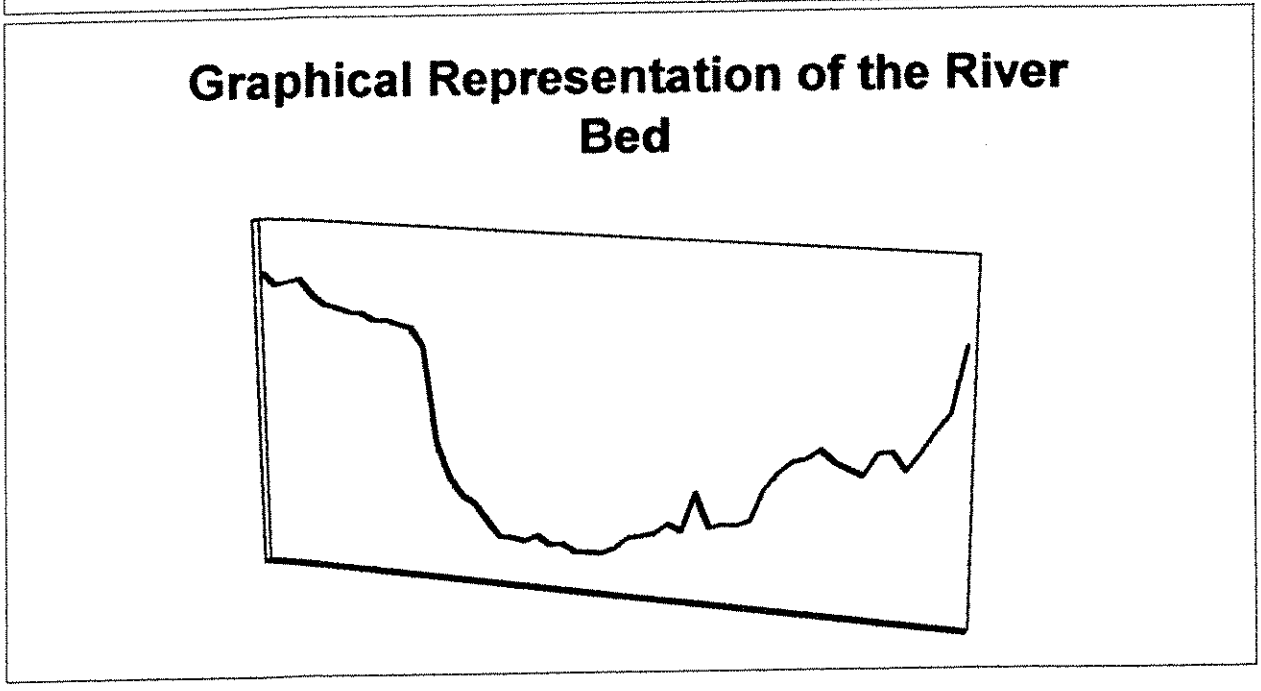


Cross-section 4, Shasta River, Fiock Ranch (Ager Rd. bridge to Yreka Western RR bridge)
Yreka High School KRIS Project, 12 May 1999, M. O'Connor - instructor
Crew: A. Ives, A. Tweedy, P. Winter, A. Cates

RAW DATA			CORRECTED DATA	
station (m)	dist. To ground (m)		station (m)	dist. To ground (m)
0.00	0.45	grass & forbs	0.00	-0.45
1.00	0.55		0.15	-0.55
2.00	0.52		1.15	-0.52
3.00	0.49		2.15	-0.49
4.00	0.63		3.15	-0.63
5.00	0.70		4.15	-0.70
6.00	0.72		5.15	-0.72
7.00	0.75		6.15	-0.75
8.00	0.75		7.15	-0.75
9.00	0.81		8.15	-0.81
10.00	0.80		9.15	-0.80
11.00	0.83		10.15	-0.83
12.00	0.85		11.15	-0.85
13.00	1.00	bank edge	12.15	-1.00
13.20	1.83	waters edge	12.35	-1.83
14.00	2.11		13.15	-2.11
15.00	2.26		14.15	-2.26
16.00	2.32		15.15	-2.32
17.00	2.46		16.15	-2.46
18.00	2.58		17.15	-2.58
18.40	2.58	before rock	17.55	-2.58
18.50	2.60	on rock	17.65	-2.60
18.70	2.54	after rock	17.85	-2.54
19.00	2.61		18.15	-2.61
19.20	2.59	before rock	18.35	-2.59
19.30	2.65	on rock	18.45	-2.65
19.30	2.64	after rock	18.45	-2.64
19.40	2.64		18.55	-2.64
20.00	2.59		19.15	-2.59
21.00	2.49		20.15	-2.49
22.00	2.46		21.15	-2.46
23.00	2.43		22.15	-2.43
24.00	2.34		23.15	-2.34
24.40	2.39	before rock	23.55	-2.39
24.50	2.06	on rock	23.65	-2.06
24.80	2.34	after rock	23.95	-2.34
25.00	2.30		24.15	-2.30
26.00	2.30	eddie	25.15	-2.30
26.10	2.25		25.25	-2.25
26.20	1.98	tules	25.35	-1.98
27.00	1.84	bank edge	26.15	-1.84
28.00	1.74	tules	27.15	-1.74
29.00	1.70		28.15	-1.70
30.00	1.62		29.15	-1.62
31.00	1.71		30.15	-1.71
32.00	1.76		31.15	-1.76
32.40	1.80	waters edge	31.55	-1.80
33.00	1.61	mud & tules	32.15	-1.61
34.00	1.59		33.15	-1.59

35.00	1.73	34.15	-1.73
36.00	1.58	35.15	-1.58
37.00	1.40	36.15	-1.40
38.00	1.25	37.15	-1.25
39.05	0.71 ref. Stake missing	38.20	-0.71





Cross-section 4, Shasta River, Fiok Ranch (Ager Rd. bridge to Yreka Western RR bridge)
Yreka High School KRIS Project, 15 Sep 1999, M. O'Connor - instructor
Crew: A. Cates, B. Dooley, B. Bogardus

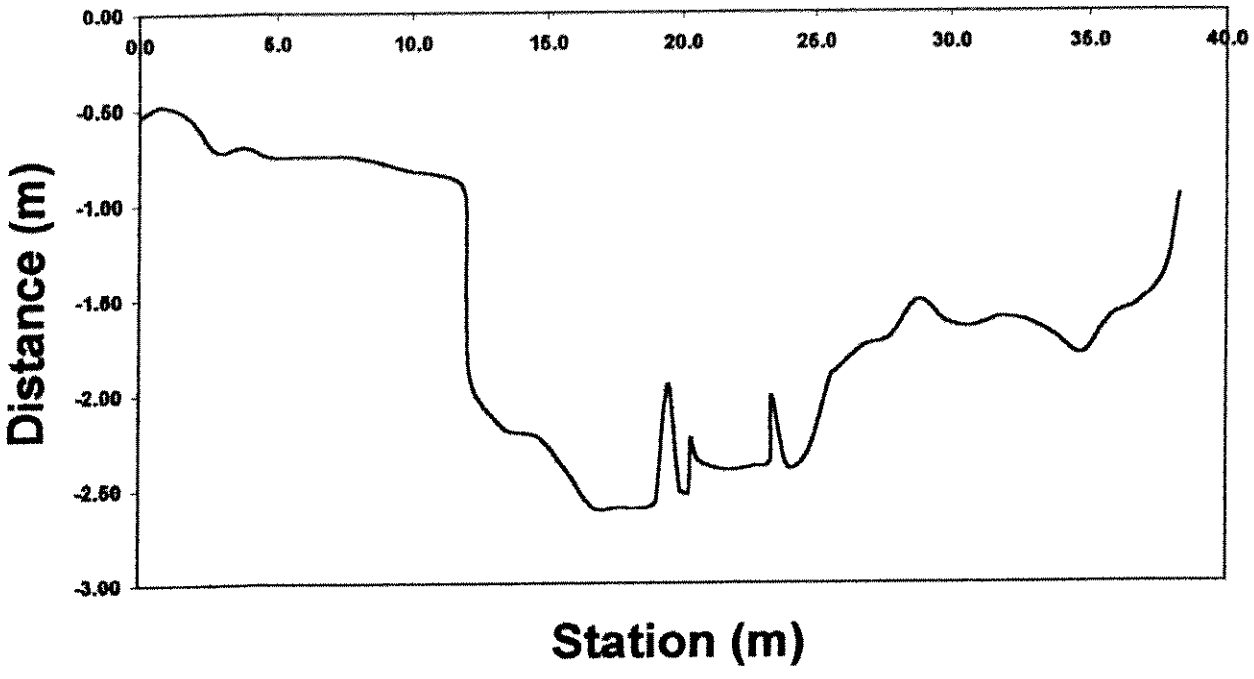
RAW DATA

station (m)	dist. To ground (m)	
0.00	0.45	reff stake
1.00	0.51	grass
2.00	0.48	
3.00	0.54	
4.00	0.72	
5.00	0.70	
6.00	0.75	
7.00	0.75	
8.00	0.75	
9.00	0.75	
10.00	0.78	
11.00	0.82	
12.00	0.84	
13.00	0.88	
13.30	0.98	banks edge
13.45	1.90	bottom of bank
14.59	2.16	waters edge
15.00	2.20	mud
16.00	2.23	gravel
17.00	2.40	
18.00	2.60	
19.00	2.60	
20.00	2.60	
20.35	2.56	before rock
20.75	1.95	on rock
21.20	2.50	after rock
21.53	2.52	before rock
21.60	2.24	on rock
21.90	2.35	after rock
23.00	2.40	gravel
24.00	2.38	
24.56	2.35	before rock
24.59	2.01	on rock
25.20	2.38	after rock
26.00	2.30	gravel
26.78	1.91	waters edge
27.00	1.88	tules
28.00	1.75	
29.00	1.70	
30.00	1.51	
31.00	1.62	
32.00	1.65	
33.00	1.60	
34.00	1.62	
35.00	1.70	
36.00	1.79	
37.00	1.60	
38.00	1.53	
39.00	1.36	
39.53	0.96	post, no reff. Stake

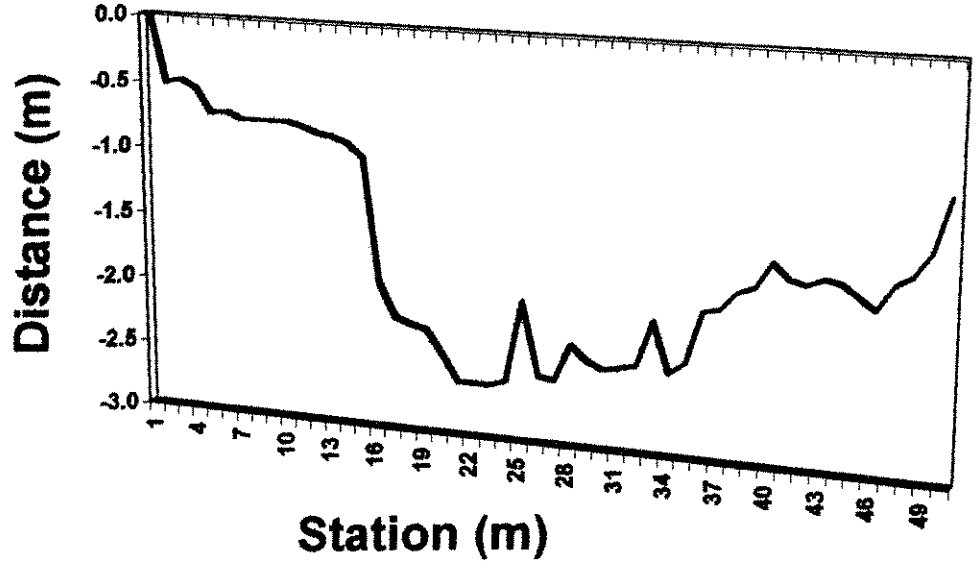
CORRECTED DATA

station (m)	dist. To ground (m)
0.00	0.00
-0.24	-0.51
0.76	-0.48
1.76	-0.54
2.76	-0.72
3.76	-0.70
4.76	-0.75
5.76	-0.75
6.76	-0.75
7.76	-0.75
8.76	-0.78
9.76	-0.82
10.76	-0.84
11.76	-0.88
12.06	-0.98
12.21	-1.90
13.35	-2.16
13.76	-2.20
14.76	-2.23
15.76	-2.40
16.76	-2.60
17.76	-2.60
18.76	-2.60
19.11	-2.56
19.51	-1.95
19.96	-2.50
20.29	-2.52
20.36	-2.24
20.66	-2.35
21.76	-2.40
22.76	-2.38
23.32	-2.35
23.35	-2.01
23.96	-2.38
24.76	-2.30
25.54	-1.91
25.76	-1.88
26.76	-1.75
27.76	-1.70
28.76	-1.51
29.76	-1.62
30.76	-1.65
31.76	-1.60
32.76	-1.62
33.76	-1.70
34.76	-1.79
35.76	-1.60
36.76	-1.53
37.76	-1.36
38.29	-0.96

Cross Section



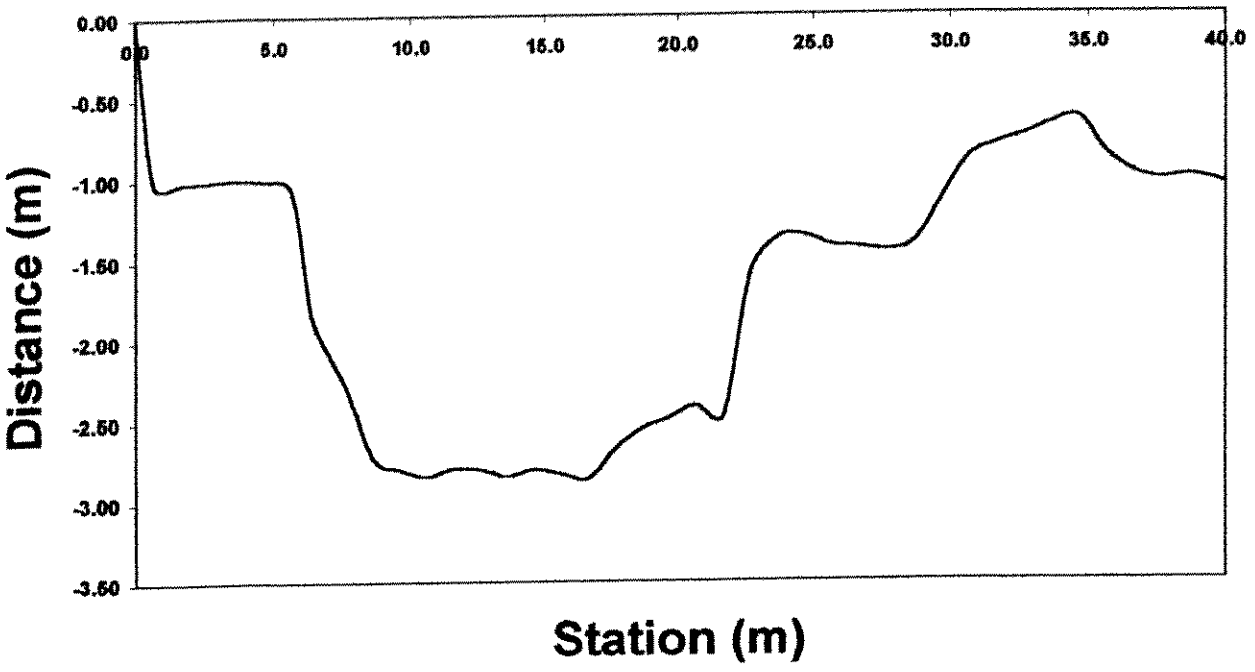
Graphical Representation of the River Bed



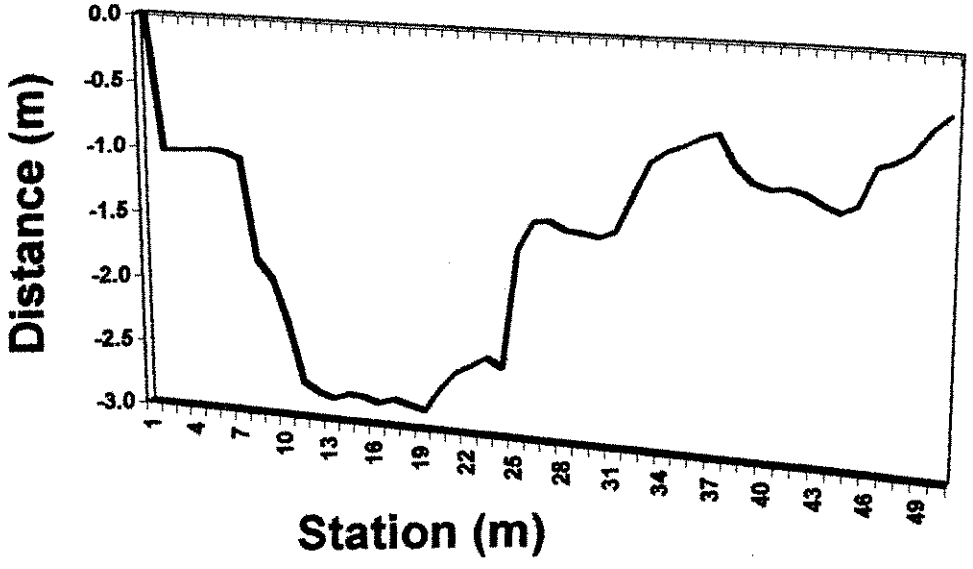
Cross-section 5, Shasta River, Fiok Ranch (Ager Rd. bridge to Yreka Western RR bridge)
Yreka High School KRIS Project, 15 Sep 1999, M. O'Connor - instructor
Crew: A. Cates, B. Dooley, B. Bogardus

RAW DATA		CORRECTED DATA	
station (m)	dist. To ground (m)	station (m)	dist. To ground (m)
0.00	0.99 reff. Stake	0.00	0.00
2.00	1.02 veg.	0.65	-1.02
3.00	1.02	1.65	-1.02
4.00	1.01	2.65	-1.01
5.00	1.00	3.65	-1.00
6.00	1.01	4.65	-1.01
7.00	1.06	5.65	-1.06
7.70	1.82 waters edge	6.35	-1.82
8.00	1.96 mud	6.65	-1.96
9.00	2.29 firm gravel	7.65	-2.29
10.00	2.73	8.65	-2.73
11.00	2.80	9.65	-2.80
12.00	2.84	10.65	-2.84
13.00	2.79	11.65	-2.79
14.00	2.80	12.65	-2.80
15.00	2.84	13.65	-2.84
16.00	2.80 mud	14.65	-2.80
17.00	2.83 thick mud	15.65	-2.83
18.00	2.86	16.65	-2.86
19.00	2.68	17.65	-2.68
20.00	2.55 very thick mud	18.65	-2.55
21.00	2.49	19.65	-2.49
22.00	2.41	20.65	-2.41
23.00	2.48	21.65	-2.48
24.00	1.58 waters edge	22.65	-1.58
25.00	1.37 thick tules	23.65	-1.37
26.00	1.36	24.65	-1.36
27.00	1.42	25.65	-1.42
28.00	1.43	26.65	-1.43
29.00	1.45	27.65	-1.45
30.00	1.40	28.65	-1.40
31.00	1.13	29.65	-1.13
32.00	0.88 grass	30.65	-0.88
33.00	0.80	31.65	-0.80
34.00	0.75	32.65	-0.75
35.00	0.68	33.65	-0.68
36.00	0.64	34.65	-0.64
37.00	0.86	35.65	-0.86
38.00	0.98	36.65	-0.98
39.00	1.02	37.65	-1.02
40.00	1.00	38.65	-1.00
41.00	1.03	39.65	-1.03
42.00	1.10	40.65	-1.10
43.00	1.15	41.65	-1.15
44.00	1.09	42.65	-1.09
45.00	0.81	43.65	-0.81
46.00	0.77	44.65	-0.77
47.00	0.70	45.65	-0.70
48.00	0.53	46.65	-0.53
48.70	0.42 reff. stake	47.35	-0.42

Cross Section

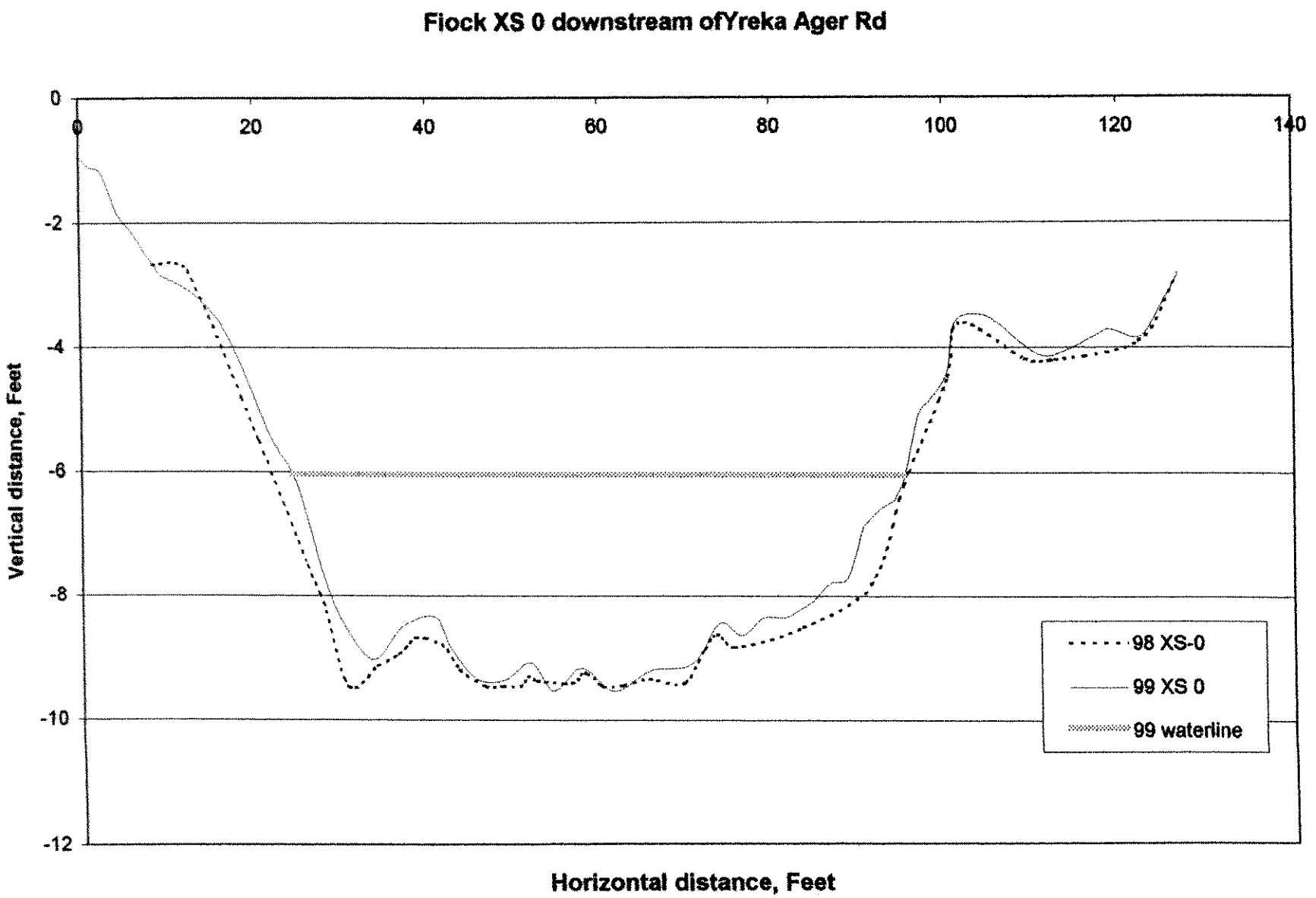


Graphical Representation of the River Bed



Appendix C

Fiock Ranch Cross Sections Below Yreka Ager Rd, 1998 and 1999


Fiock XS 0 downstream ofYreka Ager Rd
0
-2
-4
-6
-8
-10
-12
0
20
40
60
80
100
120
140
Vertical distance, Feet
Horizontal distance, Feet
98 XS-0
99 XS 0
99 waterline

Flock xs below Yreka Ager Rd comparisons

all values corrected to offset zero at anchor stakes
all heights made negative
horizontal distance made zero on river left where possible, noted where not
comparisons with stringline values from 1999, transit values from 1998

1998 XS 0 below Y-A Rd

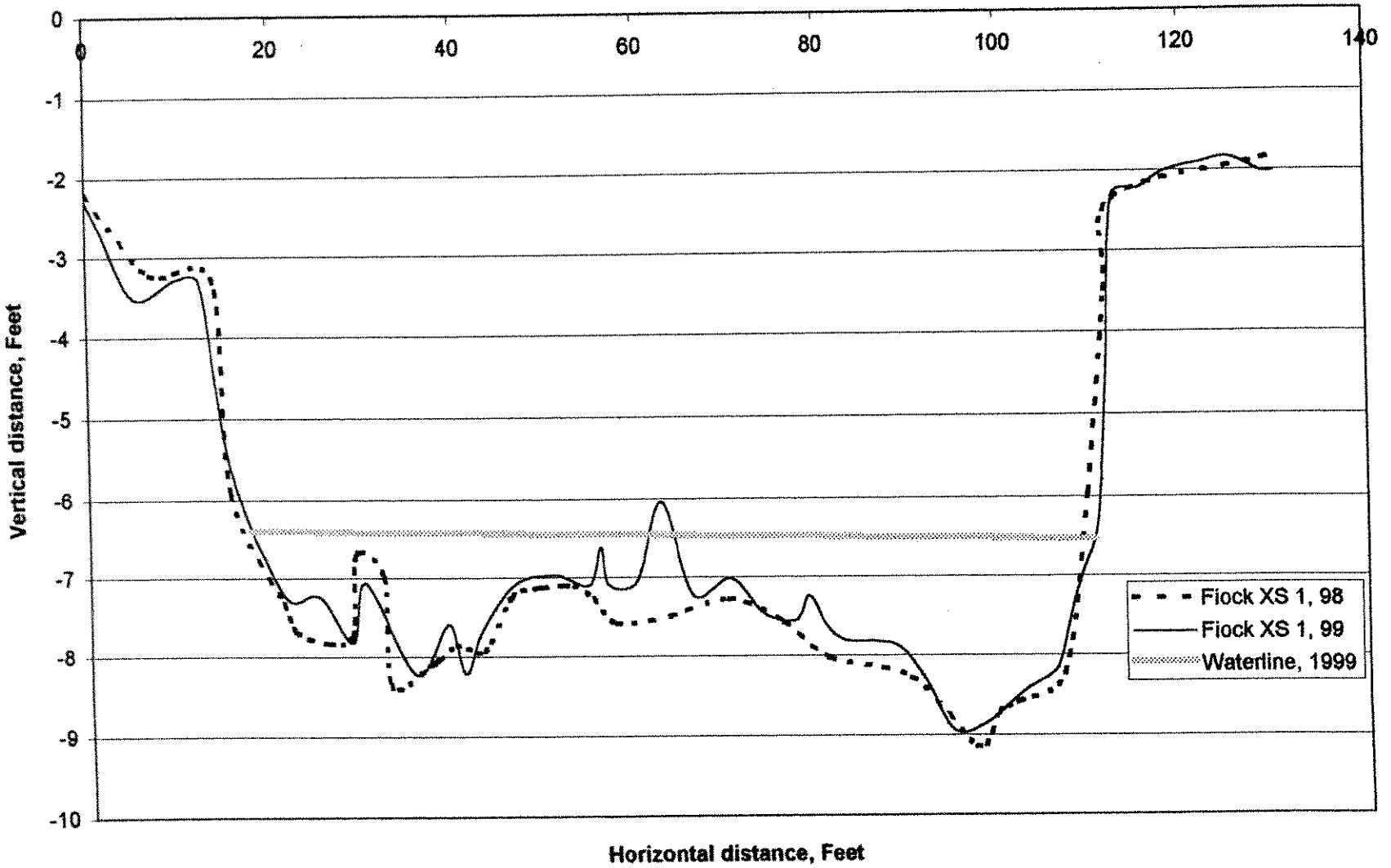
horizontal		vertical	
NOTE:1998-no ref stake, no notch in post in		NOTE:Offset correction procedur	
NOTE:zero is at anchor T post, end post on river left was lost over winter, new			
8.4	6.624	-2.674	-1.07956
12.4	6.728	-2.778	-1.25001
20.4	9.465	-5.515	-4.11993
25.9	11.46	-7.51	-6.2063
27.7	12.08	-8.13	-6.85621
30.4	13.4	-9.45	-8.22107
33.9	13.095	-9.145	-7.97422
36.4	12.905	-8.955	-7.82575
38.4	12.635	-8.685	-7.58898
41.4	12.764	-8.814	-7.76782
43.4	13.145	-9.195	-8.18205
46.4	13.411	-9.461	-8.49789
48.4	13.401	-9.451	-8.52112
50.4	13.41	-9.46	-8.56335
51.4	13.25	-9.3	-8.41996
52.4	13.325	-9.375	-8.51158
56.4	13.365	-9.415	-8.61803
57.9	13.195	-9.245	-8.47295
60.1	13.41	-9.46	-8.7245
62.4	13.395	-9.445	-8.74772
65.4	13.295	-9.345	-8.69756
69.4	13.365	-9.415	-8.83401
71.9	12.821	-8.871	-8.33155
73.4	12.583	-8.633	-8.11847
75.4	12.785	-8.835	-8.3537
83.4	12.468	-8.518	-8.16961
91.4	11.75	-7.8	-7.58452
95.2	10.156	-6.206	-6.05366
100.4	8.421	-4.471	-4.40505
101.1	7.65	-3.7	-3.64568
103.4	7.589	-3.639	-3.62289
109.4	8.135	-4.185	-4.26858
112.9	8.15	-4.2	-4.34172
122.4	7.85	-3.9	-4.19956
126.9	6.79	-2.84	-3.21432

1999 XS 0 below Y-A I

corrected horizontal	vertical
NOTE:zero is at anchc	
NOTE: In field, measu	
0	-0.94
1.15	-1.11
2.52	-1.21
4.32	-1.84
5.9	-2.13
8.4	-2.67
9.35	-2.84
12.83	-3.11
16.29	-3.65
19.12	-4.53
21.9	-5.5
24.28	-6.04
25.96	-6.78
28.14	-7.86
30.76	-8.65
33.56	-9.03
36.88	-8.5
40.57	-8.35
42.47	-8.87
45.4	-9.35
48.59	-9.36
51.61	-9.09
54.26	-9.53
57.52	-9.17
61.35	-9.53
65.57	-9.21
70.46	-9.1
73.66	-8.45
76.25	-8.65
78.68	-8.36
81.36	-8.35
82.94	-8.24
84.71	-8.06
86.66	-7.79
86.65	-7.7
90.4	-6.87
90.4	-6.87
92.3	-6.6
92.3	-6.6
94.06	-6.45
94.06	-6.45
95.34	-6.05
96.87	-5.08
98.25	-4.84

100.29	-4.39
101.28	-3.6
104.12	-3.46
106.52	-3.63
108.82	-3.91
111.58	-4.14
114.4	-4.03
117.18	-3.83
119.14	-3.71
122.55	-3.82
125.33	-3.23
126.9	-2.84

Fiock XS 1 Downstream of Yreka Ager Rd.



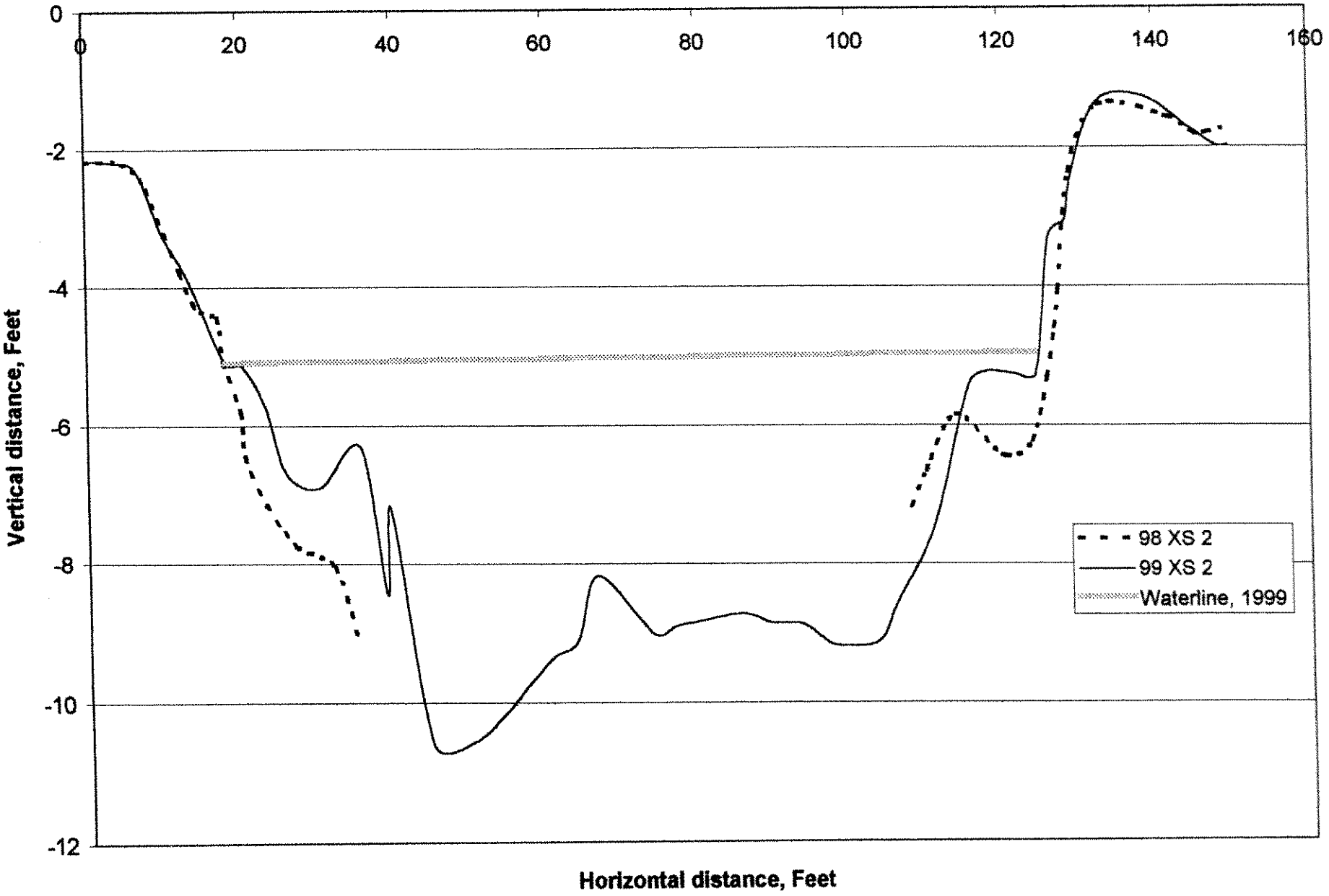
Fiock XS 1--- 1998 below Y-A Rd.

0	5.345	-2.205
7	6.361	-3.221
13.7	6.405	-3.265
15.4	9.062	-5.922
21	10.464	-7.324
22.3	10.824	-7.684
26	10.975	-7.835
28.5	10.87	-7.73
29	9.829	-6.689
32	10.135	-6.995
32.6	11.5	-8.36
37	11.26	-8.12
40	11.002	-7.862
43	11.07	-7.93
46	10.395	-7.255
49	10.275	-7.135
53	10.24	-7.1
53	10.24	-7.1
55	10.415	-7.275
57.5	10.723	-7.583
63.5	10.641	-7.501
70	10.422	-7.282
76	10.72	-7.58
81	11.168	-8.028
90	11.42	-8.28
97	12.28	-9.14
99.5	11.861	-8.721
102	11.71	-8.57
106.8	11.37	-8.23
109.6	9.088	-5.948
111.7	6.63	-3.49
112.8	5.476	-2.336
130.2	4.969	-1.829

Fiock XS 1 1999

river rt star	Riv. Left st	vert	
130.2	0	-2.29	2.29
128.53	1.67	-2.68	2.68
125.04	5.16	-3.52	3.52
120.4	9.8	-3.28	3.28
117.9	12.3	-3.31	3.31
115.24	14.96	-5.38	5.38
112.49	17.71	-6.4	6.4
111.48	18.72	-6.68	6.68
108.6	21.6	-7.29	7.29
105.24	24.96	-7.25	7.25
101.74	28.46	-7.82	7.82
100.22	29.98	-7.07	7.07
94.8	35.4	-8.23	8.23
91.17	39.03	-7.59	7.59
89.38	40.82	-8.22	8.22
87.42	42.78	-7.67	7.67
83.9	46.3	-7.1	7.1
79.54	50.66	-6.97	6.97
75.65	54.55	-7.1	7.1
74.34	55.86	-6.62	6.62
73.53	56.67	-7.1	7.1
70.37	59.83	-7.05	7.05
67.6	62.6	-6.04	6.04
64.2	66	-7.23	7.23
60	70.2	-7.02	7.02
56.35	73.85	-7.47	7.47
52.91	77.29	-7.55	7.55
51.38	78.82	-7.25	7.25
49.54	80.66	-7.62	7.62
47.49	82.71	-7.81	7.81
43.94	86.26	-7.82	7.82
41.36	88.84	-7.9	7.9
38.57	91.63	-8.32	8.32
35.6	94.6	-8.95	8.95
31.58	98.62	-8.81	8.81
28.18	102.02	-8.48	8.48
24.95	105.25	-8.25	8.25
23.9	106.3	-8.1	8.1
21.89	108.31	-7.19	7.19
19.87	110.33	-6.53	6.53
19.27	110.93	-5.98	5.98
18.39	111.81	-4.36	4.36
17.49	112.71	-2.32	2.32
14.62	115.58	-2.22	2.22
11.58	118.62	-2	2
7.8	122.4	-1.9	1.9
4.77	125.43	-1.83	1.83
1.22	128.98	-2.02	2.02
-0.05	130.25	-2.02	2.02

Fiock XS 2 Downstream of Yreka Ager Rd.



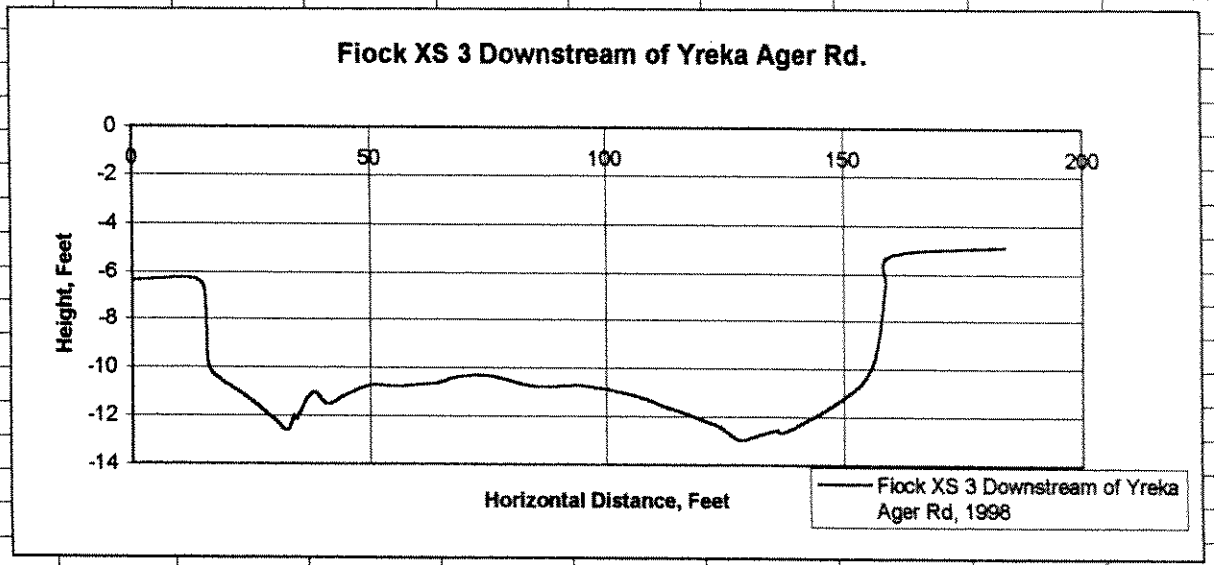
Fiock xs 2-- 98 Below Y-A Rd

0	-2.18	5.5
5	-2.205	5.525
8	-2.582	5.902
14	-4.251	7.571
17	-4.447	7.767
17.8	-5.084	8.404
20	-5.815	9.135
20.5	-6.445	9.765
23.2	-7.145	10.465
27	-7.75	11.07
32	-8.06	11.38
35	-9.145	12.465
108	-7.16	10.48
110	-6.65	9.97
114	-5.848	9.168
120	-6.426	9.746
124	-6.232	9.552
127	-4.592	7.912
129	-2.369	5.689
133	-1.399	4.719
142	-1.57	4.89
145.5	-1.821	5.141
147	-1.802	5.122
149.5	-1.724	5.044

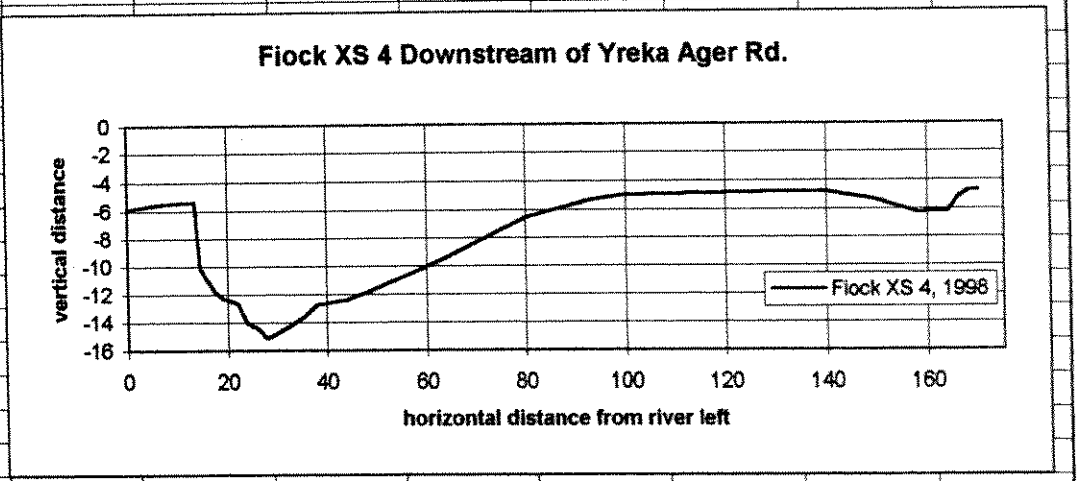
fiock XS 2---99 below

0	-2.18
1.52	-2.17
3.7	-2.2
6.67	-2.3
10.07	-3.24
13.35	-3.89
17.99	-5.1
20.16	-5.14
23.26	-5.74
25.7	-6.67
30.12	-6.89
35.62	-6.32
38.78	-8.45
39.41	-7.2
44.48	-10.59
49.72	-10.56
54.03	-10.15
60.15	-9.38
63.7	-9.11
66.45	-8.18
73.78	-9.01
76.56	-8.9
79.84	-8.83
84.96	-8.72
87.46	-8.77
89.25	-8.85
93.38	-8.87
96.07	-9.07
98.13	-9.17
103.41	-9.11
105.91	-8.57
110.88	-7.49
115.66	-5.42
117.94	-5.23
121.7	-5.26
124.53	-5.26
126.35	-3.29
128.46	-3.06
129.19	-2.5
131.16	-1.67
133.34	-1.3
136.55	-1.23
140.26	-1.35
144.82	-1.74
148.1	-1.98
149.7	-1.98

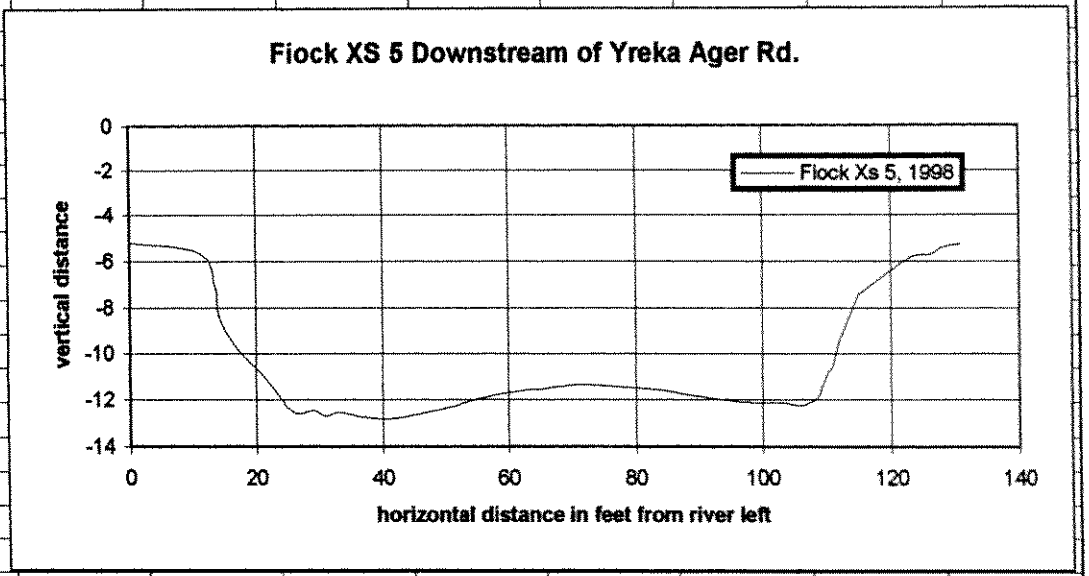
Cross Section 3												
horiz	vert		comments	vert.x(-1)								
0	6.365	-6.365	base T, RLeft									
12	6.268	-6.268	very windy									
15	6.726	-6.726										
15.7	9.584	-9.584										
17	10.301	-10.301										
24	11.2	-11.2										
28	11.864	-11.864										
30	12.155	-12.155										
32.5	12.581	-12.581										
34	12.008	-12.008										
34.3	12.165	-12.165										
38	11.008	-11.008										
41	11.52	-11.52										
45	11.13	-11.13										
50	10.732	-10.732										
55	10.784	-10.784										
60	10.708	-10.708										
64	10.631	-10.631										
68	10.41	-10.41										
75	10.325	-10.325										
85	10.748	-10.748										
95	10.726	-10.726										
106	11.123	-11.123										
112	11.55	-11.55										
123.2	12.335	-12.335										
128	12.948	-12.948										
131	12.825	-12.825										
136.1	12.549	-12.549										
137	12.66	-12.66										
148	11.512	-11.512										
156	9.926	-9.926										
158.9	6.622	-6.622										
160	5.231	-5.231										
183.8	4.874	-4.874	base t, RRight									



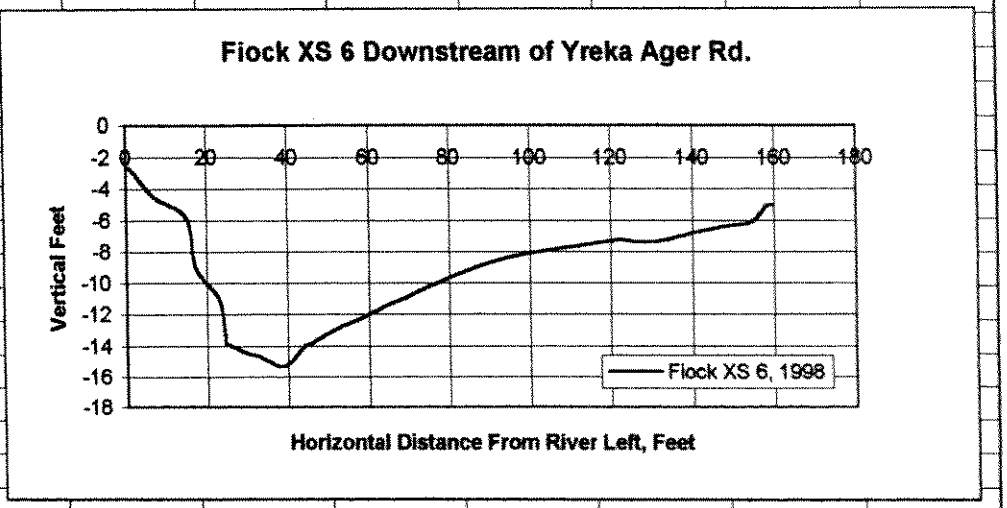
cross section 4		cross section 4		
horis. ft	vert ft	horis. ft	vert.x(-1)	comments
0	5.904	0	-5.904	base of t post, river left
6	5.545	6	-5.545	
13.5	5.348	13.5	-5.348	
14.5	10.085	14.5	-10.085	
17.5	11.795	17.5	-11.795	
19	12.308	19	-12.308	
22	12.665	22	-12.665	
24	14.05	24	-14.05	
26	14.42	26	-14.42	
28	15.17	28	-15.17	
32.5	14.29	32.5	-14.29	
35	13.67	35	-13.67	
38	12.765	38	-12.765	
40	12.669	40	-12.669	
44	12.425	44	-12.425	
48	11.886	48	-11.886	
51	11.44	51	-11.44	
59	10.22	59	-10.22	
67	8.86	67	-8.86	
80	6.575	80	-6.575	
93	5.305	93	-5.305	
100	4.99	100	-4.99	
139	4.748	139	-4.748	
150	5.364	150	-5.364	
158	6.269	158	-6.269	
164	6.195	164	-6.195	
166	5.238	166	-5.238	
168	4.769	168	-4.769	
170	4.712	170	-4.712	base of t post. river rt



cross section 5		cross section 5		
horiz ft	vert ft	horiz ft		comments
0	5.207	0	-5.207	base t post, river left
11	5.63	11	-5.63	
13.5	7.069	13.5	-7.069	
14.2	8.402	14.2	-8.402	
17	9.825	17	-9.825	
21	10.923	21	-10.923	
25	12.384	25	-12.384	
27	12.599	27	-12.599	
29	12.449	29	-12.449	
31	12.709	31	-12.709	
33	12.53	33	-12.53	
36	12.715	36	-12.715	
41	12.828	41	-12.828	
45	12.661	45	-12.661	
51	12.325	51	-12.325	
54	12.06	54	-12.06	
58	11.769	58	-11.769	
62	11.605	62	-11.605	
66	11.519	66	-11.519	
71	11.349	71	-11.349	
77	11.438	77	-11.438	
83	11.555	83	-11.555	
87	11.723	87	-11.723	
92	11.938	92	-11.938	
97	12.104	97	-12.104	
103	12.141	103	-12.141	
106	12.245	106	-12.245	
108	12.03	108	-12.03	
109	11.685	109	-11.685	
110	10.956	110	-10.956	
111	10.499	111	-10.499	
112	9.378	112	-9.378	
114	8.086	114	-8.086	
115	7.407	115	-7.407	
116	7.224	116	-7.224	
123	5.831	123	-5.831	
126	5.701	126	-5.701	
128	5.4	128	-5.4	
131	5.255	131	-5.255	base of t post, river rt



Cross Section 6			cross section 6, corrected		
horiz ft	vert. feet	(uncorrecte	horiz. feet	vert. feet	
0	2.567		0.02	-2.567	base of t post, river left
2	2.953		2.02	-2.953	
7	4.5		7.02	-4.5	
15	5.843		15.02	-5.843	
17	12.24		17.02	-8.96	
22	13.88		22.02	-10.6	
23.6	14.77		23.62	-11.49	
24.7	17.195		24.72	-13.915	
25	17.184		25.02	-13.904	
30	17.75		30.02	-14.47	
32.6	17.935		32.62	-14.655	
36	18.431		36.02	-15.151	
39	18.645		39.02	-15.365	
42	17.935		42.02	-14.655	
44	17.305		44.02	-14.025	
46	17.089		46.02	-13.809	
48	16.741		48.02	-13.461	
51	16.359		51.02	-13.079	
54	15.98		54.02	-12.7	
57	15.623		57.02	-12.343	
67	14.432		67.02	-11.152	
91	11.905		91.02	-8.625	
119	7.351		119.02	-7.351	
123	7.258		123.02	-7.258	
128	7.364		128.02	-7.364	
133	7.242		133.02	-7.242	
143	6.621		143.02	-6.621	
149	6.348		149.02	-6.348	
154.5	6.102		154.52	-6.102	
158	5.104		158.02	-5.104	
159.7	5.036		159.72	-5.036	base of t post, river right



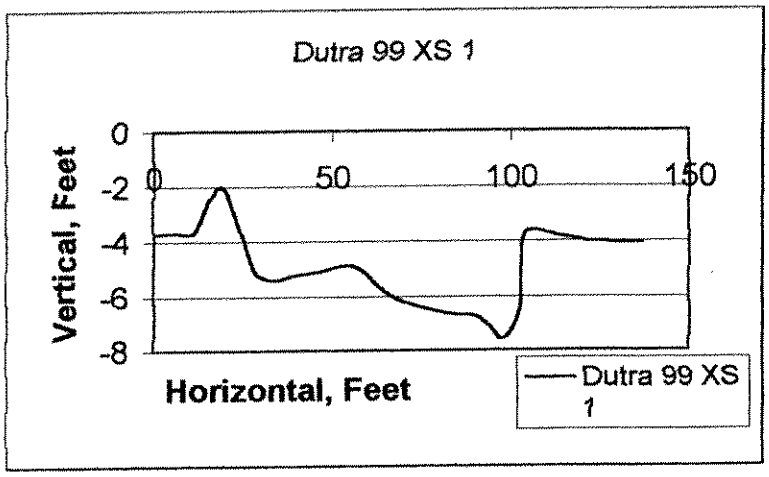
Appendix D

Dutra Ranch Cross Sections, 1999

Dutra XS 1999

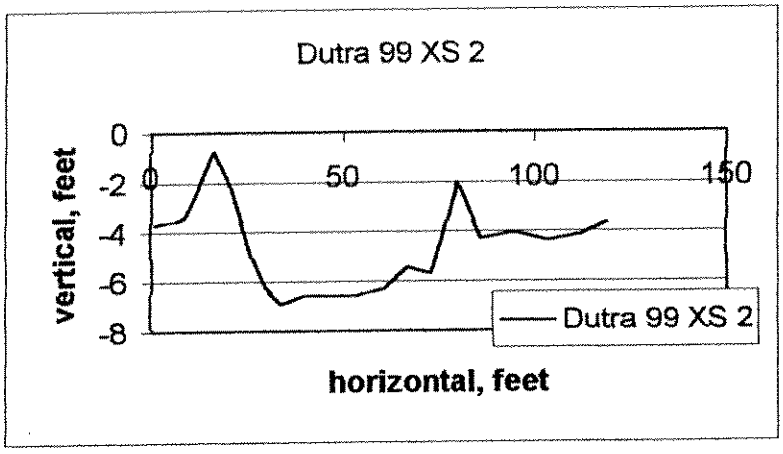
XS 1--about 200 feet upstream of the Montague Irr. Dist Canal

Horizontal	Vertical		comments
0.98	3.46		String line to Ref. Stake, river right
0.98	3.77	-3.77	
6	3.68	-3.68	
11.47	3.678	-3.678	
15.57	2.48	-2.48	
19.2	2.01	-2.01	
23.54	3.38	-3.38	
27.89	5.02	-5.02	
33.51	5.4	-5.4	
39.55	5.25	-5.25	
46.53	5.11	-5.11	
53.74	4.89	-4.89	
58.8	5.1	-5.1	
64.58	5.8	-5.8	
72.7	6.36	-6.36	
83.71	6.68	-6.68	
89.88	6.73	-6.73	
94.74	7.26	-7.26	
96.95	7.59	-7.59	
99.78	7.24	-7.24	
102.55	6.26	-6.26	
103.52	3.77	-3.77	
113.61	3.82	-3.82	
121.07	4	-4	
126.04	4.03	-4.03	
130.28	4.08	-4.08	
136.52	4.08	-4.08	ground next to ref post, river left
136.52	3.76	-3.76	string to top of ref post, river left



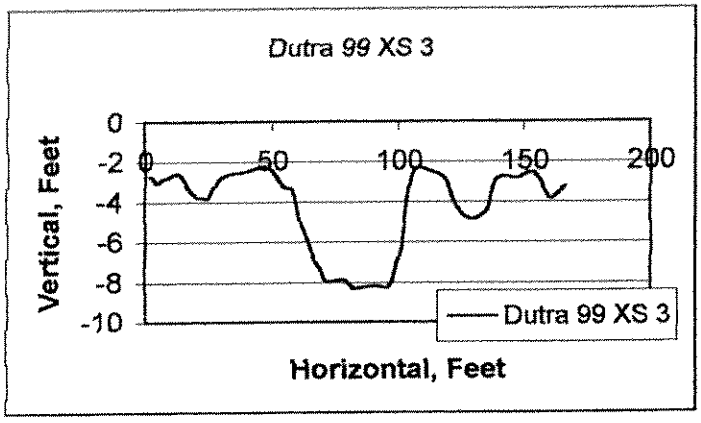
XS 2--about 500 feeet upstream of the MID Canal

horizontal	veritcal	inverted	comments
1.26	3.5		*string line to ref stake, river right*
1.26	3.74	-3.74	base of reference stake, river right
6.4	3.55	-3.55	
8.73	3.41	-3.41	
11.79	2.48	-2.48	
16.45	0.76	-0.76	
20.13	1.87	-1.87	
23.79	3.67	-3.67	
26.47	5.09	-5.09	
29.55	6.18	-6.18	
34.1	6.92	-6.92	
39.87	6.58	-6.58	
43.92	6.56	-6.56	
48.73	6.57	-6.57	
53.83	6.58	-6.58	
56.34	6.46	-6.46	
60.43	6.31	-6.31	
66.48	5.44	-5.44	
72.54	5.7	-5.7	
75.76	4.4	-4.4	
79.91	2.03	-2.03	
86.25	4.32	-4.32	
94.62	4.07	-4.07	
103.6	4.4	-4.4	
112.31	4.17	-4.17	
119.12	3.68	-3.68	base of anchor post, river left
119.12	4.01		*top of reference stake, river left*



XS 3--most upstream XS about 320 fet downstream of property line

1.78	2.425		top of ref stake, river right
1.78	2.7	-2.7	*base of ref stake, river right*
3.18	2.81	-2.81	
4.55	3.06	-3.06	
6.29	2.87	-2.87	
8.35	2.77	-2.77	
12.77	2.59	-2.59	
16.51	3.25	-3.25	
20.41	3.75	-3.75	
22.59	3.8	-3.8	
25	3.8	-3.8	
29.7	2.77	-2.77	
40.24	2.47	-2.47	
48.06	2.27	-2.27	
54.76	3.21	-3.21	
58.65	3.47	-3.47	
61.17	4.88	-4.88	
63.33	5.7	-5.7	
65.16	6.34	-6.34	
67.28	6.93	-6.93	
69.78	7.46	-7.46	
71.54	7.94	-7.94	
78.62	7.86	-7.86	
81.98	8.29	-8.29	
84.76	8.28	-8.28	
92.15	8.16	-8.16	
95.82	8.25	-8.25	
98.06	7.9	-7.9	
99.95	6.85	-6.85	
101.28	6.2	-6.2	
104.21	3.39	-3.39	
106.58	2.35	-2.35	
112.83	2.46	-2.46	
118.62	2.85	-2.85	
122.92	4.09	-4.09	
126.87	4.7	-4.7	
131.04	4.83	-4.83	
135.68	4.36	-4.36	
138.46	3.03	-3.03	
141.75	2.71	-2.71	
147.18	2.82	-2.82	
153.91	2.55	-2.55	
160.18	3.78	-3.78	
163.36	3.63	-3.63	
166.12	3.23	-3.23	*base of ref stake, river left*
166.12	2.85		top of ref stake, fiver left



Appendix E

Late Summer Aquatic Invertebrate Data from the Oregon Slough

Ore. Slough at Montague-Ager Rd 5-17-73						
1	Order	Family	T value	F desig	count	t val*count
2						
3						
4	Ephemeroptera					
5		Ameletidae	7	cg		0
6		Baetadae	4	cg	5	20
7		Caenidae	7	cg		0
8		Ephemerelidae	1	sc		0
9		Ephemeridae	4	sc		0
10		Leptophyphida	5	cg		0
11		Heptageniidae	4	sc		0
12		Leptophleibiid	2	sc		0
13		Siphlonuridae	7	cg		0
14		Other				0
15		total			5	20
16						
17	Plecoptera					
18		Capnlidae	1	sh		0
19		Chloroperlidae	1	sh		0
20		Leuctridae	0	sh		0
21		Nemouridae	2	sh		0
22		Peltoperlidae	0	sh		0
23		Perlidae	1	p		0
24		Perlodidae	2	p		0
25		Pteronarcyidae	0	sh		0
26		Taeniopterygic	2	sh		0
27		Unknown				
28		total			0	0
29						
30	Tricoptera					
31		Brachycentrida	3	cg		0
32		Calamoceratid	2	sh		0
33		Glossosomatic	0	sc		0
34		Helicopsychida	3	sc	2	6
35		Hydropsychida	4	fc	2	8
36		Hydroptilidae	4	pi		0
37		Lepidostomati	1	sh		0
38		Leptoceridae	4	cg		0
39		Limnephilidae	4	sh		0
40		Odontoceridae	0	cg		0
41		Philoptoamida	3	fc		0
42		Phryganeidae	4	sh		0
43		Polycentropod	6	fc		0
44		Pshchomyiida	2	cg		0
45		Rhyacophiidae	0	p		0
46		Sericostomatic	3	sh		0
47		Unknown				
48		Total			4	14
49						

50	Diptera					
51		Athericidae	2	pi		0
52		Blephariceridae	0	sc		0
53		Ceratopogonic	6	pi		0
54		Chiromomidae	6	cg	6	36
55		Dixidae	2	cg		0
56		Dolichopodida	4	pi		0
57		Empididae	6	pi		0
58		Muscidae	6	pi		0
59		Psychodidae	10	cg		0
60		Simulidae	6	fc		0
61		Stratiomyidae		cg		0
62		Tabanidae	6	pi	4	24
63		Thaumaleidae		sc		0
64		Tipulidae	3	sh		0
65		Unknown				
66		total			10	60
67						
68	Megaloptera					
69		Corydalidae	0	p		0
70		Sialidae	4	p		0
71		Unknown				
72		total			0	0
73						
74	Coleoptera					
75		Dytiscidae	5	p		0
76		Haliplidae	5	pi		0
77		Hydrophilidae	5	p		0
78		Elmidae	5	cg		0
79		Psephenidae	4	sc		0
80		Ptilodactylidae	2	sh		0
81		Unknown				
82		total			0	0
83						
84	Odonata					
85		Aeshnidae	3	p		0
86		Calopterygidae	5	p		0
87		Coenagrionida	9	p	30	270
88		Cordulegastrid	3	p		0
89		Corduliidae	5	p		0
90		Gomphidae	1	p		0
91		Lestidae	9	p		0
92		Libellulidae	9	p		0
93		Unknown				0
94		total			30	270
95						
96	Crustacea					
97		Amphipoda	4	cg	53	212
98		Decapoda	7	cg		0
99		Isopoda	6	sh		0
100		Unknown				

101		total			53	212
102						
103	Annelida					
104		Hirudinea	8	p	37	296
105		Oligochaeta	8	cg	174	1392
106		Tubificidae	9	fc		0
107		Unknown				
108		total			211	1688
109						
110	Molluska					
111		Bivalvia	3	fc	11	33
112		Gastropoda	7	sc	27	189
113		Unknown				0
114		total			38	222
115						
116	Arachmoidea					
117		Acari		p		0
118		Unknown				
119		total			0	0
120						
121	Turbellaria			sc		0
122		total			0	
123						
124	Other Inverts				1	
125		total			1	
126	Totals				352	2486
127	Enter count of largest gro		174			
128						
129	Summary Info					
130		Taxa Richnes	EPT Taxa	EPT Index	% dominance	Tolerant Taxa
131		11	3	0.025568	49.43182	7.082621
132						
133	FFG-CG	FFG-FC	FFG-P	FFG-PI	FFG-SC	FFG-SH
134	238	13	67	4	29	0
135	67.80627	3.7	19.1	1.1	8.3	0.0

Oregon Slough Upstream site 9-13-96						
1	Order	Family	T value	F desig	count	t val*count
2						
3						
4	Ephemeroptera					
5		Ameletidae	7	cg		0
6		Baetadae	4	cg		0
7		Caenidae	7	cg		0
8		Ephemerelidae	1	sc		0
9		Ephemeridae	4	sc		0
10		Leptophyphida	5	cg		0
11		Heptageniidae	4	sc		0
12		Leptophleibiida	2	sc		0
13		Siphlonuridae	7	cg		0
14		Other			105	0
15		total			105	0
16						
17	Plecoptera					
18		Capniidae	1	sh		0
19		Chloroperlidae	1	sh		0
20		Leuctridae	0	sh		0
21		Nemouridae	2	sh		0
22		Peltoperlidae	0	sh		0
23		Perlidae	1	p		0
24		Perlodidae	2	p		0
25		Pteronarcyidae	0	sh		0
26		Taeniopterygid	2	sh		0
27		Unknown			3	
28		total			3	0
29						
30	Tricoptera					
31		Brachycentrida	3	cg		0
32		Calamoceratid	2	sh		0
33		Glossosomatid	0	sc		0
34		Helicopsychida	3	sc		0
35		Hydropsychida	4	fc	50	200
36		Hydroptilidae	4	pi		0
37		Lepidostomatic	1	sh		0
38		Leptoceridae	4	cg		0
39		Limnephilidae	4	sh		0
40		Odontoceridae	0	cg		0
41		Philoptoamidae	3	fc		0
42		Phryganeidae	4	sh		0
43		Polycentropodi	6	fc		0
44		Pshchomyiidae	2	cg		0
45		Rhyacophiidae	0	p		0
46		Sericostomatid	3	sh		0
47		Unknown				
48		Total			50	200
49						
50	Diptera					
51		Athericidae	2	pi		0
52		Blephariceridae	0	sc		0
53		Ceratopogonid	6	pi		0
54		Chiromomidae	6	cg	46	276
55		Dixidae	2	cg		0
56		Dolichopodidae	4	pi		0
57		Empididae	6	pi		0
58		Muscidae	6	pi		0
59		Psychodidae	10	cg		0
60		Simulidae	6	fc	7	42
61		Stratiomyidae		cg		0
62		Tabanidae	6	pi		0
63		Thaumaleidae		sc		0
64		Tipulidae	3	sh		0
65		Unknown			20	
66		total			73	318
67						

68	Megaloptera					
69		Corydalidae	0	p		0
70		Sialidae	4	p		0
71		Unknown				
72		total			0	0
73						
74	Coleoptera					
75		Dytiscidae	5	p		0
76		Haliplidae	5	pi		0
77		Hydrophilidae	5	p		0
78		Elmidae	5	cg	14	70
79		Psephenidae	4	sc		0
80		Ptilodactylidae	2	sh		0
81		Unknown			1	
82		total			15	70
83						
84	Odonata					
85		Aeshnidae	3	p		0
86		Calopterygidae	5	p		0
87		Coenagrionidae	9	p		0
88		Cordulegastrid	3	p		0
89		Corduliidae	5	p		0
90		Gomphidae	1	p		0
91		Lestidae	9	p		0
92		Libellulidae	9	p		0
93		Unknown				0
94		total			0	0
95						
96	Crustacea					
97		Amphipoda	4	cg	31	124
98		Decapoda	7	cg		0
99		Isopoda	6	sh		0
100		Unknown				
101		total			31	124
102						
103	Annelida					
104		Hirudinea	8	p	7	56
105		Oligochaeta	8	cg		0
106		Tubificidae	9	fc		0
107		Unknown				
108		total			7	56
109						
110	Molluska					
111		Bivalvia	3	fc	4	12
112		Gastropoda	7	sc	5	35
113		Unknown				0
114		total			9	47
115						
116	Arachmoidea					
117		Acari		p		0
118		Unknown				
119		total			0	0
120						
121	Turbellaria			sc		0
122		total			0	
123						
124	Other Inverts					
125		total			0	
126	Totals				293	815
127	Enter count of largest grou		50			
128						
129	Summary Info					
130		Taxa Richness	EPT Taxa	EPT Index	% dominance	Tolerant Taxa
131		xxx?	xxx?	0.539249	17.06485	4.969512
132						
133	FFG-CG	FFG-FC	FFG-P	FFG-PI	FFG-SC	FFG-SH
134	91	61	7	0	5	0
135	55.4878	37.2	4.3	0.0	3.0	0.0

Ore. Slough downstream site 9-13-98					
Order	Family	T value	F desig	count	t*count
Ephemeroptera					
	Ameletidae	7	cg		0
	Baetadae	4	cg		0
	Caenidae	7	cg		0
	Ephemerelidae	1	sc		0
	Ephemeridae	4	sc		0
	Leptophelebiiae	5	cg		0
	Heptageniidae	4	sc		0
	Leptophlebiida	2	sc		0
	Siphlonuridae	7	cg		0
	Other			86	0
	total			86	0
Plecoptera					
	Capniidae	1	sh		0
	Chloroperlidae	1	sh		0
	Leuctridae	0	sh		0
	Nemouridae	2	sh		0
	Pletoperlidae	0	sh		0
	Perlidae	1	p		0
	Perlodidae	2	p		0
	Pteronarcyidae	0	sh		0
	Taeniopterygid	2	sh		0
	Unknown				
	total			0	0
Tricoptera					
	Brachycentrida	3	cg		0
	Calamoceratid	2	sh		0
	Glossosomatid	0	sc		0
	Helicopsychida	3	sc		0
	hydropsychidae	4	fc	19	76
	Hydroptilidae	4	pi		0
	Lepidostomatid	1	sh		0
	Leptoceridae	4	cg		0
	Limnephilidae	4	sh		0
	Odontoceridae	0	cg		0
	Philoptoamidae	3	fc		0
	Phryganeidae	4	sh		0
	Polycentropodi	6	fc		0
	Pshchomylidae	2	cg		0
	Rhyacophiidae	0	p		0
	sericostomatid	3	sh		0
	Unknown				
	Total			19	76
Diptera					
	Athericidae	2	pi		0
	Blephariceridae	0	sc		0
	Deratopogonid	6	pi		0
	Chiromomidae	6	cg	131	786
	Dixidae	2	cg		0
	Dolichopodidae	4	pi		0
	Empididae	6	pi		0
	Muscidae	6	pi		0
	Psychodidae	10	cg		0
	Simulidae	6	fvc	2	12
	Stratiomyidae		cg		0
	Tabanidae	6	pi		0
	Thaumaleidae		sc		0
	Tipulidae	3	sh		0
	Unknown				
	total			133	798

Megaloptera					
	Corydalidae	0	p		0
	Sialidae	4	p		0
	Unknown				
	total			0	0
Coleoptera					
	Dytiscidae	5	p		0
	haliplidae	5	pi		0
	hydrophilidae	5	p		0
	Elmidae	5	cg	4	20
	Psephenidae	4	sc		0
	Ptilodactylidae	2	sh		0
	Unknown				
	total			4	20
Odonata					
	Aeshnidae	3	p		0
	Calopterygidae	5	p	1	5
	coenagrionidae	9	p	4	36
	Cordulegastrid	3	p		0
	Corduliidae	5	p		0
	Gomphidae	1	p		0
	Lestidae	9	p		0
	Libellulidae	9	p		0
	Unknown				0
	total			5	41
					0
					0
Crustacea					
	Amphipoda	4	cg	48	192
	Decapoda	7	cg		0
	Isopoda	6	sh		0
	Unknown				
	total			48	192
Annelida					
	Hirudinea	8	p		0
	Oligochaeta	8	cg		0
	Tubificidae	9	fc		0
	Unknown				
	total			0	0
Molluska					
	Bivalvia	3	fc	7	21
	Gastropoda	7	sc	6	42
	Unknown				0
	total			13	63
Arachmoidea					
	Acari		p		0
	Unknown				
	total			0	0
			sc		
Turbellaria					0
	total			0	
Other Inverts				1	
	total			1	
Totals				309	1190
Enter count of largest grou		131			
Summary Info					
		EPT Taxa	EPT Index	% dominan	Tolerant Ta
			0.339806	42.39482	5.36036
FFG-CG	FFG-FC	FFG-P	FFG-PI	FFG-SC	FFG-SH
183	28	5	0	6	0
82.43243	12.61261261	2.252252	0	2.702703	0

Appendix F

Late Summer Aquatic Invertebrate Data from Yreka Creek

Yreka Creek @ HY 3 9-13-98						
1	Order	Family	T value	F desig	count	t val*count
2						
3						
4	Ephemeroptera					
5		Ameletidae	7	cg		0
6		Baetadae	4	cg	27	108
7		Caenidae	7	cg		0
8		Ephemerelidae	1	sc		0
9		Ephemeridae	4	sc		0
10		Leptophyphida	5	cg		0
11		Heptageniidae	4	sc	4	16
12		Leptophleibiida	2	sc		0
13		Siphlonuridae	7	cg	1	7
14		Other			9	0
15		total			41	131
16						
17	Plecoptera					
18		Capniidae	1	sh		0
19		Chloroperlidae	1	sh		0
20		Leuctridae	0	sh		0
21		Nemouridae	2	sh		0
22		Peltoperlidae	0	sh		0
23		Perlidae	1	p		0
24		Perlodidae	2	p		0
25		Pteronarcyidae	0	sh		0
26		Taeniopterygid	2	sh		0
27		Unknown				
28		total			0	0
29						
30	Tricoptera					
31		Brachycentrida	3	cg		0
32		Calamoceratida	2	sh	7	14
33		Glossosomatid	0	sc	6	0
34		Helicopsychida	3	sc		0
35		Hydropsychida	4	fc	57	228
36		Hydroptilidae	4	pi	5	20
37		Lepidostomatid	1	sh	4	4
38		Leptoceridae	4	cg		0
39		Limnephilidae	4	sh		0
40		Odontoceridae	0	cg		0
41		Philoptoamidae	3	fc		0
42		Phryganeidae	4	sh		0
43		Polycentropodi	6	fc	2	12
44		Pshchomyiidae	2	cg	1	2
45		Rhyacophiidae	0	p	19	0
46		Sericostomatid	3	sh		0
47		Unknown				
48		Total			101	280
49						
50	Diptera					
51		Athericidae	2	pi	1	2
52		Blephariceridae	0	sc		0
53		Ceratopogonid	6	pi	3	18
54		Chiromomidae	6	cg	2	12
55		Dixidae	2	cg		0
56		Dolichopodidae	4	pi		0
57		Empididae	6	pi		0
58		Muscidae	6	pi		0
59		Psychodidae	10	cg		0
60		Simulidae	6	fc		0
61		Stratiomyidae		cg		0
62		Tabanidae	6	pi	1	6
63		Thaumaleidae		sc		0
64		Tipulidae	3	sh	42	126
65		Unknown			3	
66		total			52	164
67						

68	Megaloptera					
69		Corydalidae	0	p		0
70		Sialidae	4	p		0
71		Unknown				
72		total			0	0
73						
74	Coleoptera					
75		Dytiscidae	5	p		0
76		Haliplidae	5	pi	9	45
77		Hydrophilidae	5	p		0
78		Elmidae	5	cg	28	140
79		Psephenidae	4	sc		0
80		Ptilodactylidae	2	sh		0
81		Unknown				
82		total			37	185
83						
84	Odonata					
85		Aeshnidae	3	p		0
86		Calopterygidae	5	p		0
87		Coenagrionida	9	p	4	36
88		Cordulegastrid	3	p		0
89		Corduliidae	5	p		0
90		Gomphidae	1	p	1	1
91		Lestidae	9	p		0
92		Libellulidae	9	p		0
93		Unknown				0
94		total			5	37
95						
96	Crustacea					
97		Amphipoda	4	cg	1	4
98		Decapoda	7	cg		0
99		Isopoda	6	sh		0
100		Unknown				
101		total			1	4
102						
103	Annelida					
104		Hirudinea	8	p		0
105		Oligochaeta	8	cg		0
106		Tubificidae	9	fc		0
107		Unknown				
108		total			0	0
109						
110	Molluska					
111		Bivalvia	3	fc	4	12
112		Gastropoda	7	sc	48	336
113		Unknown				0
114		total			52	348
115						
116	Arachnoidea					
117		Acari		p	4	0
118		Unknown				
119		total			4	0
120						
121	Turbellaria			sc		0
122		total			0	
123						
124	Other Inverts				1	
125		total			1	
126	Totals				294	1149
127	Enter count of largest grou		48			
128						
129	Summary Info					
130		Taxa Richnes	EPT Taxa	EPT Index	% dominance	Tolerant Taxa
131		25	13	0.482993	16.32653	4.088968
132						
133	FFG-CG	FFG-FC	FFG-P	FFG-PI	FFG-SC	FFG-SH
134	60	63	28	19	58	53
135	21.35231	22.4	10.0	6.8	20.6	18.9

Yreka Creek @ Anderson Grade Rd 9-6-73					
Order	Family	T value	F desig	count	t*count
Ephemeroptera					
	Ameletidae	7	cg		0
	Baetadae	4	cg	72	288
	Caenidae	7	cg		0
	Ephemerelidae	1	sc		0
	Ephemeridae	4	sc		0
	Leptophelebiiae	5	cg		0
	Heptageniidae	4	sc	6	24
	Leptophleibiidae	2	sc		0
	Siphlonuridae	7	cg		0
	Other				0
	total			78	312
Plecoptera					
	Capniidae	1	sh		0
	Chloroperlidae	1	sh	1	1
	Leuctridae	0	sh		0
	Nemouridae	2	sh		0
	Pletoperlidae	0	sh		0
	Perlidae	1	p		0
	Perlodidae	2	p		0
	Pteronarcyidae	0	sh		0
	Taeniopterygidae	2	sh		0
	Unknown				
	total			1	1
Tricoptera					
	Brachycentridae	3	cg		0
	Calamoceratidae	2	sh		0
	Glossosomatidae	0	sc		0
	Helicopsychidae	3	sc	1	3
	hydropsychidae	4	fc	436	1744
	Hydroptilidae	4	pi	1	4
	Lepidostomatidae	1	sh		0
	Leptoceridae	4	cg		0
	Limnephilidae	4	sh	1	4
	Odontoceridae	0	cg		0
	Philoptoamidae	3	fc		0
	Phryganeidae	4	sh		0
	Polycentropodidae	6	fc		0
	Pshchomyiidae	2	cg		0
	Rhyacophiidae	0	p	18	0
	sericostomatidae	3	sh		0
	Unknown				
	Total			457	1755
Diptera					
	Athericidae	2	pi		0
	Blephariceridae	0	sc		0
	Deratopogonidae	6	pi		0
	Chiromomidae	6	cg	79	474
	Dixidae	2	cg		0
	Dolichopodidae	4	pi		0
	Empididae	6	pi		0
	Muscidae	6	pi		0
	Psychodidae	10	cg		0
	Simulidae	6	fvc	464	2784
	Stratiomyidae		cg		0
	Tabanidae	6	pi		0
	Thaumaleidae		sc		0
	Tipulidae	3	sh		0
	Unknown			5	
	total			548	3258

Megaloptera					
	Corydalidae	0	p		0
	Sialidae	4	p		0
	Unknown				
	total			0	0
Coleoptera					
	Dytiscidae	5	p		0
	haliplidae	5	pi		0
	hydrophilidae	5	p		0
	Elmidae	5	cg		0
	Psephenidae	4	sc	22	88
	Ptilodactylidae	2	sh		0
	Unknown				
	total			22	88
Odonata					
	Aeshnidae	3	p		0
	Calopterygidae	5	p		0
	coenagrionidae	9	p	27	243
	Cordulegastridae	3	p		0
	Cordulidae	5	p		0
	Gomphidae	1	p		0
	Lestidae	9	p		0
	Libellulidae	9	p		0
	Unknown				0
	total			27	243
					0
Crustacea					0
	Amphipoda	4	cg		0
	Decapoda	7	cg		0
	Isopoda	6	sh		0
	Unknown				
	total			0	0
Annelida					
	Hirudinea	8	p	14	112
	Oligochaeta	8	cg		0
	Tubificidae	9	fc		0
	Unknown				
	total			14	112
Molluska					
	Bivalvia	3	fc		0
	Gastropoda	7	sc	19	133
	Unknown				0
	total			19	133
Arachmoidea					
	Acari		p		0
	Unknown				
	total			0	0
			sc		
Turbellaria					0
	total			0	
Other Inverts				2	
	total			2	
Totals				1168	5902
Enter count of largest group		464			
Summary Info					
		EPT Taxa	EPT Index	% dominan	Tolerant Ta
	17	8	0.458904	39.72603	5.083549
FFG-CG	FFG-FC	FFG-P	FFG-PI	FFG-SC	FFG-SH
151	900	59	1	48	2
13.00603	77.51937984	5.081826	0.086133	4.134367	0.172265

Yreka Creek 2 Gnderson Grade Rd 8-26-81					
Order	Family	T value	F desig	count	t*count
Ephemeroptera					
	Ameletidae	7	cg		0
	Baetadae	4	cg	49	196
	Caenidae	7	cg		0
	Ephemerelidae	1	sc	10	10
	Ephemeridae	4	sc		0
	Leptophelebiia	5	cg		0
	Heptageniidae	4	sc	1	4
	Leptophleibiida	2	sc		0
	Siphlonuridae	7	cg		0
	Other			1	0
	total			61	210
Plecoptera					
	Capniidae	1	sh		0
	Chloroperlidae	1	sh		0
	Leuctridae	0	sh		0
	Nemouridae	2	sh		0
	Pletoperlidae	0	sh		0
	Perlidae	1	p		0
	Perlodidae	2	p		0
	Pteronarcyidae	0	sh		0
	Taeniopterygid	2	sh		0
	Unknown				
	total			0	0
Tricoptera					
	Brachycentrida	3	cg	85	255
	Calamoceratid	2	sh		0
	Glossosomatid	0	sc	75	0
	Helicopsychida	3	sc	1	3
	hydropsychida	4	fc	101	404
	Hydroptilidae	4	pi		0
	Lepidostomatid	1	sh		0
	Leptoceridae	4	cg		0
	Limnephilidae	4	sh	16	64
	Odontoceridae	0	cg		0
	Philoptoamidae	3	fc		0
	Phryganeidae	4	sh		0
	Polycentropodi	6	fc		0
	Pshchomylidae	2	cg		0
	Rhyacophiidae	0	p		0
	sericostomatid	3	sh		0
	Unknown				
	Total			278	726
Diptera					
	Athericidae	2	pi		0
	Blephariceridae	0	sc		0
	Deratopogonid	6	pi		0
	Chiromomidae	6	cg	1	6
	Dixidae	2	cg		0
	Dolichopodidae	4	pi		0
	Empididae	6	pi		0
	Muscidae	6	pi		0
	Psychodidae	10	cg		0
	Simulidae	6	fvc	20	120
	Stratiomyidae		cg		0
	Tabanidae	6	pi		0
	Thaumaleidae		sc		0
	Tipulidae	3	sh		0
	Unknown			2	
	total			23	126

Megaloptera					
	Corydalidae	0	p		0
	Sialidae	4	p		0
	Unknown			31	
	total			31	0
Coleoptera					
	Dytiscidae	5	p	1	5
	haliplidae	5	pi		0
	hydrophilidae	5	p		0
	Elmidae	5	cg	308	1540
	Psephenidae	4	sc	17	68
	Ptilodactylidae	2	sh		0
	Unknown				
	total			326	1613
Odonata					
	Aeshnidae	3	p		0
	Calopterygidae	5	p		0
	coenagrionidae	9	p	71	639
	Cordulegastrid	3	p		0
	Corduliidae	5	p		0
	Gomphidae	1	p		0
	Lestidae	9	p		0
	Libellulidae	9	p		0
	Unknown			4	0
	total			75	639
					0
Crustacea					0
	Amphipoda	4	cg		0
	Decapoda	7	cg		0
	Isopoda	6	sh		0
	Unknown				
	total			0	0
Annelida					
	Hirudinea	8	p		0
	Oligochaeta	8	cg	3	24
	Tubificidae	9	fc		0
	Unknown				
	total			3	24
Molluska					
	Bivalvia	3	fc	1	3
	Gastropoda	7	sc	394	2758
	Unknown				0
	total			395	2761
Arachmoidea					
	Acari		p		0
	Unknown				
	total			0	0
			sc		
Turbellaria					0
	total			0	
Other Inverts				1	
	total			1	
Totals				1193	6099
Enter count of largest grou		394			
Summary Info					
		EPT Taxa	EPT Index	% dominan	Tolerant Ta
	23	9	0.284158	33.02598	5.285095
FFG-CG	FFG-FC	FFG-P	FFG-PI	FFG-SC	FFG-SH
446	122	72	0	498	16
38.64818	10.57192374	6.239168	0	43.15425	1.386482

Yreka Creek @ And. Grade Rd 9-13-98						
1	Order	Family	T value	F desig	count	t val*count
2						
3						
4	Ephemeroptera					
5		Ameletidae	7	cg		0
6		Baetadae	4	cg	12	48
7		Caenidae	7	cg		0
8		Ephemerelidae	1	sc	5	5
9		Ephemeridae	4	sc		0
10		Leptophyphida	5	cg		0
11		Heptageniidae	4	sc	5	20
12		Leptophleibiida	2	sc		0
13		Siphlonuridae	7	cg		0
14		Other			5	0
15		total			27	73
16						
17	Plecoptera					
18		Capniidae	1	sh		0
19		Chloroperlidae	1	sh	6	6
20		Leuctridae	0	sh		0
21		Nemouridae	2	sh		0
22		Peltoperlidae	0	sh		0
23		Perlidae	1	p		0
24		Perlodidae	2	p		0
25		Pteronarcyidae	0	sh		0
26		Taeniopterygid	2	sh		0
27		Unknown				
28		total			6	6
29						
30	Tricoptera					
31		Brachycentrida	3	cg		0
32		Calamoceratida	2	sh		0
33		Glossosomatid	0	sc	10	0
34		Helicopsychida	3	sc		0
35		Hydropsychida	4	fc	115	460
36		Hydroptilidae	4	pi	1	4
37		Lepidostomatid	1	sh		0
38		Leptoceridae	4	cg		0
39		Limnephilidae	4	sh		0
40		Odontoceridae	0	cg		0
41		Philoptoamidae	3	fc	1	3
42		Phryganeidae	4	sh		0
43		Polycentropodi	6	fc		0
44		Pshchomyiidae	2	cg	5	10
45		Rhyacophiidae	0	p		0
46		Sericostomatid	3	sh		0
47		Unknown				
48		Total			132	477
49						
50	Diptera					
51		Athericidae	2	pi		0
52		Blephariceridae	0	sc		0
53		Ceratopogonid	6	pi		0
54		Chiromomidae	6	cg	15	90
55		Dixidae	2	cg		0
56		Dolichopodidae	4	pi		0
57		Empididae	6	pi	4	24
58		Muscidae	6	pi		0
59		Psychodidae	10	cg		0
60		Simulidae	6	fc	21	126
61		Stratiomyidae		cg		0
62		Tabanidae	6	pi		0
63		Thaumaleidae		sc		0
64		Tipulidae	3	sh	1	3
65		Unknown				
66		total			41	243
67						

68	Megaloptera					
69		Corydalidae	0	p		0
70		Sialidae	4	p		0
71		Unknown				
72		total			0	0
73						
74	Coleoptera					
75		Dytiscidae	5	p		0
76		Haliplidae	5	pi		0
77		Hydrophilidae	5	p		0
78		Elmidae	5	cg	21	105
79		Psephenidae	4	sc		0
80		Ptilodactylidae	2	sh		0
81		Unknown				
82		total			21	105
83						
84	Odonata					
85		Aeshnidae	3	p		0
86		Calopterygidae	5	p		0
87		Coenagrionide	9	p		0
88		Cordulegastrid	3	p		0
89		Corduliidae	5	p		0
90		Gomphidae	1	p		0
91		Lestidae	9	p		0
92		Libellulidae	9	p		0
93		Unknown				0
94		total			0	0
95						
96	Crustacea					
97		Amphipoda	4	cg		0
98		Decapoda	7	cg		0
99		Isopoda	6	sh		0
100		Unknown				
101		total			0	0
102						
103	Annelida					
104		Hirudinea	8	p	3	24
105		Oligochaeta	8	cg	2	16
106		Tubificidae	9	fc		0
107		Unknown				
108		total			5	40
109						
110	Molluska					
111		Bivalvia	3	fc	11	33
112		Gastropoda	7	sc	21	147
113		Unknown				0
114		total			32	180
115						
116	Arachnoidea					
117		Acari		p	38	0
118		Unknown				
119		total			38	0
120						
121	Turbellaria			sc		0
122		total			0	
123						
124	Other Inverts					
125		total			0	
126	Totals				302	1124
127	Enter count of largest grou		115			
128						
129	Summary Info					
130		Taxa Richnes	EPT Taxa	EPT Index	% dominance	Tolerant Taxa
131		20	10	0.546358	38.07947	4.339768
132						
133	FFG-CG	FFG-FC	FFG-P	FFG-PI	FFG-SC	FFG-SH
134	55	148	41	5	41	7
135	18.51852	49.8	13.8	1.7	13.8	2.4

Appendix G

Late Summer Aquatic Invertebrate Data from Near the Mouth of the Shasta

Shasta River Near Mouth 9-71					
Order	Family	T value	F desig	count	t*count
			z		
Ephemeroptera					
	Ameletidae	7	cg		0
	Baetadae	4	cg	6	24
	Caenidae	7	cg		0
	Ephemerelidae	1	sc		0
	Ephemeridae	4	sc		0
	Leptophlebiid	5	cg		0
	Heptageniidae	4	sc		0
	Leptophlebiida	2	sc		0
	Siphlonuridae	7	cg		0
	Other				0
	total			6	24
Plecoptera					
	Capniidae	1	sh		0
	Chloroperlidae	1	sh		0
	Leuctridae	0	sh		0
	Nemouridae	2	sh		0
	Pletoperlidae	0	sh		0
	Perlidae	1	p		0
	Perlodidae	2	p		0
	Pteronarcyidae	0	sh		0
	Taeniopterygid	2	sh		0
	Unknown				
	total			0	0
Tricoptera					
	Brachycentrida	3	cg		0
	Calamoceratida	2	sh		0
	Glossosomatid	0	sc		0
	Helicopsychida	3	sc	655	1965
	hydropsychidae	4	fc	152	608
	Hydroptilidae	4	pi		0
	Lepidostomatid	1	sh		0
	Leptoceridae	4	cg		0
	Limnephilidae	4	sh	7	28
	Odontoceridae	0	cg		0
	Philoptoamidae	3	fc		0
	Phryganeidae	4	sh		0
	Polycentropodi	6	fc		0
	Pshchomyiidae	2	cg		0
	Rhyacophilidae	0	p		0
	sericostomatida	3	sh		0
	Unknown				
	Total			814	2601
Diptera					
	Athericidae	2	pi		0
	Blephariceridae	0	sc		0
	Deratopogonid	6	pi		0
	Chiromomidae	6	cg	17	102
	Dixidae	2	cg		0
	Dolichopodidae	4	pi		0
	Empididae	6	pi	1	6
	Muscidae	6	pi		0
	Psychodidae	10	cg		0
	Simulidae	6	fvc	1	6
	Stratiomyidae		cg		0
	Tabanidae	6	pi		0
	Thaumaleidae		sc		0
	Tipulidae	3	sh		0
	Unknown			1	
	total			20	114

Megaloptera					
	Corydalidae	0	p		0
	Sialidae	4	p		0
	Unknown				
	total			0	0
Coleoptera					
	Dytiscidae	5	p		0
	haliplidae	5	pi		0
	hydrophilidae	5	p		0
	Elmidae	5	cg	21	105
	Psephenidae	4	sc	11	44
	Ptilodactylidae	2	sh		0
	Unknown				
	total			32	149
Odonata					
	Aeshnidae	3	p		0
	Calopterygidae	5	p		0
	coenagrionidae	9	p	2	18
	Cordulegastrid	3	p		0
	Corduliidae	5	p		0
	Gomphidae	1	p	1	1
	Lestidae	9	p		0
	Libellulidae	9	p		0
	Unknown/other			1	0
	total			4	19
					0
Crustacea					0
	Amphipoda	4	cg	2	8
	Decapoda	7	cg		0
	Isopoda	6	sh		0
	Unknown				
	total			2	8
Annelida					
	Hirudinea	8	p		0
	Oligochaeta	8	cg	7	56
	Tubificidae	9	fc		0
	Unknown				
	total			7	56
Molluska					
	Bivalvia	3	fc	1	3
	Gastropoda	7	sc	158	1106
	Unknown				0
	total			159	1109
Arachmoidea					
	Acari		p		0
	Unknown				
	total			0	0
			sc		
Turbellaria				1	
	total			1	
Other Inverts					
	total			0	
Totals				1045	4080
Summary Info					
		EPT Taxa	EPT Index	% dominan	Tolerant Ta
		5	0.78	62.7	3.9
FFG-CG	FFG-FC	FFG-P	FFG-PI	FFG-SC	FFG-SH
53	154	3	1	824	7
5.086372	14.77927063	0.287908	0.095969	79.07869	0.671785

Shasta River Near Mouth 9-15-71						
1	Order	Family	T value	F desig	count	t*count
2				zzz		
3						
4	Ephemeroptera					
5		Ameletidae	7	cg		0
6		Baetadae	4	cg	26	104
7		Caenidae	7	cg		0
8		Ephemerelidae	1	sc		0
9		Ephemeridae	4	sc		0
10		Leptophelebiia	5	cg		0
11		Heptageniidae	4	sc		0
12		Leptophlebiida	2	sc		0
13		Siphlonuridae	7	cg		0
14		Other				0
15		total			26	104
16						
17	Plecoptera					
18		Capniidae	1	sh		0
19		Chloroperlidae	1	sh		0
20		Leuctridae	0	sh		0
21		Nemouridae	2	sh		0
22		Pletoperlidae	0	sh		0
23		Perlidae	1	p		0
24		Perlodidae	2	p		0
25		Pteronarcyidae	0	sh		0
26		Taeniopterygid	2	sh		0
27		Unknown				
28		total			0	0
29						
30	Tricoptera					
31		Brachycentrida	3	cg		0
32		Calamoceratid	2	sh		0
33		Glossosomatid	0	sc		0
34		Helicopsychida	3	sc		0
35		hydropsychida	4	fc		0
36		Hydroptilidae	4	pi		0
37		Lepidostomatid	1	sh		0
38		Leptoceridae	4	cg		0
39		Limnephilidae	4	sh		0
40		Odontoceridae	0	cg		0
41		Philoptoamidae	3	fc		0
42		Phryganeidae	4	sh		0
43		Polycentropodi	6	fc		0
44		Pshchomyiidae	2	cg		0
45		Rhyacophiidae	0	p		0
46		sericostomatid	3	sh		0
47		Unknown				
48		Total			0	0
49						
50	Diptera					
51		Athericidae	2	pi		0
52		Blephariceridae	0	sc		0
53		Deratopogonid	6	pi		0
54		Chiromomidae	6	cg	5	30
55		Dixidae	2	cg		0
56		Dolichopodidae	4	pi		0
57		Empididae	6	pi	1	6
58		Muscidae	6	pi		0
59		Psychodidae	10	cg		0
60		Simulidae	6	fvc	1	6
61		Stratiomyidae		cg		0
62		Tabanidae	6	pi		0
63		Thaumaleidae		sc		0
64		Tipulidae	3	sh		0
65		Unknown				
66		total			7	42
67						

68	Megaloptera					
69		Corydalidae	0	p		0
70		Sialidae	4	p		0
71		Unknown				
72		total			0	0
73						
74	Coleoptera					
75		Dytiscidae	5	p		0
76		haliplidae	5	pi		0
77		hydrophilidae	5	p		0
78		Elmidae	5	cg	8	40
79		Psephenidae	4	sc		0
80		Ptilodactylidae	2	sh		0
81		Unknown				
82		total			8	40
83						
84	Odonata					
85		Aeshnidae	3	p		0
86		Calopterygidae	5	p		0
87		coenagrionidae	9	p		0
88		Cordulegastrid	3	p		0
89		Corduliidae	5	p		0
90		Gomphidae	1	p		0
91		Lestidae	9	p		0
92		Libellulidae	9	p		0
93		Unknown				0
94		total			0	0
95						0
96	Crustacea					0
97		Amphipoda	4	cg	1	4
98		Decapoda	7	cg		0
99		Isopoda	6	sh		0
100		Unknown				
101		total			1	4
102						
103	Annelida					
104		Hirudinea	8	p		0
105		Oligochaeta	8	cg	20	160
106		Tubificidae	9	fc		0
107		Unknown				
108		total			20	160
109						
110	Molluska					
111		Bivalvia	3	fc		0
112		Gastropoda	7	sc	2	14
113		Unknown				0
114		total			2	14
115						
116	Arachmoidea					
117		Acari		p		0
118		Unknown				
119		total			0	0
120				sc		
121	Turbellaria					0
122		total			0	
123						
124	Other Inverts					
125		total			0	
126	Totals				64	364
127	Enter count of largest grou		26			
128						
129	Summary Info					
130		Richness	EPT Taxa	EPT Index	% dominan	Tolerant Ta
131		8	1	0.40625	40.625	5.6875
132						
133	FFG-CG	FFG-FC	FFG-P	FFG-PI	FFG-SC	FFG-SH
134	60	1	0	1	2	0
135	93.75	1.5625	0	1.5625	3.125	0

SR Near Mouth 8-26-81						
Order	Family	T value	F desig	count	t*count	
			z			
Ephemeroptera						
	Ameletidae	7	cg		0	
	Baetadae	4	cg	19	76	
	Caenidae	7	cg		0	
	Ephemerelidae	1	sc		0	
	Ephemeridae	4	sc		0	
	Leptophelebiia	5	cg		0	
	Heptageniidae	4	sc	1	4	
	Leptophleibiida	2	sc		0	
	Siphlonuridae	7	cg		0	
	Other				0	
	total			20	80	20
Plecoptera						
	Capniidae	1	sh		0	
	Chloroperlidae	1	sh		0	
	Leuctridae	0	sh		0	
	Nemouridae	2	sh		0	
	Pletoperlidae	0	sh		0	
	Perlidae	1	p	2	2	
	Perlodidae	2	p		0	
	Pteronarcyidae	0	sh	1	0	
	Taeniopterygid	2	sh		0	
	Unknown					
	total			3	2	3
Tricoptera						
	Brachycentrida	3	cg		0	
	Calamoceratid	2	sh		0	
	Glossosomatid	0	sc	2	0	
	Helicopsychida	3	sc	4200	12600	
	hydropsychidae	4	fc	67	268	
	Hydroptilidae	4	pi		0	
	Lepidostomatid	1	sh		0	
	Leptoceridae	4	cg		0	
	Limnephilidae	4	sh	4	16	
	Odontoceridae	0	cg		0	
	Philoptoamidae	3	fc		0	
	Phryganeidae	4	sh		0	
	Polycentropodi	6	fc		0	
	Pshchomylidae	2	cg		0	
	Rhyacophiidae	0	p	4	0	
	sericostomatid	3	sh		0	
	Unknown					
	Total			4277	12884	4277
Diptera						
	Athericidae	2	pi		0	
	Blephariceridae	0	sc		0	
	Deratopogonid	6	pi		0	
	Chiromomidae	6	cg		0	
	Dixidae	2	cg		0	
	Dolichopodidae	4	pi		0	
	Empididae	6	pi		0	
	Muscidae	6	pi		0	
	Psychodidae	10	cg		0	
	Simulidae	6	fvc	1	6	
	Stratiomyidae		cg		0	
	Tabanidae	6	pi		0	
	Thaumaleidae		sc		0	
	Tipulidae	3	sh		0	
	Unknown			9		
	total			10	6	1

Megaloptera						
	Corydalidae	0	p		0	
	Sialidae	4	p		0	
	Unknown					
	total			0	0	0
Coleoptera						
	Dytiscidae	5	p		0	
	haliplidae	5	pi		0	
	hydrophilidae	5	p		0	
	Elmidae	5	cg	340	1700	
	Psephenidae	4	sc	148	592	
	Ptilodactylidae	2	sh		0	
	Unknown					
	total			488	2292	488
Odonata						
	Aeshnidae	3	p		0	
	Calopterygidae	5	p		0	
	coenagrionidae	9	p	98	882	
	Cordulegastrid	3	p		0	
	Corduliidae	5	p		0	
	Gomphidae	1	p	2	2	
	Lestidae	9	p		0	
	Libellulidae	9	p		0	
	Unknown				0	
	total			100	884	100
					0	
Crustacea					0	
	Amphipoda	4	cg	15	60	
	Decapoda	7	cg	1	7	
	Isopoda	6	sh		0	
	Unknown					
	total			16	67	16
Annelida						
	Hirudinea	8	p	1	8	
	Oligochaeta	8	cg		0	
	Tubificidae	9	fc		0	
	Unknown					
	total			1	8	1
Molluska						
	Bivalvia	3	fc	1	3	
	Gastropoda	7	sc	17	119	
	Unknown				0	
	total			18	122	18
Arachmoidea						
	Acari		p		0	
	Unknown					
	total			0	0	
			sc			
Turbellaria				2	0	
	total			2		
Other Inverts				1		
	total			1		
Totals				4936	16345	4924
Enter count of largest grou		4200				
Summary Info						
		EPT Taxa	EPT Index	% dominan	Tolerant Taxa Index	
	23	9	0.871151	85.08914	3.319456	
	FFG-CG	FFG-FC	FFG-P	FFG-PI	FFG-SC	FFG-SH
	375	69	107	0	4368	5
	7.615759545	1.4013	2.17303	0	88.70837	0.101543

SR near Mouth 7-28-82					
Order	Family	T value	F desig	count	t*count
			z		
Ephemeroptera					
	Ameletidae	7	cg		0
	Baetadae	4	cg	765	3060
	Caenidae	7	cg		0
	Ephemerelidae	1	sc	36	36
	Ephemeridae	4	sc		0
	Leptophelebiia	5	cg		0
	Heptageniidae	4	sc	80	320
	Leptophleibiida	2	sc		0
	Siphlonuridae	7	cg	2	14
	Other				0
	total			883	3430
Plecoptera					
	Capniidae	1	sh		0
	Chloroperlidae	1	sh		0
	Leuctridae	0	sh		0
	Nemouridae	2	sh		0
	Pletoperlidae	0	sh		0
	Perlidae	1	p	10	10
	Perlodidae	2	p	41	82
	Pteronarcyidae	0	sh		0
	Taeniopterygid	2	sh		0
	Unknown				
	total			51	92
Tricoptera					
	Brachycentrida	3	cg	97	291
	Calamoceratida	2	sh		0
	Glossosomatid	0	sc	27	0
	Helicopsychida	3	sc	3	9
	hydropsychida	4	fc	1632	6528
	Hydroptilidae	4	pi		0
	Lepidostomatid	1	sh		0
	Leptoceridae	4	cg	1	4
	Limnephilidae	4	sh		0
	Odontoceridae	0	cg		0
	Philoptoamidae	3	fc		0
	Phryganeidae	4	sh		0
	Polycentropodi	6	fc		0
	Pshchomyiidae	2	cg		0
	Rhyacophiidae	0	p		0
	sericostomatida	3	sh		0
	Unknown				
	Total			1760	6832
Diptera					
	Athericidae	2	pi		0
	Blephariceridae	0	sc	3	0
	Deratopogonid	6	pi		0
	Chiromomidae	6	cg	1136	6816
	Dixidae	2	cg		0
	Dolichopodidae	4	pi		0
	Empididae	6	pi	8	48
	Muscidae	6	pi		0
	Psychodidae	10	cg		0
	Simulidae	6	fvc	201	1206
	Stratiomyidae		cg		0
	Tabanidae	6	pi		0
	Thaumaleidae		sc		0
	Tipulidae	3	sh	1	3
	Unknown			48	
	total			1397	8073

Megaloptera					
	Corydalidae	0	p		0
	Sialidae	4	p		0
	Unknown				
	total			0	0
Coleoptera					
	Dytiscidae	5	p		0
	haliplidae	5	pi		0
	hydrophilidae	5	p		0
	Elmidae	5	cg	1184	5920
	Psephenidae	4	sc	74	296
	Ptilodactylidae	2	sh		0
	Unknown				
	total			1258	6216
Odonata					
	Aeshnidae	3	p		0
	Calopterygidae	5	p		0
	coenagrionidae	9	p	2	18
	Cordulegastrid	3	p		0
	Corduliidae	5	p		0
	Gomphidae	1	p		0
	Lestidae	9	p		0
	Libellulidae	9	p		0
	Unknown				0
	total			2	18
					0
Crustacea					0
	Amphipoda	4	cg	6	24
	Decapoda	7	cg		0
	Isopoda	6	sh		0
	Unknown				
	total			6	24
Annelida					
	Hirudinea	8	p	11	88
	Oligochaeta	8	cg	141	1128
	Tubificidae	9	fc		0
	Unknown				
	total			152	1216
Molluska					
	Bivalvia	3	fc		0
	Gastropoda	7	sc		0
	Unknown				0
	total			0	0
Arachmoidea					
	Acari		p		0
	Unknown				
	total			0	0
			sc		
Turbellaria				1	0
	total			1	
Other Inverts				2	
	total			2	
Totals				5512	25901
Enter count of largest grou		1632			
Summary Info					
		EPT Taxa	EPT Index	% dominan	Tolerant Ta
	25	11	0.488752	29.60813	4.742904
FFG-CG	FFG-FC	FFG-P	FFG-PI	FFG-SC	FFG-SH
3332	1833	64	8	223	1
61.01447	33.56528108	1.171947	0.146493	4.083501	0.018312

	SR near Mouth 9-13-98					
1	Order	Family	T value	F desig	count	t val*count
2						
3						
4	Ephemeroptera					
5		Ameletidae	7	cg	1	7
6		Baetedae	4	cg	5	20
7		Caenidae	7	cg		0
8		Ephemerelidae	1	sc	1	1
9		Ephemeridae	4	sc		0
10		Leptophyphida	5	cg		0
11		Heptageniidae	4	sc	1	4
12		Leptophleibiida	2	sc		0
13		Siphlonuridae	7	cg	1	7
14		Other			37	0
15		total			46	39
16						
17	Plecoptera					
18		Capniidae	1	sh		0
19		Chloroperlidae	1	sh	2	2
20		Leuctridae	0	sh		0
21		Nemouridae	2	sh		0
22		Peltoperlidae	0	sh		0
23		Perlidae	1	p	3	3
24		Perlodidae	2	p	1	2
25		Pteronarcyidae	0	sh		0
26		Taeniopterygid	2	sh		0
27		Unknown				
28		total			6	7
29						
30	Tricoptera					
31		Brachycentrida	3	cg		0
32		Calamoceratida	2	sh		0
33		Glossosomatid	0	sc		0
34		Helicopsychida	3	sc	8	24
35		Hydropsychida	4	fc	92	368
36		Hydroptilidae	4	pi	9	36
37		Lepidostomatid	1	sh		0
38		Leptoceridae	4	cg	1	4
39		Limnephilidae	4	sh		0
40		Odontoceridae	0	cg		0
41		Philoptoamidae	3	fc		0
42		Phryganeidae	4	sh		0
43		Polycentropodi	6	fc	2	12
44		Pshchomyiidae	2	cg		0
45		Rhyacophiidae	0	p		0
46		Sericostomatid	3	sh		0
47		Unknown				
48		Total			112	444
49						
50	Diptera					
51		Athericidae	2	pi		0
52		Blephariceridae	0	sc		0
53		Ceratopogonid	6	pi		0
54		Chiromomidae	6	cg	25	150
55		Dixidae	2	cg		0
56		Dolichopodidae	4	pi		0
57		Empididae	6	pi		0
58		Muscidae	6	pi		0
59		Psychodidae	10	cg		0
60		Simulidae	6	fc		0
61		Stratiomyidae		cg	1	0
62		Tabanidae	6	pi		0
63		Thaumaleidae		sc		0
64		Tipulidae	3	sh		0
65		Unknown				
66		total			26	150
67						

68	Megaloptera					
69		Corydalidae	0	p		0
70		Sialidae	4	p		0
71		Unknown				
72		total			0	0
73						
74	Coleoptera					
75		Dytiscidae	5	p		0
76		Haliplidae	5	pi		0
77		Hydrophilidae	5	p		0
78		Elmidae	5	cg	85	425
79		Psephenidae	4	sc	1	4
80		Ptilodactylidae	2	sh		0
81		Unknown			13	
82		total			99	429
83						
84	Odonata					
85		Aeshnidae	3	p		0
86		Calopterygidae	5	p		0
87		Coenagrionidae	9	p		0
88		Cordulegastrid	3	p		0
89		Corduliidae	5	p		0
90		Gomphidae	1	p		0
91		Lestidae	9	p		0
92		Libellulidae	9	p		0
93		Unknown				0
94		total			0	0
95						
96	Crustacea					
97		Amphipoda	4	cg		0
98		Decapoda	7	cg		0
99		Isopoda	6	sh		0
100		Unknown				
101		total			0	0
102						
103	Annelida					
104		Hirudinea	8	p	8	64
105		Oligochaeta	8	cg	4	32
106		Tubificidae	9	fc		0
107		Unknown				
108		total			12	96
109						
110	Molluska					
111		Bivalvia	3	fc	1	3
112		Gastropoda	7	sc	6	42
113		Unknown				0
114		total			7	45
115						
116	Arachmoidea					
117		Acari		p	3	0
118		Unknown				
119		total			3	0
120						
121	Turbellaria			sc		0
122		total			0	
123						
124	Other Inverts				7	
125		total			7	
126	Totals				318	1210
127	Enter count of largest group		92			
128						
129	Summary Info					
130		Taxa Richnes	EPT Taxa	EPT Index	% dominance	Tolerant Taxa
131		26	13	0.515723	28.93082	4.689922
132						
133	FFG-CG	FFG-FC	FFG-P	FFG-PI	FFG-SC	FFG-SH
134	123	95	15	9	17	2
135	47.1	36.4	5.7	3.4	6.5	0.8