ABSTRACT

Phase VI of the School-Based Klamath Restoration Project (319h) is a collaborative effort between seven Siskiyou County schools, the Siskiyou County Office of Education (SCOE), and the United States Fish and Wildlife Service (USFWS).

The objectives of the project include:

- Expanding hands-on field science watershed education.
- Encouraging a sense of resource stewardship among students at all grade levels.
- Collecting quality data for inclusion in the 319h data base.
- Teaching applications of the scientific method.
- Providing on-going inservice training for teachers to increase the effectiveness of the project.

Project tasks that were completed include acquisition and analysis of Klamath River Watershed Data, including river water temperatures, river cross sectional profiles and spawning ground surveys. Descriptions of methodology are included in the report. Many other watershed-related projects were undertaken by schools. In some cases the field data was collected and compiled by agency personnel. The spawning ground survey data collected by student volunteers was part of a project conducted by the California Department of Fish and Game and the U.S. Forest Service.

Although a substantial amount of excellent work has been accomplished by the schools, the opportunity exists to improve the program at all levels. Increased field and technical support is needed to successfully integrate the goals of the project. Computer training for teachers and students is an essential component of the project, which would allow analysis of data and creation of web sites within classrooms. Data analysis and reporting is the critical component of the project that would provide students with a complete understanding of scientific research methodology. Providing a forum for communication between the 319h participants is another important area of the project that needs to be expanded. Travel time, mountainous topography, and intense winter storms can be barriers to travel in Siskiyou County. Communication helps to increase the level of standardization of data collection and transfer and gives teachers a chance to share successful ideas. Communication also sustains the positive momentum of the project, reinforcing the idea of working as a team towards establishing common goals for watershed education.

INTRODUCTION

Phase VI participants in the School-Based Klamath River Restoration Project include three elementary schools and four high schools. See Appendix J for a complete list of participating schools and teachers.

The efforts of these schools are supported by the SCOE who acts as the grantee. The SCOE provides field and technical support, manages the project and reports on project progress to the USFWS.

DESCRIPTION OF THE STUDY AREA

Study sites are located throughout Siskiyou County including the Tulelake area, the Salmon River sub-basin, the Shasta River sub-basin and other tributaries of the Klamath River. Study areas are described in detail in each of the school reports.

METHODS AND MATERIALS

Water temperature data was collected using remote temperature collection devices (Hobo Temps and Stow Aways), following study design criteria established by United States Geological Survey (USGS), *Techniques of Water-Resources Investigations of the United States Geological Survey: Water Temperature - Influential Factors, Field Measurement, and Data Presentation* (Stevens, Ficke, Smoot, 1975). Calibration of units was conducted as described in the above mentioned protocol.

Hobo Temps accurately record water temperature data continuously for up to 120 days, recording eighteen temperature readings in one twenty-four hour period. The new Stow Away temperature recording probes will accurately record water temperature data for up to five years, taking a temperature reading every hour. These new state of the art probes are encased in resin and completely water proof, requiring no special cases. The Stow Away probes communicate with a laptop computer or shuttle via infrared light rather than electrical cable. The new Stow Away probes can be downloaded and relaunched in the field with an extremely compact shuttle device. This option eliminates the need to carry costly laptop computers to field sites to facilitate data downloads. Another benefit of the new Stow Away probes is continuous data collection during the field season. An entire field season of temperature data recorded on Hobo Temp probes involves multiple data sets, which each then need to be "clipped", to eliminate erroneous data at the beginning and end of the data collection period. These clean data sets must then be

spliced together to create one seasons data for a particular field site. The process of clipping data sets and splicing them together can be cumbersome and time consuming, especially, when large numbers of field sites are involved. Occasionally the data sets are slightly disjointed. Stow Aways are perfect for sites which can become inaccessible due to muddy roads in remote areas. If the field site becomes inaccessible, valuable data is still collected for up to five years, in comparison, the Hobo Temp probes would shut down after 120 days.

The Hobo Temp and Stow Away temperature recording probes make it possible for students at all grade levels to be successful contributors to the 319h data base. Though most schools use lap top computers to download the Hobo Temps in the field, some schools launch the Hobo Temps with a classroom computer, and then transport the active Hobos to the field locations. There they exchange the entire set of Hobo Temps, replacing the set that was collecting field data with the recently launched set from their classroom. This method is cumbersome and makes it more difficult to track the Hobo Temp identification numbers. Also, this Hobo Temp data contains erroneous data points that need to be deleted from the data set at either end of the recording interval. Using the new Stow Away probes would eliminate this problem entirely. After collection, the Hobo Temp data is transferred to the SCOE and then to the USFWS.

River cross sectional profiles were done by Yreka and Weed High Schools. Please see the methods sections from Yreka and Weed High Schools for a complete description of field protocols for the cross sectional profiles.

RESULTS PHASE V, VI AND DISCUSSION OF PHASE VII

PHASE VII

Phase VII of the School Based Klamath River Restoration Project was not grant funded. Data was collected, but funding was not available for trainings, travel or analysis of data. Not all of the Phase VII data has been downloaded from the remote temperature sensors. A limited amount of data is included in this report. As Phase VII data becomes available, it will be given to the U.S. Fish and Wildlife Service in Yreka.

PHASE VI

Phase VI funding of the School Based Klamath River Restoration Project came extremely late. Phase VI temperature data collection centered around the summer season of 1999. Even though no funding was available to schools during the Phase VI data collection season, schools continued to collect field data. Siskiyou County Office of Education was unable to provide teacher inservice trainings in the use of KRIS for data analysis or web page creation technology seminars. Also money was not available for student or teacher travel. The School Based Klamath River Restoration Project was not able to offer the annual Spring Forum. In summary funds for Phase VI became available in the summer of 2000, one full year after the field data had been collected. The grant funds from Phase VI were used to purchase computer equipment needed by participating schools to process KRIS data. Phase VI funds were also used to convert Tulelake and Butte Valley temperature monitoring sites to the new Stow Away temperature probes.

PHASE V

The third year of the School-Based Klamath River Restoration Project (Phase V) made progress towards accomplishing the objectives of the project. Both teachers and students expressed strong enthusiasm for the project. Students know data they are collecting is important, which encourages accuracy and quality in data collection. The fact that the data becomes part of a real data base gives the project a unique quality.

Phase V of the 319h project was extremely successful in many ways. All eight schools were represented at the "Spring Student Forum", twenty five students participated in presentations on March 16, 1999. Many professional scientific cooperators presented slide shows and talks on their research and restoration 319h projects.

During Phase V instructors and students participated in two inservice trainings. The uses of the KRIS database taught by Pat Higgins of Kier Associates, and a Web Page

training taught by Kirk Heims of Tulelake High School. Both inservice trainings were well attended by teachers, students, AmeriCorps crew members, resource professionals and school technology support staff. Training students in data collection, analysis, reporting and web page creation is vital to the success of the 319h project. Inviting students to attend the inservice trainings is an important step towards attaining the goal of student understanding of the scientific method as it applies to "real life" science in their own watersheds.

The phase V, KRIS database training was offered on January 21, 1999. This training showed teachers and students the power and scope of the KRIS database. The steps involved in using KRIS for data analysis were demonstrated.

The phase V, Web Page training was given on November 5, 1998. This training resulted in the creation of numerous web pages which were uploaded into the SCOE system.

In Phase V, two new sets of Stow Away temperature recording probes were launched, Bogus Elementary School was the first site to test the new probes at nine field site locations. Discovery High School also launched four new probes. The USFWS generously donated thirteen probes an optic shuttle and base station needed to download field data and transfer it to a computer. The new Stow Away probes are preforming flawlessly. Conversion to the new style Stow Aways will streamline the data collection process, allowing more time to concentrate on data analysis and student projects.

In phase V, over 120 Siskiyou County students were trained in Salmon Survey technique, at an intensive two day training at the Petersburg Ranger Station. Representatives of the U.S. Forest Service and the California Department of Fish and Game conducted the training. Numerous AmeriCorps members, community members, and resource professionals also participated. Without student volunteer crews the data essential to establish statistics on fish populations could not be collected. These statistics establish "take", for fish harvest and allow resource managers to recognize dangerously low fish populations which may require protection. In addition to the two day training, students attend a one day white water safety training, held on the Shasta river each year.

The Yreka Greenhouse project is run by students from Discovery High School. This U.S. Forest Service greenhouse is on Yreka Creek in Yreka, California. Students collect seed and take cuttings of native riparian plants and then raise the stock in the greenhouse facility. The plants raised are used for restoration projects county wide. The Shasta Valley Wildlife Refuge, and the Shasta River Coordinated Resource Management Planning group use native stock grown by Discovery High School students. The Yreka Greenhouse Project continues to expand, the facility is also used as a classroom for grade school students to learn about plant propagation and riparian restoration.

In Phase VI, which is slated to begin in December of 1999, we will strive to improve all aspects of the project, focusing on:

- Higher quality data collection
- Increased student understanding of the scientific method and field science projects
- Promotion of watershed stewardship
- Establishment of clear and uniform expectations for reporting procedures
- On-going standardization of field procedures for data collection
- Use of the KRIS database for data analysis and storage
- Use of KRIS as a student resource
- Acquisition of the computer equipment needed to house the KRIS database
- School based analysis and reporting of Hobo Temp data using the KRIS program
- High quality inservice training for participating teachers and students
- Increased communication between the 319h participants, agencies and support staff

In phase VI, the main technology focus will be conversion to the new Stow Away probes. This will streamline the data collection process, and eliminate the need to carry laptop computers to field sites. The ability to launch and download to a compact shuttle will eliminate the need to launch probes in the classroom and then exchange entire sets in the field. Converting to Stow Away probes will cut down on the number of data sets that need to be handled, clipped and combined. Acquisition of an IBM style computer for each school site to house the KRIS database will give each site the ability to store and analyze data. The computer will also give students the ability to access KRIS for research purposes.

Hands on field science and promotion of resource stewardship continue to be the most important themes in the school based 319h project.

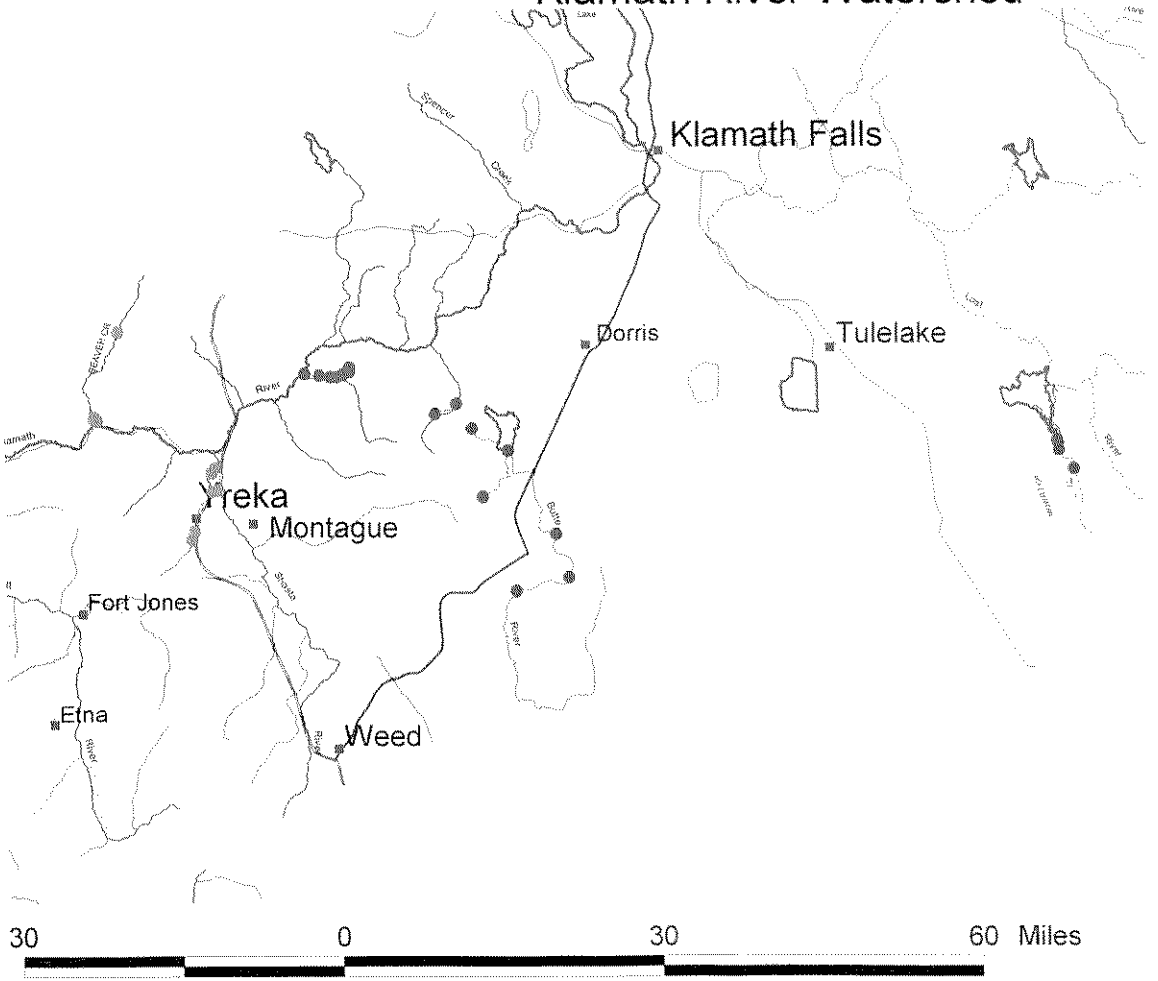
SUMMARY OF EXPENDITURES

IN-KIND CONTRIBUTIONS

Teachers Salaries: 7 teachers @ $1,800.00 Field Trips = 4 days @ $200 = $800 Teaching = 5 days (30 class hours) @ 200 = $1,000	**$12,600.00**
Student Volunteer hours: 2700 hrs @ $5.15 50 high school students, 54 hours each	**$13,905.00**
Student Volunteer Hours: 1296 hrs @ $2.55 24 grade school students, 54 hours each	**$ 3,304.80**
Facility:	**$ 1,500.00**
Transportation:	**$ 1,700.00**
Use of Technology:	**$ 2,000.00**
Science Education Specialist Salary	**$ 4,000.00**
TOTAL:	**$39,009.80**

APPENDICES

School Based Restoration Project-Siskiyou County
Stream Temperature Monitoring Locations for the
Klamath River Watershed



- Xsection.shp

School hobotemp sites
- Bogus Elementary School
- Butte Valley Gender Academy
- Discovey High School
- Tulelake High School

Text Stream names (1:500k)

Streams (1:500k)
- Klamath River
- Second order tributaries
- Smaller tributaries
- Smallest creeks

Text City Names (1:100k)
- Cities (1:100k)

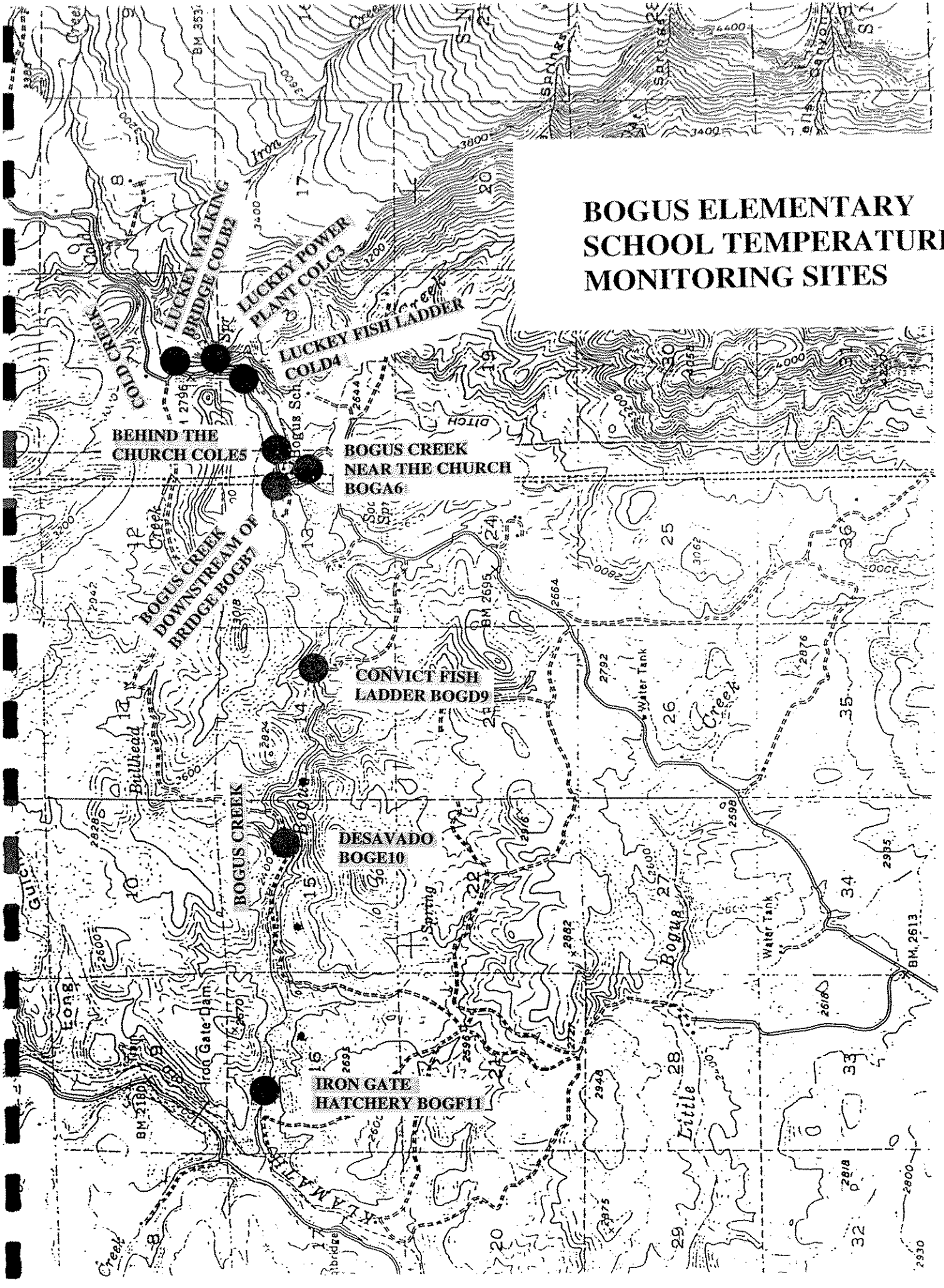
Roads (1:2m) - Major roads only
- Interstate
- Other U.S. highway
- State secondary highway
- Other state primary highway
- Parallel highway
- Improved road

Data from 1997

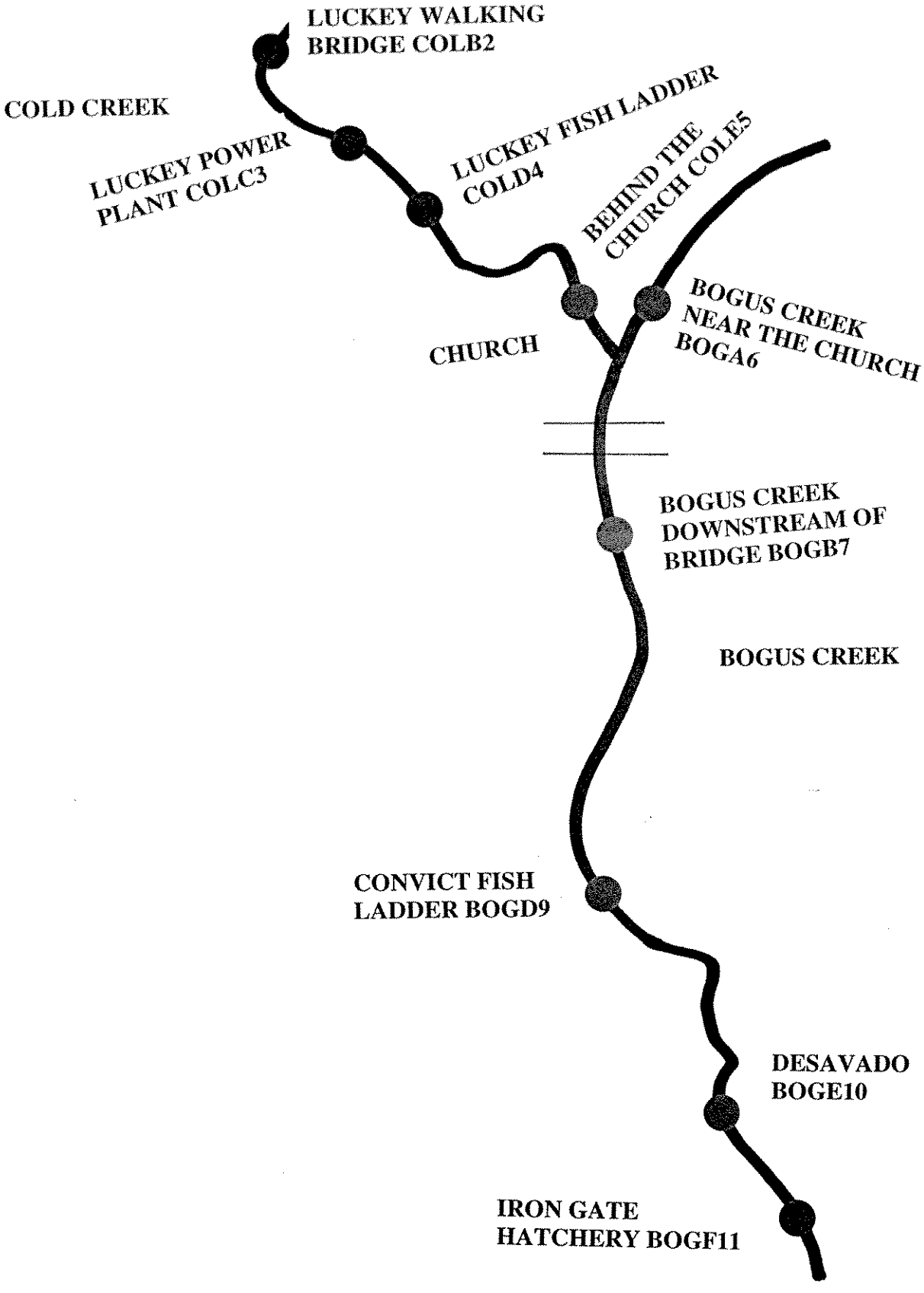
Data and Plot by U.S. Fish and Wildlife Service and Siskiyou County Superintendent of Schools Office

Appendix B

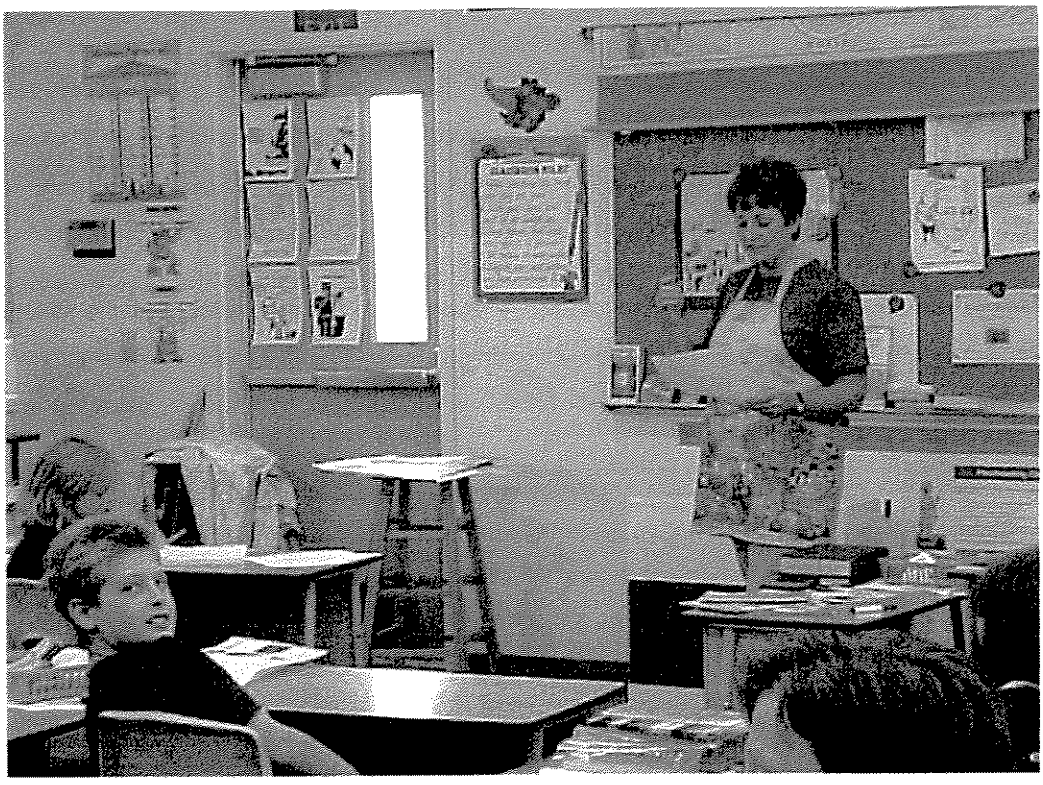
Bogus Elementary School Temperature Graphs

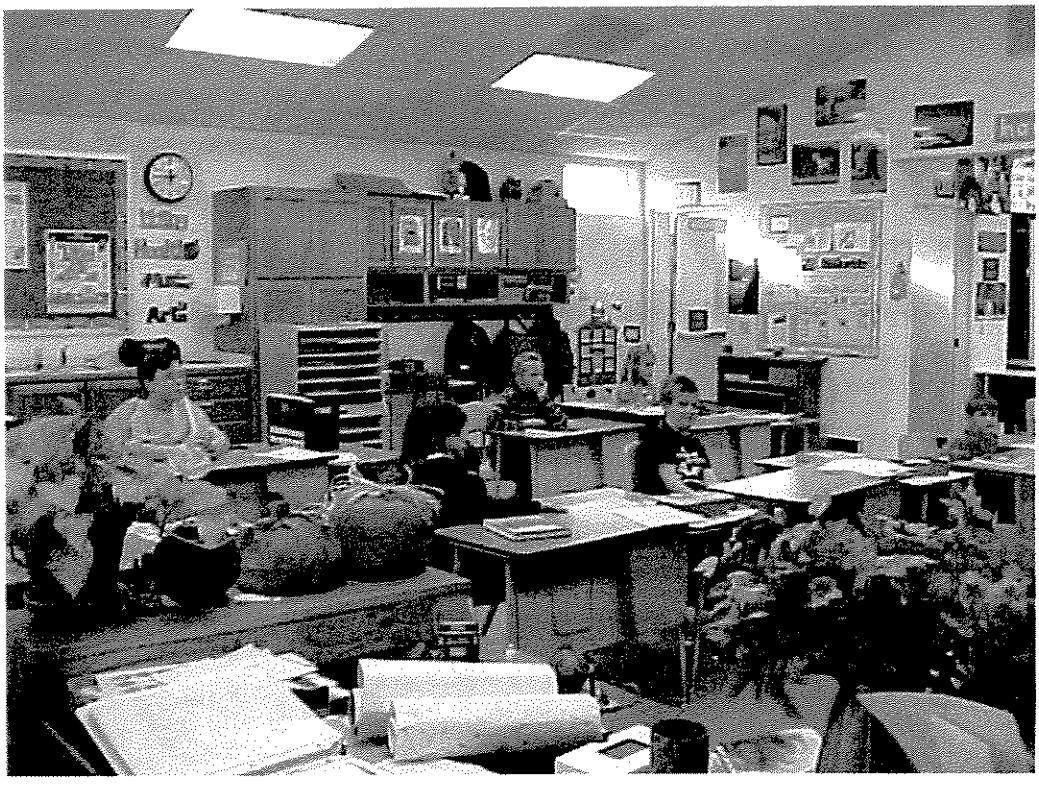

BOGUS ELEMENTARY SCHOOL TEMPERATURE MONITORING SITES
LUCKEY WALKING BRIDGE COLB2
LUCKEY POWER PLANT COLC3
LUCKEY FISH LADDER COLD4
COLD CREEK
BEHIND THE CHURCH COLE5
BOGUS CREEK NEAR THE CHURCH BOGA6
BOGUS CREEK DOWNSTREAM OF BRIDGE BOGB7
CONVICT FISH LADDER BOGD9
DESAVADO BOGE10
BOGUS CREEK
IRON GATE HATCHERY BOGF11
Iron Gate Dam
Bullhead Gulch
Water Tank
Spring
Little Bogus Creek
KLAMATH

BOGUS ELEMENTARY SCHOOL
TEMPERATURE MONITORING SITES

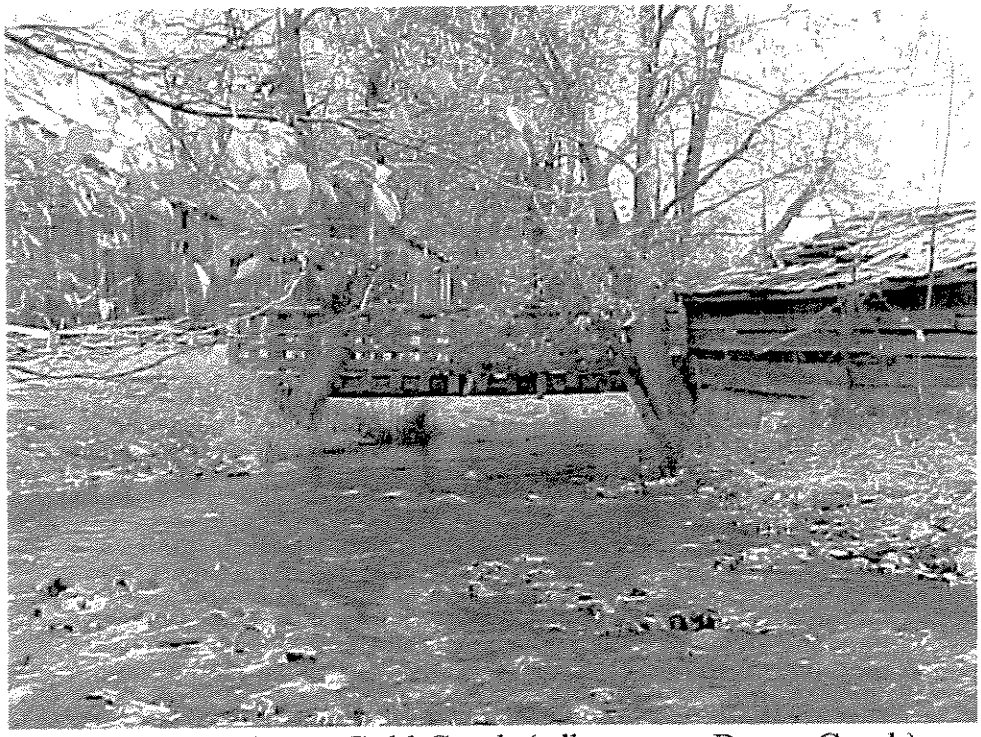


Bogus Elementary School 1999
Janness Ferwerda's K-6 class.

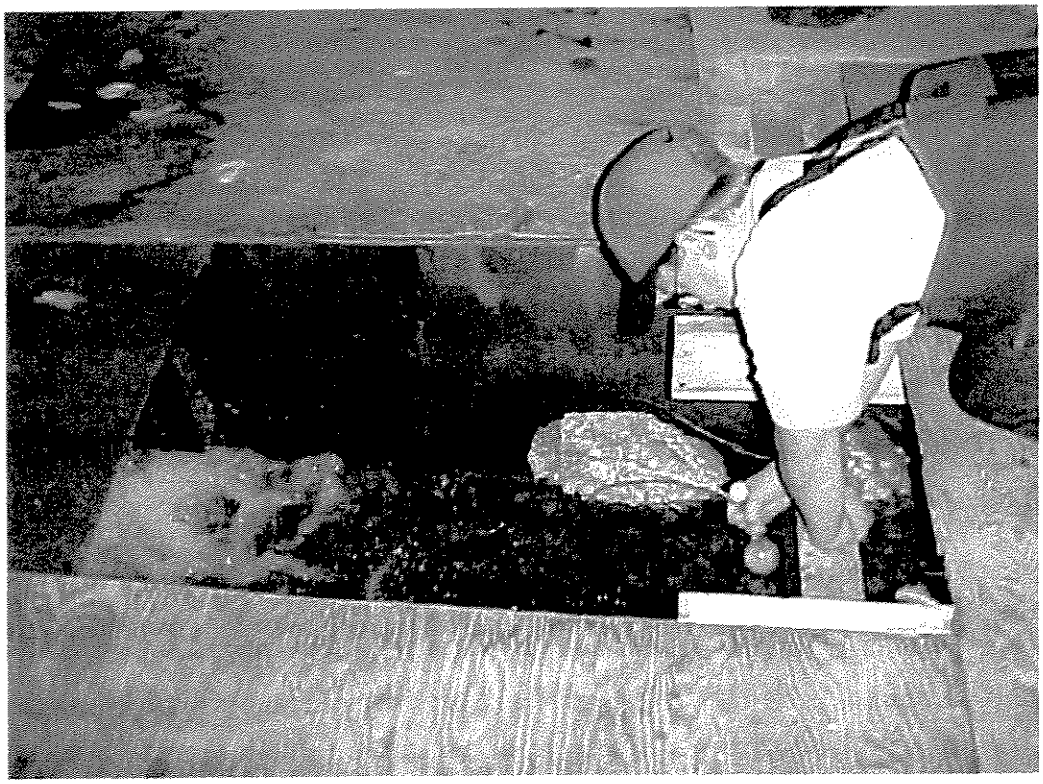




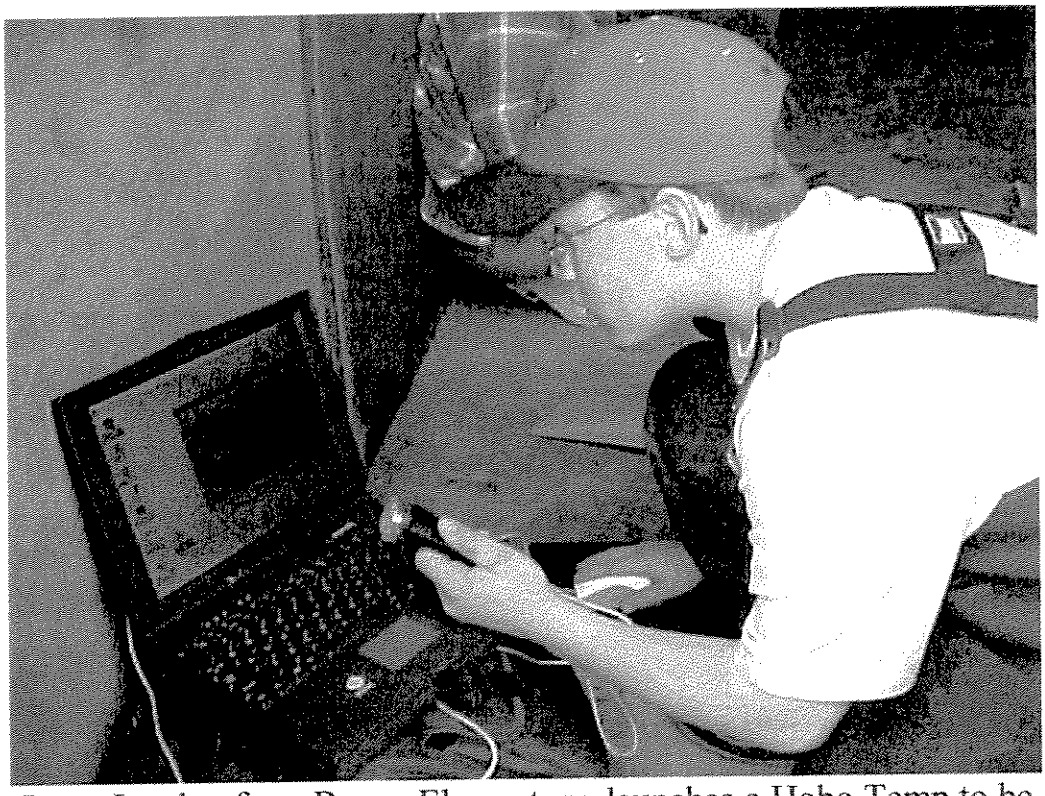
Bogus Creek Temperature Monitoring Sites 1999



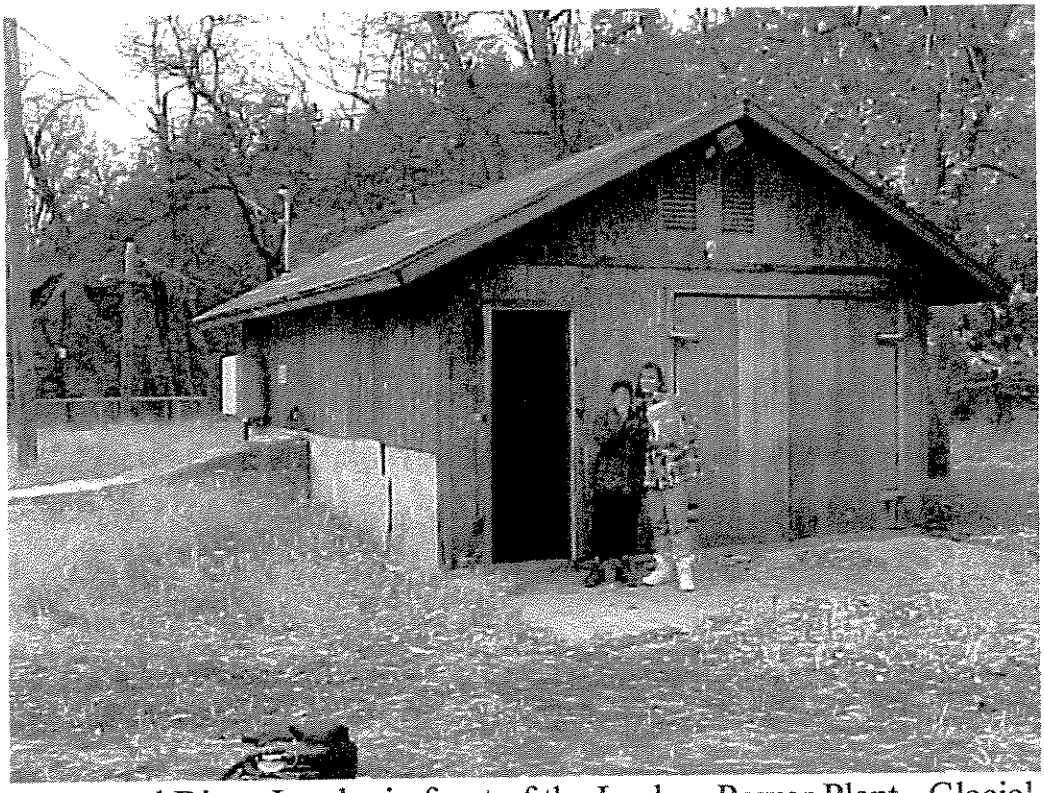
Monitoring site on Cold Creek (tributary to Bogus Creek). Site is Luckey Walking Bridge, looking upstream. COLB2



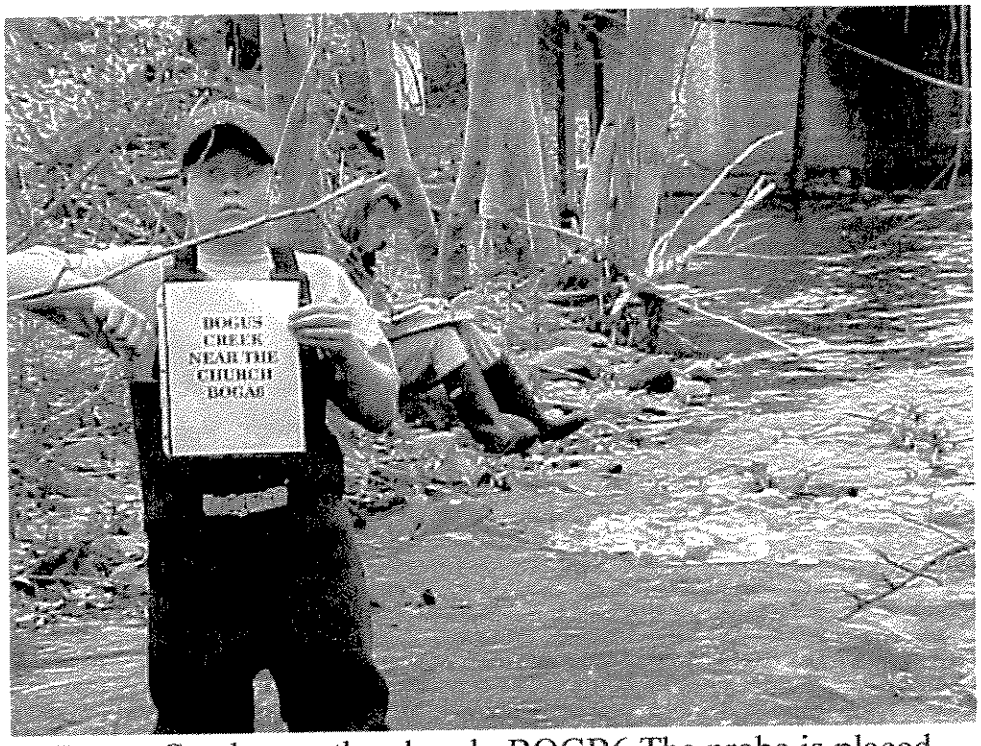
Bogus Elementary student Jason Lemke places a Stow Away temperature probe at the Luckey Power Plant.COLC3. Water from the Luckey Power Plant feeds into Cold Creek below the Luckey Bridge.



Jason Lemke, from Bogus Elementary, launches a Hobo Temp to be placed at the Luckey Power Plant.



Jason and Diane Lemke in front of the Luckey Power Plant. Glacial melt water from Mt. Shasta runs through underground lava tubes, appearing as springs 200 feet upslope of the Luckey Power Plant. The spring water is collected and piped to the turbine in the power plant.

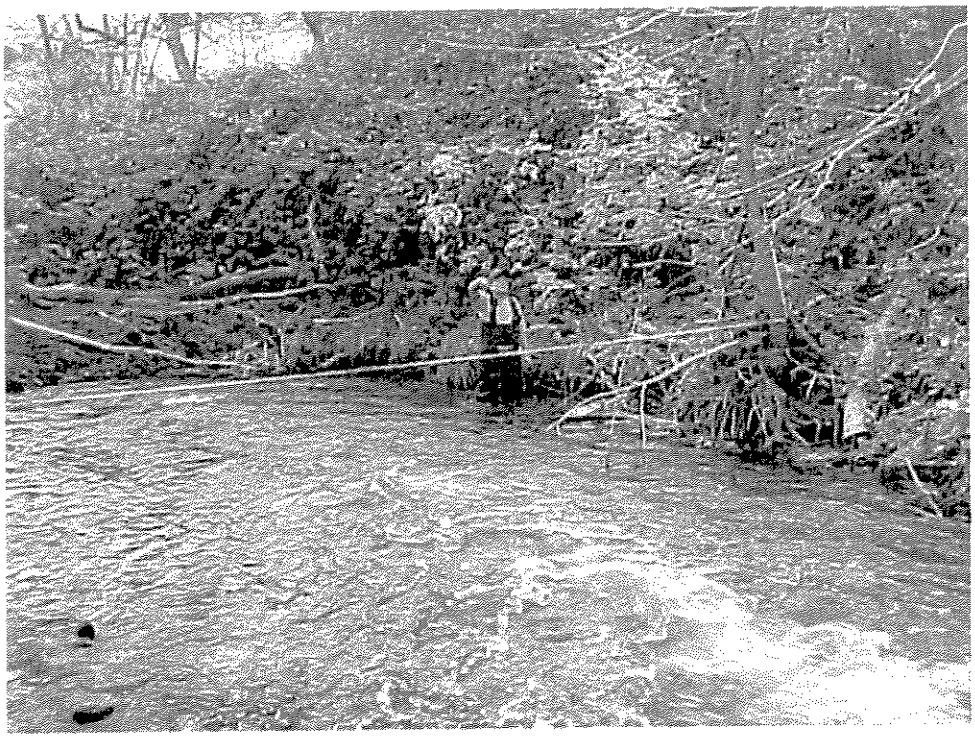


Bogus Creek near the church, BOGB6,The probe is placed upstream of the confluence of Cold and Bogus Creek.

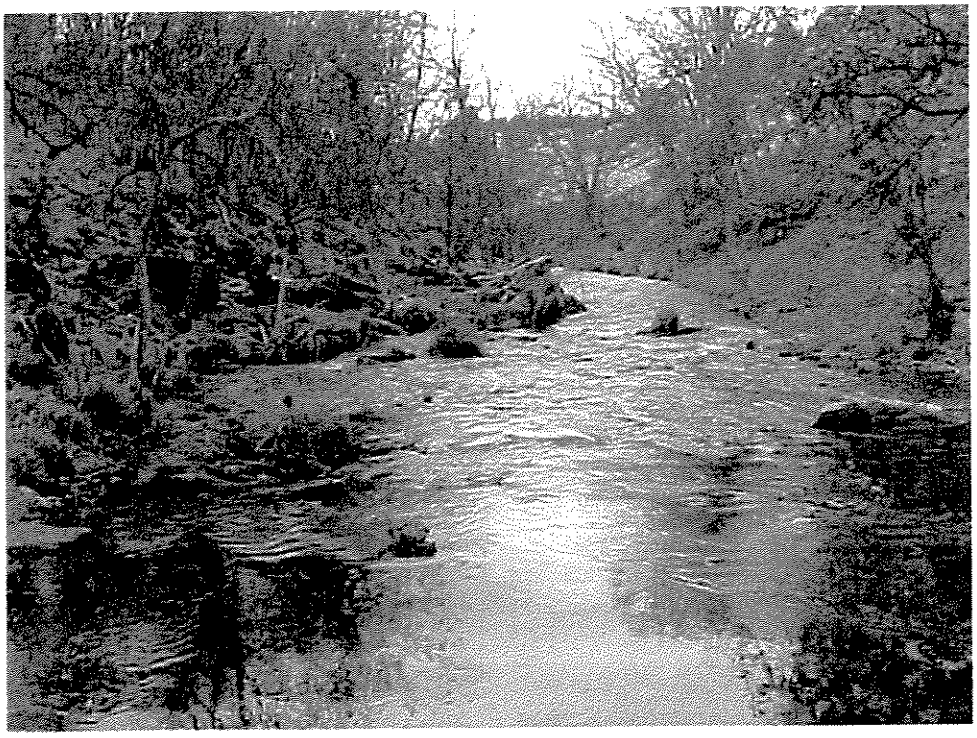
Monitoring site on Cold Creek showing the confluence with Bogus Creek. Picture looking upstream. COLE5

Monitoring site is just upstream of these falls on Bogus Creek. Convict Fish Ladder was built to allow fish to swim past the falls. BOGD9

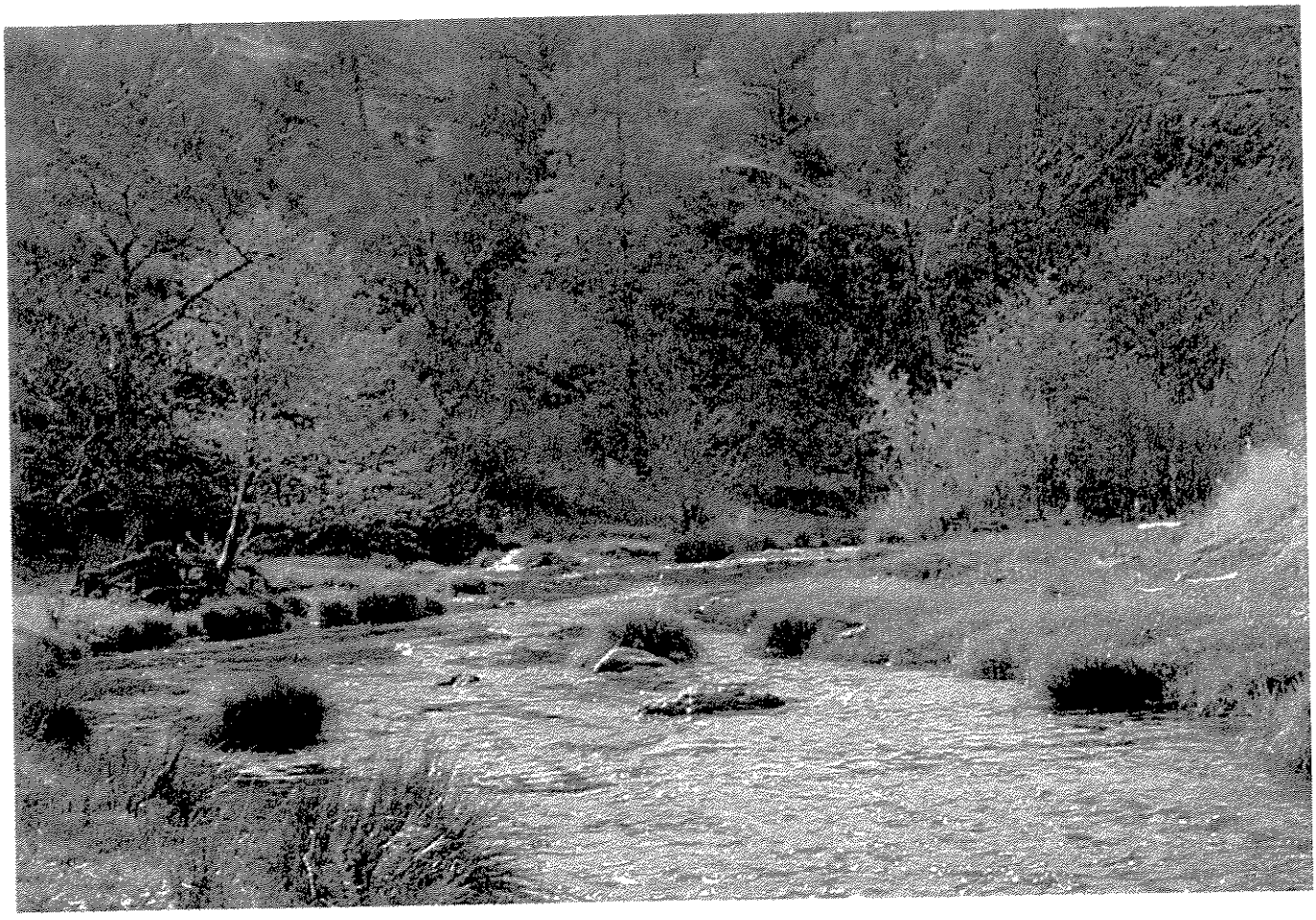
Monitoring site at Iron Gate Hatchery. The Stow Away is tied to the tree in the left of the photo. Photo taken from the bridge, looking downstream. BOGF11



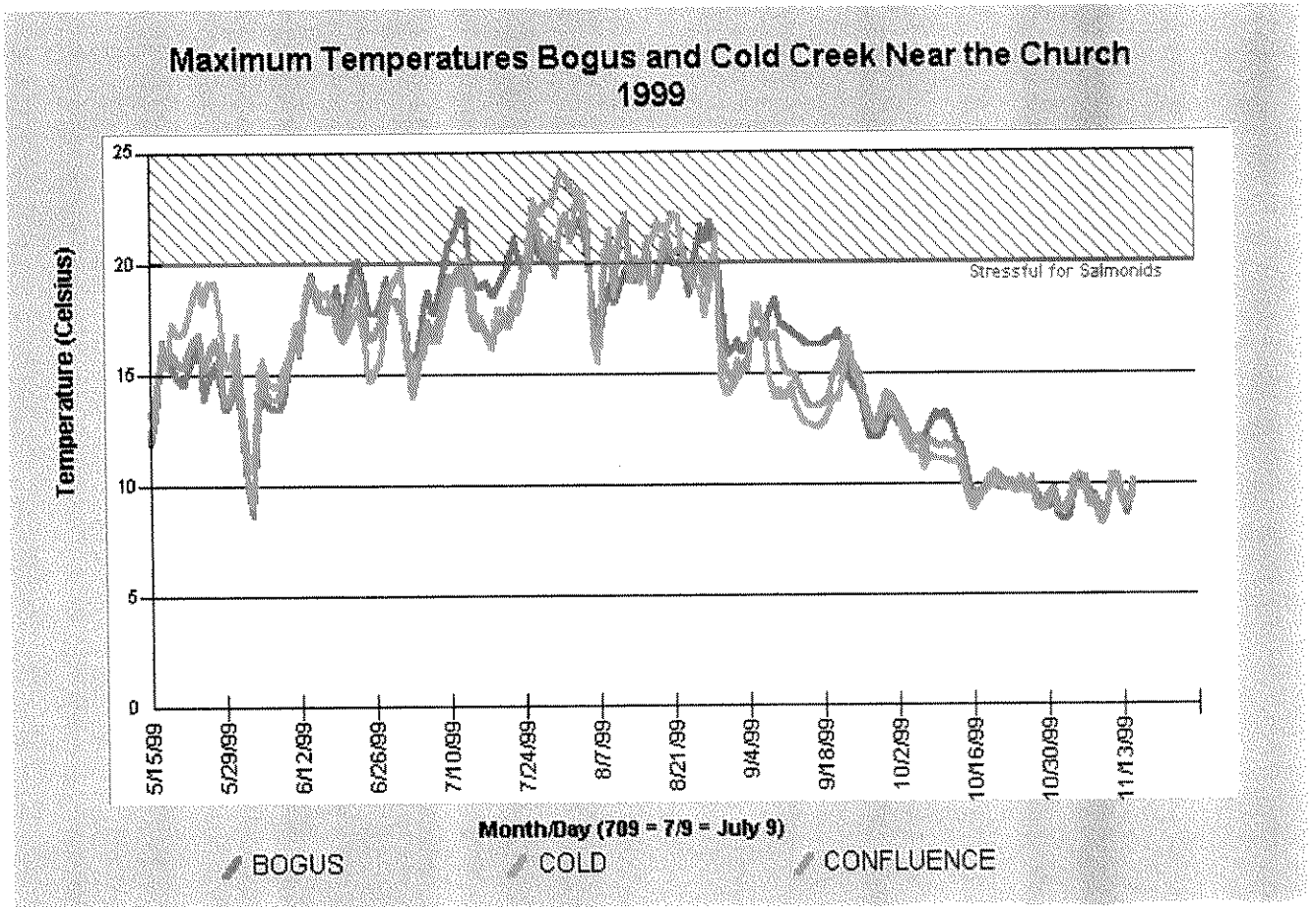
Monitoring site on Bogus Creek below the confluence of Cold Creek and Bogus Creek. BOGB7. Note the electric wire to keep cattle out of the bridge construction area.



Desavado, looking downstream. BOGE10

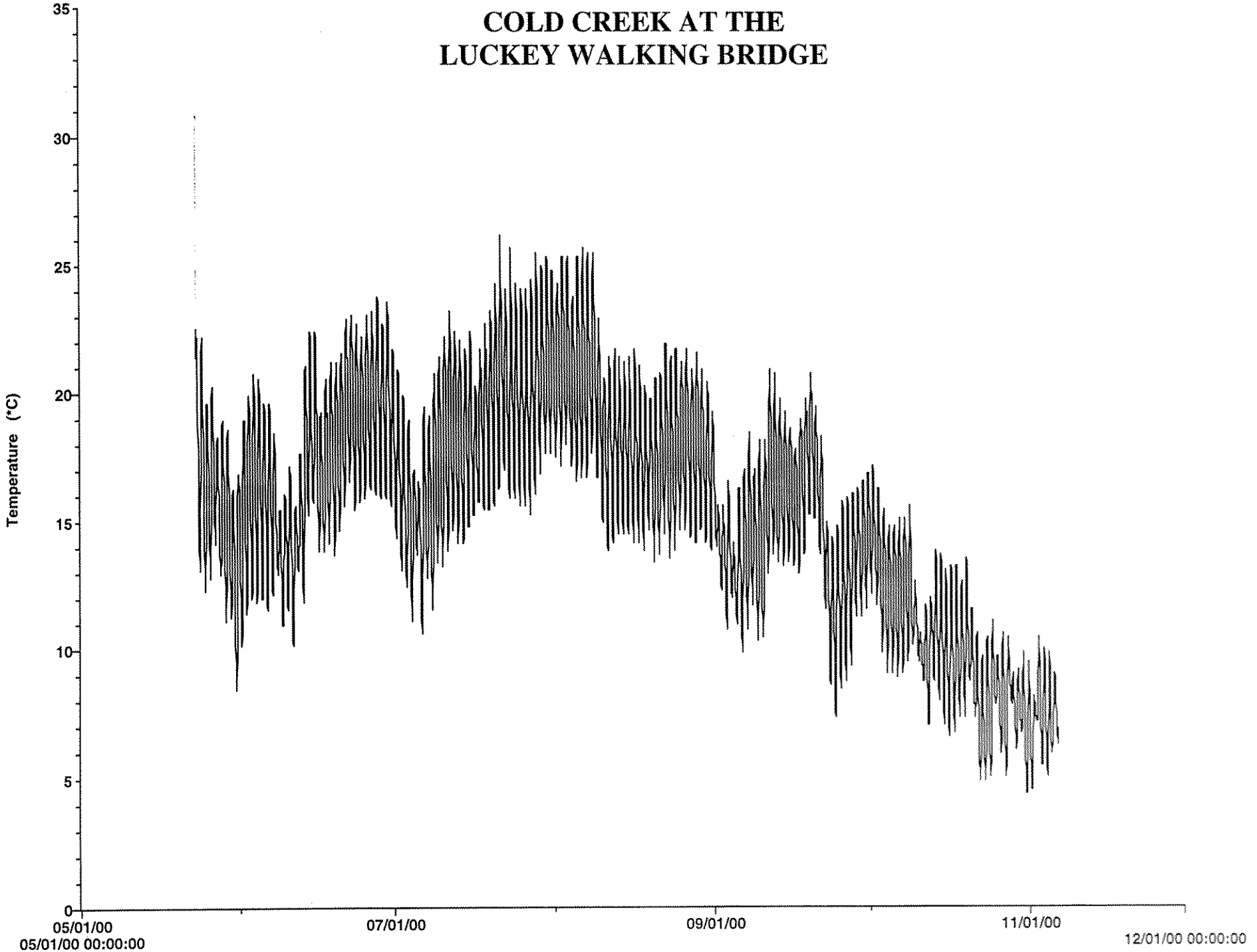


Bogus Creek



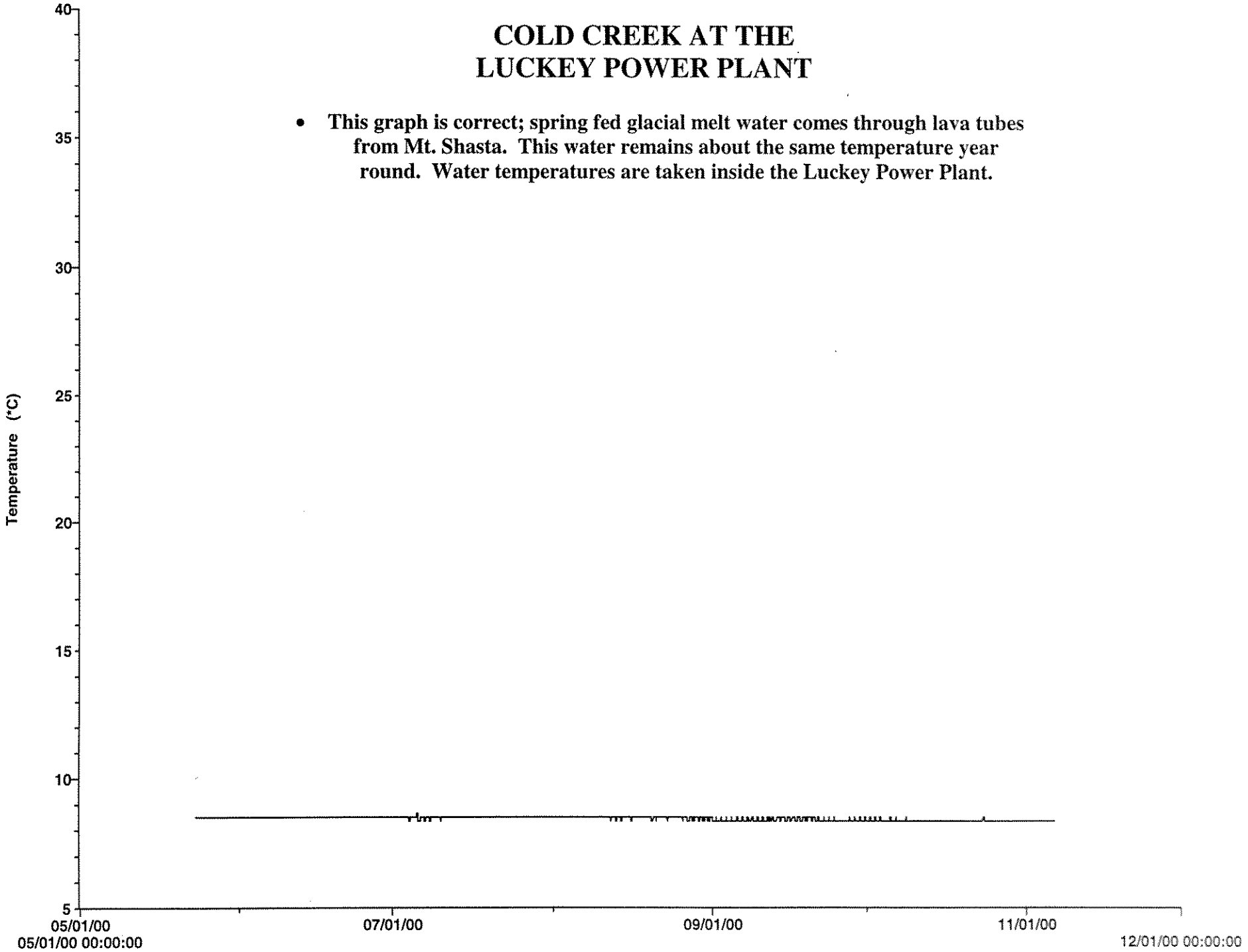
Maximum daily water temperature on Bogus and Cold Creeks during the summer of 1999, near the church. Data Collected by Bogus Elementary School using new Stow Away temperature probes. "Bogus", is Bogus Creek behind the church. "Cold", is Cold Creek behind the church. "Confluence", is Bogus Creek downstream of the bridge and downstream of the confluence of Cold and Bogus Creeks. *Road construction has resulted in reduced cover downstream of the confluence.

COLD CREEK AT THE LUCKEY WALKING BRIDGE

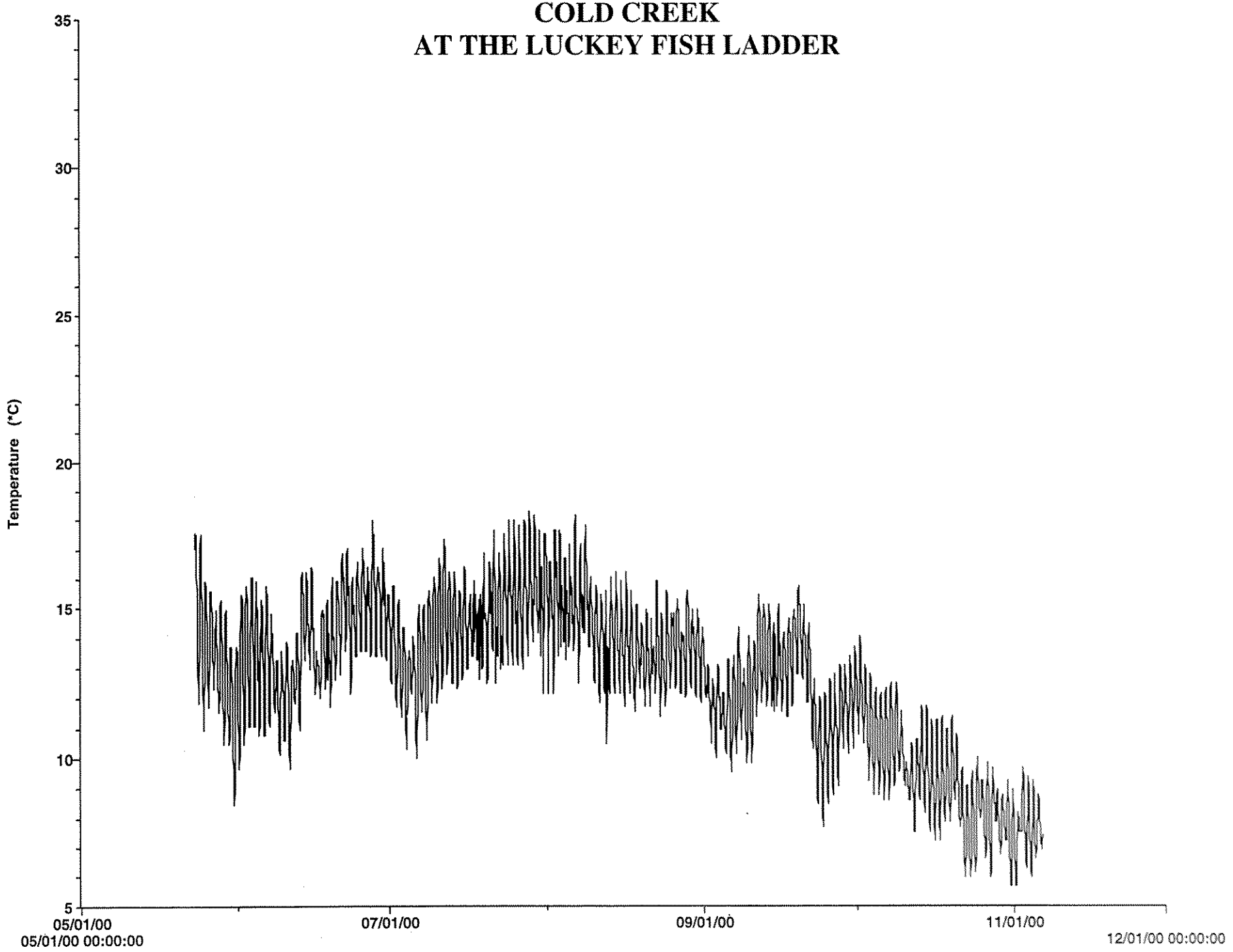


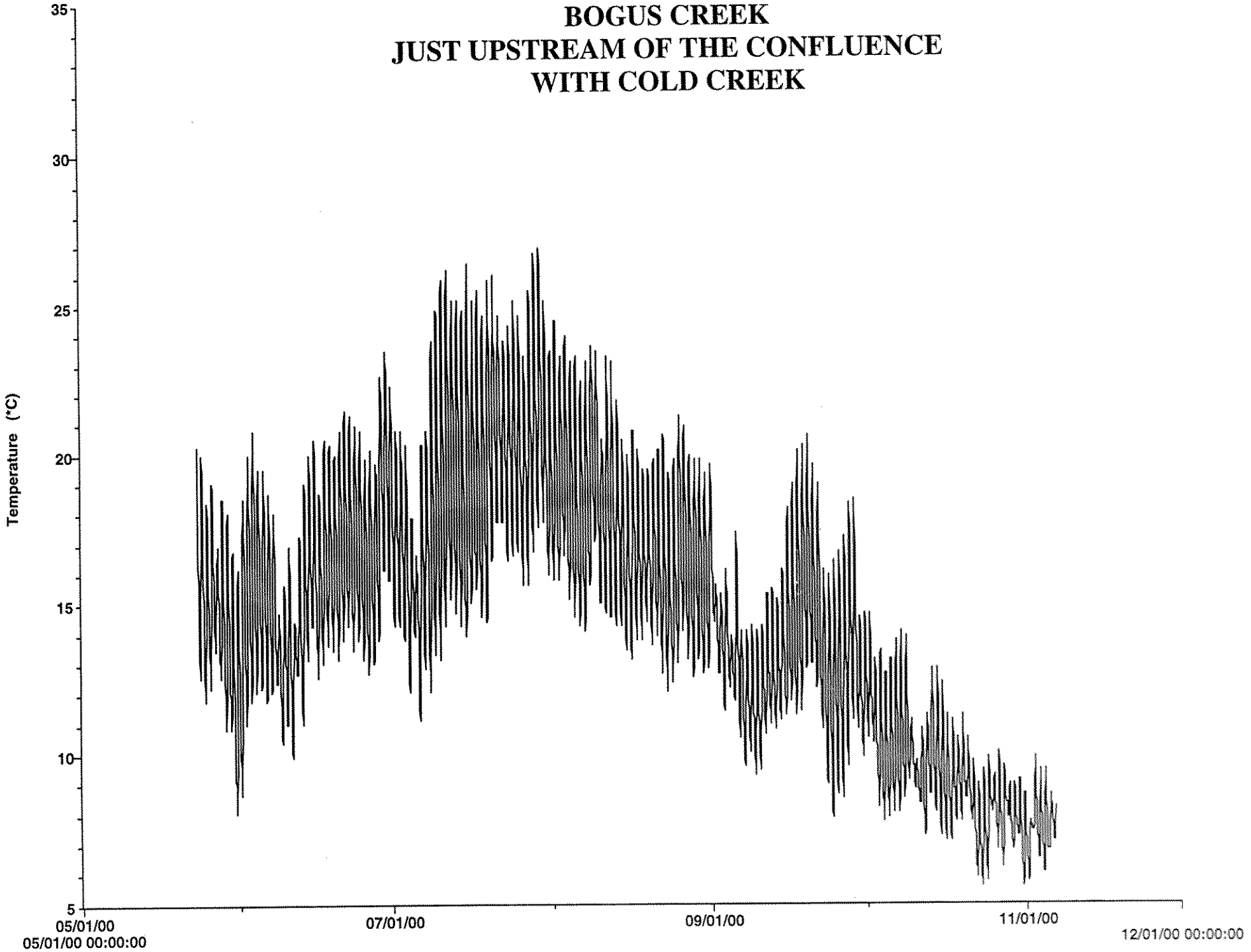
COLD CREEK AT THE LUCKEY POWER PLANT

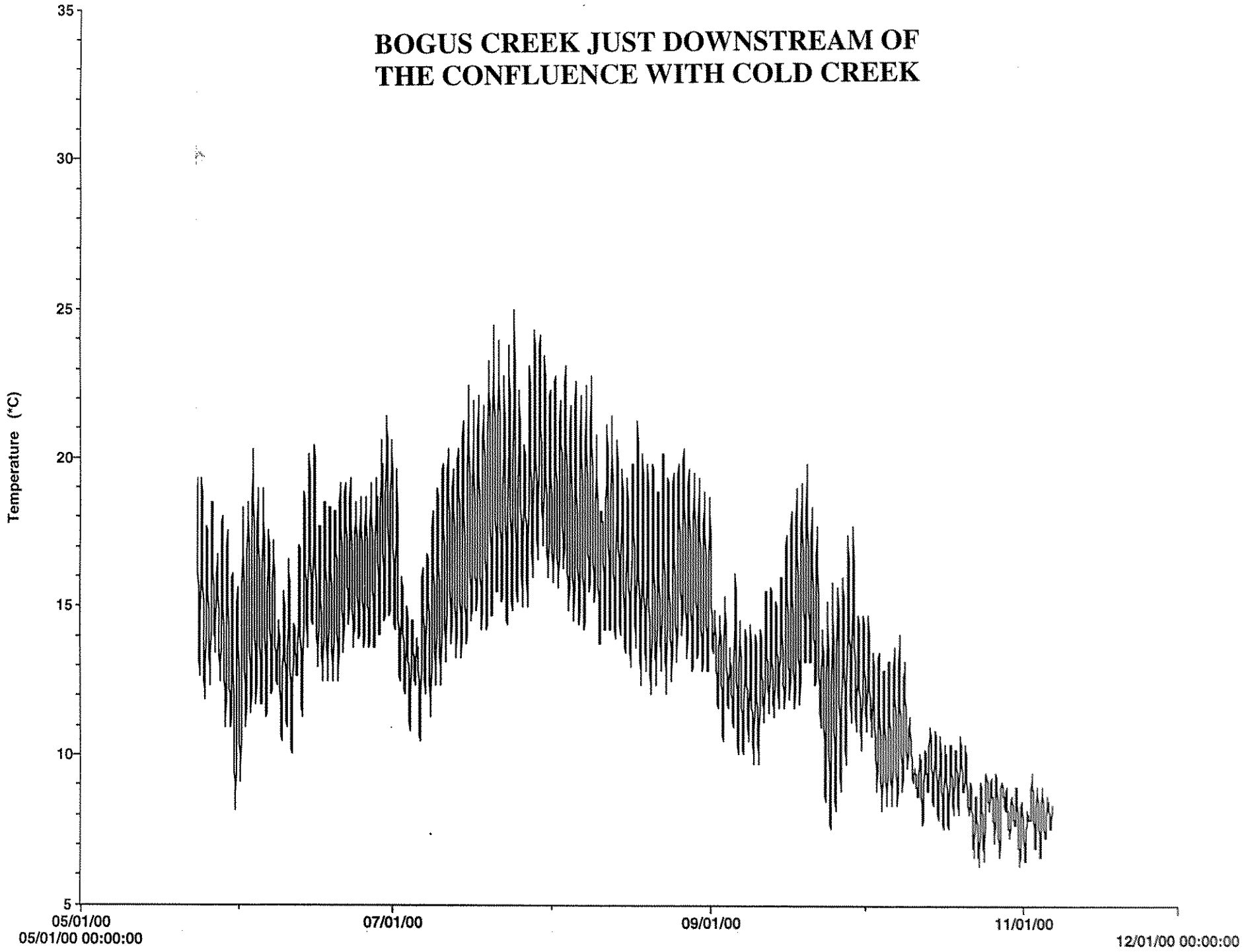
- **This graph is correct; spring fed glacial melt water comes through lava tubes from Mt. Shasta. This water remains about the same temperature year round. Water temperatures are taken inside the Luckey Power Plant.**



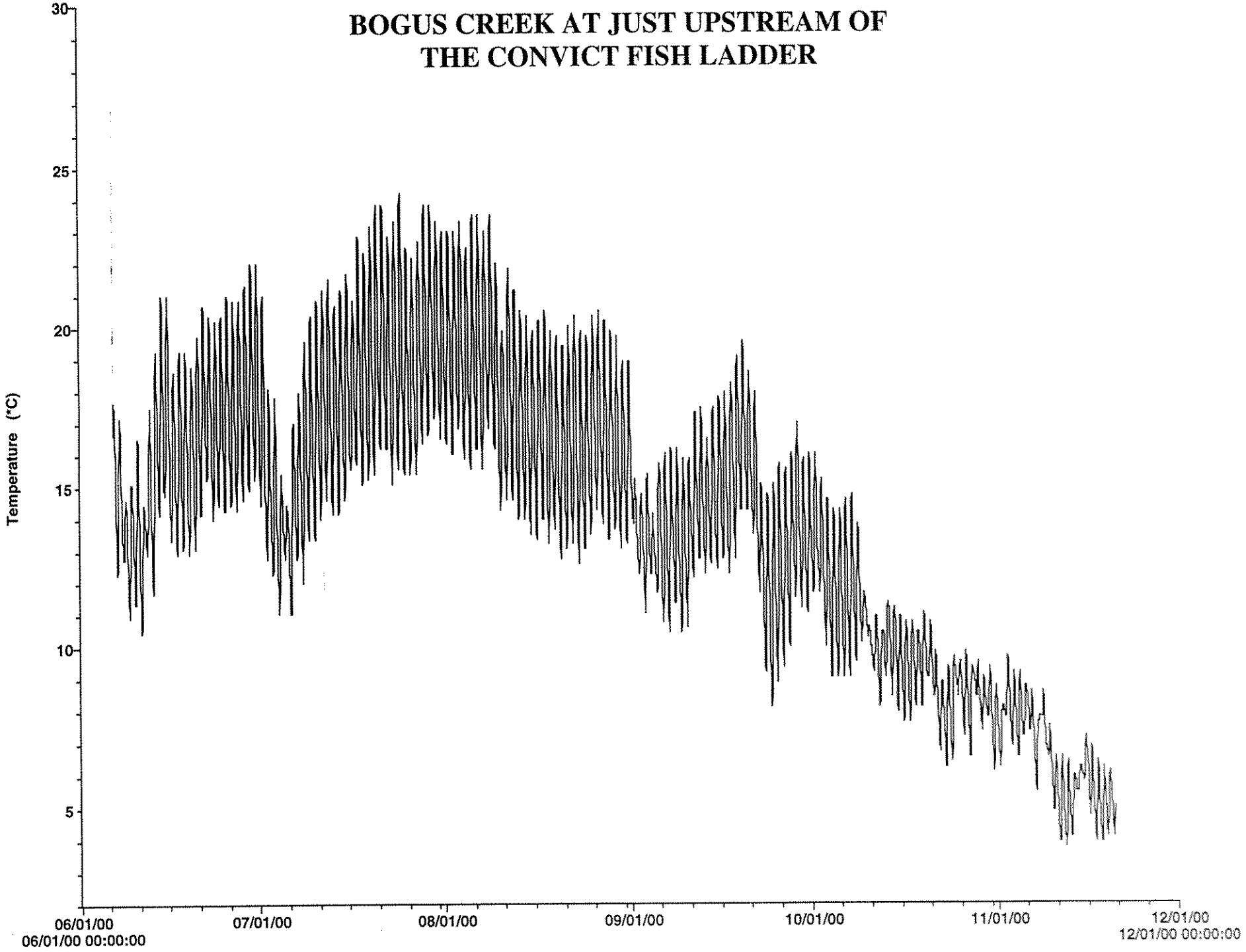
COLD CREEK
AT THE LUCKEY FISH LADDER



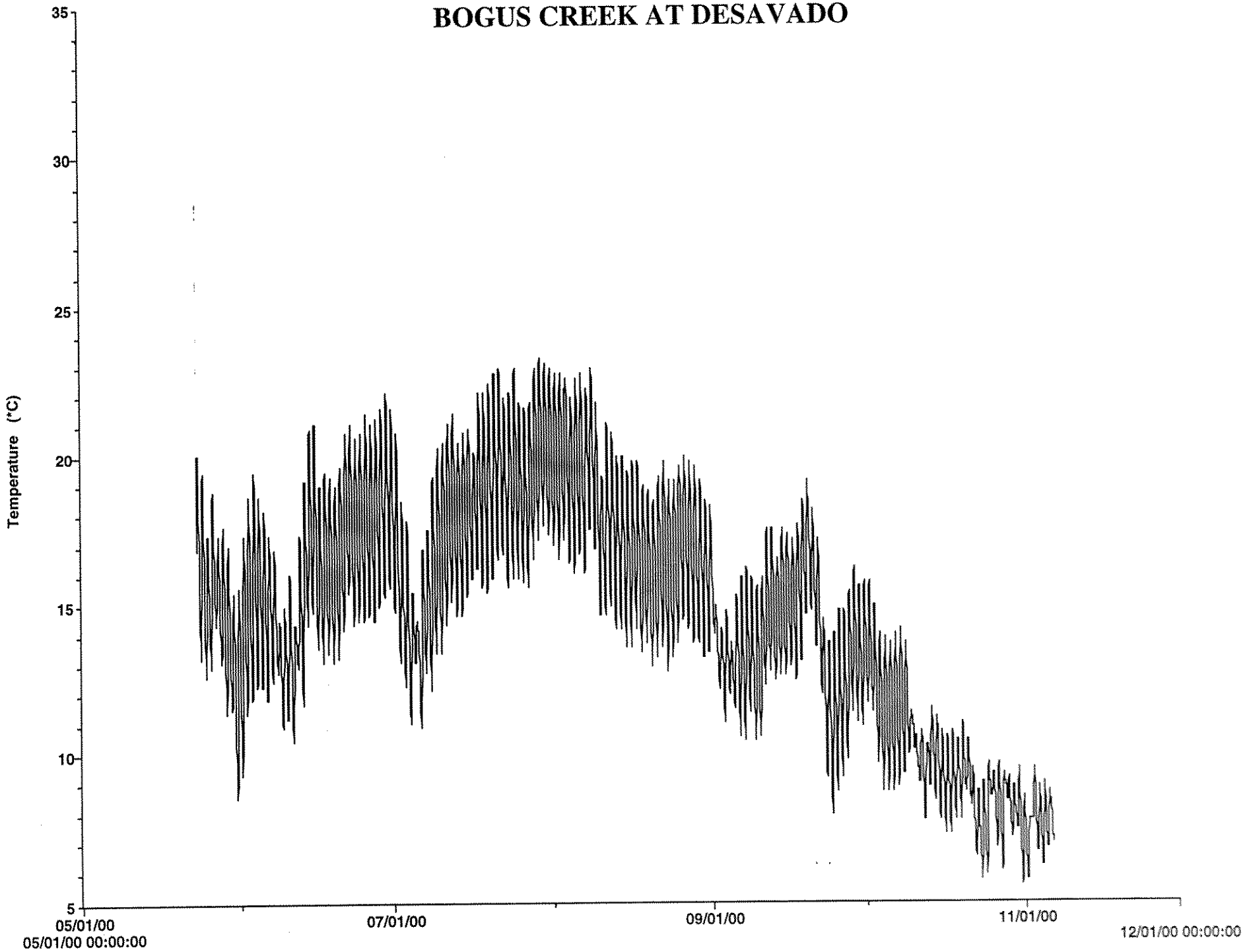

BOGUS CREEK
JUST UPSTREAM OF THE CONFLUENCE
WITH COLD CREEK
Temperature (°C)
35
30
25
20
15
10
5
05/01/00
05/01/00 00:00:00
07/01/00
09/01/00
11/01/00
12/01/00 00:00:00

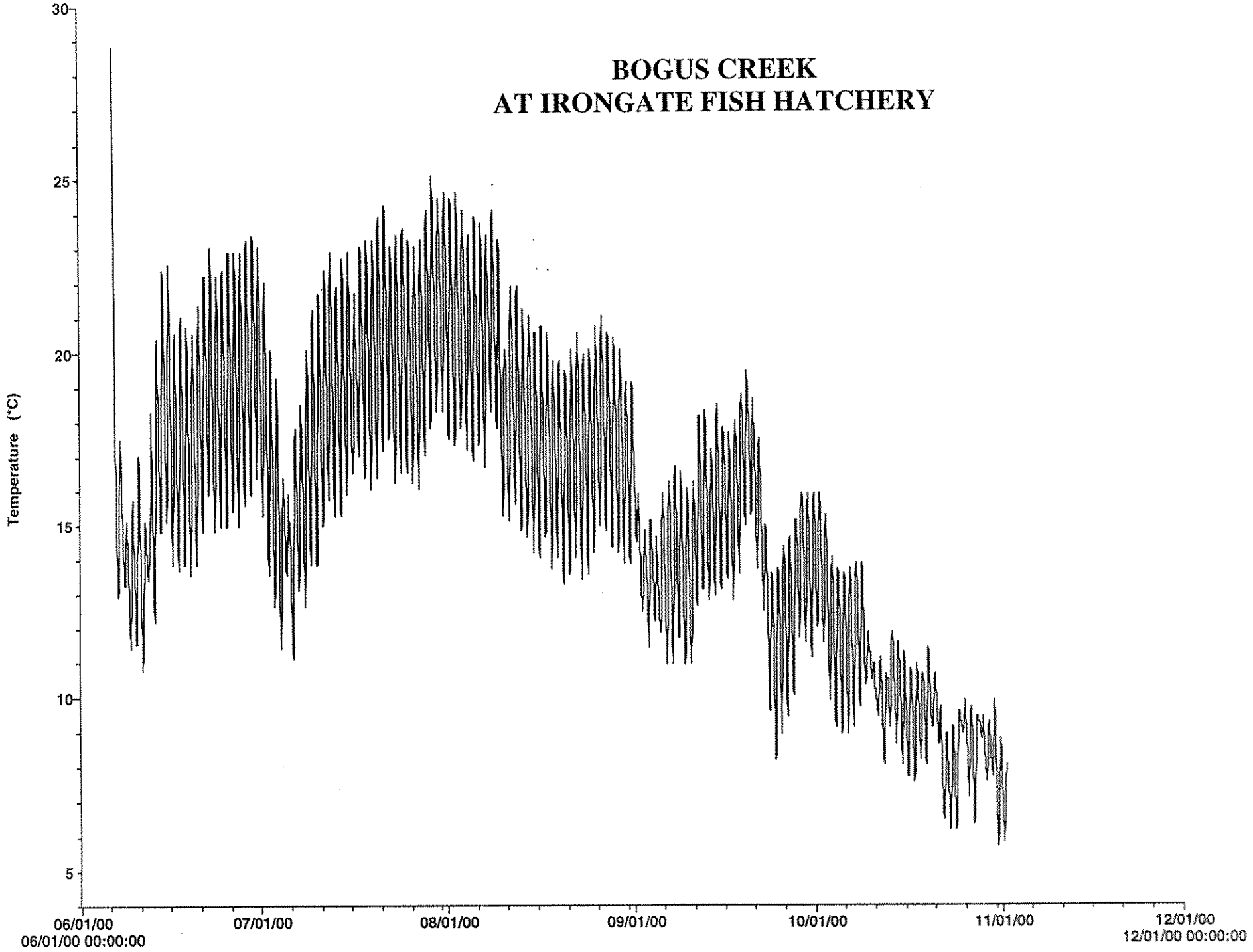

BOGUS CREEK JUST DOWNSTREAM OF
THE CONFLUENCE WITH COLD CREEK
Temperature (*C)
35
30
25
20
15
10
5
05/01/00
05/01/00 00:00:00
07/01/00
09/01/00
11/01/00
12/01/00 00:00:00

BOGUS CREEK AT JUST UPSTREAM OF THE CONVICT FISH LADDER



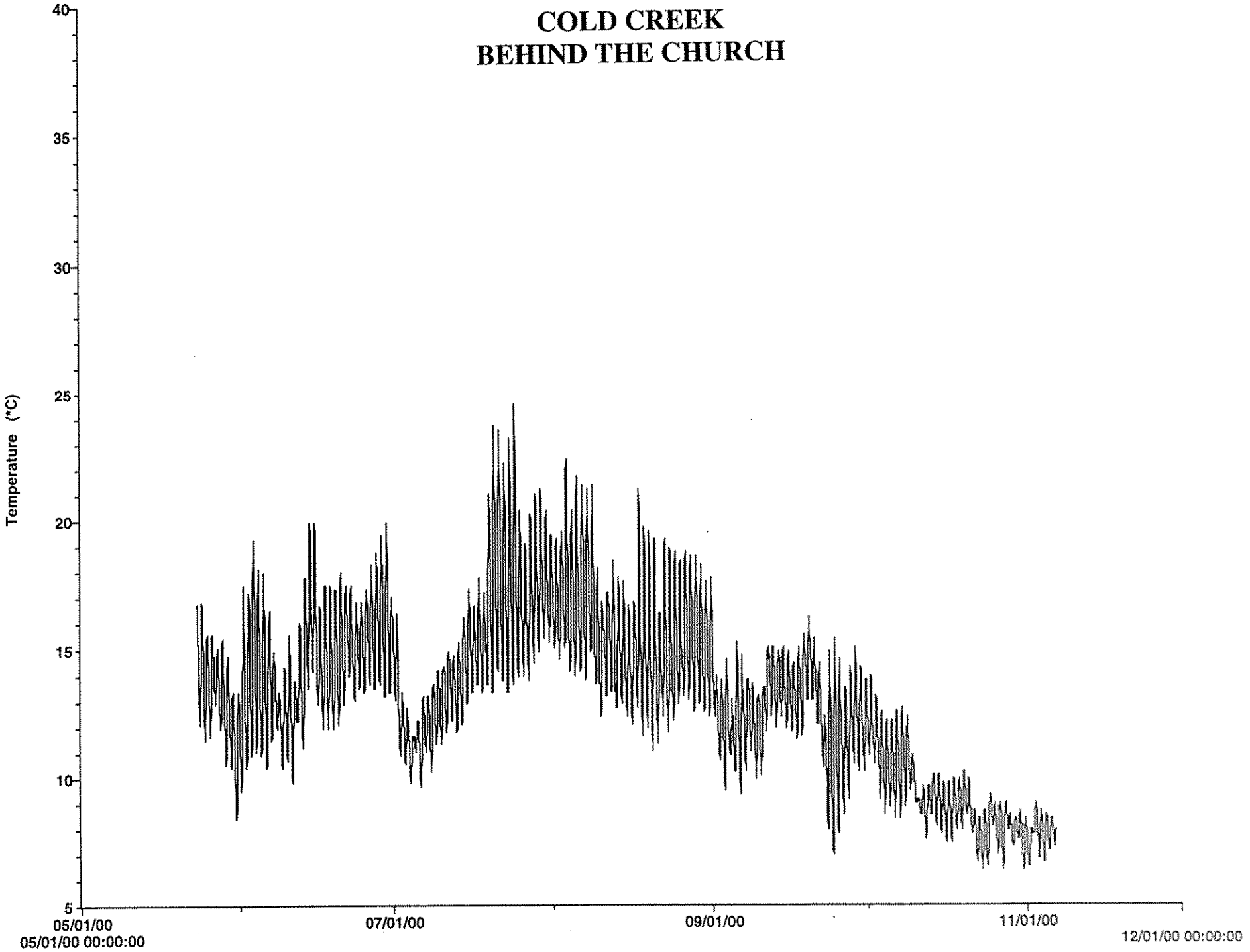
BOGUS CREEK AT DESAVADO




BOGUS CREEK
AT IRONGATE FISH HATCHERY
Temperature (°C)
30
25
20
15
10
5
06/01/00
06/01/00 00:00:00
07/01/00
08/01/00
09/01/00
10/01/00
11/01/00
12/01/00
12/01/00 00:00:00

Appendix C

Butte Valley High School Temperature Graphs


COLD CREEK
BEHIND THE CHURCH
Temperature (°C)
40
35
30
25
20
15
10
5
05/01/00
05/01/00 00:00:00
07/01/00
09/01/00
11/01/00
12/01/00 00:00:00

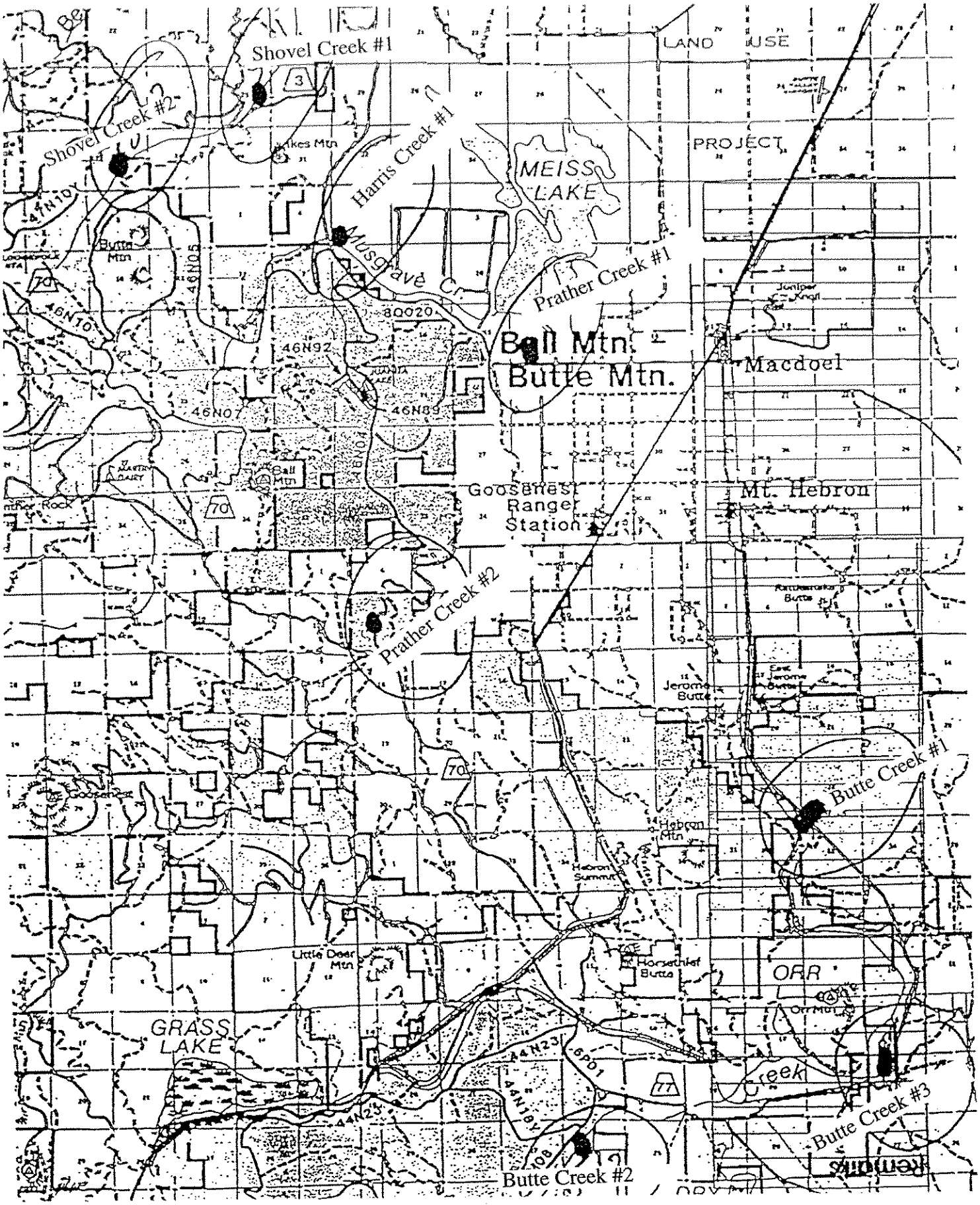
BUTTE VALLEY HIGH SCHOOL
TEMPERATURE MONITORING SITES

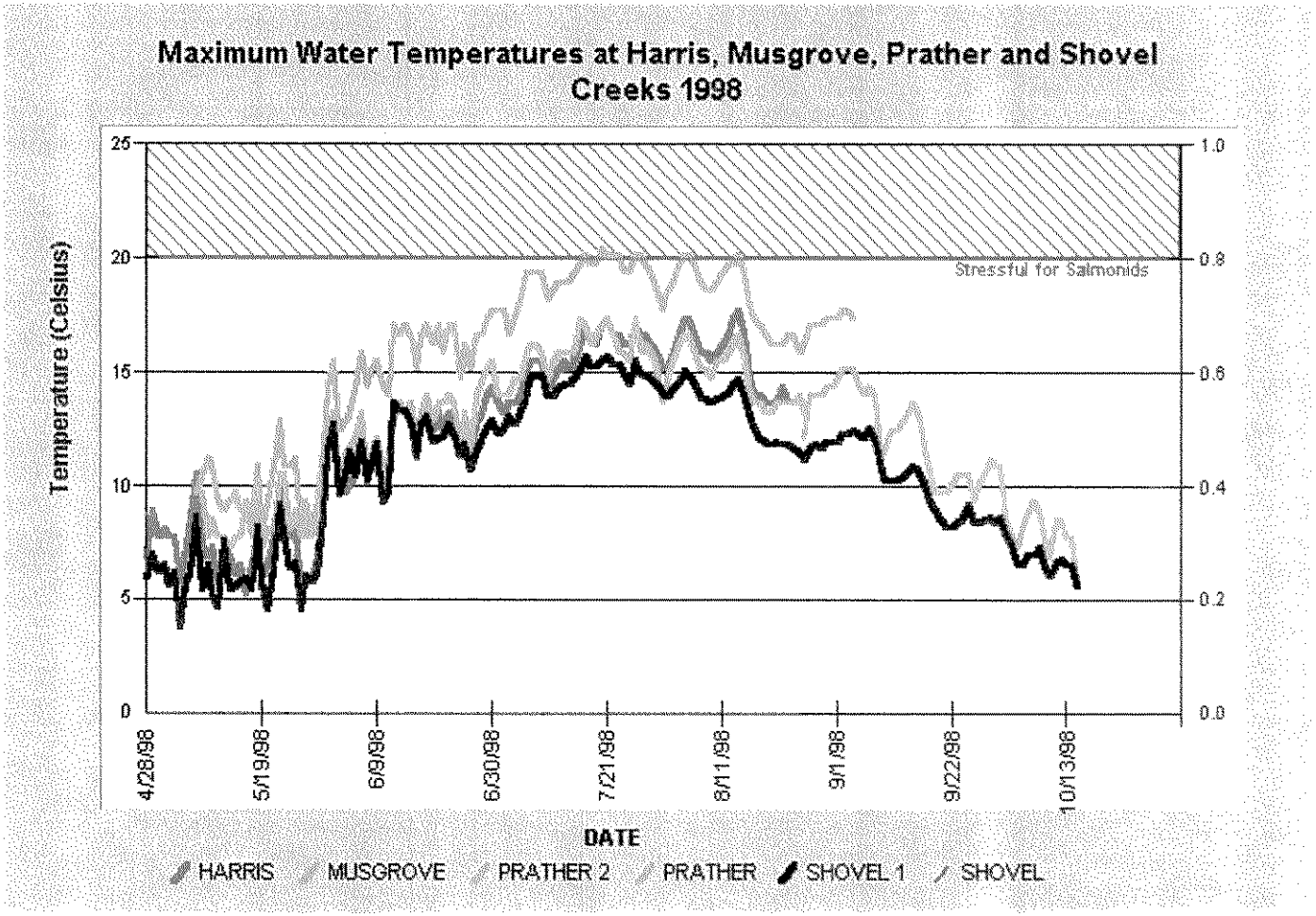
Dave Van Scoyoc Instructor

*Ten study sites.

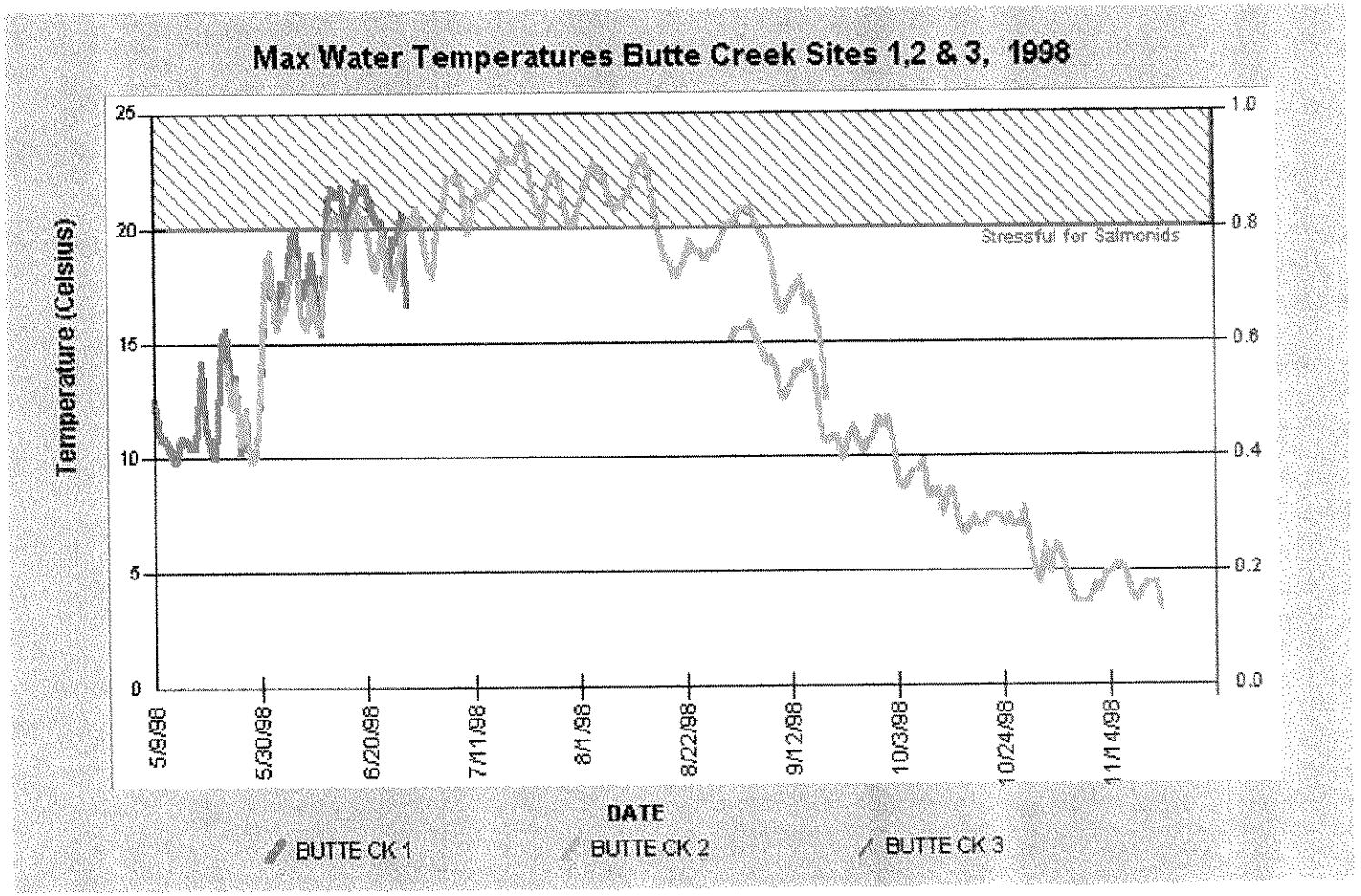
Butte Creek #1	BC1	Shafter Camp Ground
Butte Creek #2	BC2	Soulet Ranch-Just south of the Tennant/Hwy 97 paved road
Butte Creek #3	BC3	In Bray Canyon
Harris Creek #1	HC1	Butte Valley Wildlife Refuge-Just east of the Meiss Lake Road crossing
Musgrave Creek #1	MC1	On North Juanita Lake Road-West of Meiss Lake Road
Prather Creek #1	PC1	Butte Valley Wildlife Refuge-Just north of the Meiss Lake Road crossing
Prather Creek #2	PC2	In Prather Creek Canyon
Shovel Creek #1	SC1	Timber Products land-Just west of the lower crossing bridge
Shovel Creek #2	SC2	In the Meadow near the Kuck Cabin
Shovel Creek #3	SC3	Burnt Camp

BUTTE VALLEY HIGH SCHOOL
TEMPERATURE MONITORING SITES





Maximum daily water temperatures during the summer of 1998 for Harris, Musgrove, Prather and Shovel Creeks in Butte Valley. Of the four creeks shown, only Musgrove Creek has peak temperatures which are occasionally stressful for salmonids. Data collected by Dave Van Scoyoc, and students from Butte Valley High School. Data is shown for Prather Creek site 2, in Prather Canyon, and Shovel Creek site 1, just west of the lower crossing bridge on Timber Products land.



The daily maximum water temperatures at three Butte Creek sites during the summer of 1998. Data recorded with Hobo Temp remote temperature sensing devices. Data collected by Butte Valley High School students and instructor Dave Van Scoyoc. Butte Creek Site 1 is at Shafter Campground, this probe was accidentally set for a two month interval rather than a four month interval. Butte Creek Site 2 is at the Soulet Ranch, the Hobo Temp probe which collected data from May through August was lost. Butte Creek Site 3 is in Bray Canyon. Chart table BVbtck98.dbf was constructed from the source table BUVA9798.DBF.

Appendix D

Discovery High School

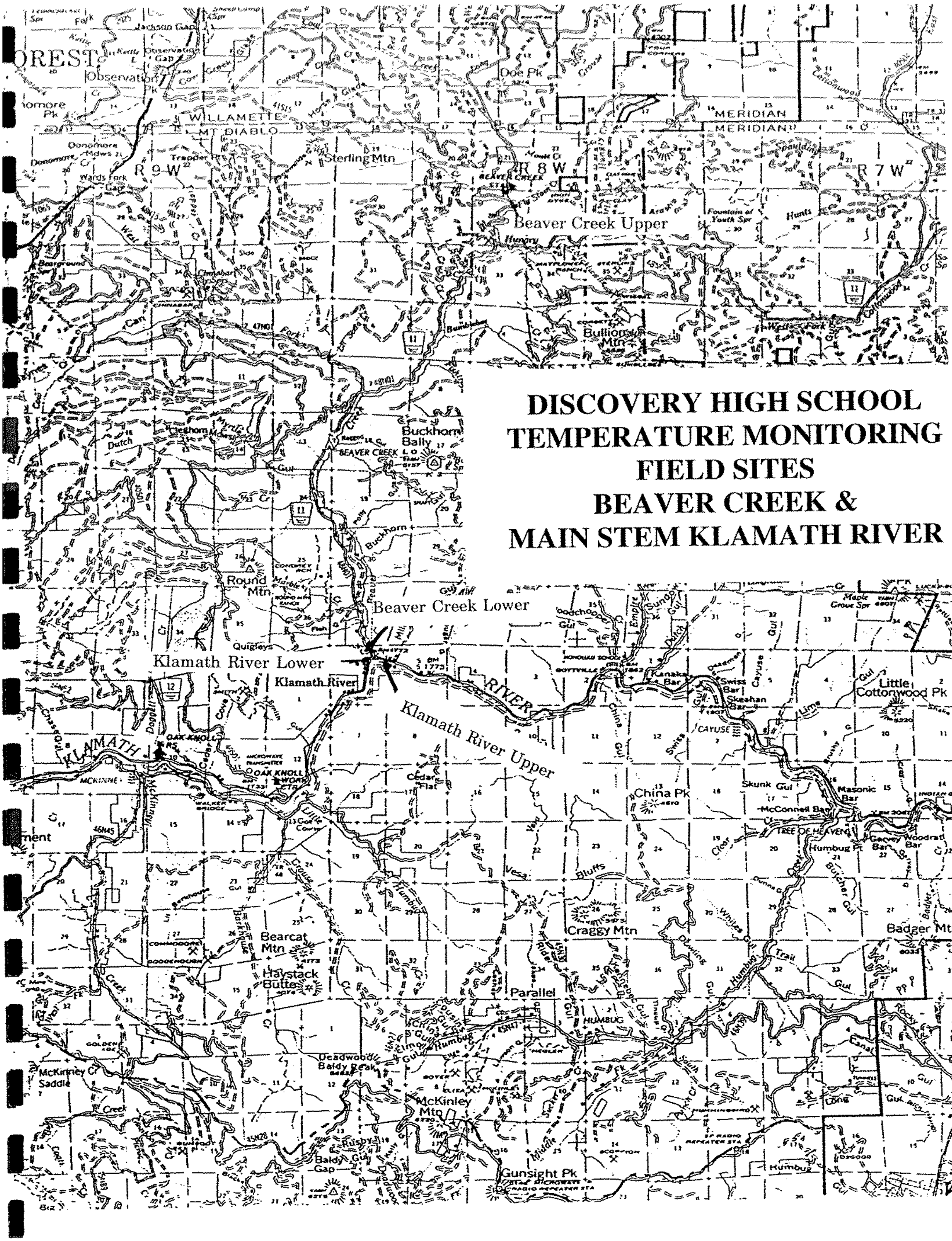
DISCOVERY HIGH SCHOOL
TEMPERATURE MONITORING
FIELD SITE LOCATIONS

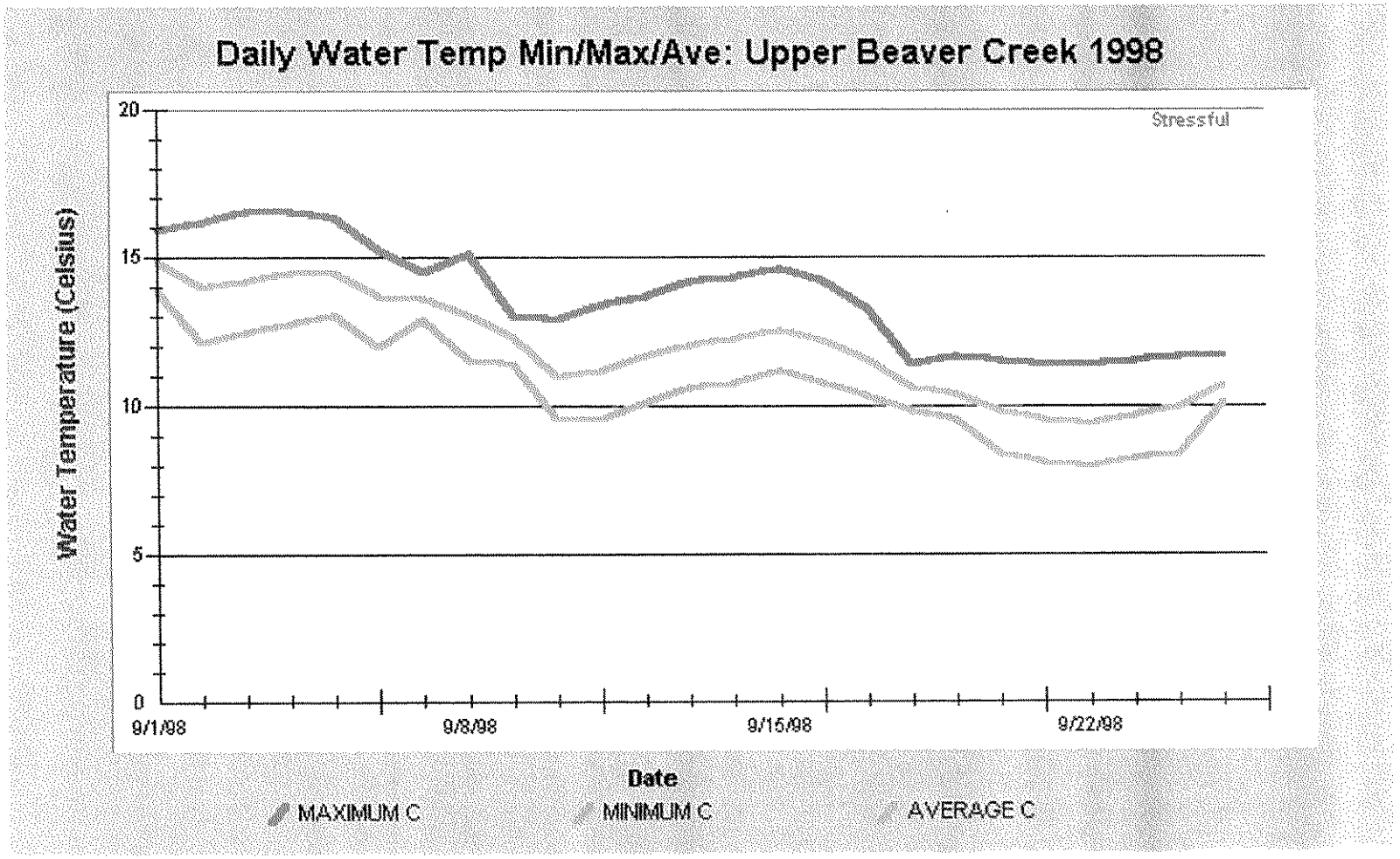
- *Field Sites for DiscoveryHigh School fall into two groups: Yreka Creek and its confluence with the Shasta River, and Beaver Creek and its confluence with the Main Stem of the Klamath River.*

Field Site Designations

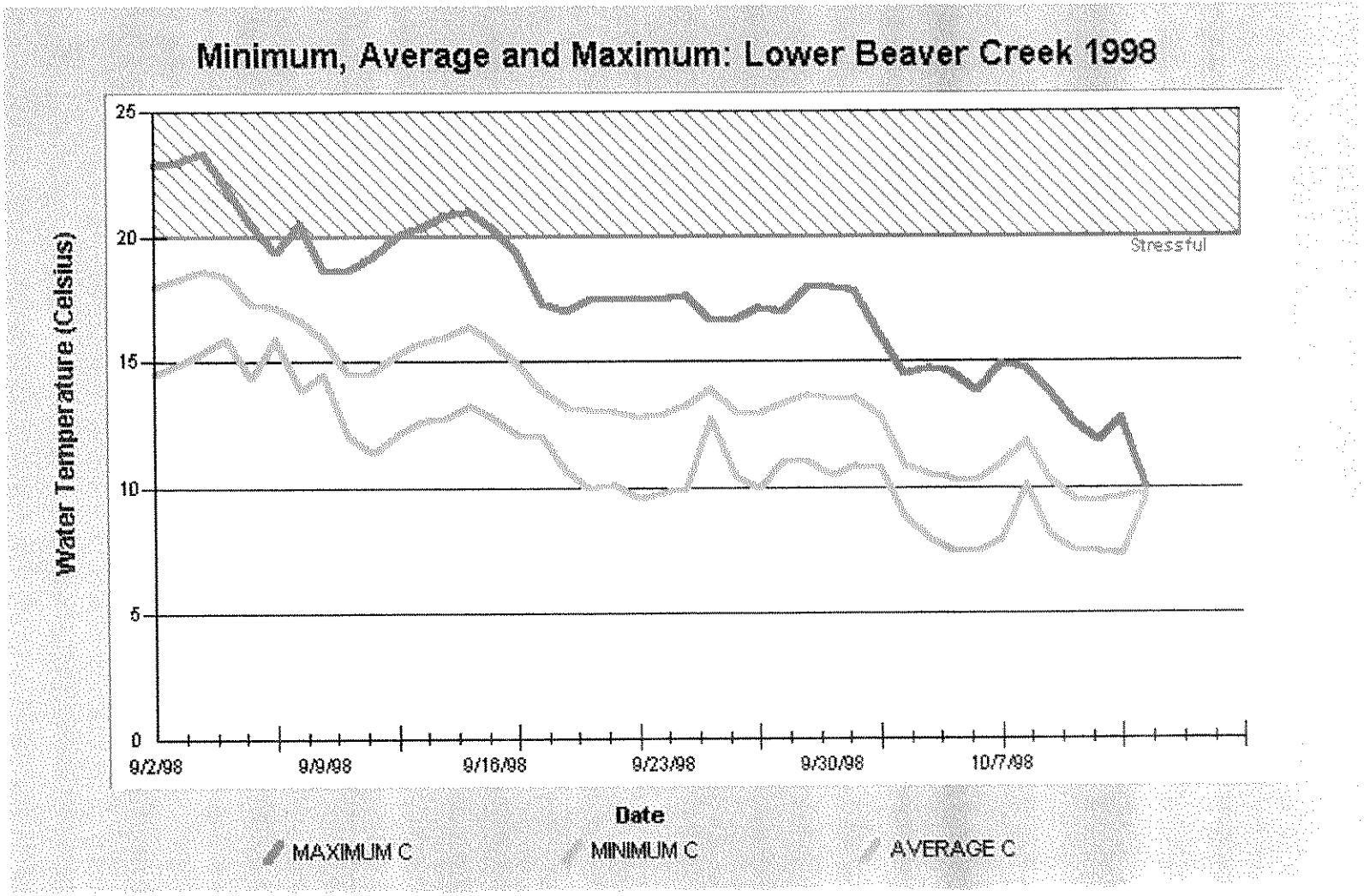
YCU	Yreka Creek Upper	Kevin Velarde	Fairgrounds
YCM	Yreka Creek Middle	Kevin Velarde	Greenway
YCL	Yreka Creek Lower	Kevin Velarde	Anderson Bridge (Yreka Cr.)
SRU	Shasta River Upper	Kevin Velarde	Anderson Bridge (Shasta)
SRM	Shasta River Middle	Kevin Velarde	Salmon Heaven
SRL	Shasta River Lower	Kevin Velarde	Gillens
BCU	Beaver Creek Upper	Rick Meredith	Oak Knoll Cabin
BCL	Beaver Creek Lower	Rick Meredith	Mouth of Beaver Creek
KRU	Klamath River Upper	Rick Meredith	Fisher's Campground & RV
KRL	Klamath River Lower	Rick Meredith	Just Downstream of Confluence with the Main Klamath

DISCOVERY HIGH SCHOOL TEMPERATURE MONITORING FIELD SITES BEAVER CREEK & MAIN STEM KLAMATH RIVER

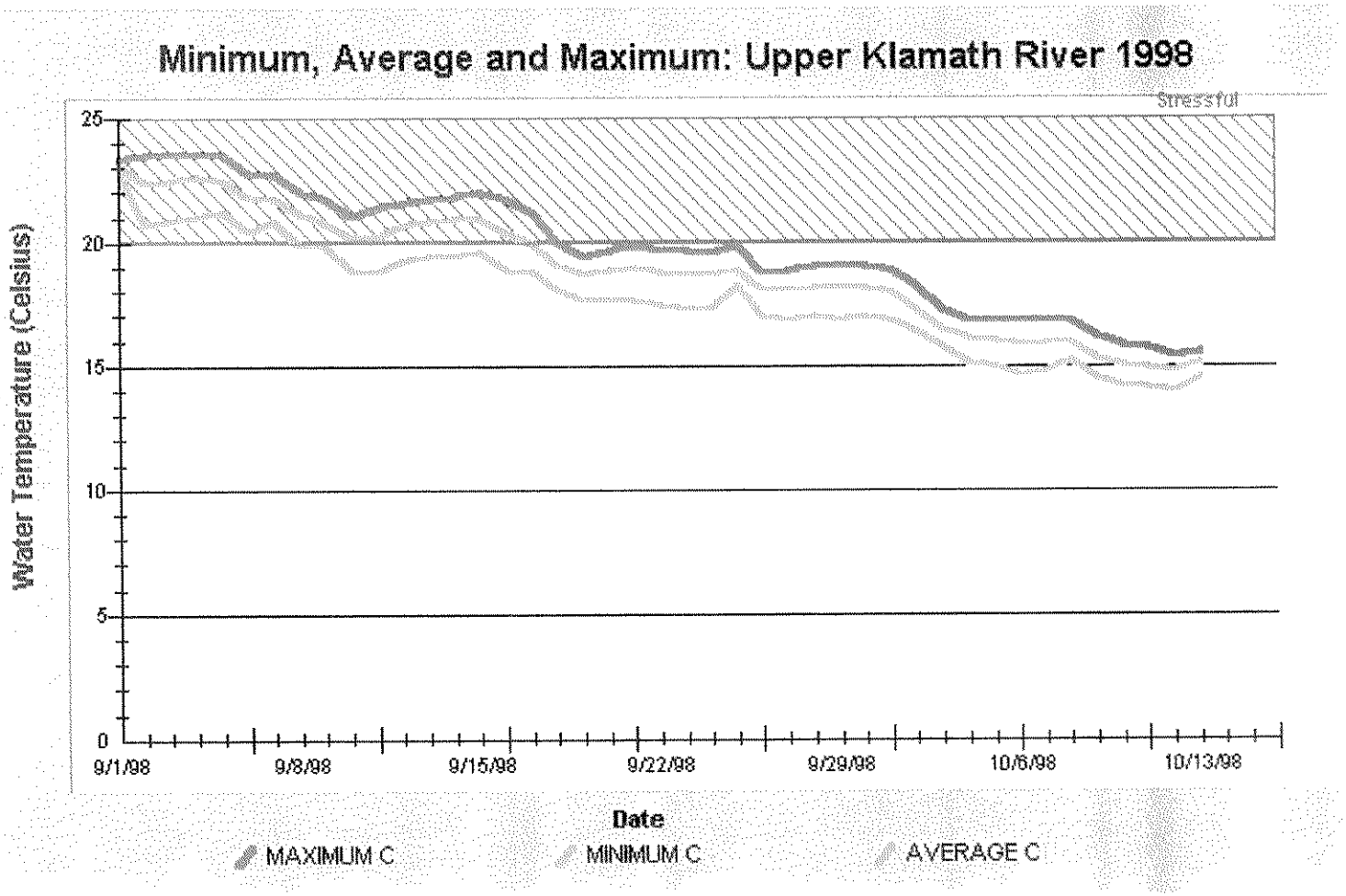




Water temperature data collected by Discovery High School Students. Data was collected using Onset Stow-Away Hobotemps.



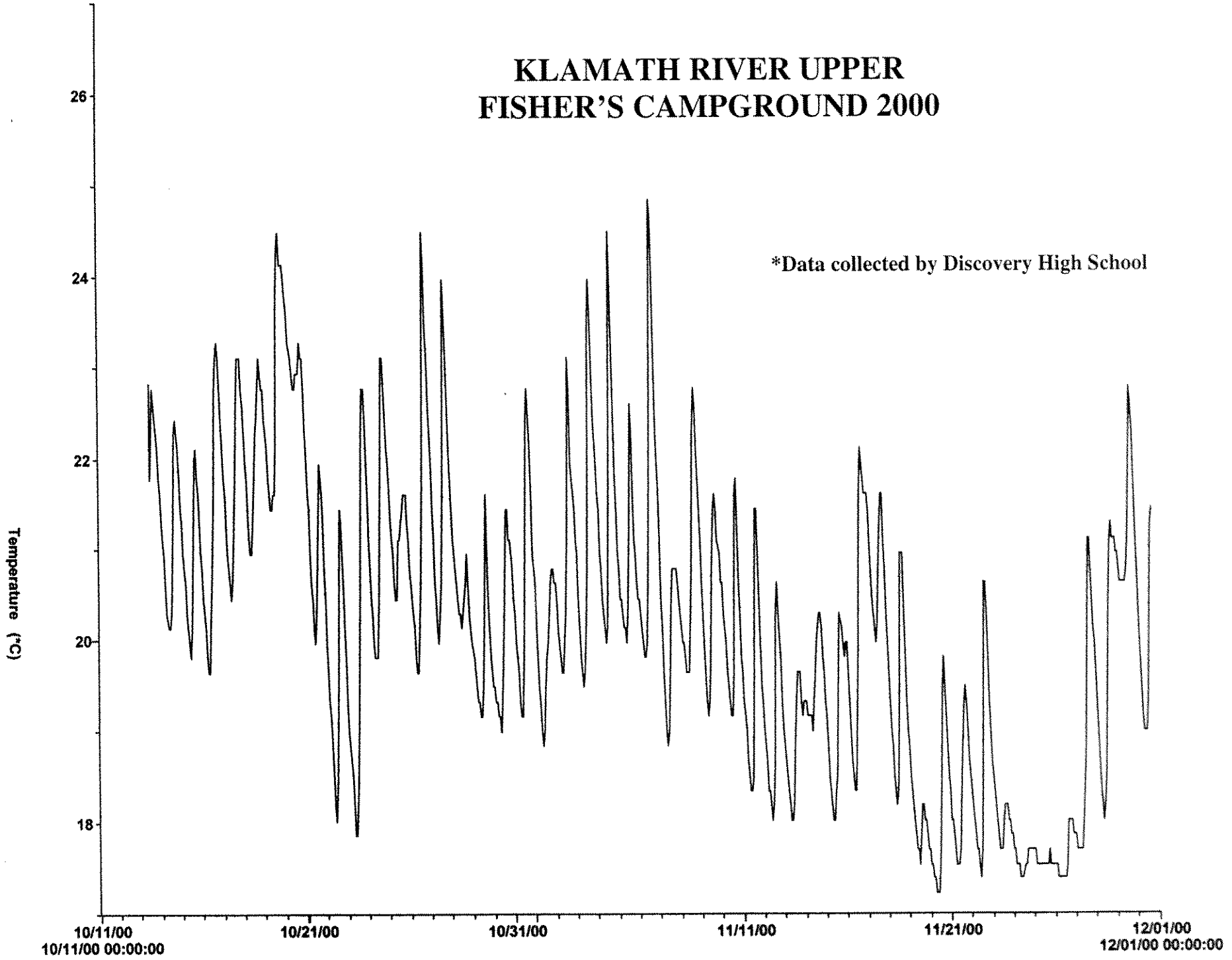
Water temperature data collected by Discovery High School Students. Data was collected using Onset Stow-Away Hobotemps.



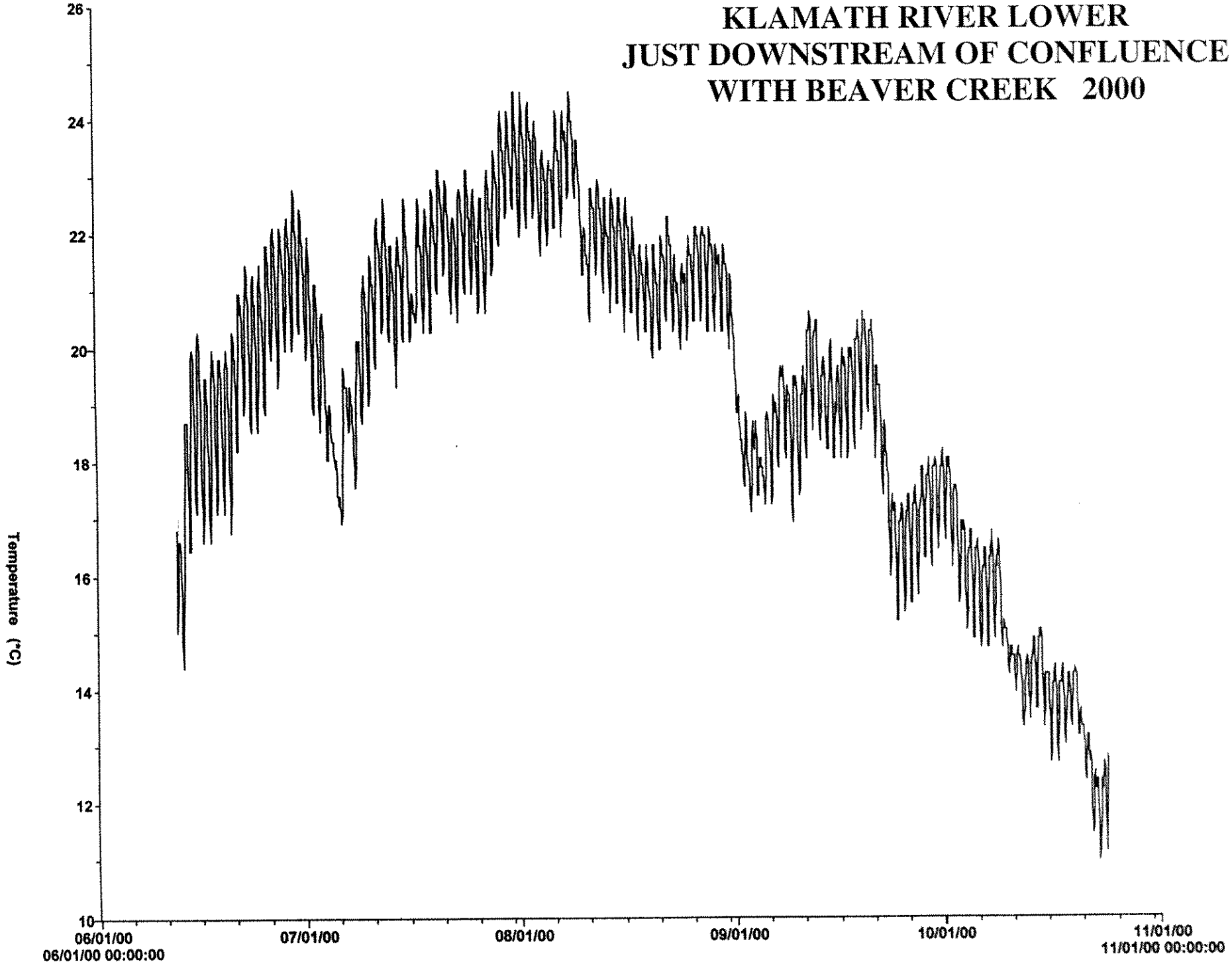
Water temperature data collected by Discovery High School Students. Data was collected using Onset Stow-Away Hobotemps.

KLAMATH RIVER UPPER
FISHER'S CAMPGROUND 2000

*Data collected by Discovery High School



KLAMATH RIVER LOWER
JUST DOWNSTREAM OF CONFLUENCE
WITH BEAVER CREEK 2000



DISCOVERY HIGH SCHOOL
NATURAL RESOURCES PROJECTS

Rick Meredith, Kevin Velarde and Mark O'Connor, teachers at Discovery High School in Yreka, California run an extensive Natural Resources Program. In addition to the collection of water temperature data and the mapping of river cross sectional profiles, students participate in a number of natural resources based activities. In the fall students help the California Department of Fish and Game conduct spawning surveys, to determine the number of salmon spawning in the Scott and Shasta rivers. Students attend a full day white water safety training and an intensive two-day course where they learn to identify adult salmonids and practice walking stream reaches and survey skills to prepare for salmon survey. Students also learn to identify juvenile salmonids using under water survey techniques. Stream Condition Inventory procedures were used to assess stream health using physical measurements. Discovery High School students often volunteer at the Iron Gate Fish Hatchery, learning many facets of hatchery production.

Oak Knoll Education Center on Beaver Creek was constructed to a large extent by Discovery High School students over a five year period. The facility is designed to serve as a field research center for the Yreka High School District. Beaver Creek provides an excellent opportunity to conduct long term field studies. Discovery High School currently monitors water temperatures in Beaver Creek using remote sensing devices called Stow Aways. Future plans for the Oak Knoll Education Center includes a small scale fish hatchery and multi-day field projects.

The effort of Discovery High School teachers have helped to spark an interest in natural resources careers for many Discovery High School students. A large state of the art green house facility was recently constructed at Discovery High. The green house will serve as a native plant propagation facility, an orchard will be planted and a senior community garden area is planned.

Discovery High School

Discovery High School is a continuation high school in Yreka, CA.. It has an enrollment of between 80 and 120 students, 4 teachers and a principal/superintendent/counselor. Most of the students are between the ages of 16 and 19 years of age and have come to DHS because they have not been successful in the regular school setting. The curriculum is geared to hands-on, outdoor activities with a strong emphasis on natural resources, especially fisheries. In 1991, the school entered into a partnership with the Klamath National Forest to provide educational experiences for students. The partnership resulted in the development of the Oak Knoll Education Center, a residential outdoor school facility. Students have an opportunity to be working in the field four out of five days. Regular trips include water quality and greenhouse activities. Seasonal activities include; HOBO monitoring, salmon and steelhead surveys, juvenile fish surveys, Stream Condition Inventory, stream profiles, salamander and bird surveys, and aquatic insect collecting.
We have HOBOs in upper and lower Yreka Creek, in the Shasta River above and below the mouth of Yreka Creek and at the lower end of the river. We also have them in upper and lower Beaver Creek and in the Klamath River above and below the mouth of Beaver Creek.

Rick Meredith

Instructor: Discovery High School

Assignment: Natural Resources, Science, Math

Bachelor of Science Degree in Zoology, Humboldt State University, 1977

Teaching Credential, Southern Oregon University, 1984

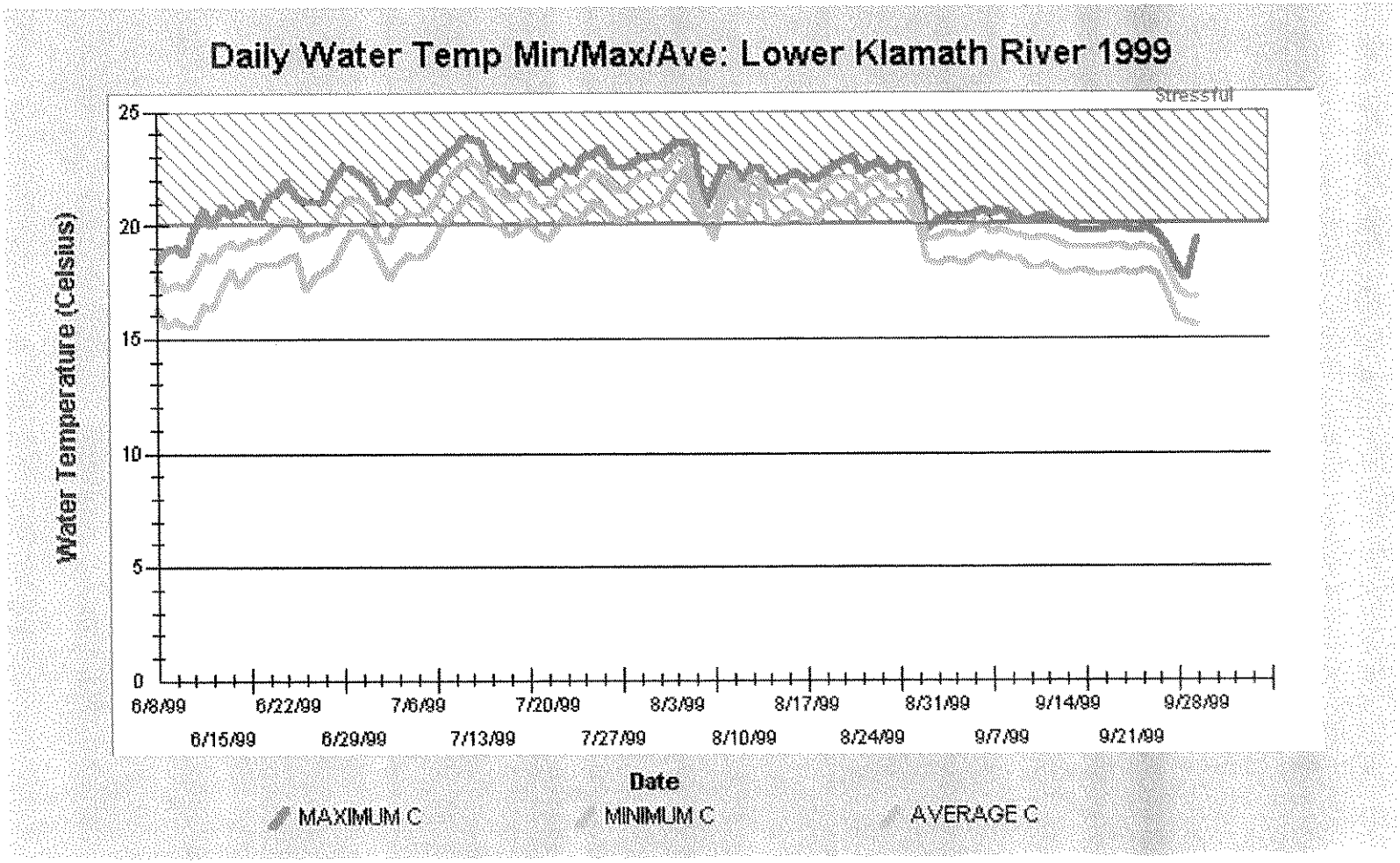
Master of Science Degree in Environmental Education, Southern Oregon University, 1998

Worked as a Wildlife Biologist for the U. S. Fish and Wildlife Service, U.S. Forest Service, National Audubon Society, and Wilderness Research Institute. 1977-1981

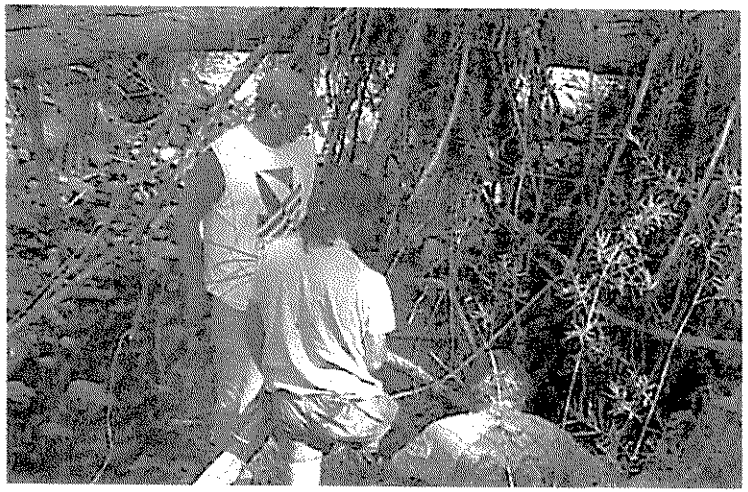
Animal Health Technician at Scott Valley Animal Clinic. 1981-1984

Director of the W.R.I. Wildlife Rescue Center caring for injured and orphaned wildlife of Siskiyou County.

Teacher at Discovery High School, teaching science, math, and natural resources. Developed educational partnerships with the Klamath National Forest and the Calif. Dept. of Fish and Game. Designed and coordinated the development of the Oak Knoll Education Center, a residential, outdoor educational facility.



Water temperature data collected by Discovery High School Students. Data was collected using Onset Stow-Away Hobotemps.



CONTACT OUR PROGRAM

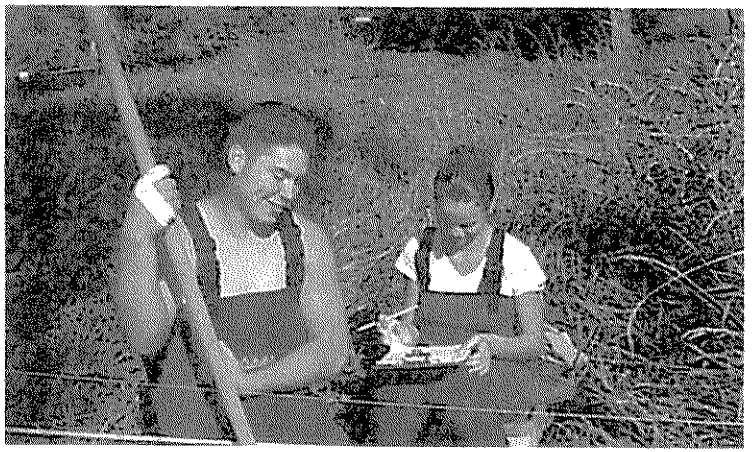
YREKA UNION HIGH SCHOOL DISTRICT

Richard Meredith

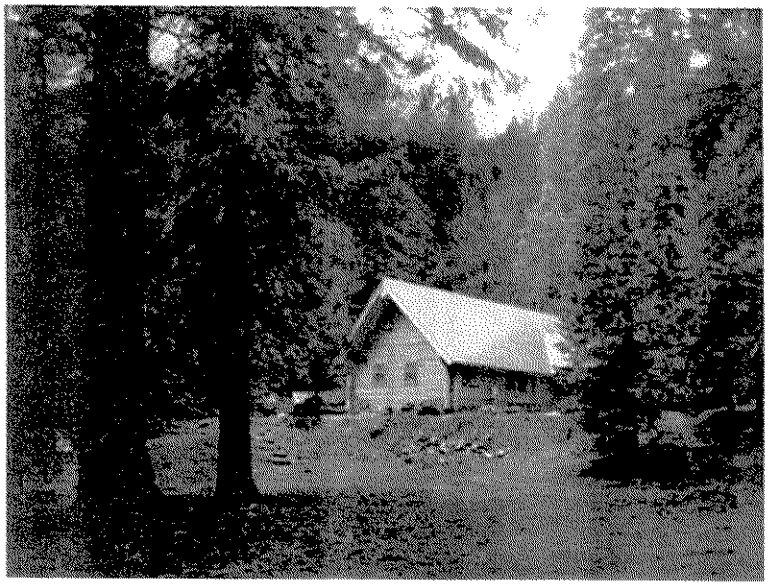
431 Knapp St.

Yreka, CA 96097

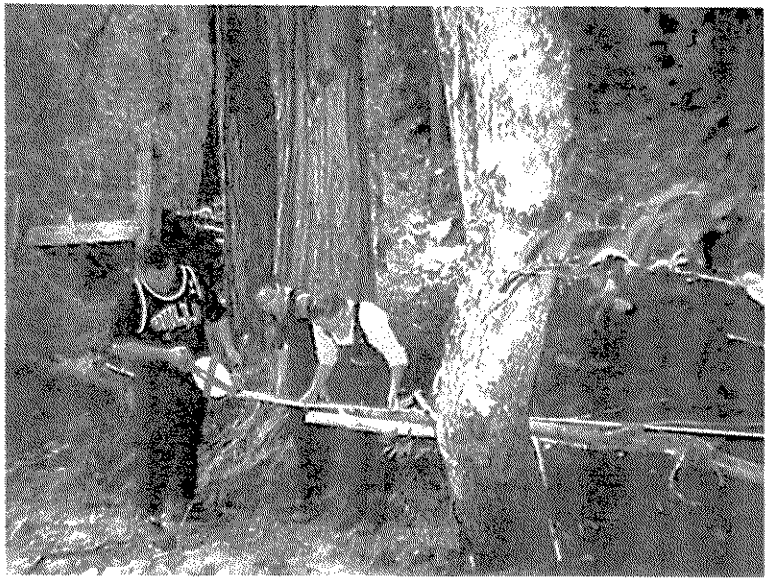
530) 842-6151 ext. 310



OAK KNOLL



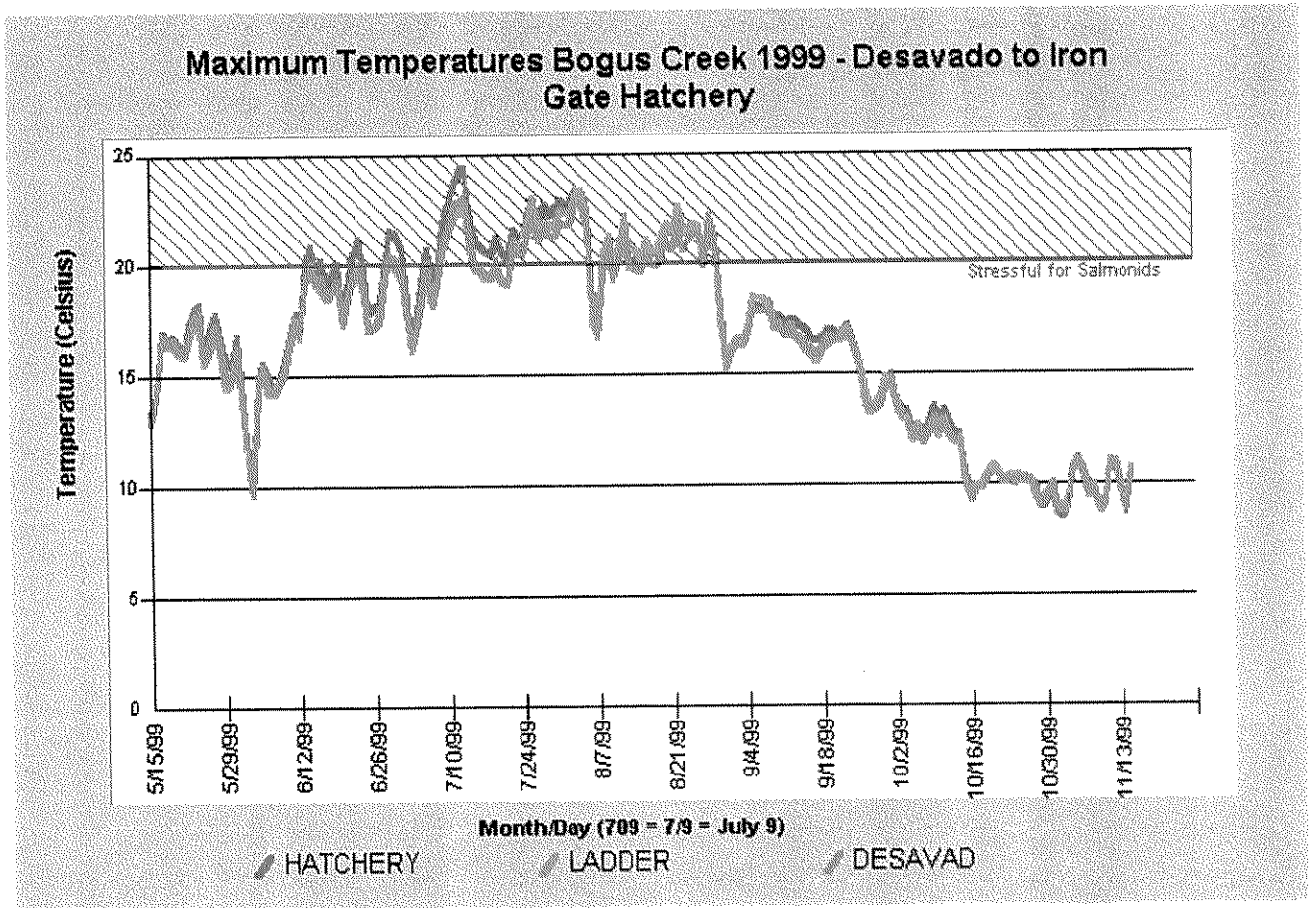
Oak Knoll Education Center



Students completing Stream Condition Inventory

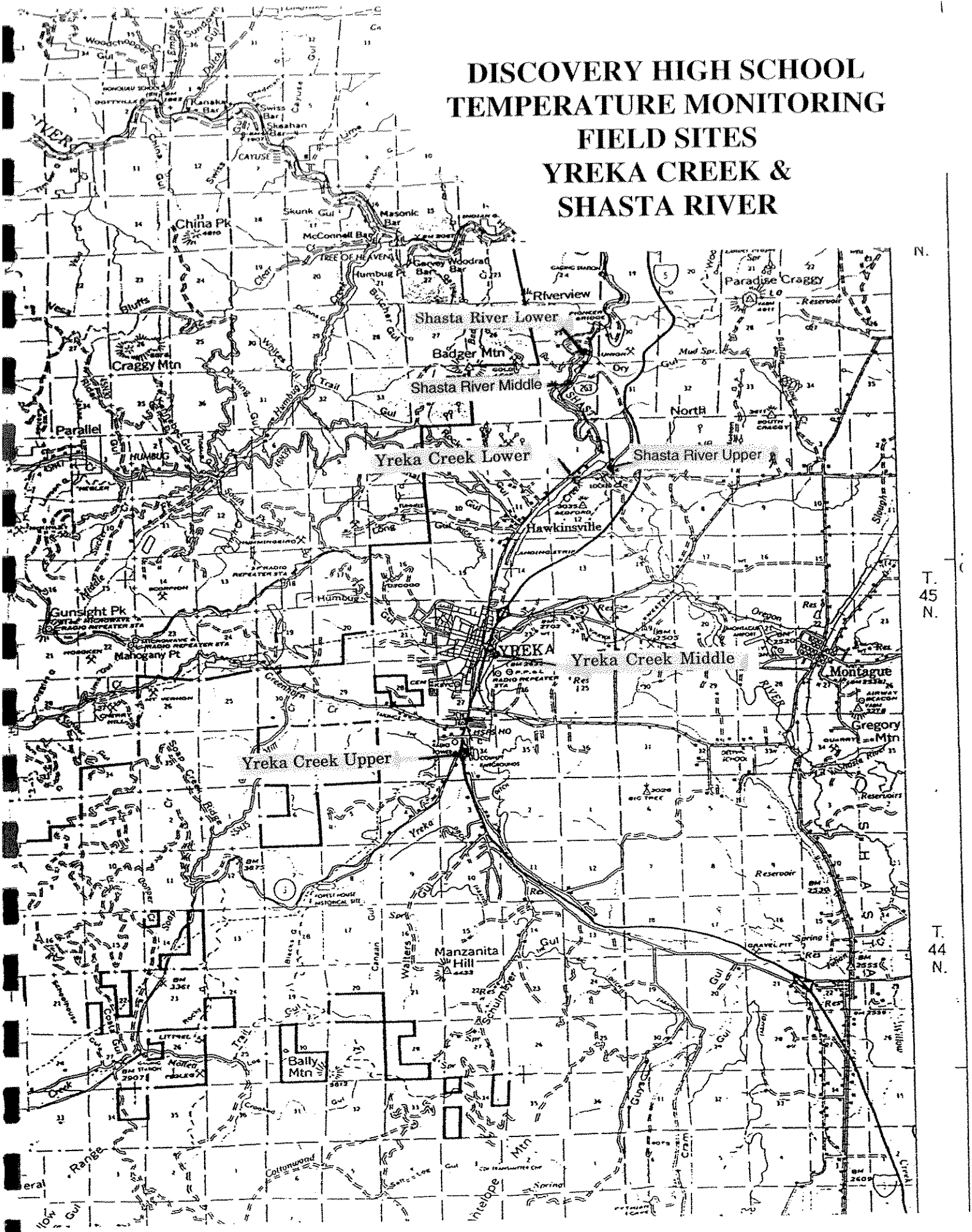
EDUCATION CENTER

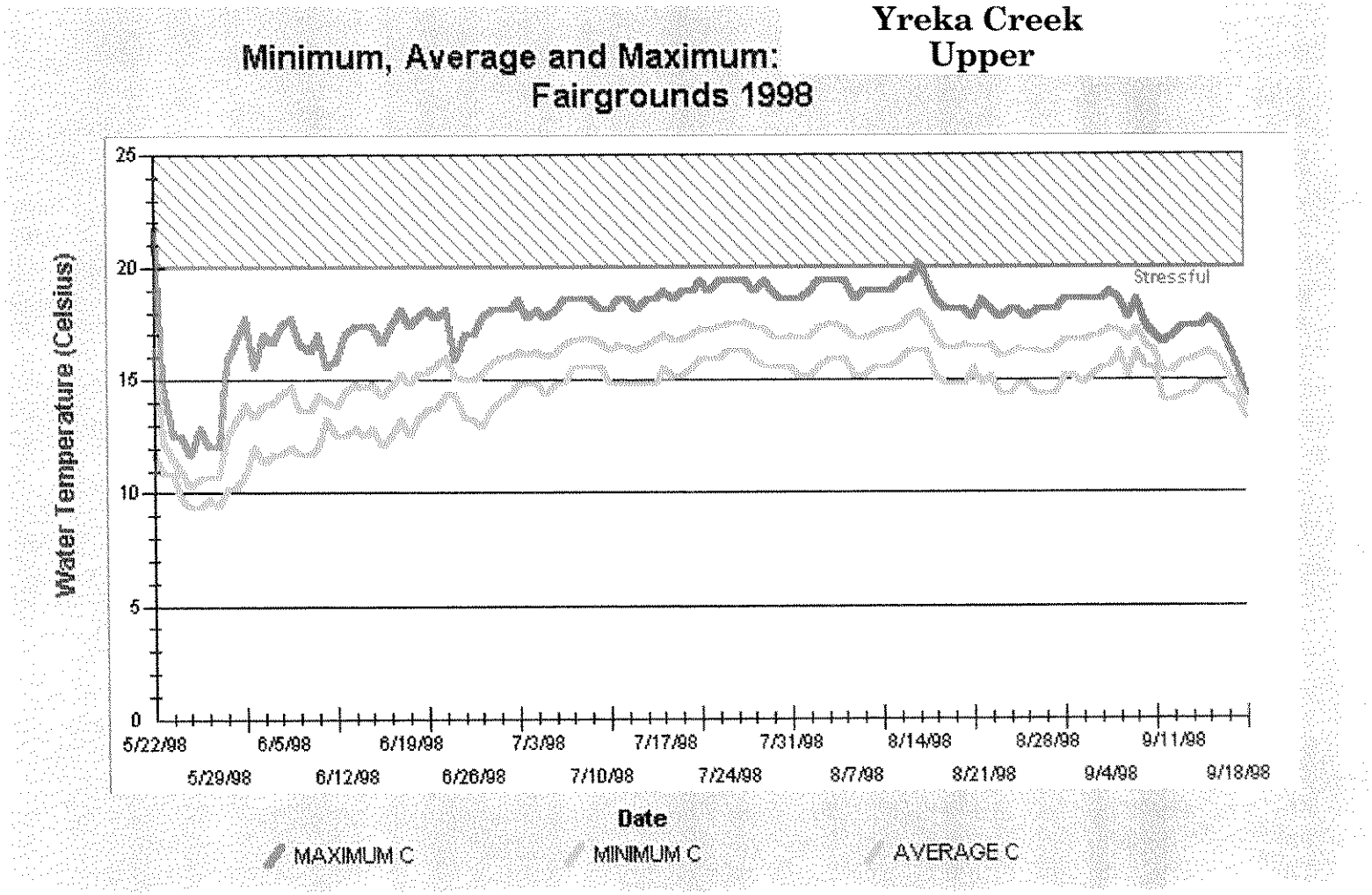
A NATURAL PLACE TO GROW



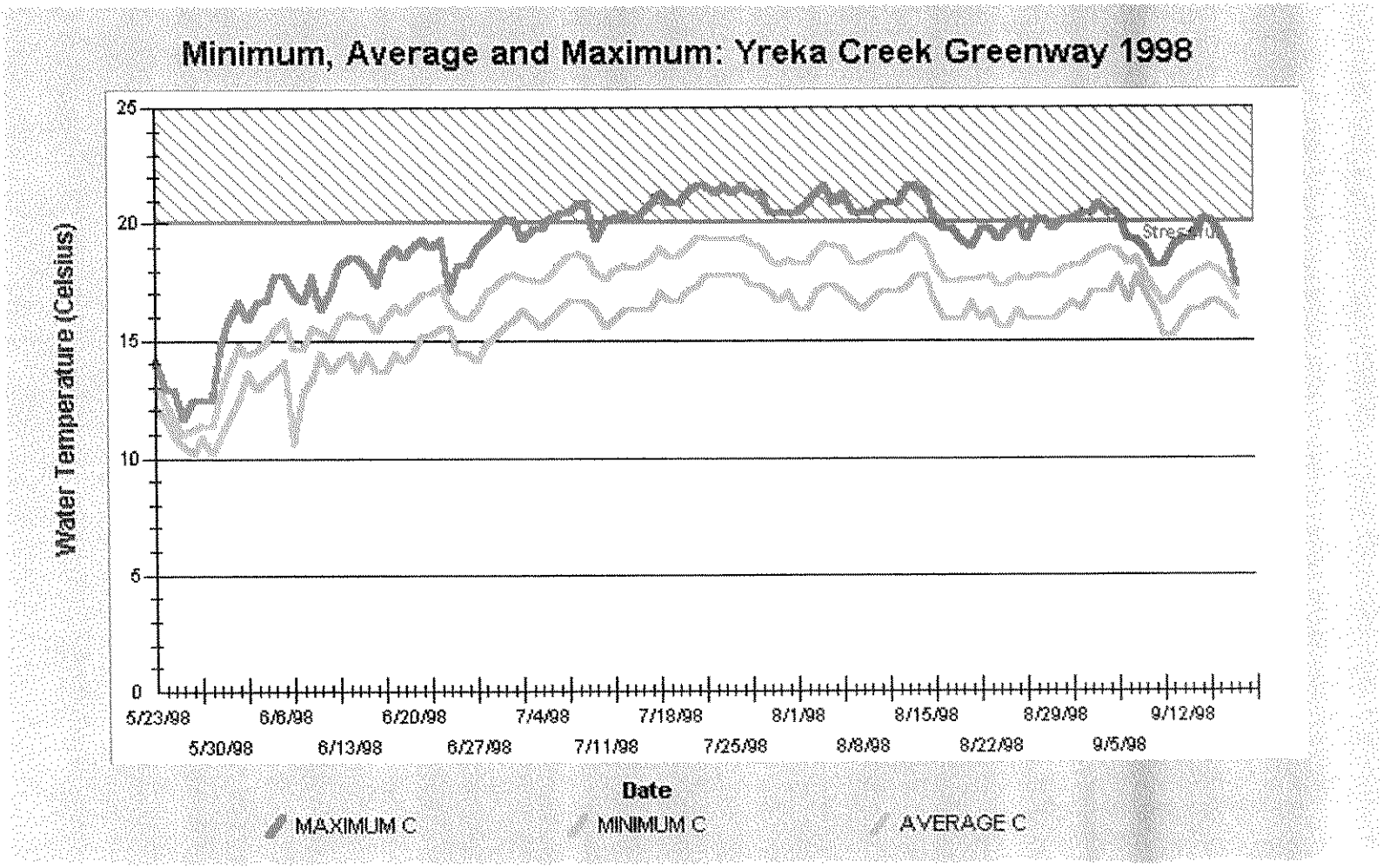
Maximum daily water temperatures during summer of 1999, on Bogus Creek from the Iron Gate Fish Hatchery to the Convict Fish Ladder. Data Collected by Bogus Elementary School using new Stow Away temperature probes. "Hatchery", is at the Iron Gate Fish Hatchery on Bogus Creek, just downstream of the bridge. "Ladder", is just upstream of the Convict Fish Ladder. "Desavado", is between the Iron Gate Fish Hatchery and the Convict Fish Ladder.

DISCOVERY HIGH SCHOOL TEMPERATURE MONITORING FIELD SITES YREKA CREEK & SHASTA RIVER

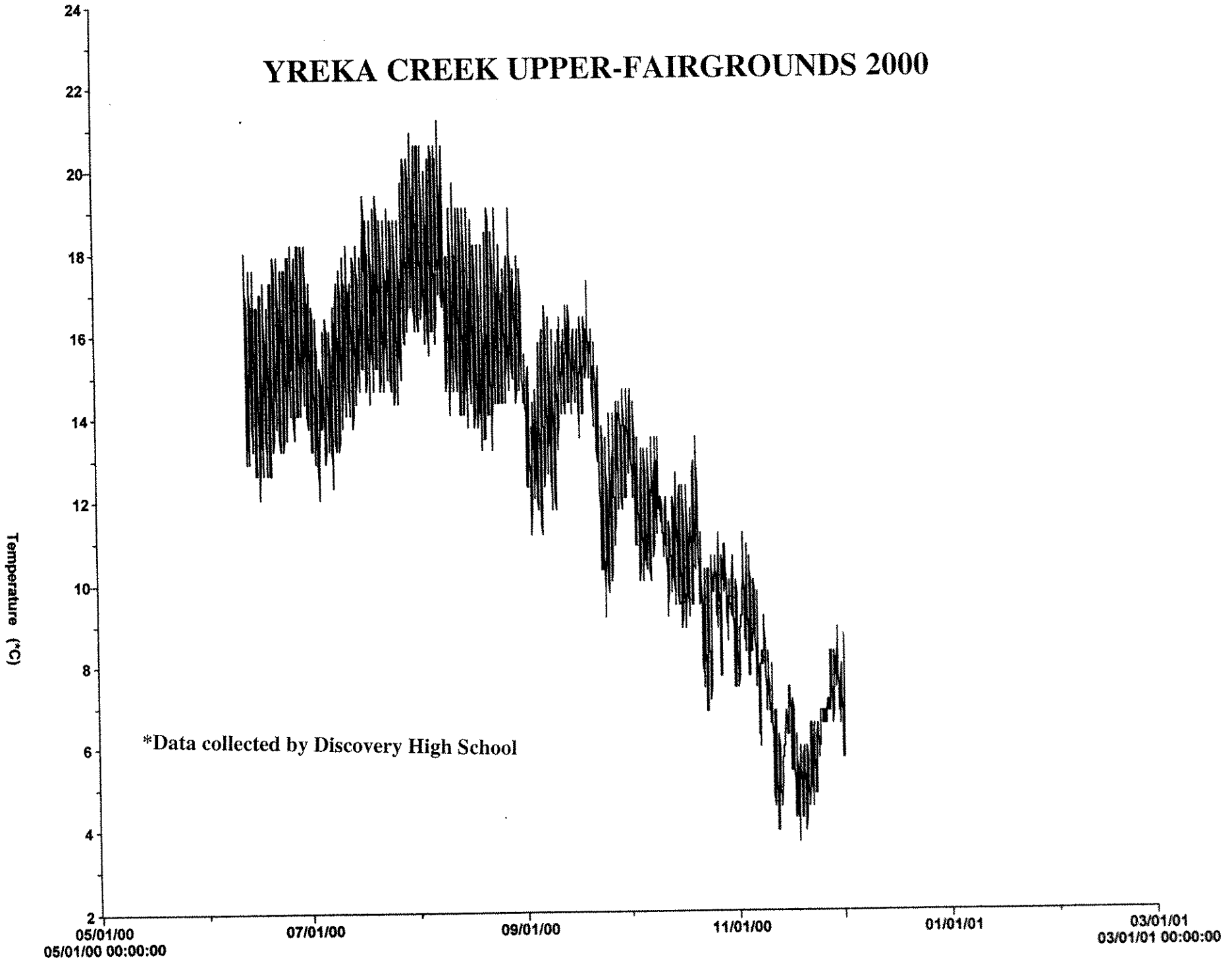




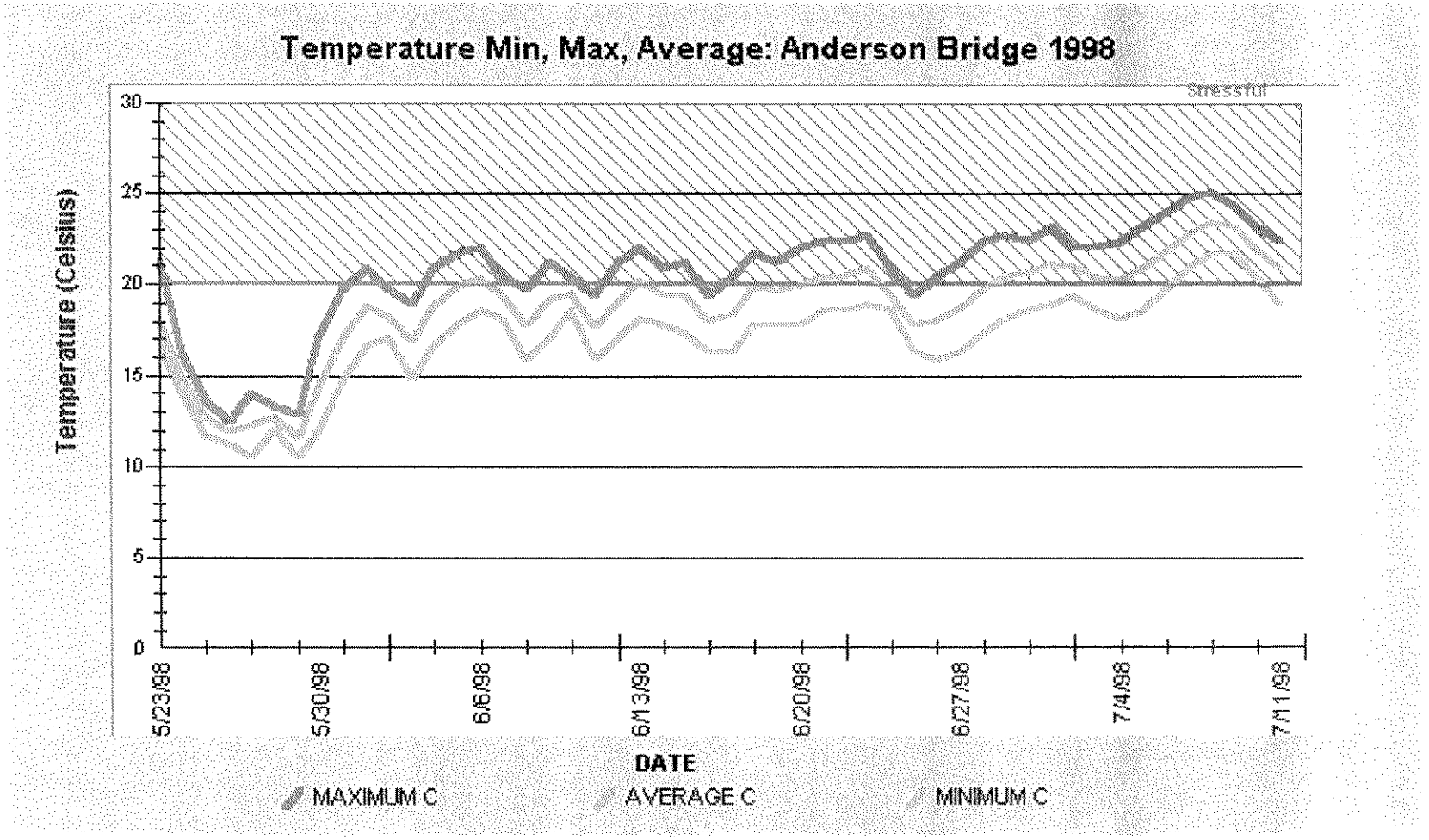
Water temperatures for Yreka Creek, at the Fairgrounds. Data Collected By Discovery High Students using Onset StowAway Hobotemps.



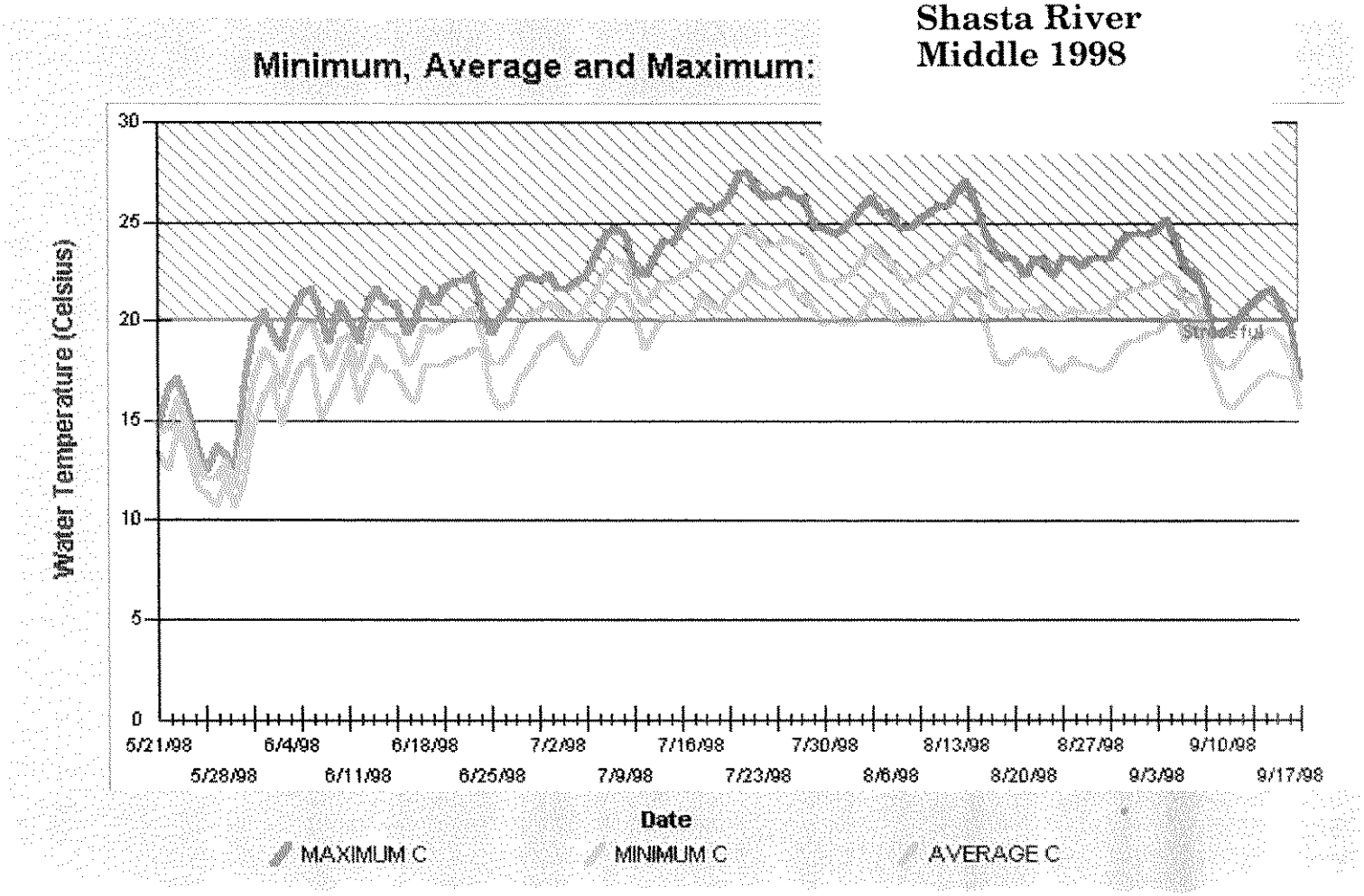
Water temperatures for Yreka Creek, at the Greenway. Data Collected By Discovery High Students using Onset StowAway Hobotemps.


YREKA CREEK UPPER-FAIRGROUNDS 2000
Temperature (°C)
24
22
20
18
16
14
12
10
8
6
4
2
*Data collected by Discovery High School
05/01/00
05/01/00 00:00:00
07/01/00
09/01/00
11/01/00
01/01/01
03/01/01
03/01/01 00:00:00

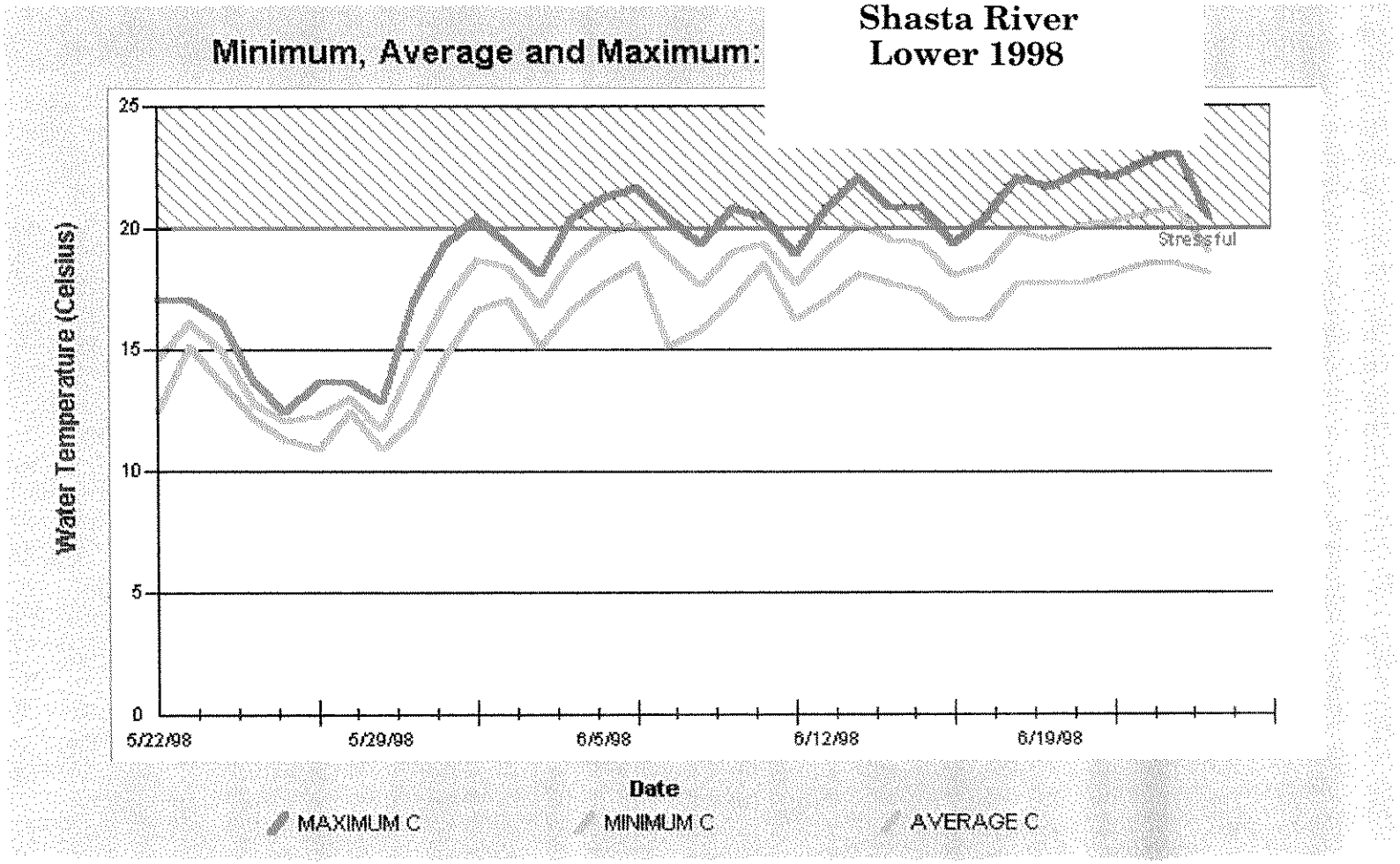
Shasta River
Upper Site



Temperature Data for Shasta at the Anderson Bridge. Data Collected By Discovery High Students using Onset StowAway Hobotemps.

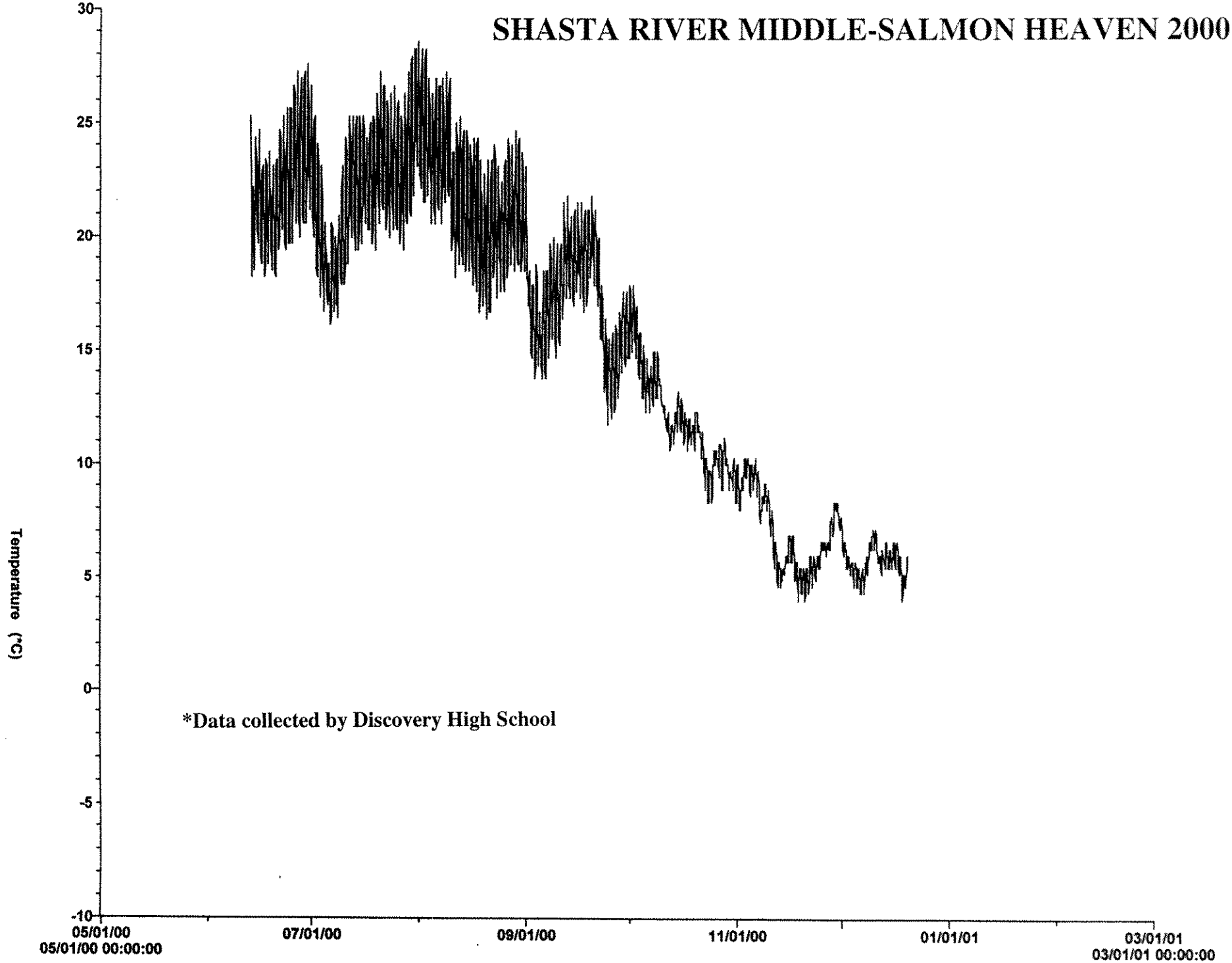


Water temperatures for Shasta River. Data Collected By Discovery High Students using Onset StowAway Hobotemps.



Water temperatures for Lower Shasta Riv. Data Collected By Discovery High Students usingOnset StowAway Hobotemps. Hobotemp was found above water after 6/25. The data was discarded.

SHASTA RIVER MIDDLE-SALMON HEAVEN 2000



*Data collected by Discovery High School

Appendix E

Forks of Salmon Elementary School
Temperature Graphs

DESCRIPTION OF THE SALMON RIVER AREA

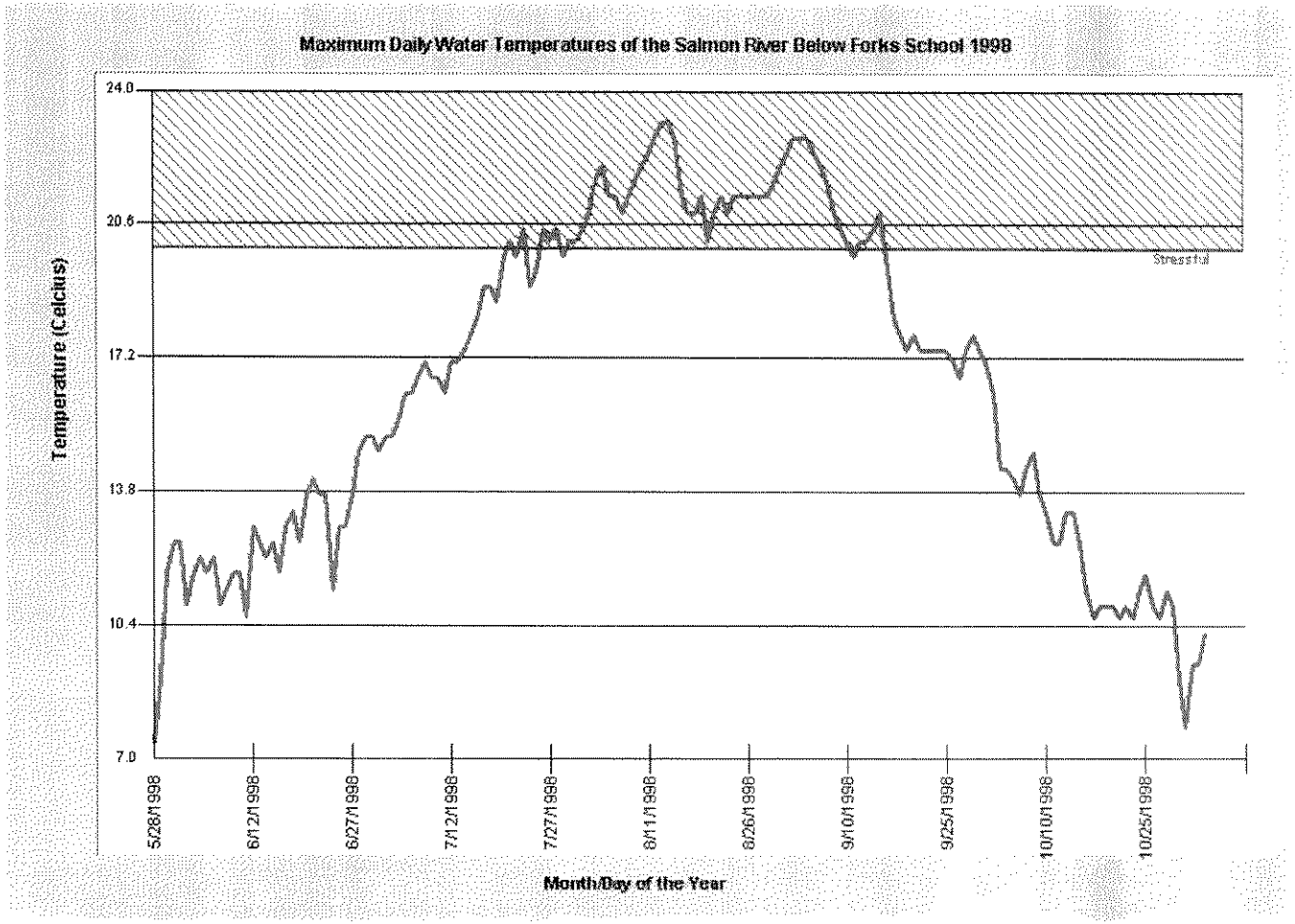
A beautiful emerald river meanders through craggy bedrock canyons and forest of conifer, madrone, and oak. Bobcat, Black bear, gray fox, marten, Chinook salmon, steelhead trout, and mountain lion call the Salmon River Watershed , one of the wildest places still left in California, their home. This sub-watershed, is part of the Klamath Basin with 98.7% of the land part of the Klamath National Forest.

The area around the Forks of Salmon School is steep and breathtaking. We are surrounded by towering peaks green forests and pristine river systems. Our school is located right after the mergence of the North Fork and South Fork of the Salmon River. Past our school, the river is referred to as the mainstem of the Salmon River. Meandering below the Forks School, the Salmon River flows westward out to the Klamath River. This huge river will eventually end at the Pacific Ocean.

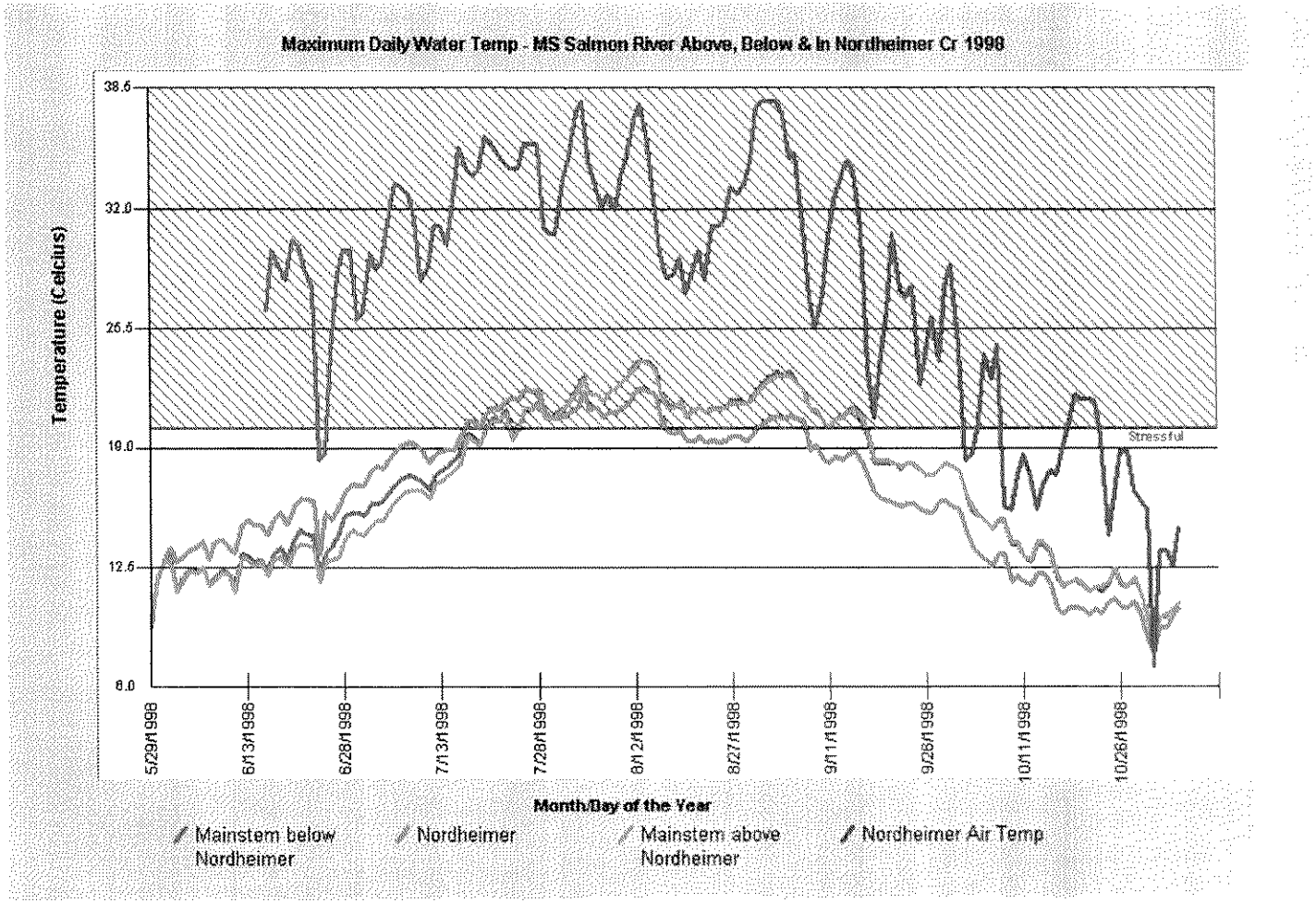
Forks School has shrunk in recent years. We have K-8th grades all taught by one teacher. With logging and mining activities dwindling down, the population of Forks of Salmon has drastically shrunk. Total enrollment at Forks School is at 9 students. A positive aspect of the small class size is that fieldtrips to places in the watershed are frequent. We collect and key out aquatic insects, plant native plants on riverbars, and do wildlife observations. In the fall we are lucky enough to observe Chinook Salmon passing right below our classroom as they make their journey upriver to their spawning grounds. Amazingly enough, these spawning areas are the same places where they emerged from as small fry. We have a hobo temp located below the school that records the water temperature of the Salmon River. Forks School also has hobo temps in several of the river's tributaries. Part of our classroom activities include analyzing the graphs of these temperatures.

Sawyers Bar Elementary School is located on the North Fork of the Salmon River. Our school is a traditional one-room schoolhouse with grades K-8th. When the US Forest Service moved its Salmon River Ranger District Office out to Ft. Jones in 1989, our town was heavily impacted. With the relocation, many families left the area. Each year since the move we have had less students. Historically, resource extraction has made up our economic base. With these operations being phased out, Sawyers Bar has few jobs to attract people. Sawyers Bar School now has a total of 8 students in school.

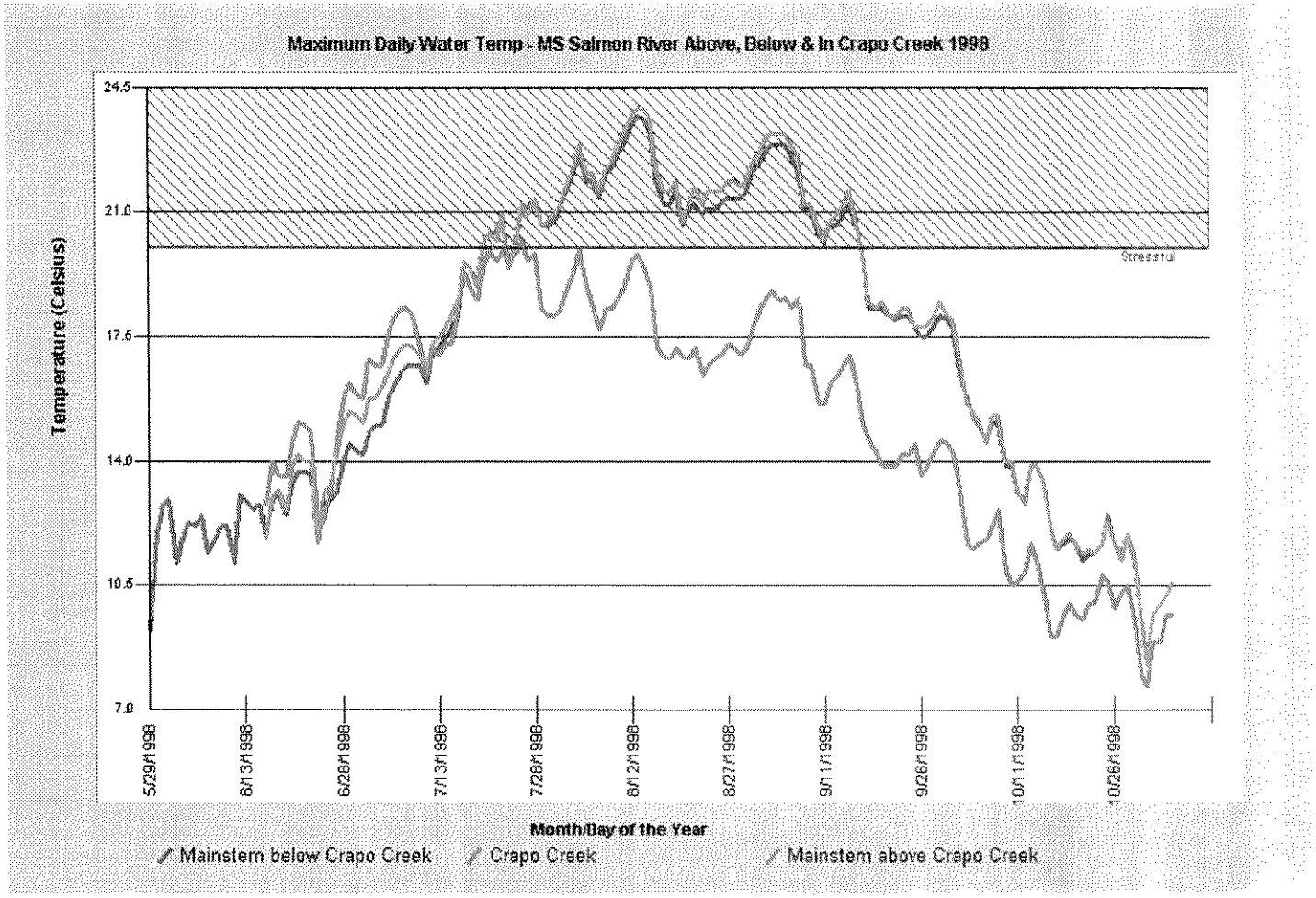
The most promising economic base seems to be restoration activities. Taking the students out into the field to learn how to do streamflow measurements, water temperature monitoring, and habitat typing can only add to their education. Our watershed program has been a practical way for students to learn about the components that make up this biologically diverse area. Not very many places in this country still have anadromous fish making runs up river or mountain lions and bears passing through town. This year we had salmon making redds in the river just a stone's throw from our classroom. Because we live in the middle of a national forest, the students interact with the places and wildlife in this drainage on a regular basis. Our watershed studies program enables them to pursue more in depth studies about the biology and geography of the Salmon River.



Maximum daily water temperature of the Salmon River below Forks of Salmon Elementary School in 1998 are displayed above. Note that temperatures became stressful for salmonids at the end of July and continued until approximately September 15, 1998. Data collected by Students from Forks of Salmon Elementary School.

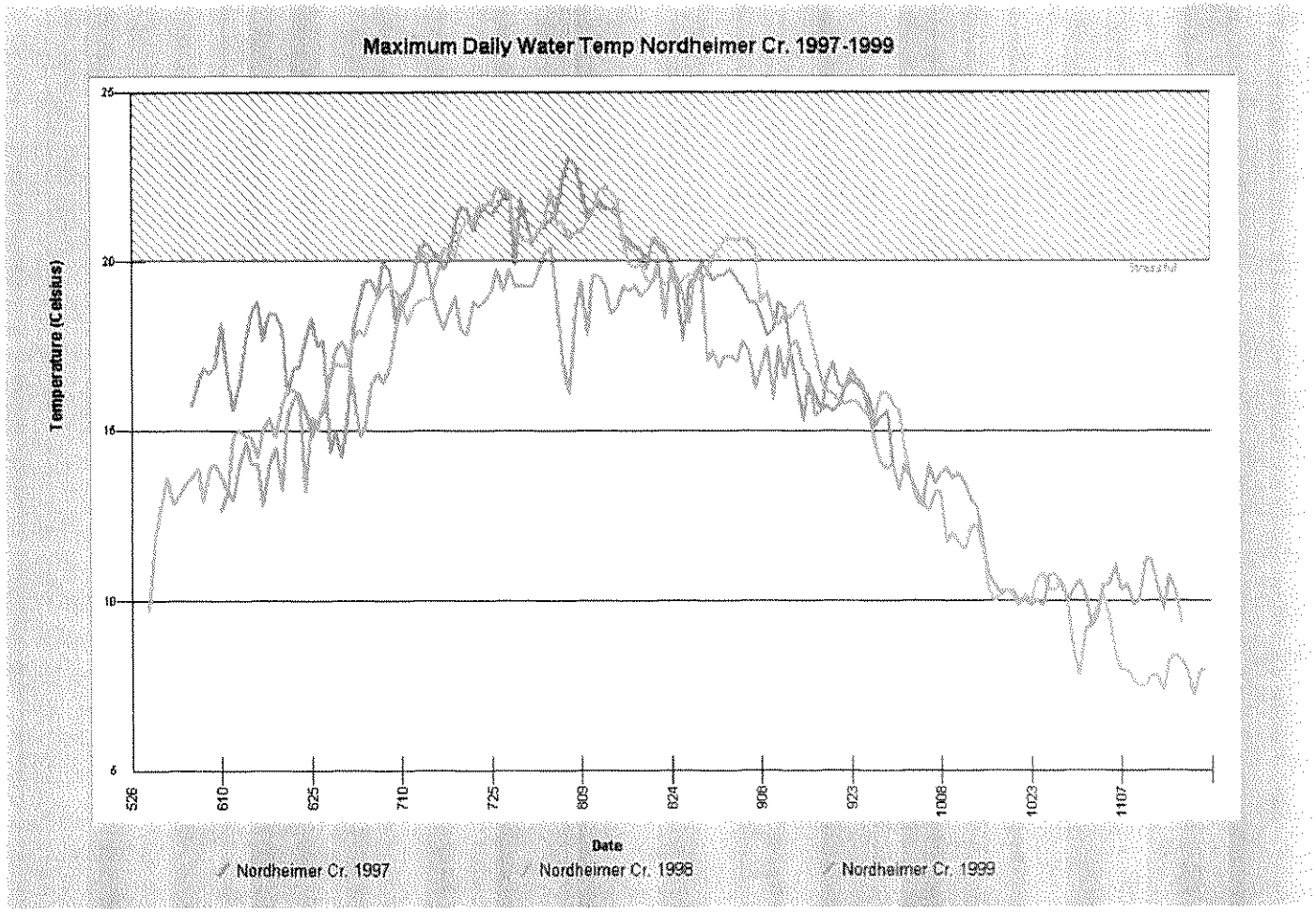


The chart shows maximum daily water temperatures during summer of 1998 of the Mainstem Salmon River above, below and in Nordheimer Creek. Mainstem temperatures are critical in this reach from early July through mid September. Note the Nordheimer was warmer than the Mainstem until about July 29th. It appears that Nordheimer's flow is not sufficient to substantially modify the water temp in the Mainstem. Data collected by Students from Forks of Salmon Elementary School.

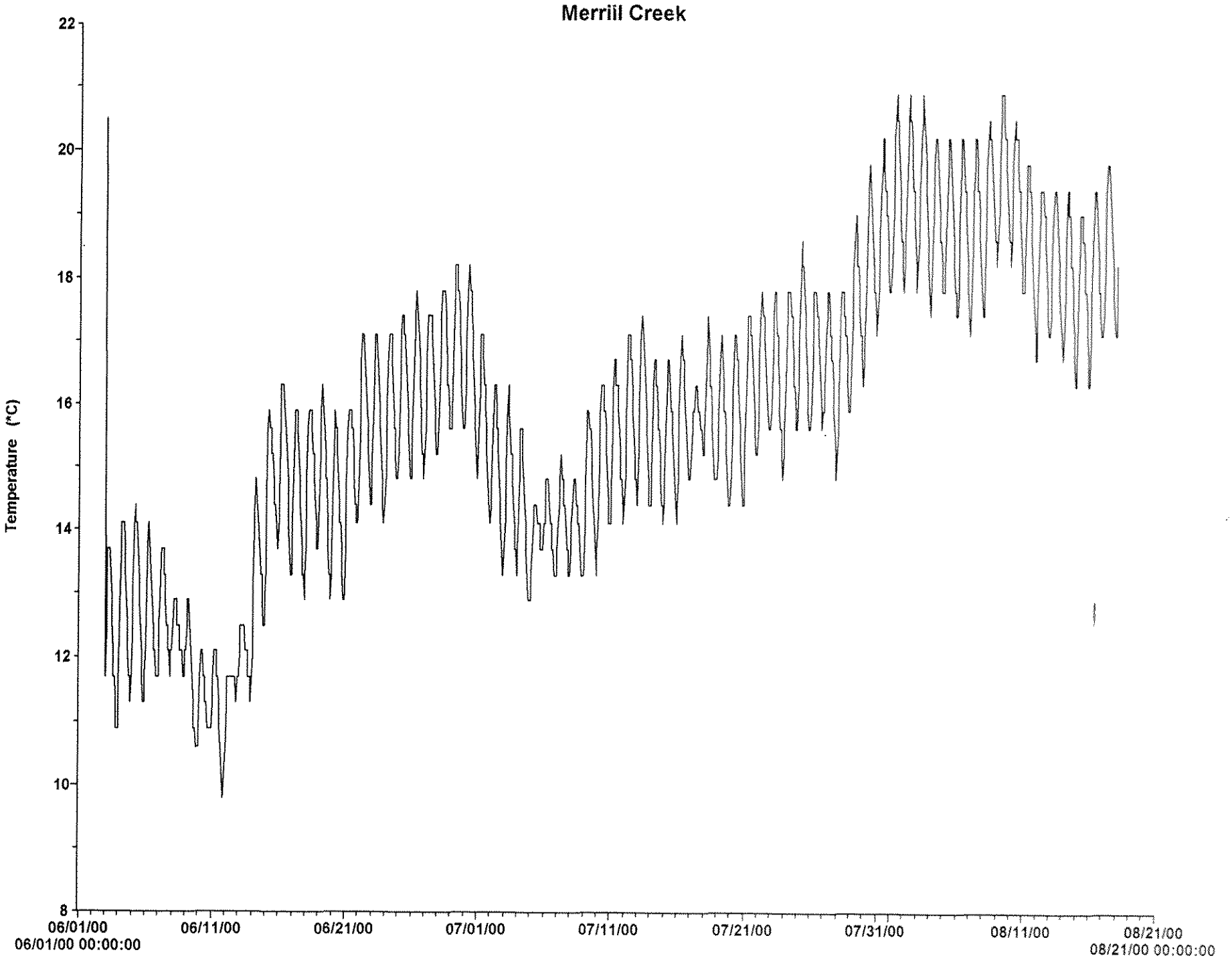


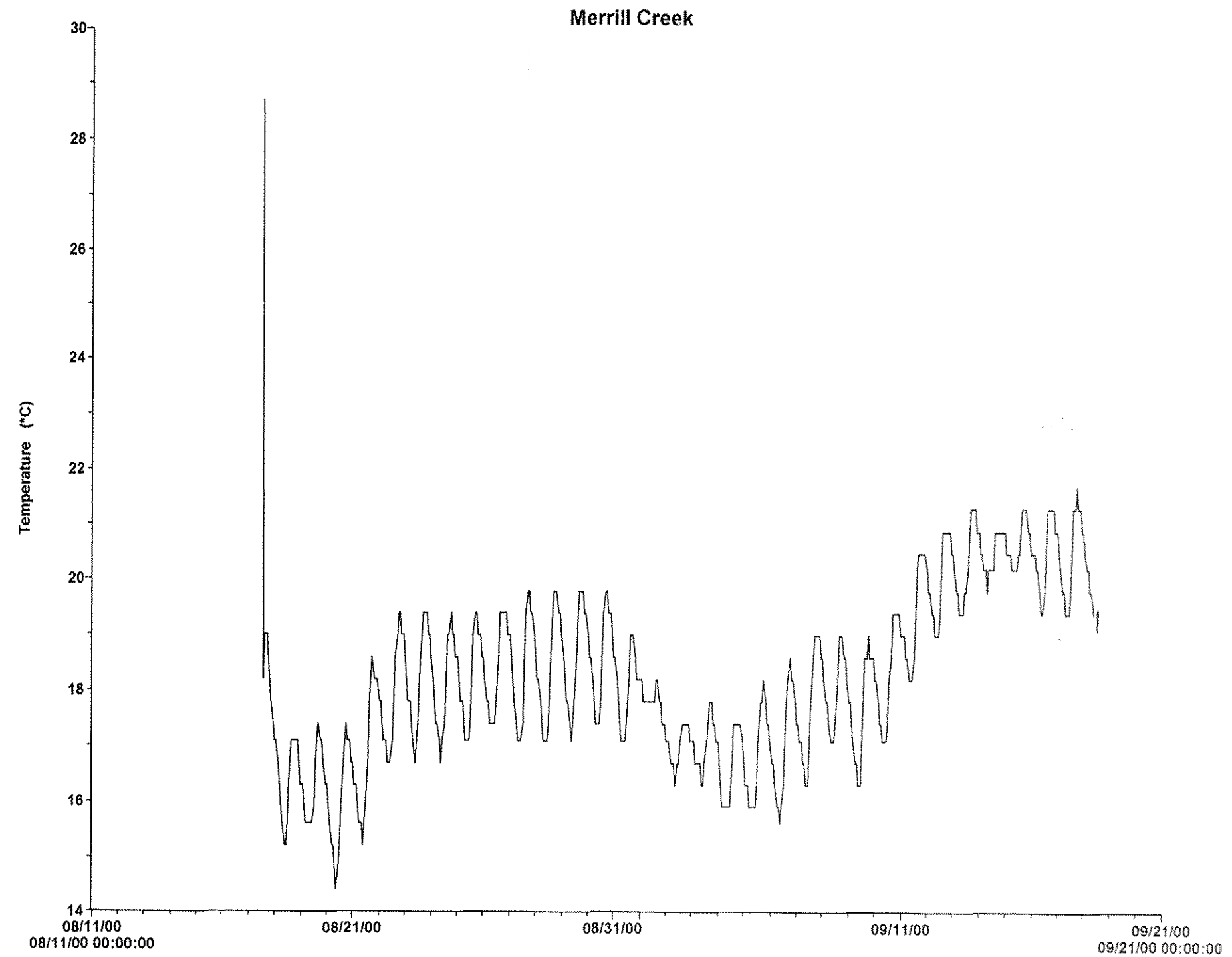
The chart shows maximum daily water temperatures during summer of 1998 of the Main Stem Salmon River above, below and in Crapo Creek. Main Stem temperatures were critical in this reach from late July through mid September. Data collected by Students from Forks of Salmon Elementary School.

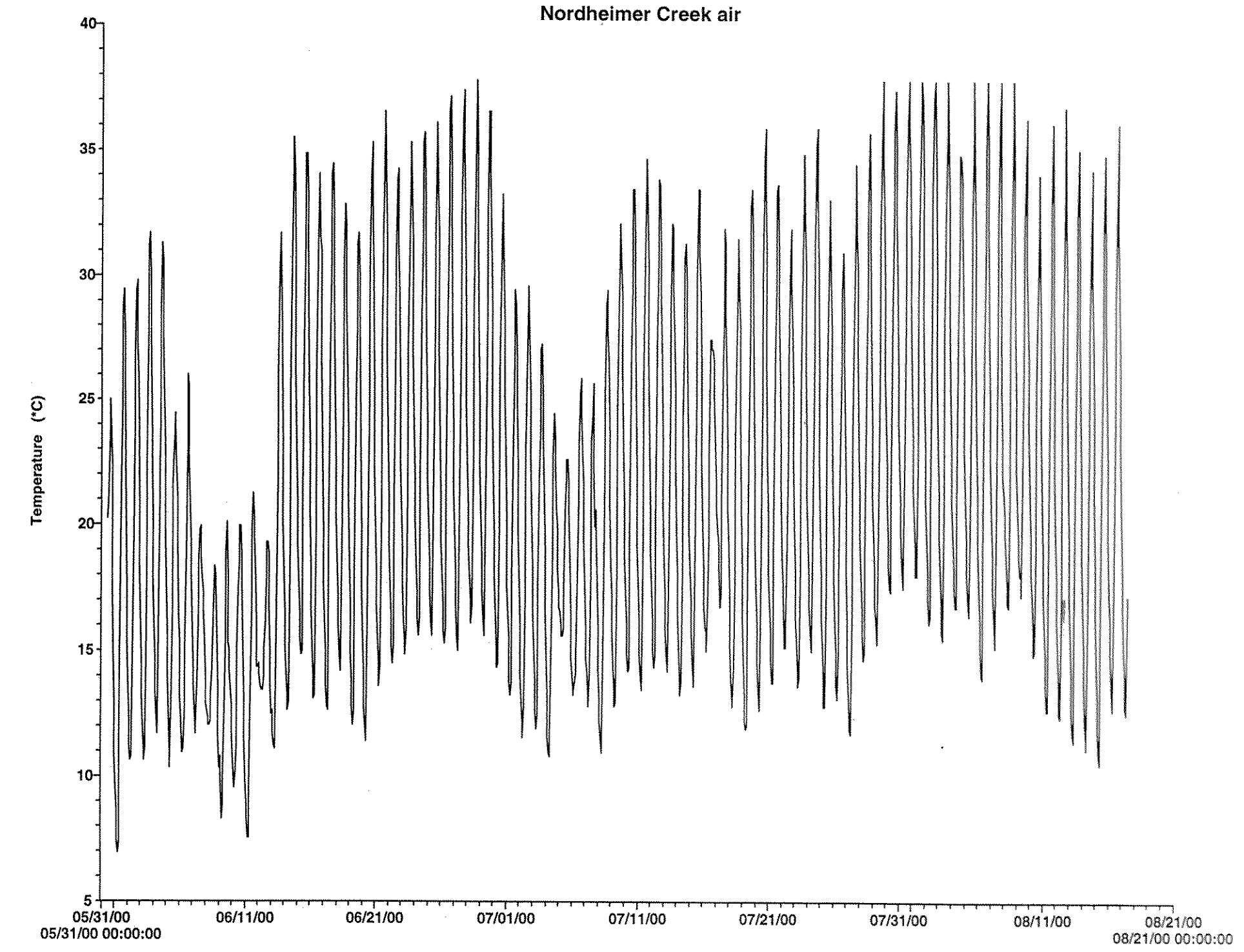
Nordheimer Creek during the summers of 1997, 1998 and 1999



This chart shows maximum daily water temperatures in Nordheimer Creek during the summers of 1997, 1998 and 1999. Mainstem temperatures were critical in this reach from early July through mid September in 1997 and 1998. Data gaps exist in 1997 because the temperature sensor below Nordheimer was buried in the sand and the sensor above Nordheimer was out of the water. Data was collected from automated temperature sensors called Hobotemps, which anchored in moving water in the shade. Hobotemps were monitored by students at the three river schools, community volunteers, and paid staff of the Salmon River Restoration Council. Click on Picture* to see photographs of Hobotemp sites.


Merriil Creek
Temperature (°C)
22
20
18
16
14
12
10
8
06/01/00
06/01/00 00:00:00
06/11/00
06/21/00
07/01/00
07/11/00
07/21/00
07/31/00
08/11/00
08/21/00
08/21/00 00:00:00


Merrill Creek
Temperature (°C)
30
28
26
24
22
20
18
16
14
08/11/00
08/11/00 00:00:00
08/21/00
08/31/00
09/11/00
09/21/00
09/21/00 00:00:00


Nordheimer Creek air
Temperature (°C)
40
35
30
25
20
15
10
5
05/31/00
05/31/00 00:00:00
06/11/00
06/21/00
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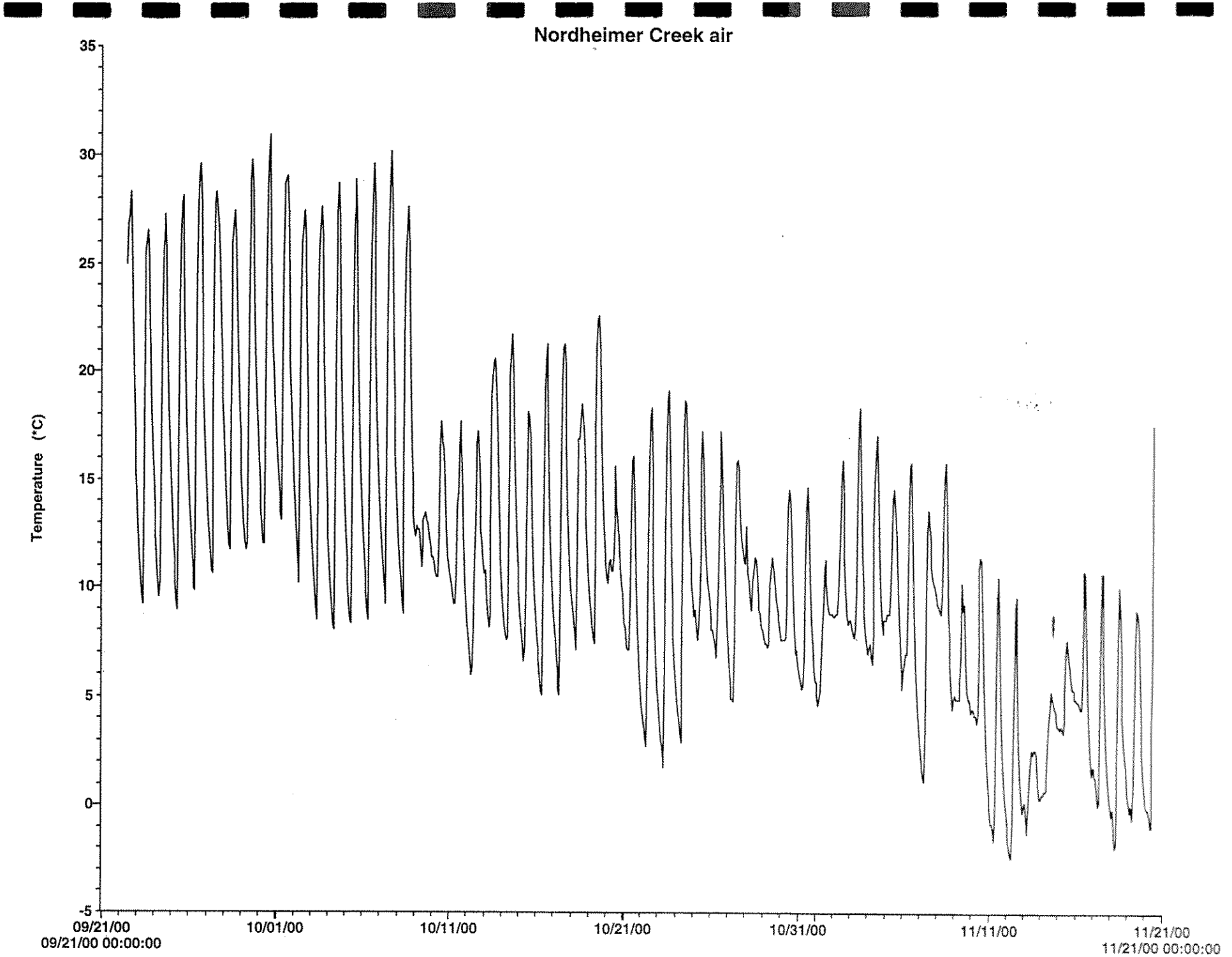
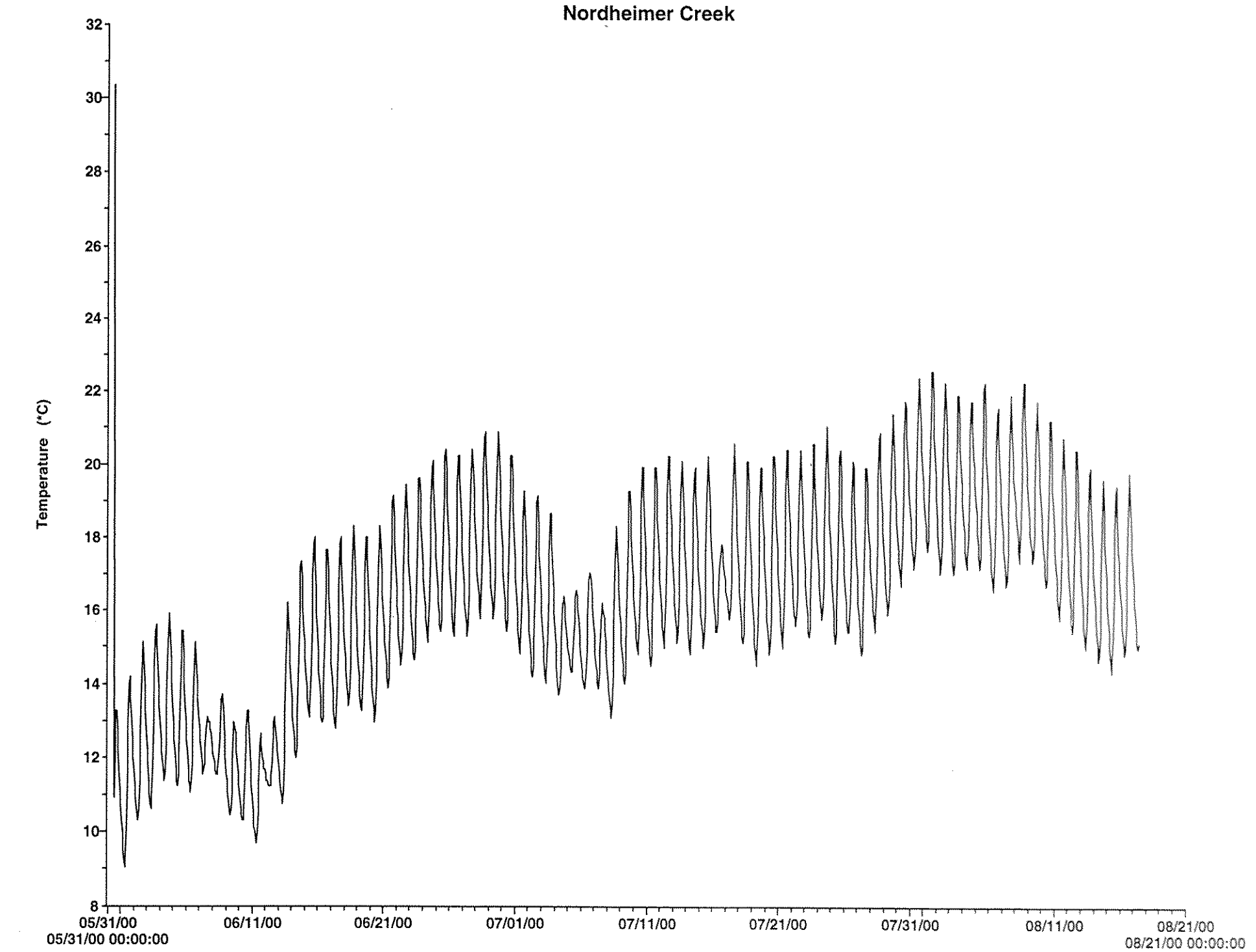
08/21/00
08/21/00 00:00:00


Nordheimer Creek air
Temperature (°C)
35
30
25
20
15
10
5
0
-5
09/21/00
09/21/00 00:00:00
10/01/00
10/11/00
10/21/00
10/31/00
11/11/00
11/21/00
11/21/00 00:00:00


Nordheimer Creek
Temperature (°C)
32
30
28
26
24
22
20
18
16
14
12
10
8
05/31/00
05/31/00 00:00:00
06/11/00
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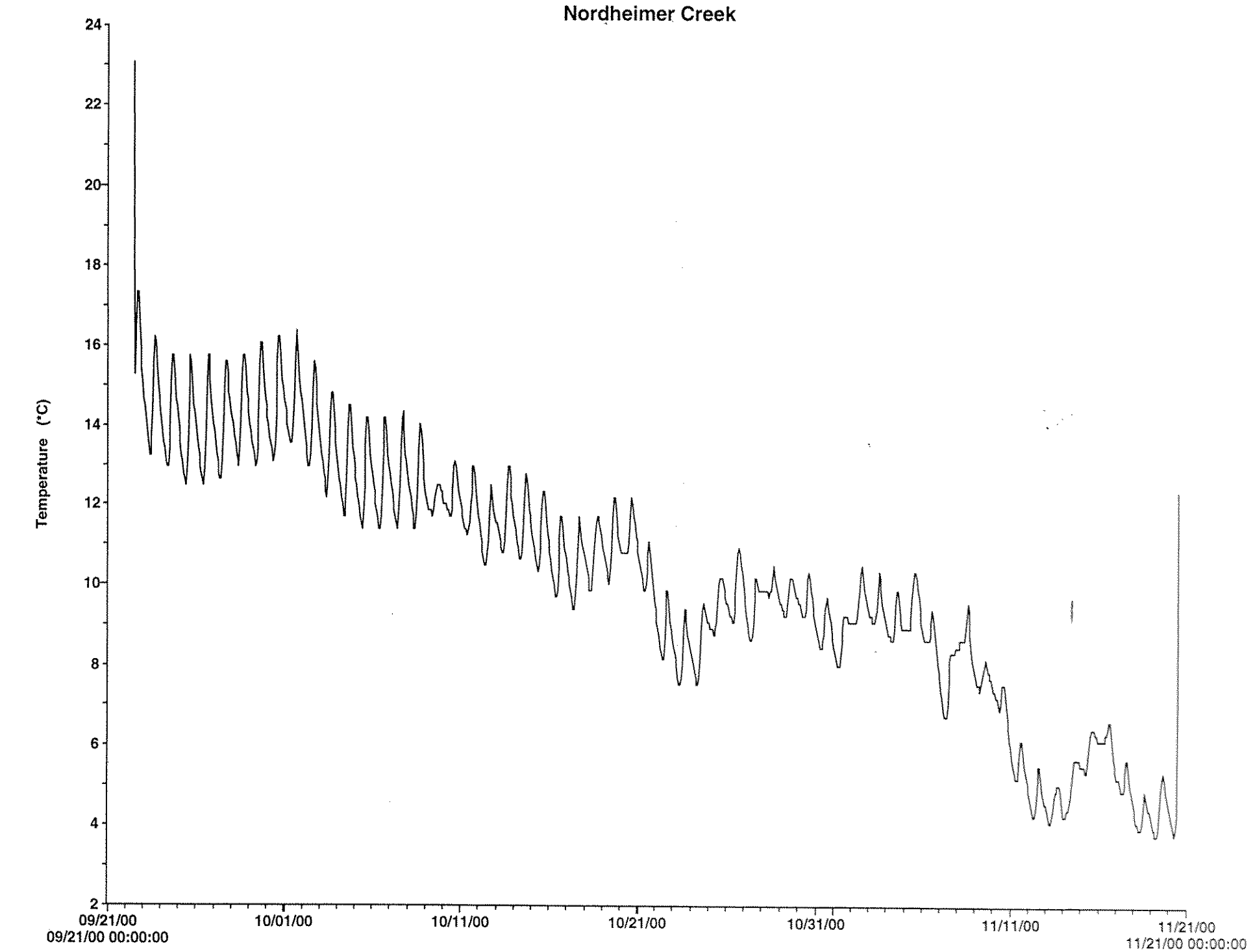
08/11/00
08/21/00
08/21/00 00:00:00


Nordheimer Creek
Temperature (°C)
24
22
20
18
16
14
12
10
8
6
4
2
09/21/00
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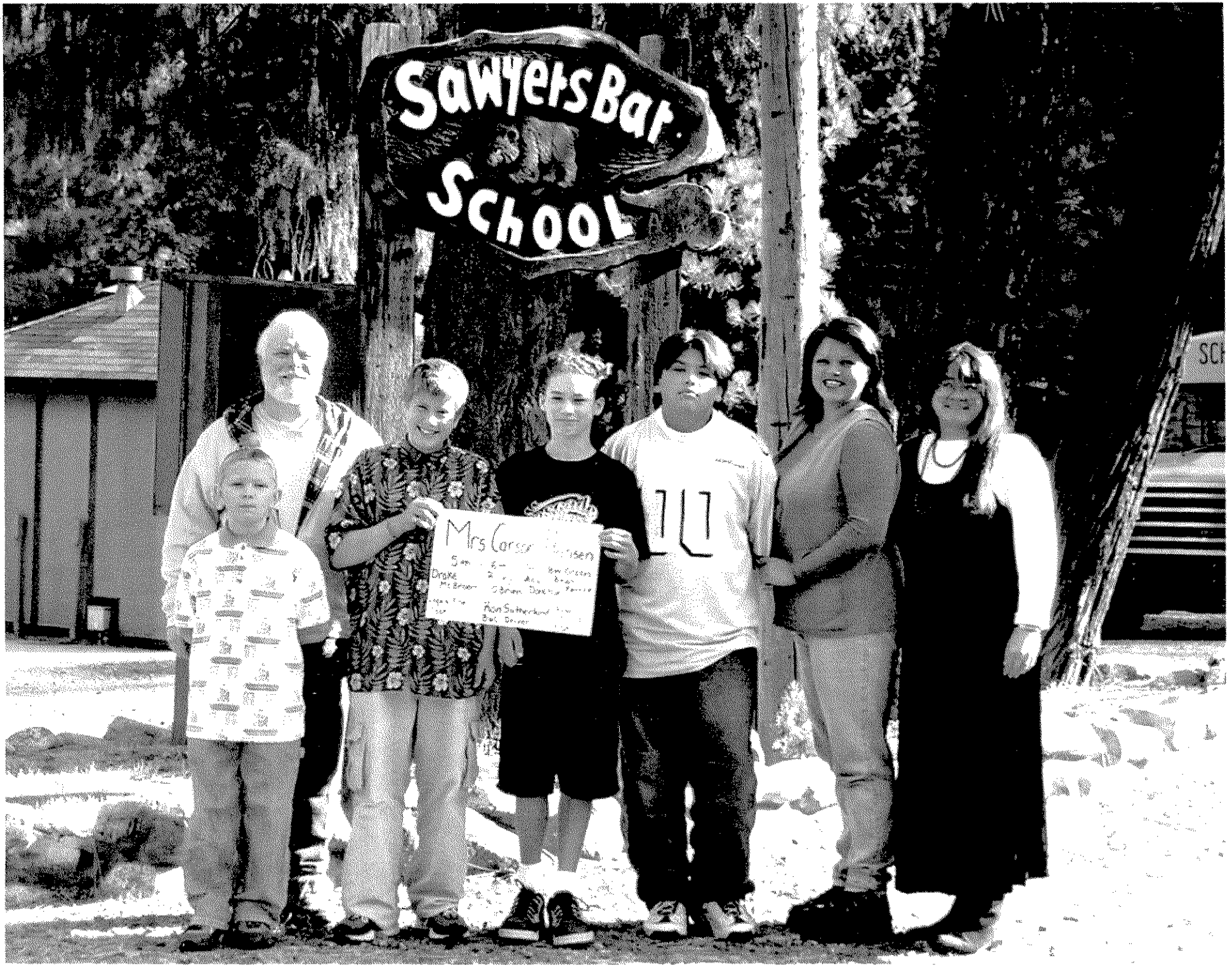
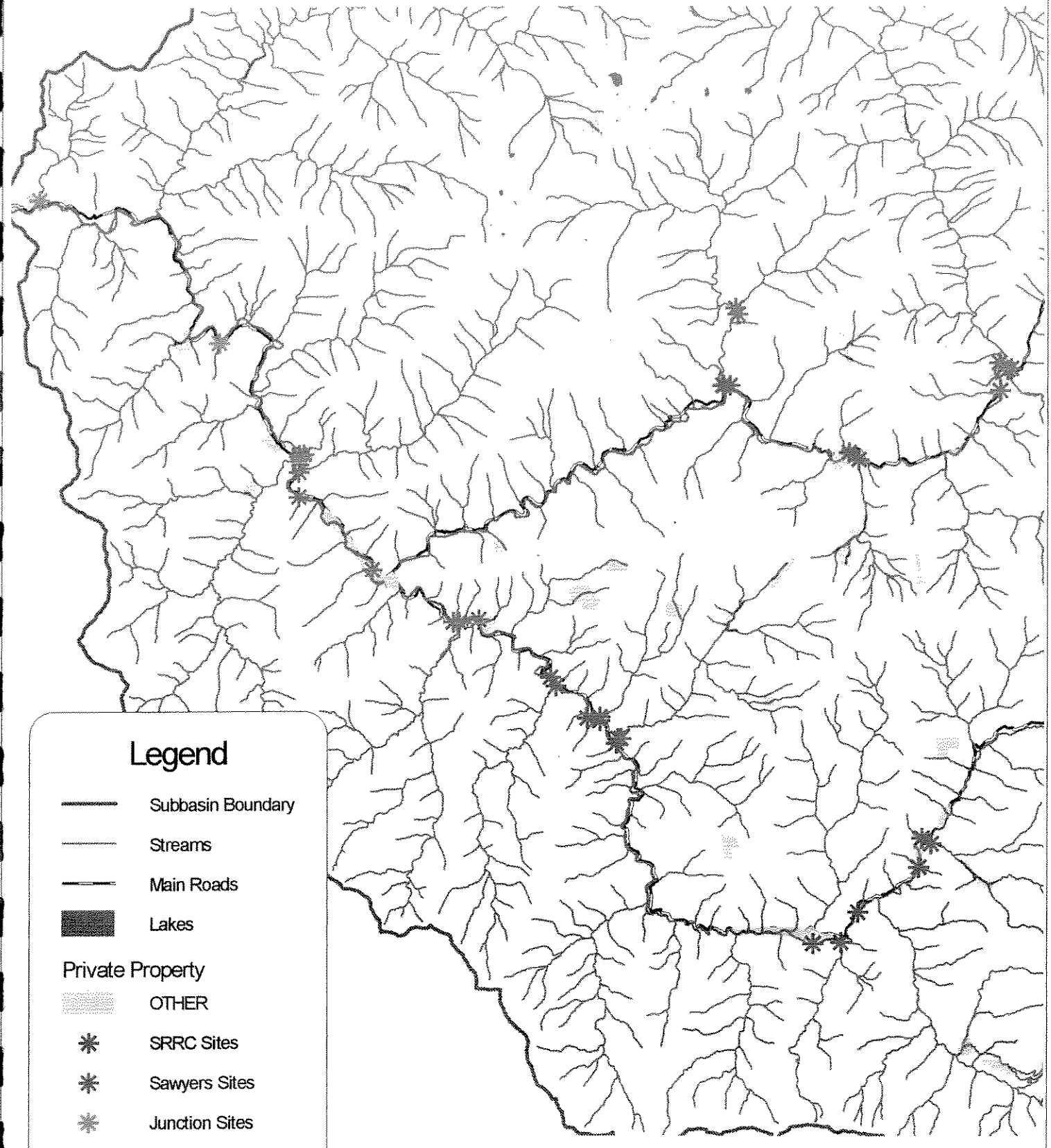
11/11/00
11/21/00
11/21/00 00:00:00


Sawyers Bar
School

1998 Salmon River HoboTemp Locations



Legend

- Subbasin Boundary
- Streams
- Main Roads
- Lakes

Private Property

- OTHER
- SRRC Sites
- Sawyers Sites
- Junction Sites
- Forks Sites

5 0 5 10 Miles

N
W E
S

Appendix F

Sawyers Bar Elementary School Temperature Graphs

KRIS FINAL REPORT-Phase V (1998-1999)

"C" DOWNLOAD OF HOBO TEMP DATA

In November 1998, students from Sawyers Bar School and Forks School downloaded hobo temp data for the following sites in the Salmon River Watershed:

SAWYERS BAR SCHOOL
North Fork of Salmon River Above Eddy Gulch
Eddy Gulch Creek
North Fork of Salmon River Below Eddy Gulch
Little North Fork Creek
Little North Fork Creek Air
North Fork of Salmon River Above Little North Fork
North Fork of Salmon River Below Little North Fork

FORKS SCHOOL
South Fork of Salmon below Forks School
Main Salmon River below Nordheimer
Main Salmon River above Nordheimer
Nordheimer Creek Air
Nordheimer Creek
South Fork of Salmon below Knownothing
South Fork of Salmon above Knownothing
Knownothing Creek
Crapo Creek
Main Salmon River above Crapo

1999 KRIS SPRING FORUM

A student representing each elementary school was sent to the 1999 KRIS Spring Forum in March at the County Office of Education. Students described their methods and procedures for launching, checking, and downloading hobo temps to State Water Resources Control Board members, US Fish & Wildlife, CA Fish & Game, resource groups, high school students, and teachers. Temperature results for several creeks were displayed while students compared and contrasted the graphs. The students also depicted several hypotheses to account for the variability of temperatures in different tributaries of the Salmon River. For their outstanding presentations both students were awarded with the Overall Best Presentation Awards for the forum. They were also recognized publicly for their excellent presentations by the communities of Sawyers Bar and Forks of Salmon at a community banquet.

HOBO TEMP CALIBRATION- May 5, 1999

A total of 40 Hobo Temps were calibrated in a zero degree C water bath on May 5, 1999. This was accomplished by two community volunteers, two students from Sawyers Bar School, the AmeriCorps member and the Salmon River Restoration Council (SRRC) project leader. Students learned the importance of calibrating equipment, how to load batteries into the hobo temp unit, designate filenames for each hobo temp, and set parameters for the hobo temp data collection.

LAUNCHING HOBO TEMPS

In May, Sawyers Bar and Forks Schools launched hobo temps for the following sites:

SAWYERS BAR SCHOOL
Little North Fork Creek
Little North Fork Creek Air
North Fork of Salmon River Below Little North Fork
Eddy Gulch Creek

FORKS SCHOOL
South Fork of Salmon below Forks School
Nordheimer Creek
Nordheimer Creek Air

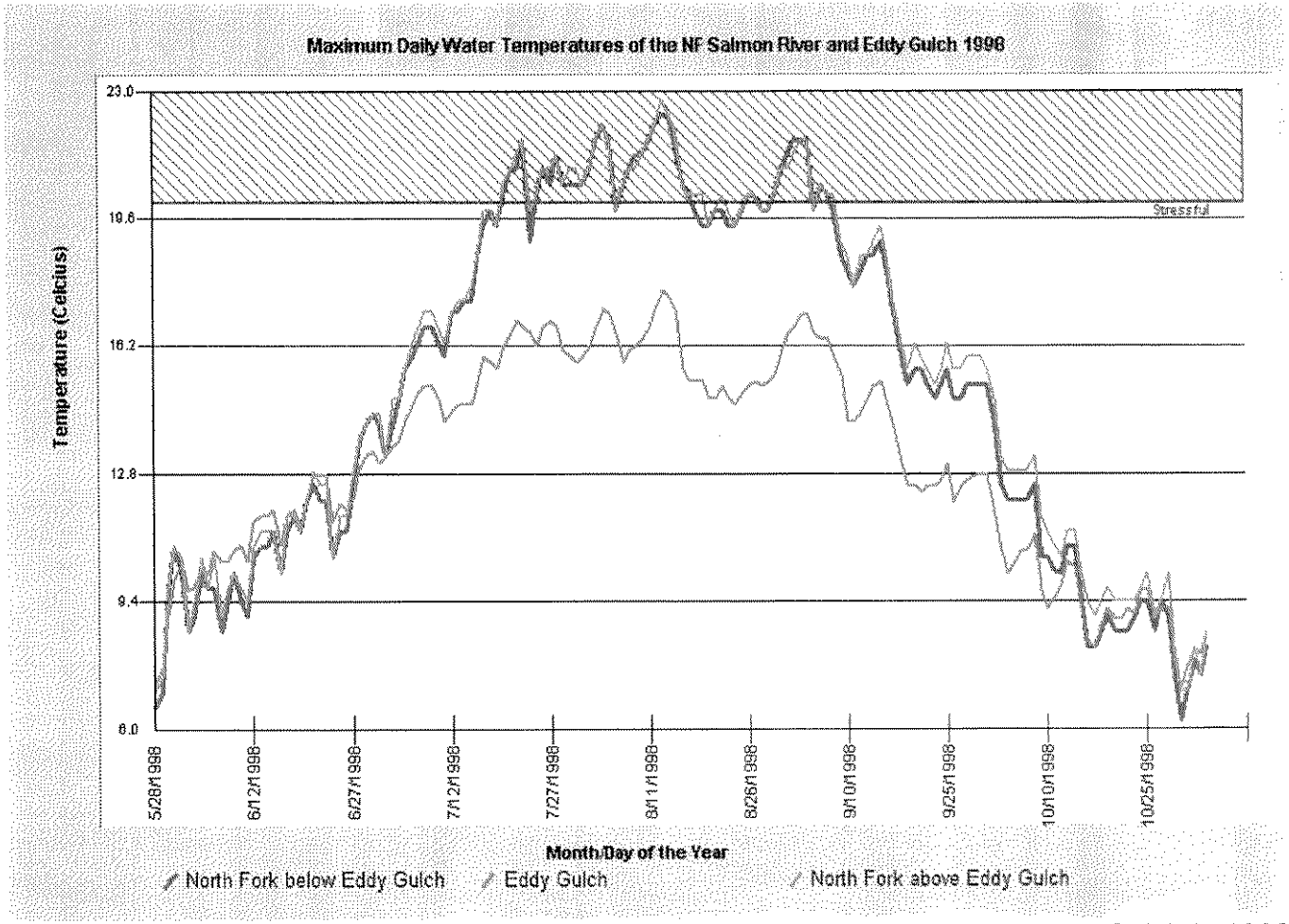
Stream temperature, shade canopy, and stream width measurements were taken at this time. Students also learned about the importance of accurate data recording, making site descriptions, and drawing of site maps.

"B" DOWNLOAD OF HOBO TEMP DATA

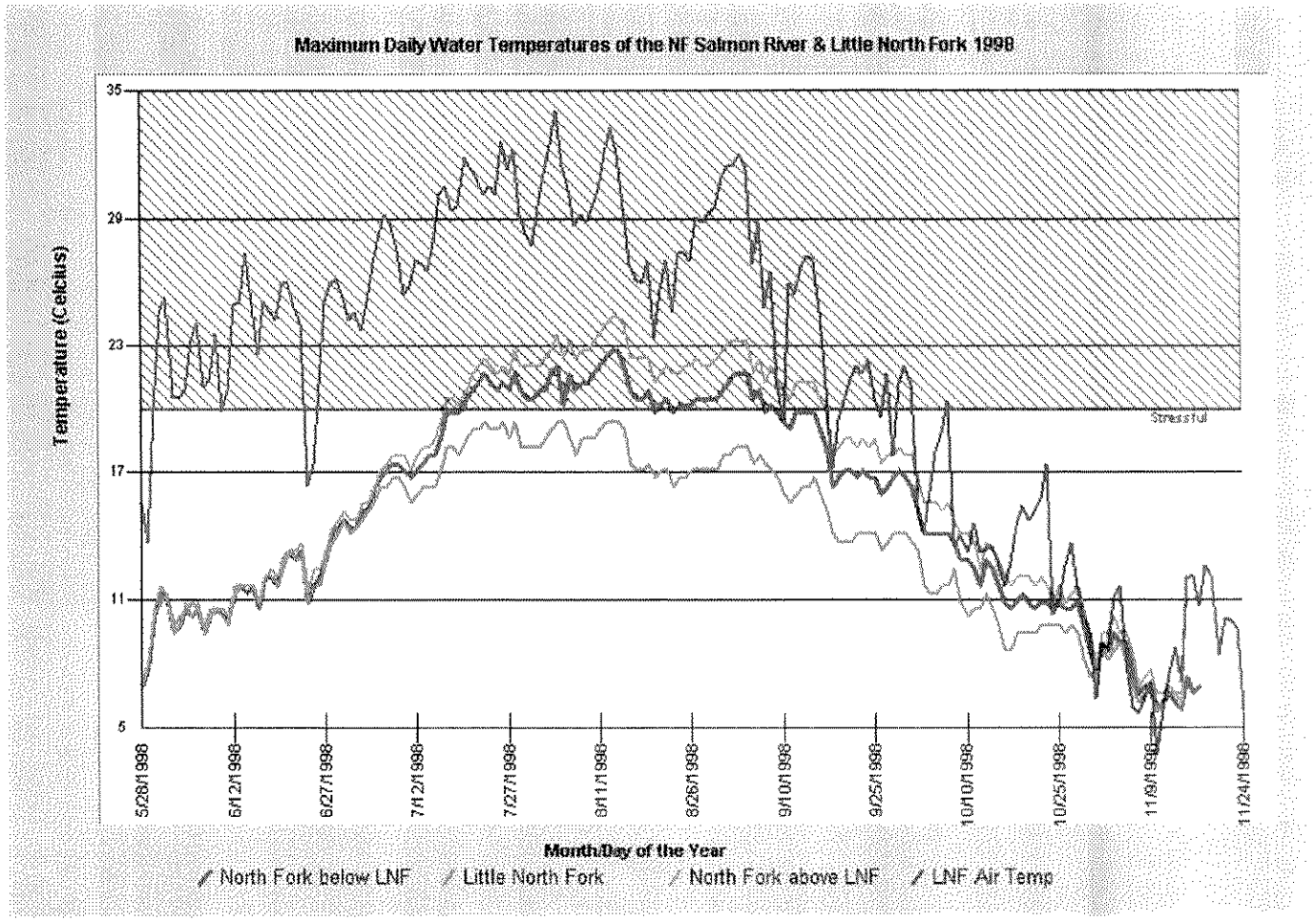
In late August 1999, Sawyers Bar and Forks School students took field trips to their designated hobo temp sites and downloaded data using laptop computers. Stream temperature, shade canopy, and stream width measurements were taken. We discussed our observations about how sites had changed from the spring. KRIS stream temperature graphs were then used as an integral part of several lessons on graph and chart reading in the classrooms. Students compared and contrasted summer temperature trends and maximum/minimum temperatures for the Salmon River and its tributaries.

"C" DOWNLOAD OF HOBO TEMP DATA

In mid-November 1999, the final download of the hobo temp data was completed by Sawyers Bar and Forks Schools.



Maximum daily water temperature of the North Fork Salmon River below, above and in Eddy Gulch in 1998. Note that temperatures became stressful for salmonids in the North Fork and not in Eddy Gulch. Data collected by Sawyers Bar Elementary School students and the SRRC.



Maximum daily water temperature of the North Fork Salmon River below, above and in Little North Fork during 1998. Note that temperatures became stressful for salmonids in the North Fork and not in the Little North Fork. The Little North Fork obviously provides enough cold water to the North Fork to lower the river temp during stressful times. Data collected by Sawyers Bar Elementary School and SRRC.

SAWYERS BAR SCHOOL

WATERSHED EDUCATION PROGRAM

The students of Sawyers Bar School have started working on the Watershed Education Program. Here the kids learn about downloading hobotemps, aquatic insect study, Chinook Salmon Survey, wildlfe observations, raising Salmon Eggs in the Aquarium Incubator project, and Native Plant study. Each student choses at least one of these special projects to become experts on. Below is information on each of the projects. This page will be updated as we work on our projects.

HOBOTEMPS: Students monitor stream temperatures using hobotemp devices.

AQUATIC INSECT STUDY: Students learn about different insects that live in the water.

CHINOOK SALMON SURVEY: Students learn how to detect how long fish had been dead, how old the fish were, and the sex of the fish.

They spend time walking the river looking for redds(fish nests.)

WILDLIFE OBSERVATIONS: This group studies bears, deer, and mountain lions. In winter, we track these animals.

SALMON INCUBATOR PROJECT: This project involves raising salmon eggs to fry(juvenile fish eggs.)

NATIVE PLANT STUDY:Students study native botany and invasive non-native plant species.

Below are some links to web related sites

SISKIYOU COUNTY OFFICE OF EDUCATION

TULE LAKE BIOLOGY

SALMON RIVER RESTORATION COUNCIL

KRIS (KLAMMOTH RIVER INFORMATION SYSTEM)

Students learning how to download hobo temps with Americorps Watershed Coordinator

Teacher Marka Carson with Sawyers Bar Students

Watershed Ed - Training

4th Grader from
Junction Elementary School
takes Temperature of
Merrill Creek

Students learn Aquatic Insect Collection Techniques

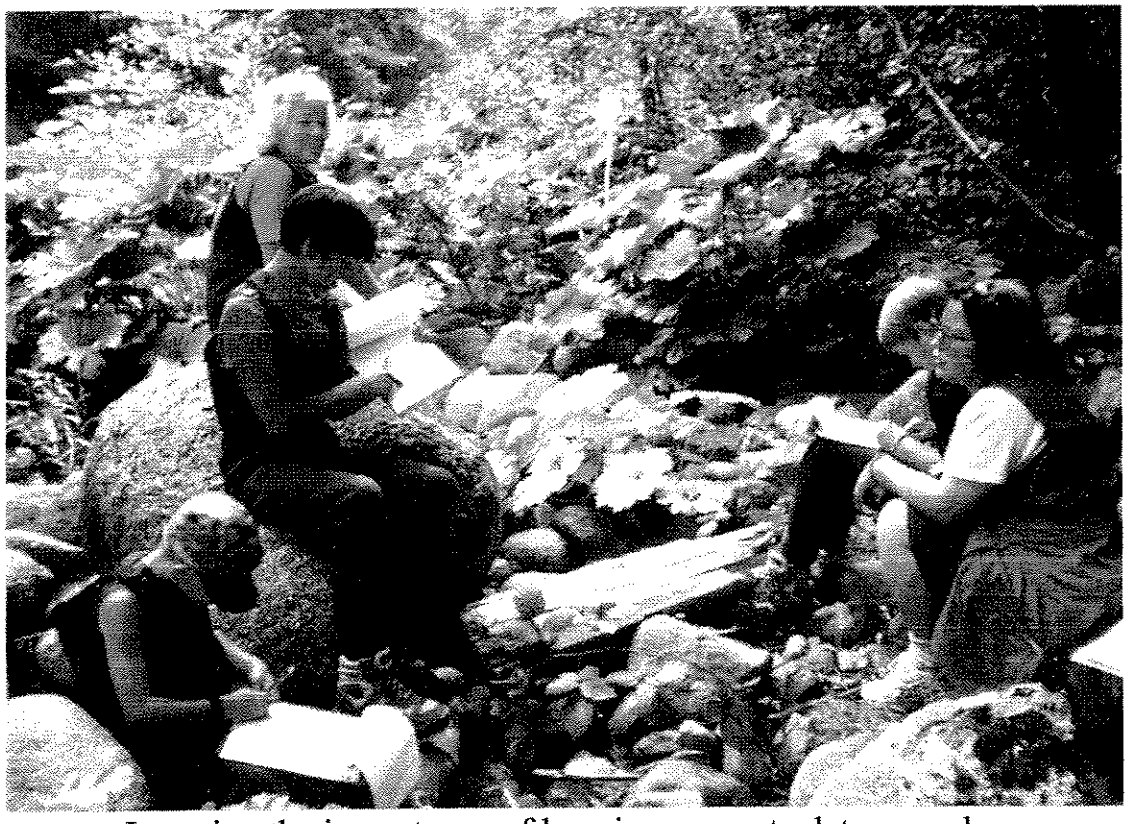
Students calibrating hobo temps in May 1999 at the Salmon River Restoration Council

At the Little North Fork Creek launching hobo temps with laptop computer (Spring 1999)

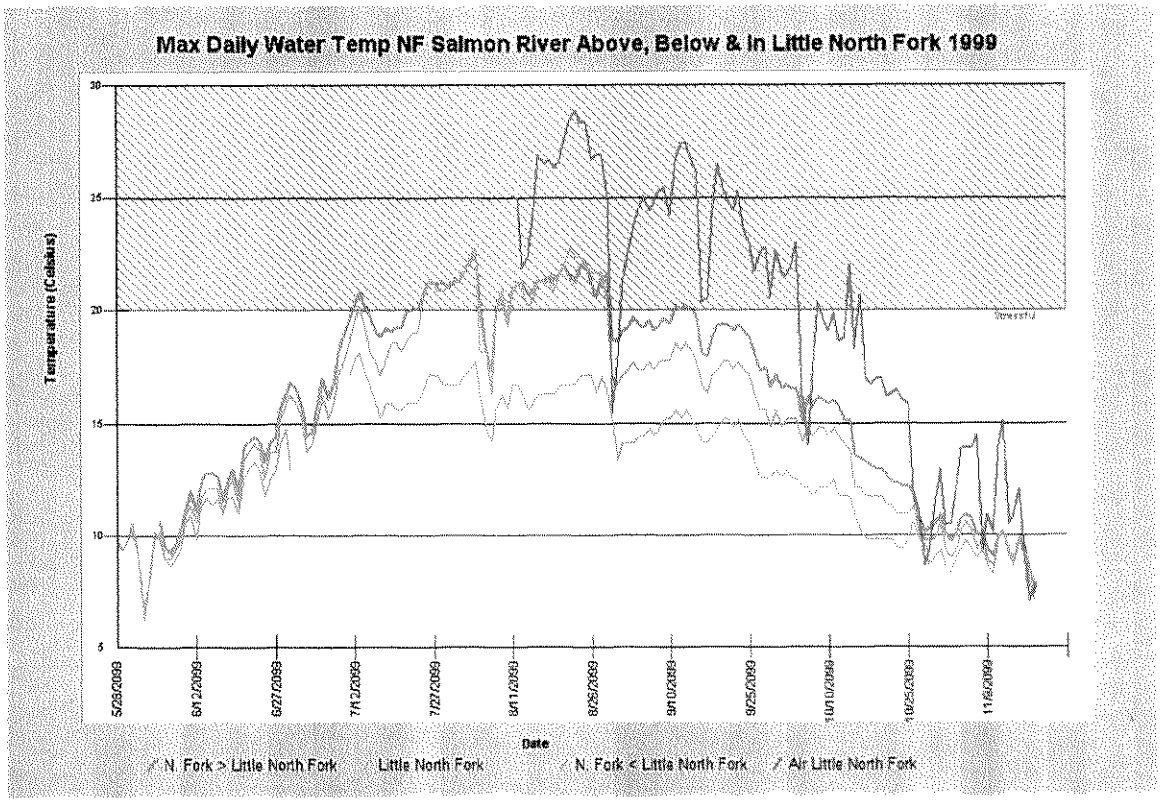
Sawyers Bar students opening protective metal casing to download 1998 hobo temp data

At each site visit, the water temperature is taken with a thermometer.

Gearing up in waders and wading boots to launch hobo temps



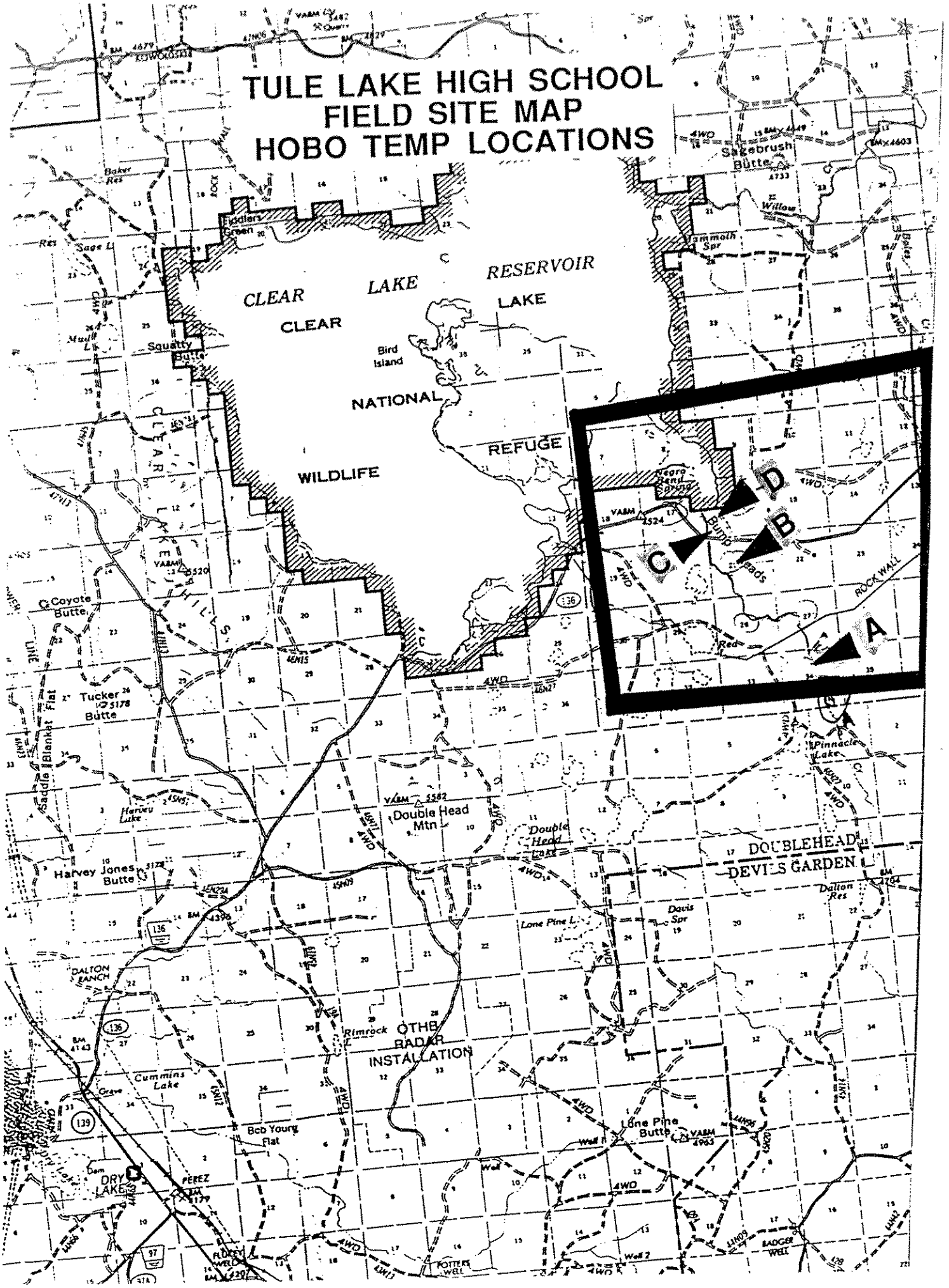
Learning the importance of keeping accurate data records

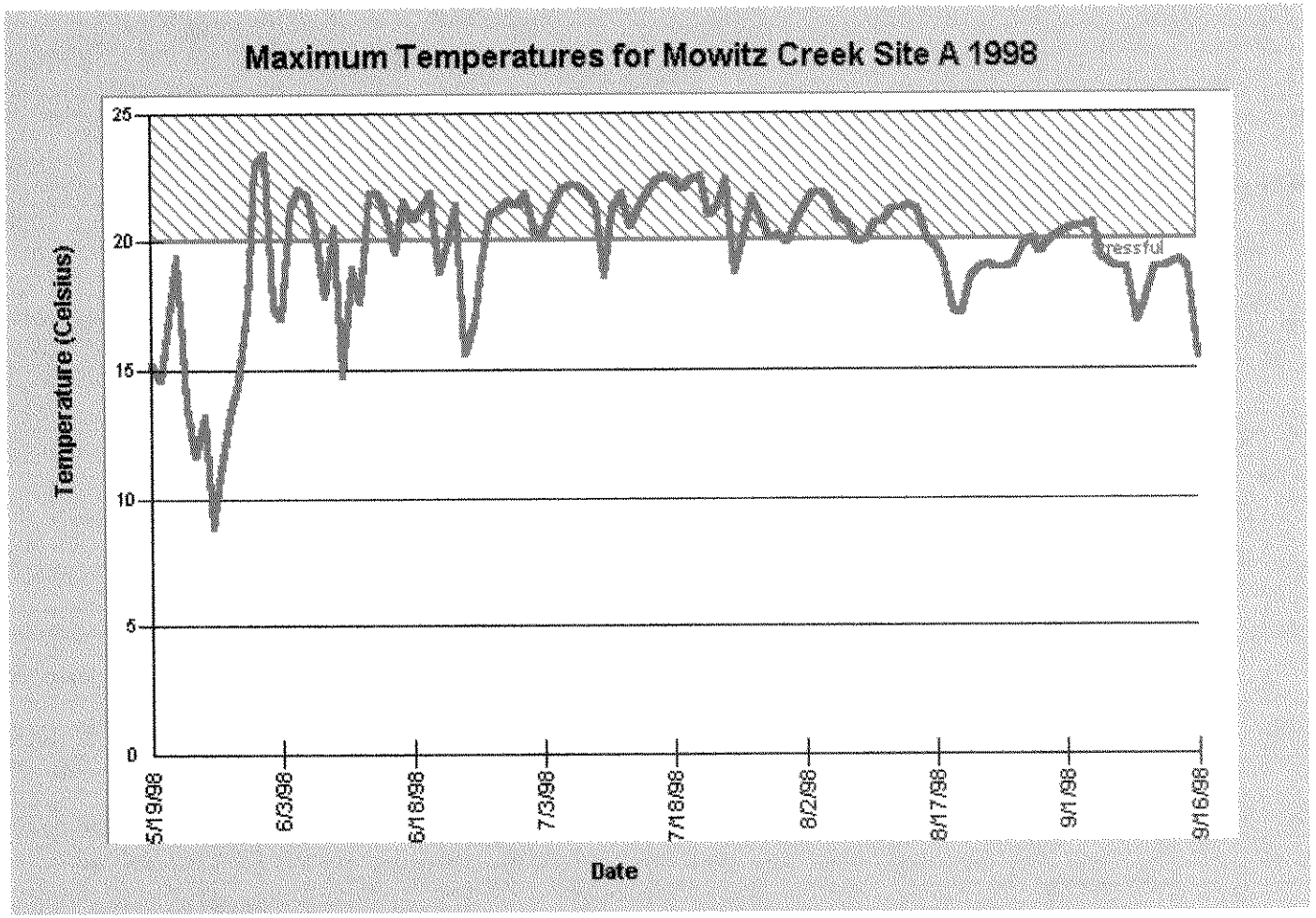


This chart shows the maximum daily water temperatures during the summer of 1999 of the NF Salmon River above, below and in the Little North Fork and the air temperature at the Little North Fork. Notice that the water temperatures in the NF Salmon River reached levels stressful to Salmonids during mid summer. The Little North Fork this year did not seem to influence the water temperature in the NF Salmon during mid summer. From late August on, however, the Little North Fork did seem have a cooling effect on the NF Salmon. This was probably due to the volume relationships. Air temperature peaks and dips appear to correlate with the same periods of change in the water temperatures. Data gaps for water temperature in the Little North Fork in early July and for air temperature in June and July were due to malfunctioning temperature sensors. Data was collected by automated temperature sensors called Hobotemps, which were anchored in flowing water in the shade between May and November 1999. Hobotemps were monitored by students at Sawyers Bar School and paid staff of the Salmon River Restoration Council.

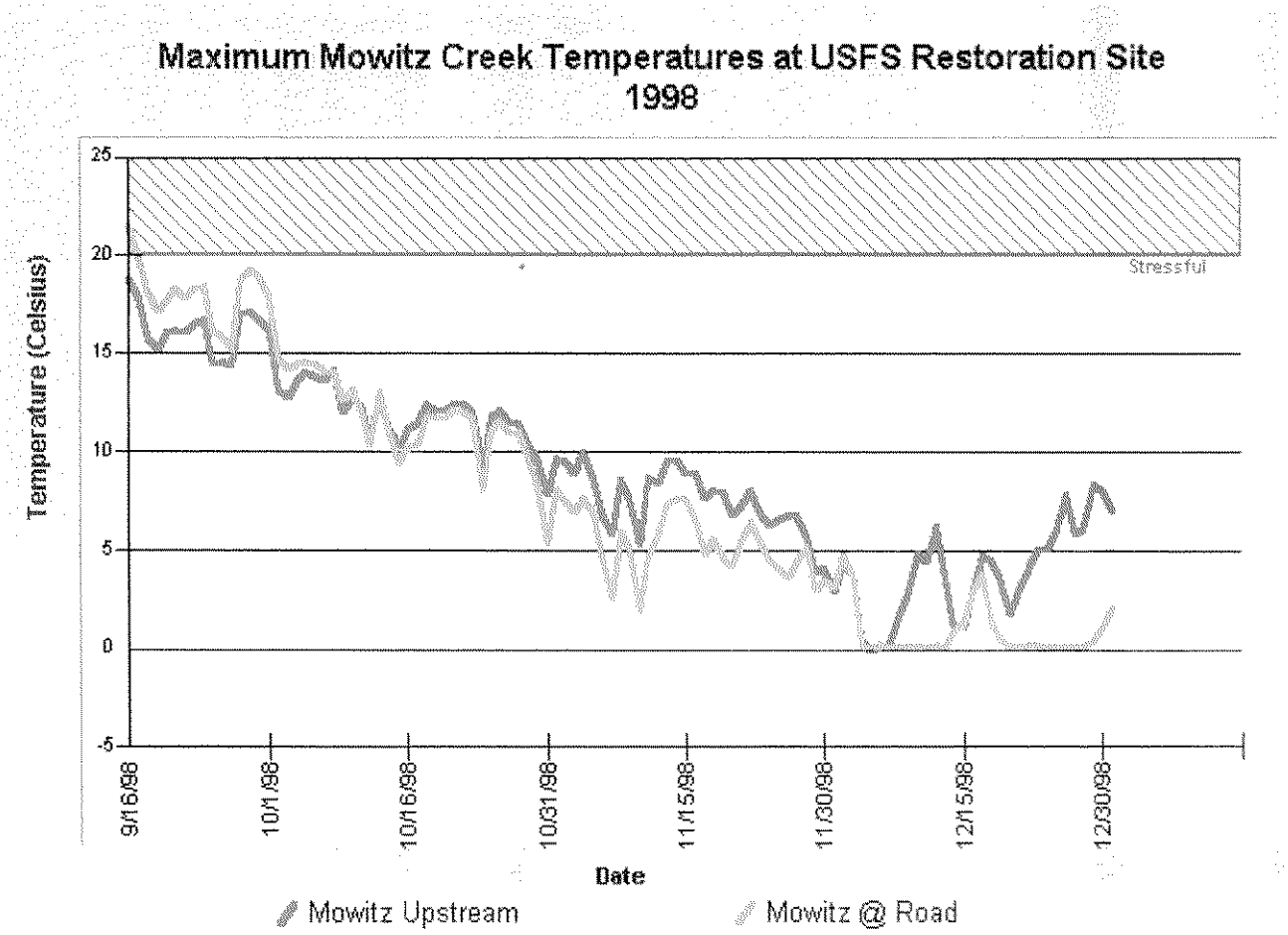
Tulelake High School Temperature Graphs

TULE LAKE HIGH SCHOOL
FIELD SITE MAP
HOBO TEMP LOCATIONS

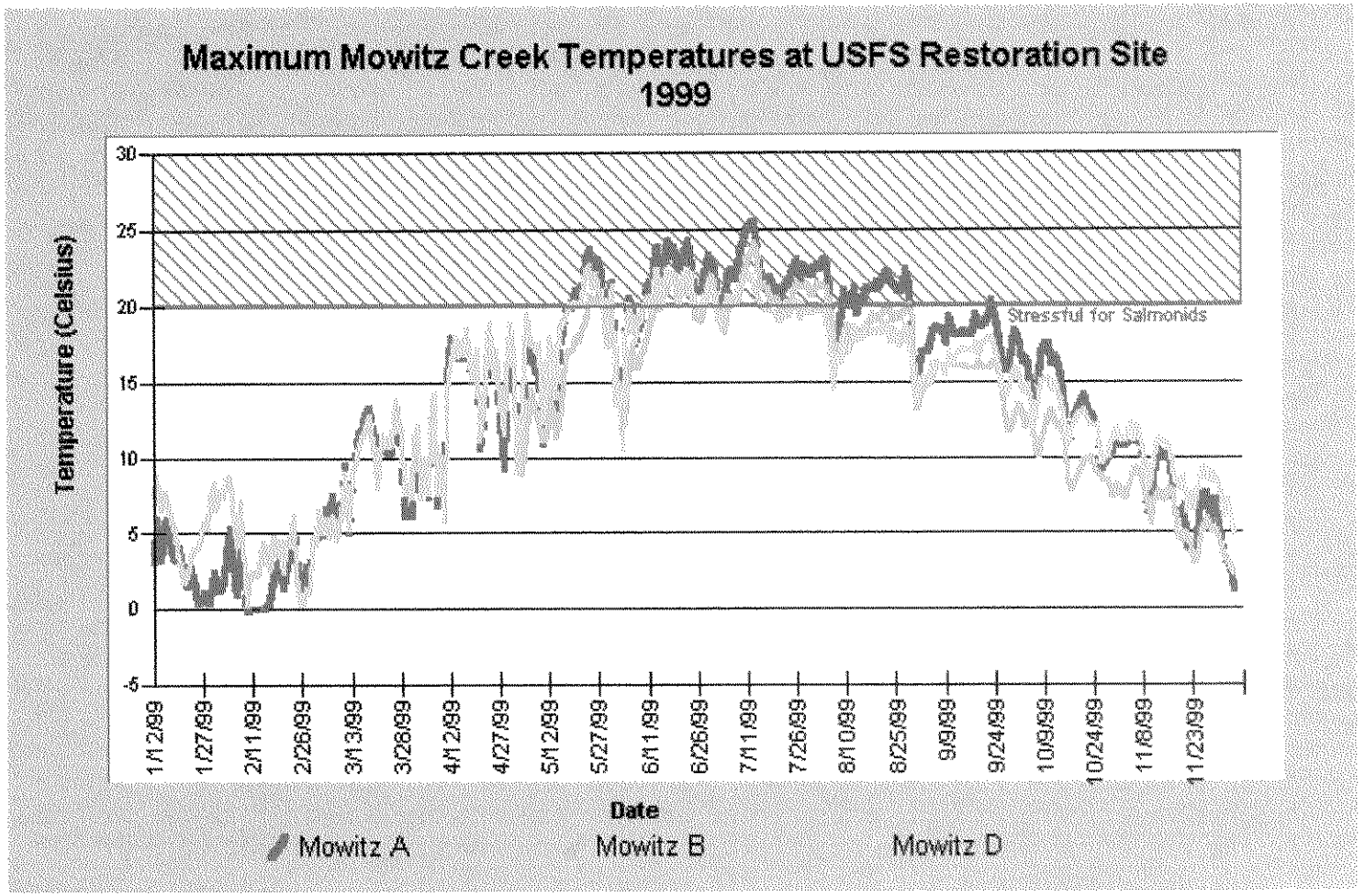




Maximum daily water temperatures during the summer of 1998 for Mowitz Creek, site A, the furthest upstream. Data collected by Kirk Heims and students from Tule Lake High School using a Hobo Temp remote temperature sensing device. *This probe was actually launched in July of 1997, and lost. The probe was set on wrap around mode and recovered in mid September of 1998. The probe memory contained only the last 120 days of data, which is displayed on this graph. All other data for Mowitz Creek during this interval was lost in a hard drive crash at Tule Lake High School. Mowitz Creek is a tributary to Clear Lake, and a potential spawning site for the Lost River and Shortnosed Sucker fish. Chart table moa98.dbf was constructed from source table MOW98.dbf.

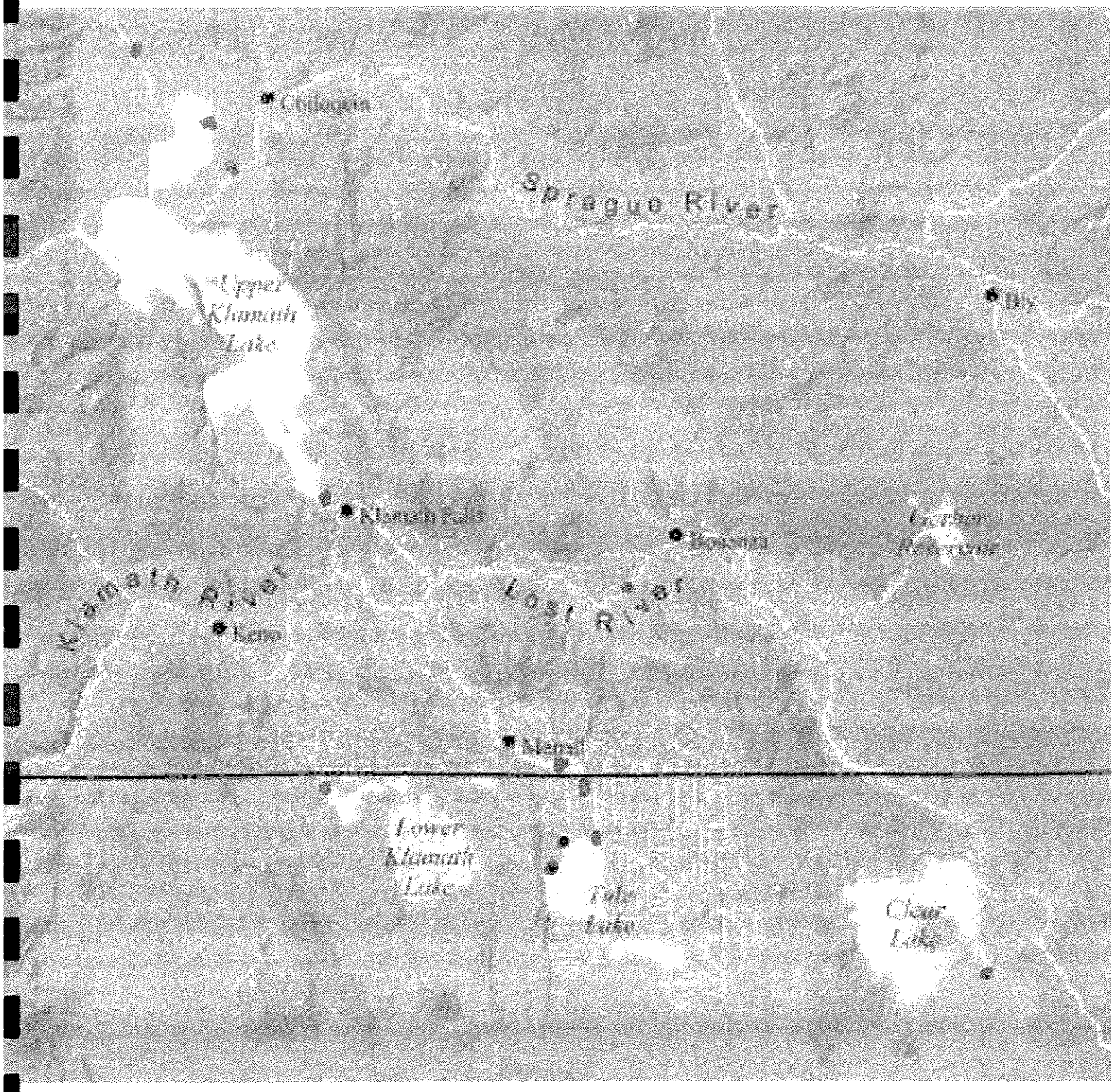


Maximum daily water temperatures during the fall of 1998 on Mowitz Creek. "Mowitz Upstream" refers to site A, and "Mowitz @ Road", refers to site B. Data collected by Kirk Heims, and students from Tule Lake High School using Stow Away remote temperature sensing devices. Mowitz Creek is a tributary to Clear Lake, and a potential spawning site for the Lost River and Shortnosed Sucker fish. Chart table MWMX9899.DBF was constructed from source table mow9899.dbf. Summer data for this site was lost in a computer hard drive crash.



Maximum daily water temperatures for three Mowitz Creek sites in 1999. Peak summer temperatures at all 3 sites show extended periods above 20 degrees Celsius. Data recorded with new Stow Away remote temperature sensing devices. Mowitz Creek is a tributary of Clear Lake, and a potential site for spawning of the Lost River and Shortnosed Sucker fish. Chart table MOWMOX99.DBF was constructed from source table MOWITZ99.DBF. Mowitz site C remote temperature sensing device was lost during high water.

Tule Lake High School
Temperature Monitoring Sites 2000-2001



Appendix H

Yreka High School Cross Sectional Profiles

Fall Chinook Salmon Survey 1998

Bogus Creek Salmon Survey Crew 1998. Yreka and Discovery High students led by Bill Chesney from California Dept of Fish and Game. High School Students were part of a cooperative spawning survey effort. Participants included Ca. Fish and Game, U.S. Forest Service, Yurok Tribe, Salmon River Restoration Council, Yreka High, Etna High, Discovery High, and Mt. Shasta High.

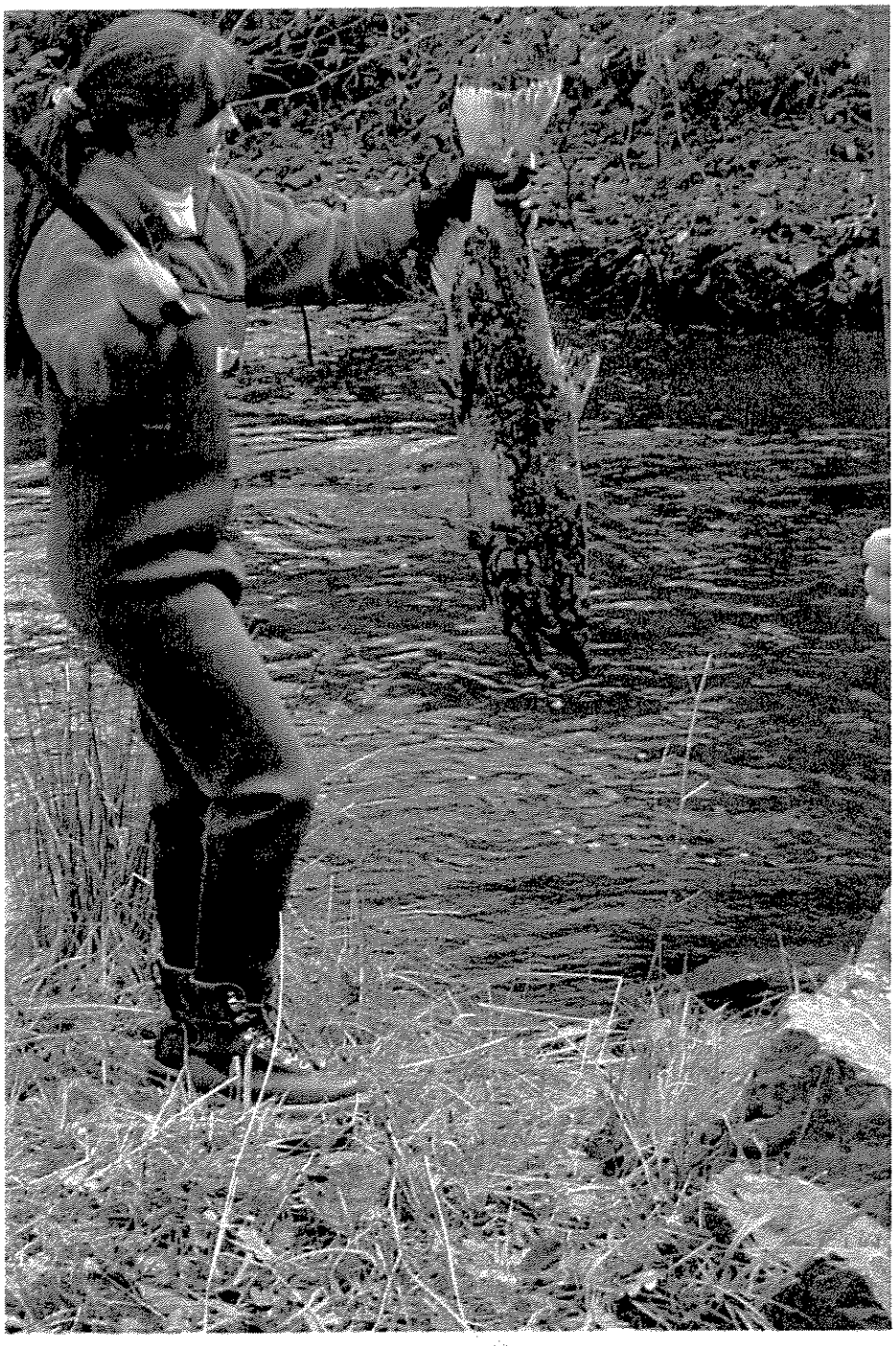
Scale samples are taken from each carcass recovered. The scales are then analyzed to determine the age of the fish. Fish returning to spawn are typically 3-5 years old.

Measuring of the forklength of salmon carcasses.

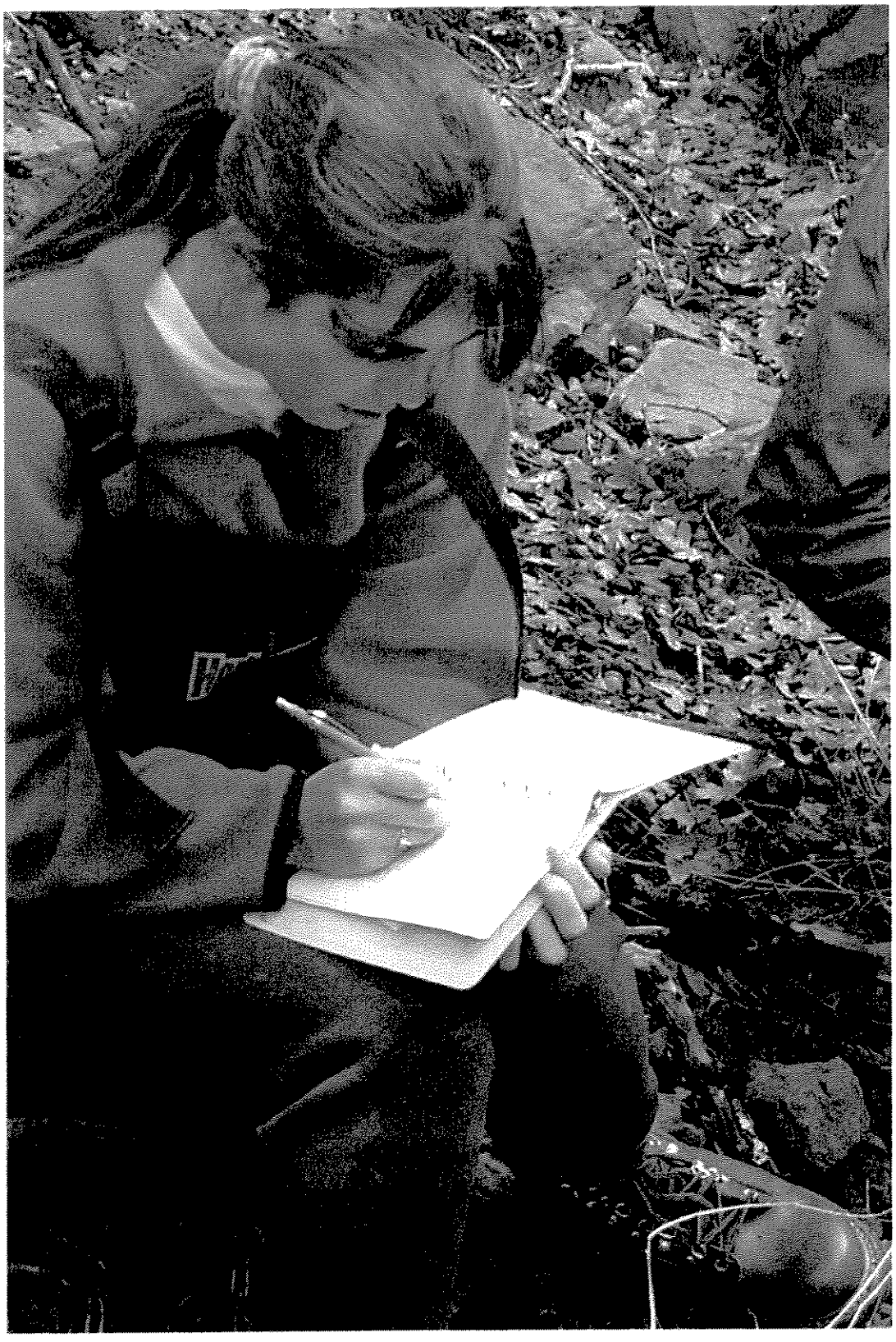
Mark and Recapture

Bill Chesney demonstrates putting a numbered jaw tag in the salmon carcass. Fresh carcasses are tagged and thrown back into the creek the first time they are found. The percentage of tagged carcasses recovered on the next survey helps Fish and Game to determine the accuracy of the count. The statistics are put thorough an equation called the Peterson estimate.

Carcass Chopping.

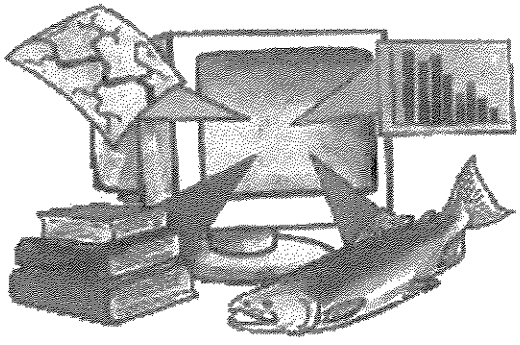


Old carcasses, or carcasses that have been recovered with a jaw tag are chopped to prevent recounting.



Yreka High School student entering survey data. Data recorded for each carcass found includes: sex, forklength, and if the fish has spawned or not. This data is used to get an idea of the reproducing population.

Yreka High School



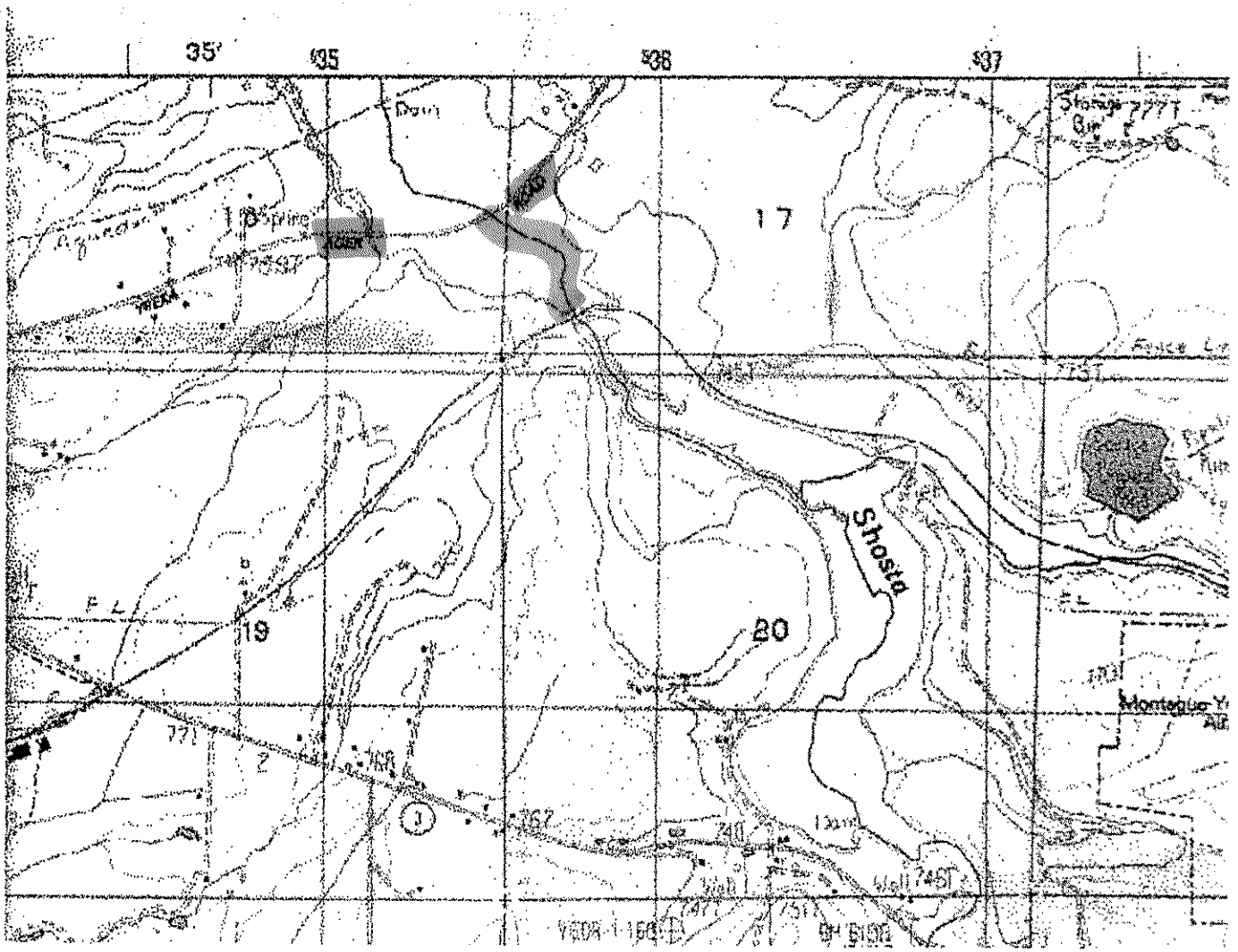
KRIS Project
Fall 1999 – Spring 2000

Prepared By

Adam Cates

Study Area

Fiock Ranch between Yreka-Ager Road and Yreka Western RR bridge



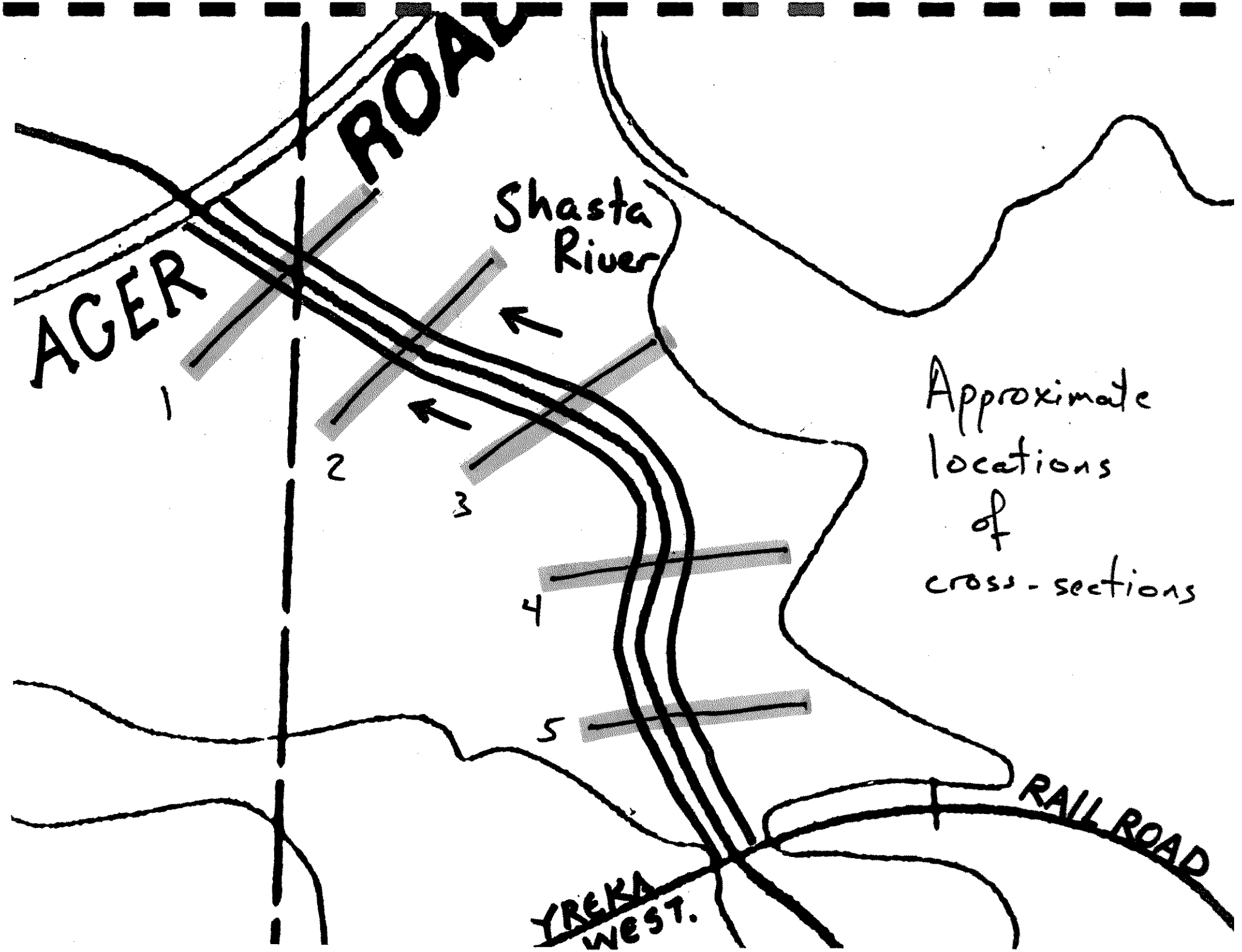

ROAD
ACER
Shasta River
1
2
3
4
5
Approximate locations of cross-sections
RAIL ROAD
EUREKA WEST.

Table of Contents

NARRATIVE
October 1999 – March 2000

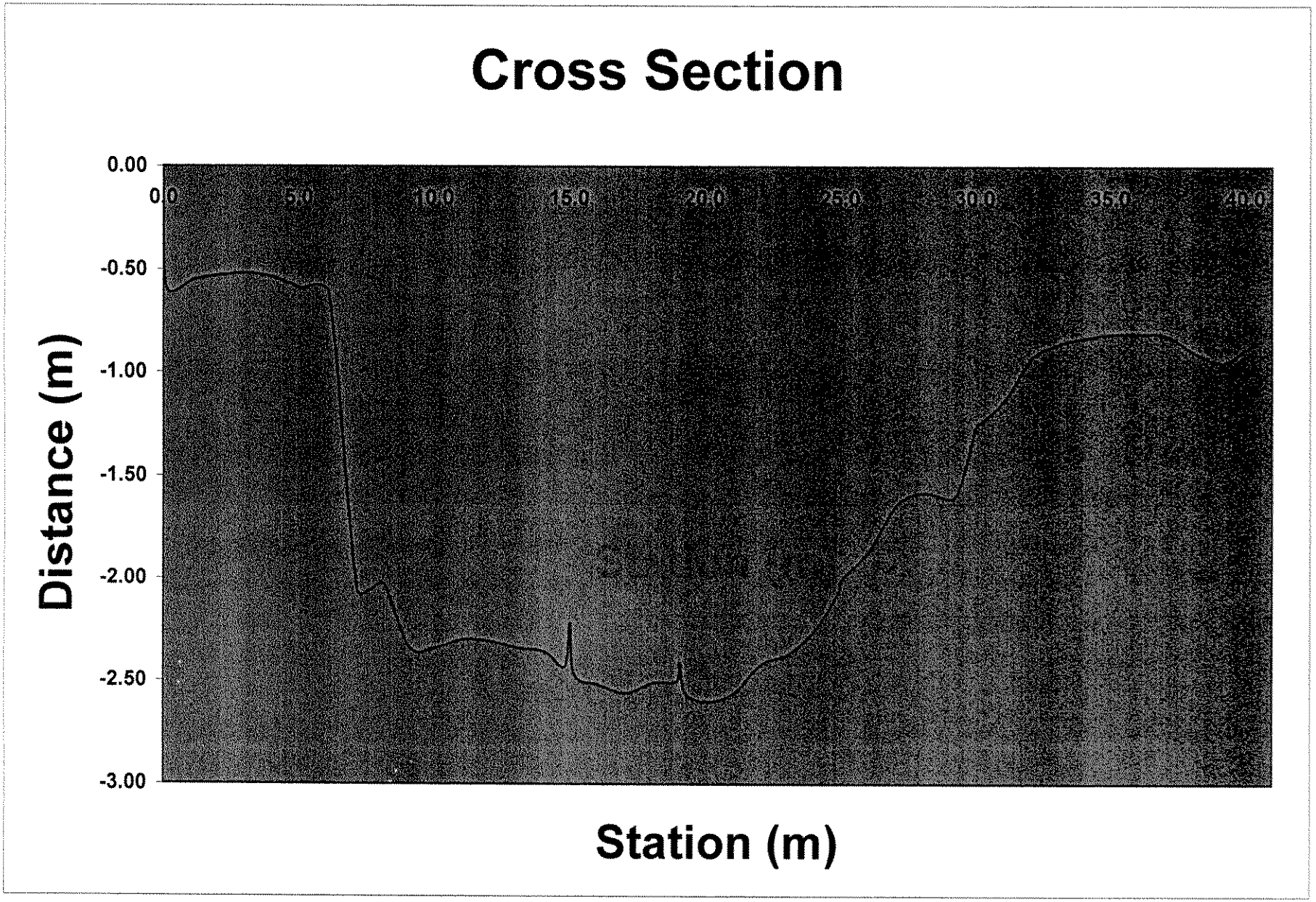
In the fall of 1999 Yreka High School Senior, Adam Cates, with the help of Mr. Mark O'Connor, collected cross-section and GPS (Global Positioning System) data at the KRIS site located on Yreka – Ager Road. Data has been collected from the five cross sections for the past three years except for the spring of 1998. Data was not collected in 1998 because water levels did not permit.

Cross sections were measured by attaching a tape to fence posts near the permanent reference stake. We used the " string with level – ends" method. Our data was taken in meters using a stadia rod. The string acts as the x-axis while the stadia rod acts as the y-axis. The x-axis is broken into stations that are one meter in length, except when the bank edge, water edge, or rock is encountered, then the measurements become smaller and more precise. The data collected is recorded on sight and is considered RAW because there are corrections that have to be made in the distances. When we return to the classroom the data is entered into Microsoft Excel and CORRECTED. After that the data is compiled into a scatter plot graph to simulate the river bottom.

GPS data was collected to create a map of the site. Pathfinder Geo Explorer and Pathfinder office were used in the data collection and processing. The GPS data is accurate within one to five meters.

Cross-section 1, Shasta River, Fiock 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

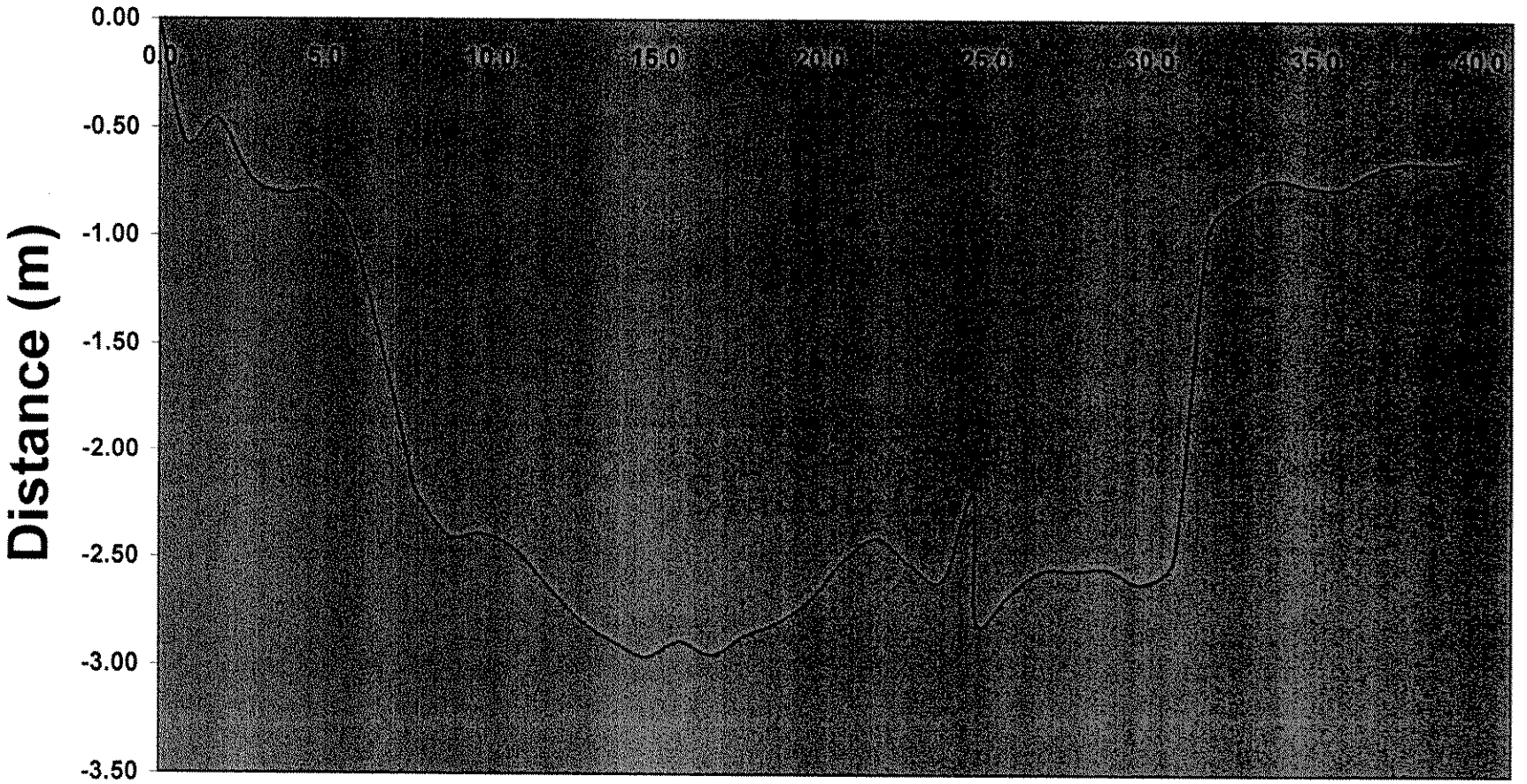
RAW DATA			CORRECTED DATA	
station (m)	dist. To ground (m)		station (m)	dist. To ground (m)
0.00	0.55	Reff. Stake	0.00	0.00
1.00	0.59	Grass	0.12	-0.59
2.00	0.55		1.12	-0.55
3.00	0.53		2.12	-0.53
4.00	0.52		3.12	-0.52
5.00	0.54		4.12	-0.54
6.00	0.59		5.12	-0.59
7.00	0.61	Bank Edge	6.12	-0.61
8.07	2.06	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
Distance (m)
0.0
5.0
10.0
15.0
20.0
25.0
30.0
35.0
40.0
Station (m)

Cross-section 2, Shasta River, Fiock 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	0.61	Reff. Stake	0.00	0.00
2.00	0.56	dead thistle	0.78	-0.56
3.00	0.46		1.78	-0.46
4.00	0.73		2.78	-0.73
5.00	0.80		3.78	-0.80
6.00	0.79		4.78	-0.79
7.00	0.96		5.78	-0.96
8.00	1.53	banks edge	6.78	-1.53
8.90	2.13	waters edge	7.68	-2.13
9.00	2.19	mud	7.78	-2.19
10.00	2.40	moss	8.78	-2.40
11.00	2.39		9.78	-2.39
12.00	2.46		10.78	-2.46
13.00	2.63		11.78	-2.63
14.00	2.79		12.78	-2.79
15.00	2.89		13.78	-2.89
16.00	2.96		14.78	-2.96
17.00	2.89	gravel	15.78	-2.89
18.00	2.95	mud	16.78	-2.95
19.00	2.86		17.78	-2.86
20.00	2.80		18.78	-2.80
21.00	2.69		19.78	-2.69
22.00	2.51		20.78	-2.51
23.00	2.41		21.78	-2.41
24.00	2.53		22.78	-2.53
25.00	2.60		23.78	-2.60
25.90	2.20	waters edge	24.68	-2.20
26.00	2.80	banks edge	24.78	-2.80
27.00	2.67	grass	25.78	-2.67
28.00	2.56		26.78	-2.56
29.00	2.56		27.78	-2.56
30.00	2.55		28.78	-2.55
31.00	2.62		29.78	-2.62
32.00	2.50	before rise	30.78	-2.50
33.00	0.99	top of rise	31.78	-0.99
34.00	0.81	dead thistle	32.78	-0.81
35.00	0.73		33.78	-0.73
36.00	0.76		34.78	-0.76
37.00	0.77		35.78	-0.77
38.00	0.69		36.78	-0.69
39.00	0.65		37.78	-0.65
40.00	0.66		38.78	-0.66
40.90	0.64	reff. stake	39.68	-0.64

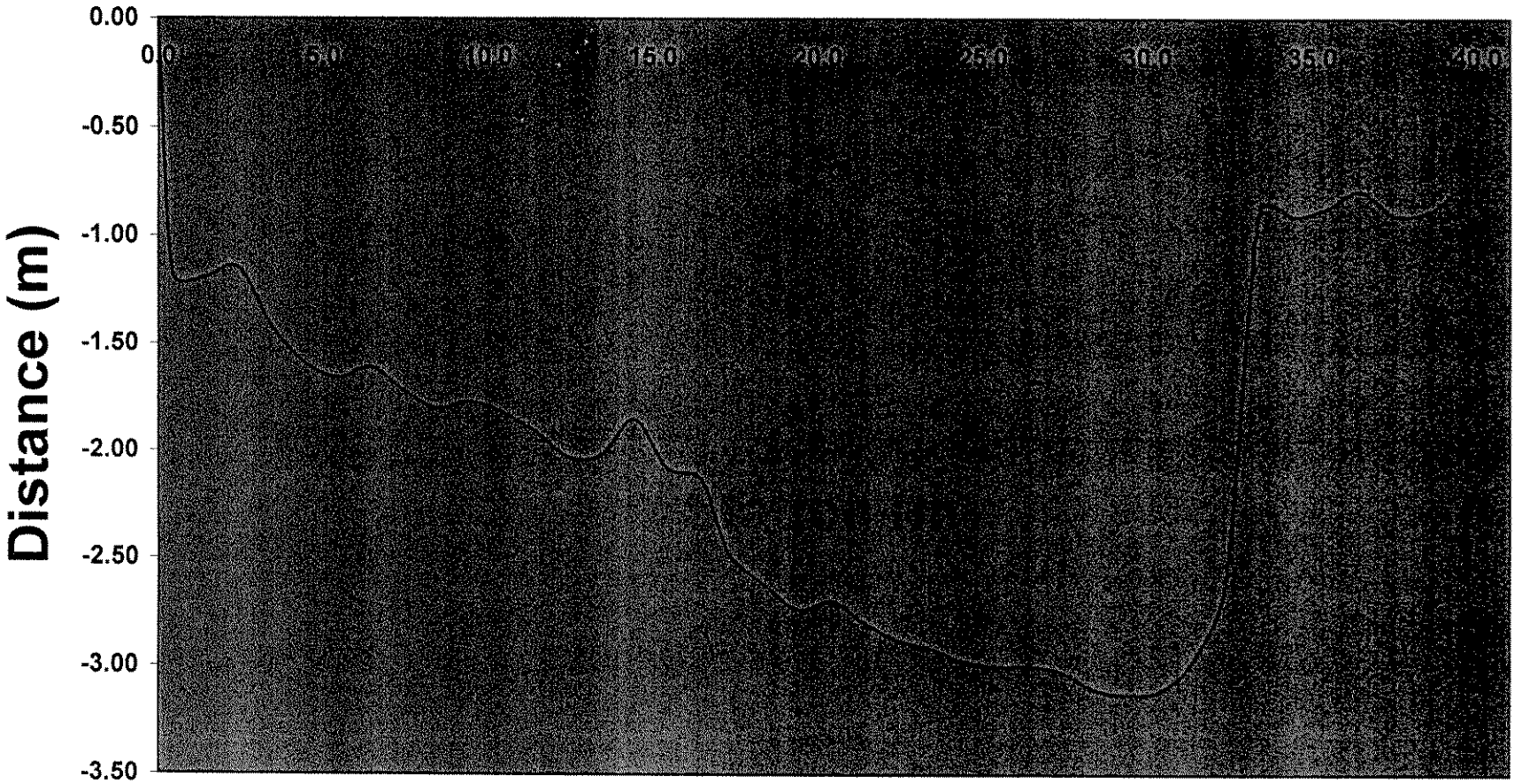
Cross Section



Cross-section 3, Shasta River, Fiock 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	1.06	reff. Stake	0.00	0.00
2.00	1.18	grass	0.45	-1.18
3.00	1.19		1.45	-1.19
4.00	1.15		2.45	-1.15
5.00	1.42		3.45	-1.42
6.00	1.59		4.45	-1.59
7.00	1.66		5.45	-1.66
8.00	1.61		6.45	-1.61
9.00	1.72		7.45	-1.72
10.00	1.80		8.45	-1.80
11.00	1.77		9.45	-1.77
12.00	1.82		10.45	-1.82
13.00	1.91		11.45	-1.91
14.00	2.03		12.45	-2.03
15.00	2.02		13.45	-2.02
16.00	1.85		14.45	-1.85
17.00	2.08		15.45	-2.08
18.00	2.13		16.45	-2.13
18.65	2.40	waters edge	17.10	-2.40
19.00	2.51	moss	17.45	-2.51
20.00	2.63		18.45	-2.63
21.00	2.74		19.45	-2.74
22.00	2.70		20.45	-2.70
23.00	2.80	gravel	21.45	-2.80
24.00	2.88		22.45	-2.88
25.00	2.92		23.45	-2.92
26.00	2.98		24.45	-2.98
27.00	3.00		25.45	-3.00
28.00	3.00		26.45	-3.00
29.00	3.03		27.45	-3.03
30.00	3.11		28.45	-3.11
31.00	3.13		29.45	-3.13
32.00	3.11		30.45	-3.11
33.00	2.96	moss	31.45	-2.96
33.93	2.61	waters edge	32.38	-2.61
34.95	0.87	top of bank	33.40	-0.87
36.00	0.91	grass	34.45	-0.91
37.00	0.87		35.45	-0.87
38.00	0.79		36.45	-0.79
39.00	0.90		37.45	-0.90
40.00	0.89		38.45	-0.89
40.76	0.81	reff. stake	39.21	-0.81

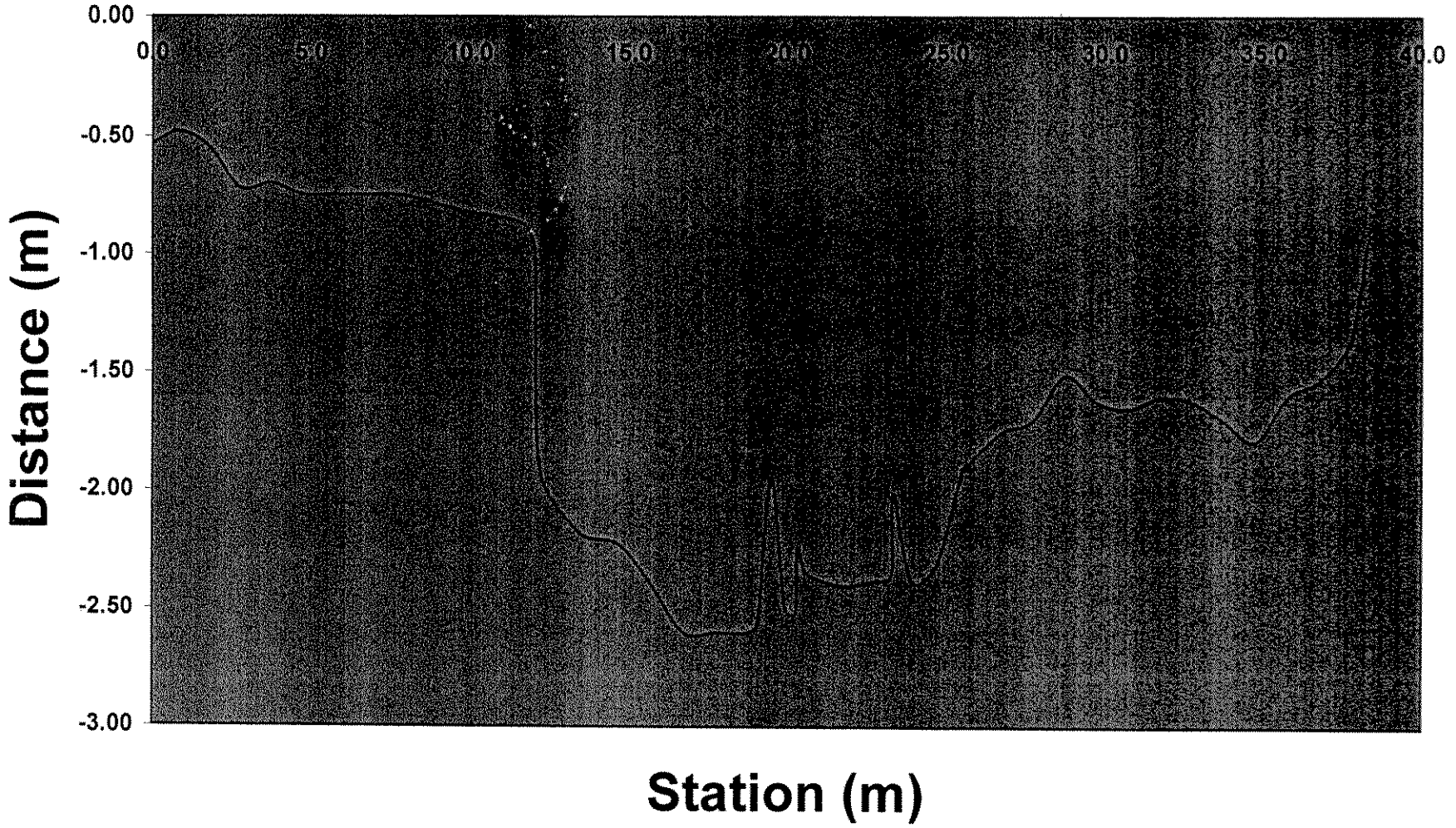
Cross Section



Cross-section 4, Shasta River, Fiock 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

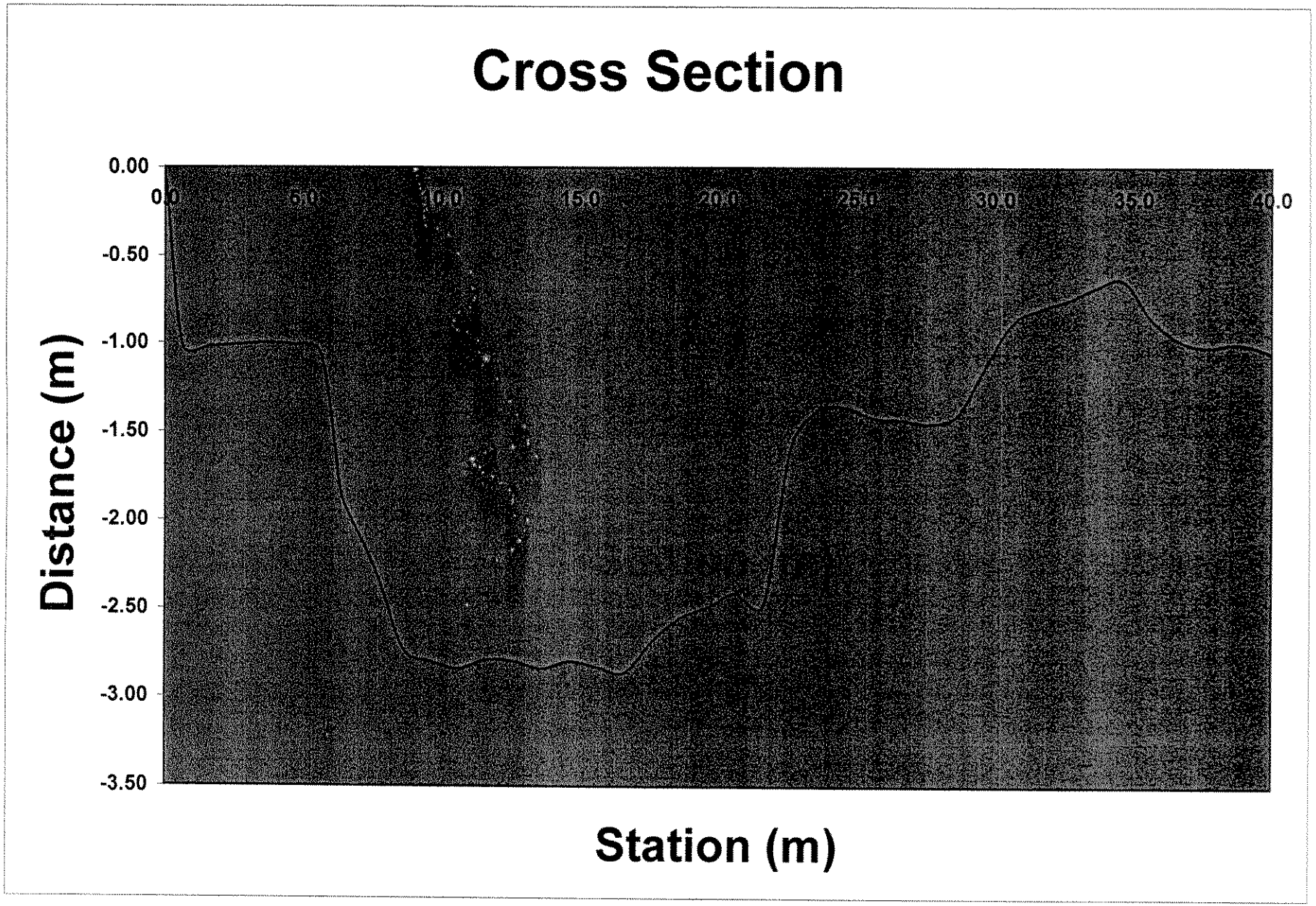
RAW DATA			CORRECTED DATA	
station (m)	dist. To ground (m)		station (m)	dist. To ground (m)
0.00	0.45	reff stake	0.00	0.00
1.00	0.51	grass	-0.24	-0.51
2.00	0.48		0.76	-0.48
3.00	0.54		1.76	-0.54
4.00	0.72		2.76	-0.72
5.00	0.70		3.76	-0.70
6.00	0.75		4.76	-0.75
7.00	0.75		5.76	-0.75
8.00	0.75		6.76	-0.75
9.00	0.75		7.76	-0.75
10.00	0.78		8.76	-0.78
11.00	0.82		9.76	-0.82
12.00	0.84		10.76	-0.84
13.00	0.88		11.76	-0.88
13.30	0.98	banks edge	12.06	-0.98
13.45	1.90	bottom of bank	12.21	-1.90
14.59	2.16	waters edge	13.35	-2.16
15.00	2.20	mud	13.76	-2.20
16.00	2.23	gravel	14.76	-2.23
17.00	2.40		15.76	-2.40
18.00	2.60		16.76	-2.60
19.00	2.60		17.76	-2.60
20.00	2.60		18.76	-2.60
20.35	2.56	before rock	19.11	-2.56
20.75	1.95	on rock	19.51	-1.95
21.20	2.50	after rock	19.96	-2.50
21.53	2.52	before rock	20.29	-2.52
21.60	2.24	on rock	20.36	-2.24
21.90	2.35	after rock	20.66	-2.35
23.00	2.40	gravel	21.76	-2.40
24.00	2.38		22.76	-2.38
24.56	2.35	before rock	23.32	-2.35
24.59	2.01	on rock	23.35	-2.01
25.20	2.38	after rock	23.96	-2.38
26.00	2.30	gravel	24.76	-2.30
26.78	1.91	waters edge	25.54	-1.91
27.00	1.88	tules	25.76	-1.88
28.00	1.75		26.76	-1.75
29.00	1.70		27.76	-1.70
30.00	1.51		28.76	-1.51
31.00	1.62		29.76	-1.62
32.00	1.65		30.76	-1.65
33.00	1.60		31.76	-1.60
34.00	1.62		32.76	-1.62
35.00	1.70		33.76	-1.70
36.00	1.79		34.76	-1.79
37.00	1.60		35.76	-1.60
38.00	1.53		36.76	-1.53
39.00	1.36		37.76	-1.36
39.53	0.96	post, no reff. Stake	38.29	-0.96

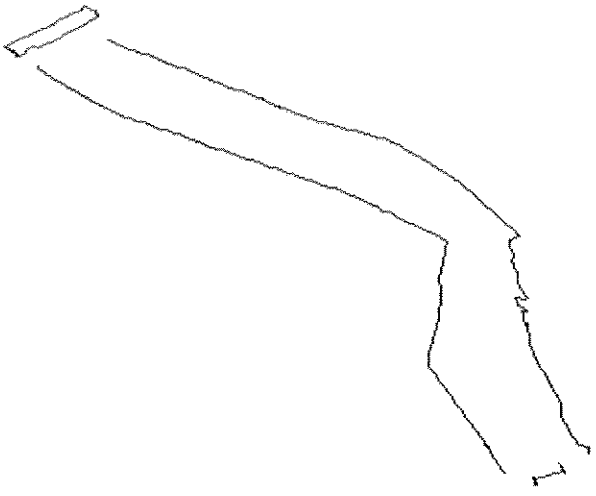
Cross Section



Cross-section 5, Shasta River, Fiock 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
0.00
-0.50
-1.00
-1.50
-2.00
-2.50
-3.00
-3.50
Distance (m)
0.0
5.0
10.0
15.0
20.0
25.0
30.0
35.0
40.0
Station (m)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Appendix I

Weed High School

Shasta River Restoration Project

The following document describes restoration efforts on the Shasta River northeast of Grenada. The property belongs to the Freeman family and is located in township 44 north, range 2 east, in the northwest corner of section 11. The latitude is 41° 41' north and 122° 30' 44" west longitude.

Table of Contents

Procedures

The following procedures were described in the U. S. Forest Service publication **"Stream Channel Reference Sites: An Illustrated Guide to Field Technique"** which was published in April 1994. We used the techniques described specifically in sections 5 & 6, **"Surveying Basics"** and **"Measuring Channel Cross-Section."**

River Profiles

Preparations

Before bringing students to the site, Dave Webb and I selected the six locations for the cross sections. We chose one at the beginning of the property where the river ran straight, one on a turn to the right, one on a turn to the left, one where the river had recently changed its course and there is severe erosion on river left, one where there was erosion on river right, and the last at the end of the property where the river just begins to turn right. The six sites were marked with a metal fence post driven in upside down to indicate a survey marker. A post was driven in on each side of the river about 15 to 25 meters back from the low water's edge. Another small piece of a metal fence post was driven almost to the ground level just a few centimeters toward the river inside the large metal fence post on river left, where we access the property.

Equipment

We used a Lietz engineering transit, a 10 meter PVC stadia rod designed for water use, two 100 meter fiberglass tapes, hip and chest waders with boots, a small inflatable raft with foot pump, personal flotation devices, a compass, clip boards, pencils, notebooks and a camera.

Student Activity

At the landowner's request only four or five students were involved on each trip and for this activity that is actually perfect. One or two students are recorders, one must handle the stadia rod and one must be on each side of the river in order to hold the raft in position when the water is deep enough to require its use.

To get started once we were on location, there were five jobs:

1) Locate and level the transit. For proper surveying the transit should be located relative to a permanent

benchmark stepping over if distance requires. Five of our six cross sections required at least one step over to our cross section location. For cross section #1, the farthest location from our benchmark, three turning points were required! Leveling the transit is the most important task of the day, without a level transit all other efforts are wasted!! Take your time and get it level! The transit should be located where the 100 meter tape is completely visible and the turning point (or the benchmark) can be sighted.

2) The recorder(s) should begin noting the date, time, people involved, vegetation on each side of the river, and the location by range, township and section and/or by latitude and longitude. Basically, begin the data sheet.

3) The 100 meter tape should be securely attached to the tall metal post.

4) One person should determine the depth of the river to decide whether or not the raft is required. This will probably necessitate the use of waders and boots. This person should then stretch the 100 meter tape across the river and attach it to the metal post on the opposite bank so that it is level. The tape should be pulled as taut as possible.

5) If the raft is required, inflate it.

When everything is ready, begin with the stadia rod right next to the small metal post which has been completely driven into the ground. This is the origin, record the position on the 100 meter tape ("Station" on the data sheet) and the height on the stadia rod when sighted through the transit ("Foresight"). This short metal post is considered zero, later when the data is entered into a computer spreadsheet all "Station" numbers should be reduced by the offset, the reading on the 100 meter tape. This allows for a constant origin so that the cross section can be duplicated accurately many months or years later.

The person handling the stadia rod should begin moving along the 100 meter tape no more than .5 meters at a time. Record the station and foresight at each position. The person handling the stadia rod should look for changes in terrain and vegetation. If the level of the ground changes, a hole or hill, take enough readings to record these changes, every 5 cm if necessary! The recorder should also be told of any changes in vegetation or consistency of the river bottom. Notes such as "mucky" or "gravel" or "sandy" may be of great interest in years to come. Survey all the way through the river and out to the fence post on the opposite bank. We also

surveyed back through the cattle fence, those appear as negative station numbers. When the river was too deep to stand with the stadia rod, we used the raft with a rope attached to each side and held by people on each shore. The person in the raft then maneuvered the stadia rod from within the boat, no easy feat.
When the surveying is completed, step back to the benchmark to close the survey.

Computer Work

We entered all data into a spreadsheet, Microsoft Excel, just as it appears on the data sheet. Data entry was done in pairs, a reader and a keyer. Data was entered one column at a time, if the two columns ended in different lengths we checked for missed or duplicated entries. When the data was graphed we could easily check for values which were too small or too large.
The benchmark is given an arbitrary elevation, 10 meters worked for our surveys. All other elevations are relative to the benchmark.
Using formulae in a spreadsheet made the elevations very easy to obtain. The graphs were produced using the "station" as the x-coordinate and the "elevation" as the y-coordinate. The closing difference is the difference between the beginning elevation of the benchmark, 10 meters, and the ending elevation of the benchmark after surveying and stepping back.

457.7 meters @ 155 degrees from the benchmark

Cross sectional data crew:	Tiffany Heckman, Johhny Palangvanh, Rosy Salcedo,				
	Trudy Rilling, John Aviani.				
Date & conditions:	9/18/98	Warm day, light breeze, partly cloudy.			
River left:	Willows, star thistle, tules, and grasses.				
River right:	Grasses, newly planted trees.				
Heading & distance:	457.7 meters east, 155 degrees from the benchmark.				
Tape measure offset	.30 meters				
Comments	**Station**	**Backsight**	**Height of Inst.**	**Foresight**	**Elevation**
Duplex nais through reflector T-pole	Benchmark		11.930	1.930	10.000 meters
Top of Rock, Turning Point #1				1.540	10.390
		1.494	11.884		
Top of flat log, Turning Point #2				1.211	10.673
		1.586	12.259		
Top of low metal benchmark post,				1.352	10.907
Turning Point #3		1.431	12.338		
Grass	-0.30	meters		1.358	10.980 meters
Grass	0.20			1.398	10.940
Grass	0.70			1.416	10.922
Grass	1.20			1.458	10.880
Grass	1.70			1.468	10.870
Grass	2.20			1.484	10.854
Grass	2.70			1.552	10.786
Grass	3.20			1.680	10.658
Grass	3.70			1.816	10.522
Grass	4.20			1.930	10.408
end of grass	4.50			2.012	10.326
Pink Flowers, Smart Weed	5.00			2.098	10.240
Pink Flowers, (Polyconaceae)	5.50			2.132	10.206
Pink Flowers, (Polyconaceae)	6.00			2.159	10.179
Tules	6.50			2.164	10.174
Tules	7.00			2.197	10.141
Tules	7.50			2.192	10.146
Tules	8.00			2.220	10.118
Tules	8.50			2.228	10.110
Tules	9.00			2.224	10.114
Tules	9.50			2.306	10.032
Tules	10.00			2.332	10.006
Tules	10.50			2.388	9.950
Tules	11.00			2.330	10.008
Tules	11.50			2.339	9.999
Tules	12.00			2.465	9.873
Edge of water	12.30			2.735	9.603
In water	12.80			3.115	9.223
Middle water	13.30			3.050	9.288
Middle water	13.80			3.010	9.328
Willow Trees	14.30			3.065	9.273

457.7 meters @ 155 degrees from the benchmark

Willow Trees	14.70			3.100	9.238
Willow Trees	15.20			2.950	9.388
Willow Trees	15.70			2.770	9.568
Edge of water (hill)	16.20			2.143	10.195
Turning point #4			12.338	1.450	10.888
		1.635			
Turning point #5			12.523		
Trees	16.70			2.160	10.363
Wood	17.20			2.020	10.503
Wood	17.70			1.974	10.549
Wood	18.20			2.194	10.329
Wood	18.70			2.187	10.336
Wood	19.20			2.175	10.348
Wood	19.70			1.667	10.856
Wood	20.20			1.625	10.898
Wood	20.70			1.606	10.917
Wood	21.20			1.559	10.964
Wood	21.70			1.540	10.983
Wood	22.20			1.530	10.993
Wood	22.70			1.527	10.996
Wood	23.20			1.545	10.978
Wood	23.70			1.583	10.940
Wood	24.20			1.606	10.917
Wood	24.70			1.608	10.915
Wood	25.20			1.680	10.843
Wood	25.70			1.645	10.878
Wood	26.20			1.538	10.985
Wood	26.70			1.550	10.973
Wood	27.20			1.524	10.999
Wood	27.70			1.510	11.013
Wood	28.20			1.506	11.017
Wood	28.70			1.488	11.035
Wood	29.20			1.468	11.055
Wood	29.70			1.470	11.053
Wood	31.70			1.509	11.014
Wood	32.20			1.520	11.003
Wood	32.70			1.539	10.984
Wood	33.20			1.534	10.989
Wood	33.70			1.588	10.935
Slope/grass	34.15			1.660	10.863
Sand	34.20			1.800	10.723
Sand	34.70			1.829	10.694
Sand	34.85			1.878	10.645
Sand	35.05			2.107	10.416
Sand	35.20			2.261	10.262
Grass/shore	35.70			2.535	9.988
Grass/shore	36.20			2.723	9.800
Muddy edge of water	36.80			2.792	9.731

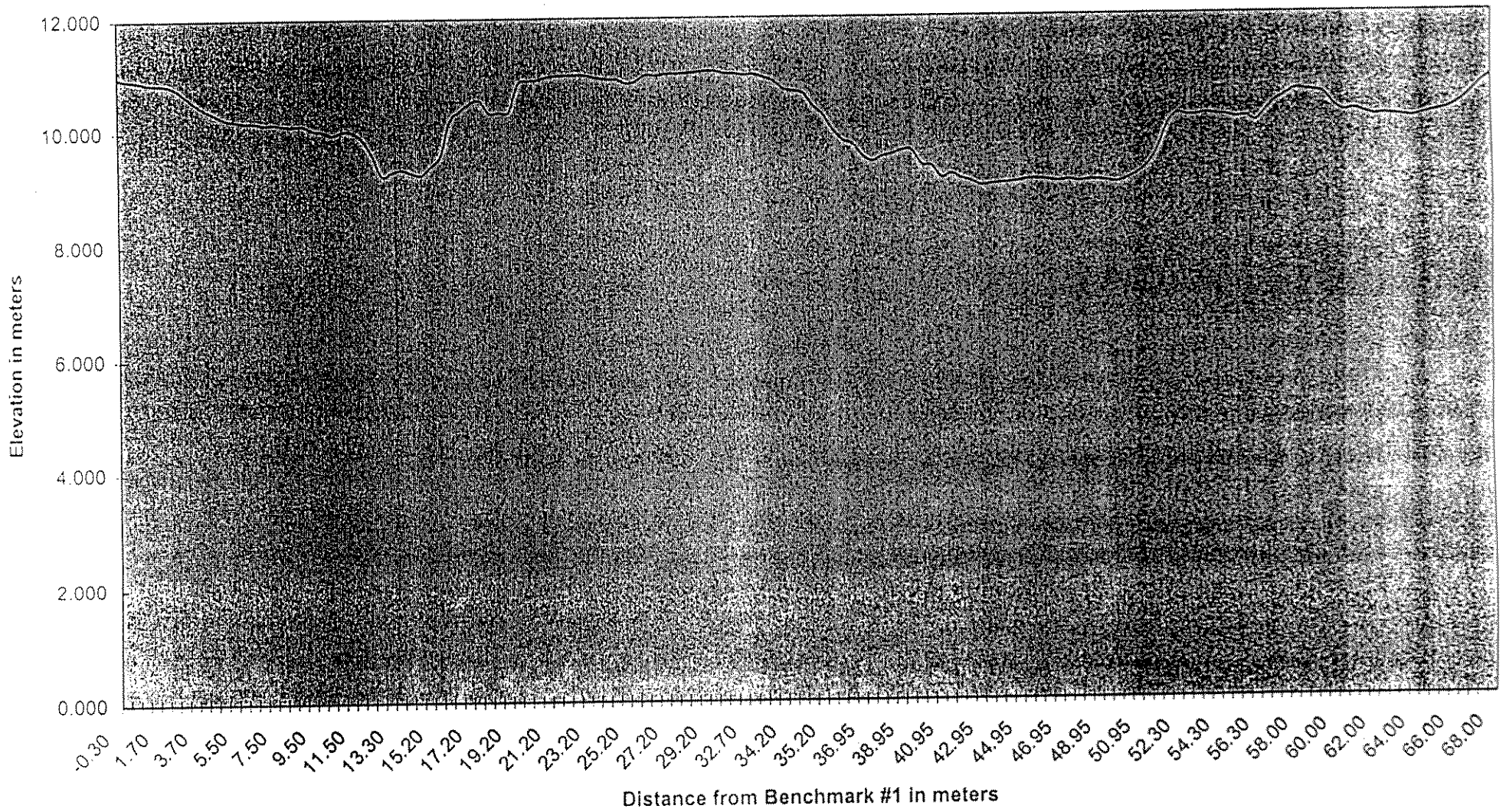
Cross Section #1

457.7 meters @ 155 degrees from the benchmark

Slope/down	60.00			2.171	10.352
End of slope	60.50			2.270	10.253
End of slope	61.00			2.240	10.283
End of slope	61.50			2.295	10.228
End of slope	62.00			2.346	10.177
End of slope	62.50			2.337	10.186
End of slope	63.00			2.351	10.172
End of slope	63.50			2.372	10.151
End of slope	64.00			2.390	10.133
End of slope	64.50			2.341	10.182
End of slope	65.00			2.301	10.222
End of slope	65.50			2.266	10.257
Going up	66.00			2.205	10.318
Going up	66.50			2.094	10.429
Going up	67.00			1.946	10.577
Going up	67.50			1.779	10.744
Pole	68.00			1.654	10.869
Turning point, #6		1.635			10.888
Turning point			12.496	1.608	
Turning point #7		2.052			10.444
Turning point for closing			11.934	1.490	
Turning point for closing, #8		0.929			11.005
			12.234	1.229	
Turning point #9, for closing survey		2.015			10.219
			Closing difference:		0.219 meters

Freeman Ranch Cross Section #1

457.7 meters @ 155 degrees from the benchmark



341.0 meters @ 147 degrees from the benchmark

Cross sectional data crew:	John Aviani, James Goldie, Ron Buggs, Steven Alvarado & Justin Barbieri				
Date & conditions:	19-Sep-97	Clear, warm day, no wind	Approx. 78 degrees F.		
River left:	Star thistle, grass, gravel on river bank, sedges, small planted trees.				
River right:	Grasses, small planted trees, tules upstream about 5 meters				
Heading & distance:	65.16 meters @ 109 degrees from true north.				
Comments	**Station**	**Backsight**	**Height of Inst.**	**Foresight**	**Elevation**
Duplex nail thru reflector	Benchmark		11.387	1.387	10.000 meters
on the telephone pole	Turning Point	1.747			9.640
			11.508	1.868	
	Turning Point	0.929			10.579
			11.982	1.403	
Grasses	-0.19			1.448	10.534
	0.31			1.449	10.533
	0.81			1.452	10.530
	1.31			1.457	10.525
	1.81			1.462	10.520
	2.31			1.446	10.536
	2.81			1.448	10.534
	3.31			1.459	10.523
	3.81			1.445	10.537
	4.31			1.448	10.534
	4.81			1.417	10.565
	5.31			1.410	10.572
	5.81			1.406	10.576
	6.31			1.397	10.585
	6.81			1.398	10.584
	7.31			1.386	10.596
	7.81			1.398	10.584
	8.31			1.398	10.584
	8.81			1.397	10.585
	9.31			1.402	10.580
	9.81			1.398	10.584
	10.31			1.388	10.594
	10.81			1.398	10.584
	11.31			1.383	10.599
	11.81			1.384	10.598
	12.31			1.382	10.600
	12.81			1.381	10.601
	13.31			1.407	10.575
	13.81			1.411	10.571
	14.31			1.425	10.557
	14.81			1.414	10.568
	15.31			1.420	10.562
	15.81			1.417	10.565

Cross Section #2

341.0 meters @ 147 degrees from the benchmark

	16.31		1.395	10.587
	16.81		1.411	10.571
	16.91		1.455	10.527
	16.81		1.648	10.334
	16.81		2.106	9.876
	16.93		2.126	9.856
	17.41		2.095	9.887
Gravel	17.91		2.036	9.946
Gravel	18.41		2.021	9.961
Gravel	18.91		2.068	9.914
Gravel	19.41		2.106	9.876
Gravel	19.91		2.173	9.809
Gravel	20.41		2.302	9.680
Gravel	20.91		2.439	9.543
Gravel	21.50		2.565	9.417
Gravel	21.81		2.647	9.335
Gravel	22.31		2.772	9.210
Gravel	22.81		2.858	9.124
Gravel	23.31		2.901	9.081
Gravel	23.81		2.942	9.040
Gravel	24.31		2.968	9.014
Gravel	24.81		2.955	9.027
Gravel	25.36		2.987	8.995
Gravel	25.81		2.954	9.028
Gravel	26.31		2.926	9.056
Gravel	26.81		2.873	9.109
Gravel	27.31		2.986	8.996
Gravel	27.81		3.032	8.950
Gravel	28.31		3.099	8.883
Gravel	28.81		3.128	8.854
Gravel	29.31		3.144	8.838
Gravel	29.81		3.184	8.798
Gravel	30.31		3.119	8.863
Edge of the River	30.81		3.040	8.942
Grass	30.98		2.584	9.398
Grass	31.31		2.469	9.513
Grass	31.81		2.410	9.572
Grass	32.31		2.370	9.612
Grass	32.81		2.343	9.639
Grass	33.31		2.238	9.744
Grass	33.81		2.210	9.772
Grass	34.31		2.195	9.787
Grass	34.81		2.110	9.872
Grass	35.31		2.143	9.839
Grass	35.81		2.130	9.852
Grass	36.31		2.122	9.860

457.7 meters @ 155 degrees from the benchmark

Muddy edge of water	36.95		3.000	9.523
Muddy edge of water	37.45		3.090	9.433
Muddy edge of water	37.95		3.005	9.518
Muddy edge of water	38.45		2.967	9.556
Muddy edge of water	38.95		2.905	9.618
Muddy end of shore	39.45		2.907	9.616
Water/mud bottom	39.95		3.158	9.365
Water/mud bottom	40.45		3.182	9.341
Water/mud bottom	40.95		3.387	9.136
Water/mud bottom	41.45		3.323	9.200
Water/mud bottom	41.95		3.410	9.113
Water/mud bottom	42.45		3.459	9.064
Rocky	42.95		3.538	8.985
Rocky	43.45		3.517	9.006
Rocky	43.95		3.500	9.023
Rocky	44.45		3.488	9.035
Rocky	44.95		3.465	9.058
Rocky	45.45		3.435	9.088
Rocky	45.95		3.430	9.093
Rocky	46.45		3.455	9.068
Rocky	46.95		3.475	9.048
Rocky	47.45		3.456	9.067
Rocky	47.95		3.480	9.043
Rocky	48.45		3.463	9.060
Rocky	48.95		3.459	9.064
Rocky	49.45		3.480	9.043
Rocky	49.95		3.500	9.023
Rocky	50.45		3.435	9.088
Rocky	50.95		3.340	9.183
Shore	51.45		3.195	9.328
Edge of water	51.90		2.909	9.614
Edge of water	52.25		2.480	10.043
Top of slope/grass	52.30		2.295	10.228
Grass	52.80		2.327	10.196
Grass	53.30		2.325	10.198
Grass	53.80		2.291	10.232
Grass	54.30		2.319	10.204
Grass	54.80		2.333	10.190
Grass	55.30		2.375	10.148
Grass	55.80		2.354	10.169
Grass	56.30		2.433	10.090
Grass	56.80		2.257	10.266
Bottom of hill	57.30		2.080	10.443
Bottom of hill	57.50		1.981	10.542
Bottom of hill	58.00		1.876	10.647
Top of hill	58.50		1.887	10.636
Top of hill	59.00		1.908	10.615
Slope/down	59.50		1.954	10.569

341.0 meters @ 147 degrees from the benchmark

Grass	36.81		2.097	9.885
Grass	37.31		2.107	9.875
Grass	37.81		2.139	9.843
Grass	38.31		2.134	9.848
Grass	38.81		2.125	9.857
Grass	39.31		2.132	9.850
Grass	39.81		2.108	9.874
Grass	40.31		2.086	9.896
Grass	40.81		2.105	9.877
Grass	41.31		2.109	9.873
Grass	41.81		2.125	9.857
Grass	42.31		2.153	9.829
Grass	42.81		2.146	9.836
Grass	43.31		2.145	9.837
Grass	43.81		2.102	9.880
Grass	44.31		2.052	9.930
Tules and Flowers	44.81		2.099	9.883
Tules and Flowers	45.31		2.110	9.872
Tules and Flowers	45.81		2.127	9.855
Tules and Flowers	46.31		2.130	9.852
Tules and Flowers	46.81		2.115	9.867
Tules and Flowers	47.31		2.127	9.855
Tules and Flowers	47.81		2.151	9.831
Tules and Flowers	48.31		2.140	9.842
Tules and Flowers	48.81		2.094	9.888
Tules and Flowers	49.31		2.080	9.902
Tules and Flowers	49.81		2.070	9.912
Tules and Flowers	50.31		2.072	9.910
Tules and Flowers	50.81		2.104	9.878
Tules and Flowers	51.31		2.201	9.781
Tules and Flowers	51.81		2.231	9.751
Tules and Flowers	52.31		2.268	9.714
Tules and Flowers	52.81		2.236	9.746
Tules and Flowers	53.31		2.241	9.741
Tules and Flowers	53.81		2.237	9.745
Tules and Flowers	54.31		2.217	9.765
Tules and Flowers	54.81		2.056	9.926
Tules and Flowers	55.31		2.095	9.887
Tules and Flowers	55.81		2.092	9.890
Tules and Flowers	56.31		2.089	9.893
Tules and Flowers	56.81		2.119	9.863
Grass	57.31		2.129	9.853
Grass	57.81		2.133	9.849
Grass	58.31		2.185	9.797
Grass	58.81		2.219	9.763
Grass	59.31		2.220	9.762

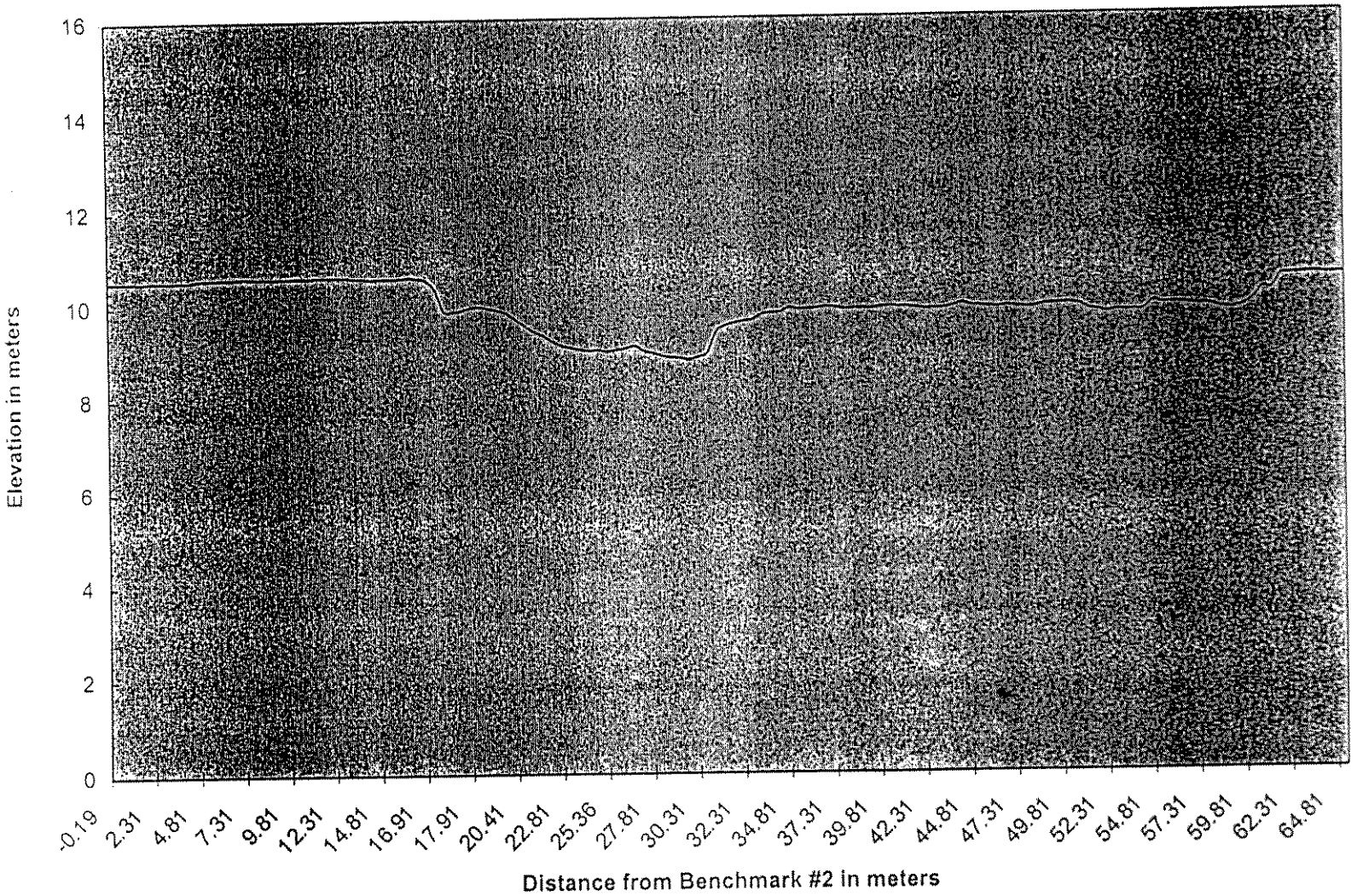
Cross Section #2

341.0 meters @ 147 degrees from the benchmark

Grass	59.81			2.159	9.823
Grass	60.31			2.047	9.935
Grass	60.81			1.807	10.175
Grass	61.31			1.824	10.158
Grass	61.81			1.561	10.421
Grass	62.31			1.531	10.451
Grass	62.81			1.523	10.459
Grass	63.31			1.508	10.474
Grass	63.81			1.505	10.477
Grass	64.31			1.527	10.455
Grass	64.81			1.526	10.456
Grass	65.16			1.513	10.469
				1.406	10.576
		0.935	11.511		
				1.879	9.632
		1.786	11.418		
				1.425	9.993
			Closing difference:		0.007 meters

Freeman Ranch Cross Section #2

341.0 meters @ 147 degrees from the benchmark



Freeman Ranch Cross Section #3

181.9 meters @ 135 degrees from the benchmark

Cross sectional data crew:	John Aviani, Brian Bowles, Jonathon Mathet & Justin McMahon				
Date & conditions:	10-Sep-97	Breezy warm day, about 80 degrees F.			
River left:	Grasses, star thistle, small planted trees				
River right:	Thistles & small trees. Some tules 5 meters upstream.				
Heading & distance:	63.89 meters @ 81 degrees from true north.				
Tape measure offset:	.31 meters				
Comments	**Station**	**Backsight**	**Height of Inst.**	**Foresight**	**Elevation**
Duplex nail thru reflector	Benchmark		11.259	1.259	10.000 meters
on the telephone pole		1.080			10.179
	Turning Point		11.197	1.018	
Grass	-0.31			1.056	10.141
Grass	0.19			1.061	10.136
Grass	0.69			1.049	10.148
Grass	1.19			1.038	10.159
Grass	1.69			1.018	10.179
Grass	2.19			0.993	10.204
Grass	2.69			0.950	10.247
Grass	3.19			0.947	10.250
Grass	3.69			0.959	10.238
Grass	4.19			0.961	10.236
Grass	4.69			0.957	10.240
Grass	5.19			0.988	10.209
Grass	5.69			1.012	10.185
Grass	6.19			1.025	10.172
Grass	6.69			1.046	10.151
Grass	7.19			1.048	10.149
Grass	7.69			1.060	10.137
Grass	8.19			1.082	10.115
Grass	8.69			1.121	10.076
Grass	9.19			1.143	10.054
Grass	9.69			1.143	10.054
Grass	10.19			1.167	10.030
Grass	10.69			1.333	9.864
Grass	11.19			1.366	9.831
Grass	11.69			1.281	9.916
Grass	12.19			1.303	9.894
Grass	12.69			1.304	9.893
Grass	13.19			1.400	9.797
Grass	13.69			1.407	9.790
Grass	14.19			1.425	9.772
Grass	14.69			1.400	9.797
Grass	15.19			1.347	9.850
Grass	15.69			1.323	9.874
Grass	16.19			1.263	9.934
Grass	16.69			1.254	9.943

Freeman Ranch Cross Section #3

181.9 meters @ 135 degrees from the benchmark

Small gravel	38.89	3.086	8.111
Small gravel	39.39	3.080	8.117
Small gravel	39.89	3.085	8.112
Small gravel	40.39	3.030	8.167
Small gravel	40.89	2.961	8.236
Small gravel	41.39	2.770	8.427
Small gravel	41.89	2.669	8.528
Waters edge	42.19	2.540	8.657
	42.69	2.220	8.977
	43.19	2.092	9.105
Cliff at bottom	43.69	1.944	9.253
Cliff at top	43.99	1.658	9.539
	44.49	1.572	9.625
Grasses	44.99	1.553	9.644
	45.49	1.541	9.656
Tules and Flowers	45.99	1.523	9.674
Tules and Flowers	46.49	1.465	9.732
Tules and Flowers	46.99	1.445	9.752
Tules and Flowers	47.49	1.488	9.709
Tules and Flowers	47.99	1.545	9.652
Tules and Flowers	48.49	1.581	9.616
Tules and Flowers	48.99	1.624	9.573
Tules and Flowers	49.99	1.666	9.531
Tules and Flowers	50.49	1.697	9.500
Tules and Flowers	50.99	1.726	9.471
Tules and Flowers	51.49	1.747	9.450
Tules and Flowers	51.99	1.760	9.437
Tules and Flowers	52.49	1.846	9.351
Tules and Flowers	52.99	1.834	9.363
Tules and Flowers	53.49	1.854	9.343
Tules and Flowers	53.99	1.759	9.438
Tules and Flowers	54.49	1.670	9.527
Tules and Flowers	54.99	1.658	9.539
Tules and Flowers	55.49	1.672	9.525
Tules and Flowers	55.99	1.689	9.508
Tules and Flowers	56.49	1.736	9.461
Tules and Flowers	56.99	1.740	9.457
Tules and Flowers	57.49	1.705	9.492
Tules and Flowers	57.99	1.734	9.463
Grass	58.49	1.799	9.398
Grass	58.99	1.876	9.321
Grass	59.49	1.921	9.276
Grass	59.99	1.976	9.221
Grass	60.49	1.994	9.203
Grass	60.99	1.987	9.210
Grass	61.49	1.947	9.250

Freeman Ranch Cross Section #3

181.9 meters @ 135 degrees from the benchmark

Grass	17.19		1.250	9.947
Grass	17.69		1.214	9.983
Grass	18.19		1.228	9.969
River Bank is .62 M south	18.69		1.271	9.926
	19.19		1.398	9.799
River Bank is .60 M south	19.69		1.448	9.749
	19.89		1.530	9.667
	20.19		1.530	9.667
	20.69		1.512	9.685
	21.19		1.730	9.467
	21.69		1.800	9.397
Edge of log	21.99		1.849	9.348
	22.39		1.896	9.301
	22.99		1.948	9.249
	23.39		1.971	9.226
	23.89		2.000	9.197
	24.39		2.023	9.174
	24.89		2.016	9.181
	25.39		2.033	9.164
	25.89		2.063	9.134
	26.39		2.083	9.114
	26.89		2.117	9.080
	27.39		2.100	9.097
	27.89		2.177	9.020
	28.39		2.143	9.054
	28.89		2.147	9.050
	29.39		2.186	9.011
	29.89		2.203	8.994
	30.39		2.216	8.981
	30.89		2.213	8.984
	31.39		2.333	8.864
	31.99		2.227	8.970
	32.39		2.240	8.957
Edge of bank	32.79		2.252	8.945
Bottom of drop	32.99		2.467	8.730
Edge of water	33.39		2.587	8.610
Small gravel	33.89		2.669	8.528
Small gravel	34.39		2.693	8.504
Small gravel	34.89		2.742	8.455
Small gravel	35.39		2.705	8.492
Small gravel	35.89		2.717	8.480
Small gravel	36.39		2.763	8.434
Small gravel	36.89		2.819	8.378
Small gravel	37.39		2.924	8.273
Small gravel	37.89		2.984	8.213
Small gravel	38.39		3.038	8.159

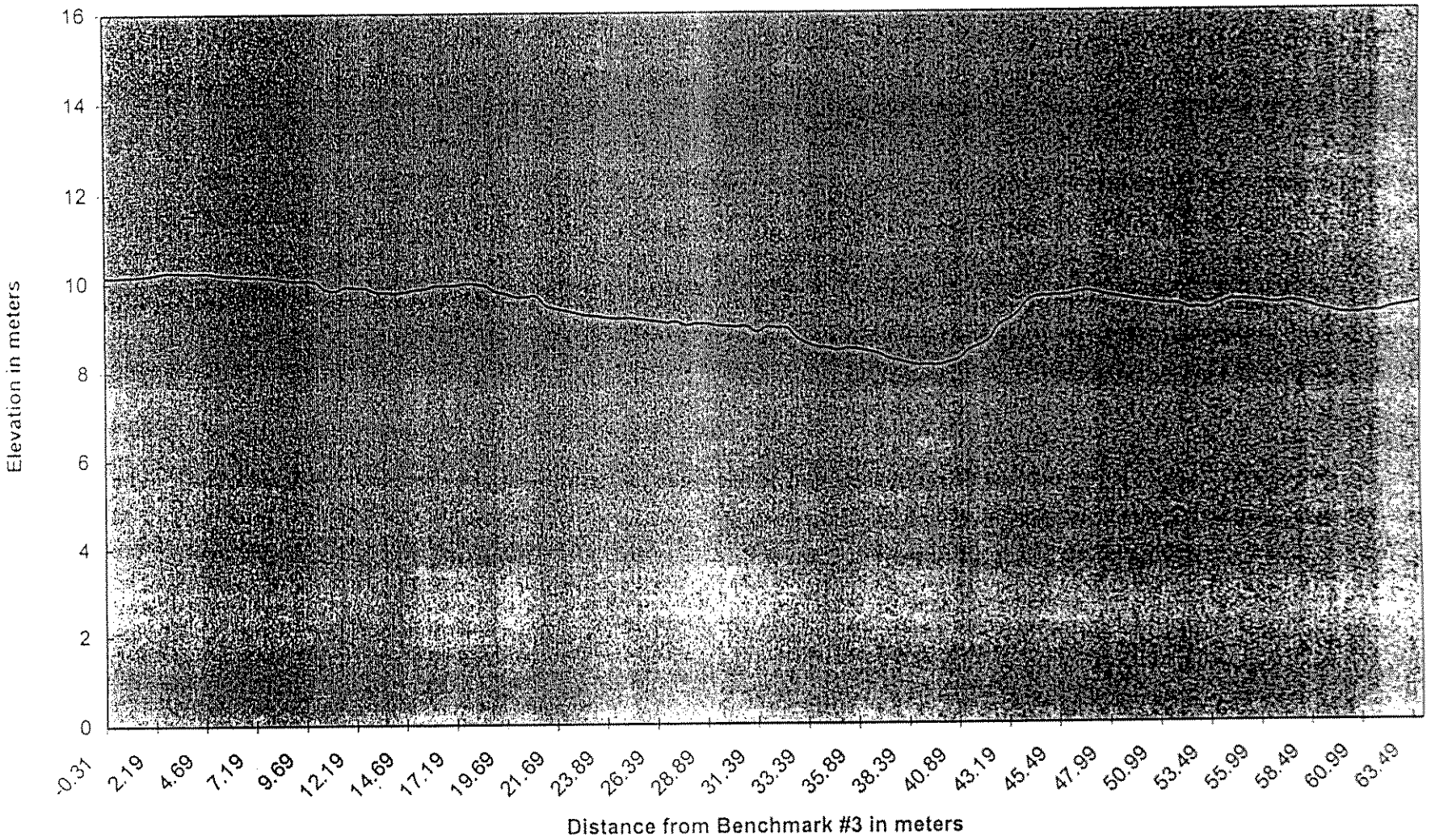
Freeman Ranch Cross Section #3

181.9 meters @ 135 degrees from the benchmark

Grass	61.99			1.946	9.251
Grass	62.49			1.872	9.325
Grass	62.99			1.834	9.363
Grass	63.49			1.793	9.404
Grass	63.89			1.739	9.458
Top of rock	Turning point	1.968			9.229
	for closure		11.298	2.069	
				1.306	9.992 meters
			Closing difference		**0.008**

Freeman Ranch Cross Section #3

181.9 meters @ 135 degrees from the benchmark



58.5 Meters @ 110 degrees from the benchmark

Cross sectional data crew:	Zack Amaral, John Aviani, Zack McCrillis, Adan Melendez & Steven Toms				
Date & conditions:	23-May-97 Warm & sunny day with a light breeze, about 77 degrees F.				
	Clouds increased during the day. We hurried to beat the rain, about 2:30.				
River left:	Grasses, wildflowers, foxtails. A telephone pole stands about 10 m south				
	of the cross section, right at the river's edge.				
River right:	Grasses, sedges and wildflowers.				
Heading & distance:	99.17 meters @ degrees from benchmark #4				
Comments	**Station**	**Backsight**	**Height of Inst.**	**Foresight**	**Elevation**
Duplex nail thru reflector	Benchmark		10.963	0.963	10.000 meters
on the telephone pole	-0.29 meters			1.352	9.611
Grasses & wildflowers	0.21			1.356	9.607
Grasses & wildflowers	0.71			1.340	9.623
Grasses & wildflowers	1.21			1.349	9.614
Grasses & wildflowers	1.71			1.358	9.605
Grasses & wildflowers	2.21			1.400	9.563
Grasses & wildflowers	2.71			1.420	9.543
Grasses & wildflowers	3.21			1.429	9.534
Grasses & wildflowers	3.71			1.470	9.493
Grasses & wildflowers	4.21			1.522	9.441
Grasses & wildflowers	4.71			1.567	9.396
Grasses & wildflowers	5.21			1.620	9.343
Grasses & wildflowers	5.71			1.722	9.241
Grasses & wildflowers	6.21			1.878	9.085
Grasses & wildflowers	6.71			1.967	8.996
Grasses & wildflowers	7.21			2.036	8.927
Grasses & wildflowers	7.71			2.062	8.901
Grasses & wildflowers	8.21			2.065	8.898
Grasses & wildflowers	8.71			2.116	8.847
Grasses & wildflowers	9.21			2.130	8.833
Grasses & wildflowers	9.71			2.055	8.908
Grasses & wildflowers	10.21			1.914	9.049
Grasses & wildflowers	10.71			1.830	9.133
Grasses & wildflowers	11.21			1.830	9.133
Grasses & wildflowers	11.71			1.857	9.106
Grasses & wildflowers	12.21			1.833	9.130
Grasses & wildflowers	12.71			1.826	9.137
Grasses & wildflowers	13.21			1.799	9.164
Grasses & wildflowers	13.71			1.752	9.211
Grasses & wildflowers	14.21			1.710	9.253
Grasses & wildflowers	14.71			1.668	9.295
Grasses & wildflowers	15.21			1.646	9.317
Grasses & wildflowers	15.71			1.683	9.280
Grasses & wildflowers	16.21			1.586	9.377
Grasses & wildflowers	16.71			1.554	9.409
Grasses & wildflowers	17.21			1.523	9.440
Grasses & wildflowers	17.71			1.498	9.465

58.5 Meters @ 110 degrees from the benchmark

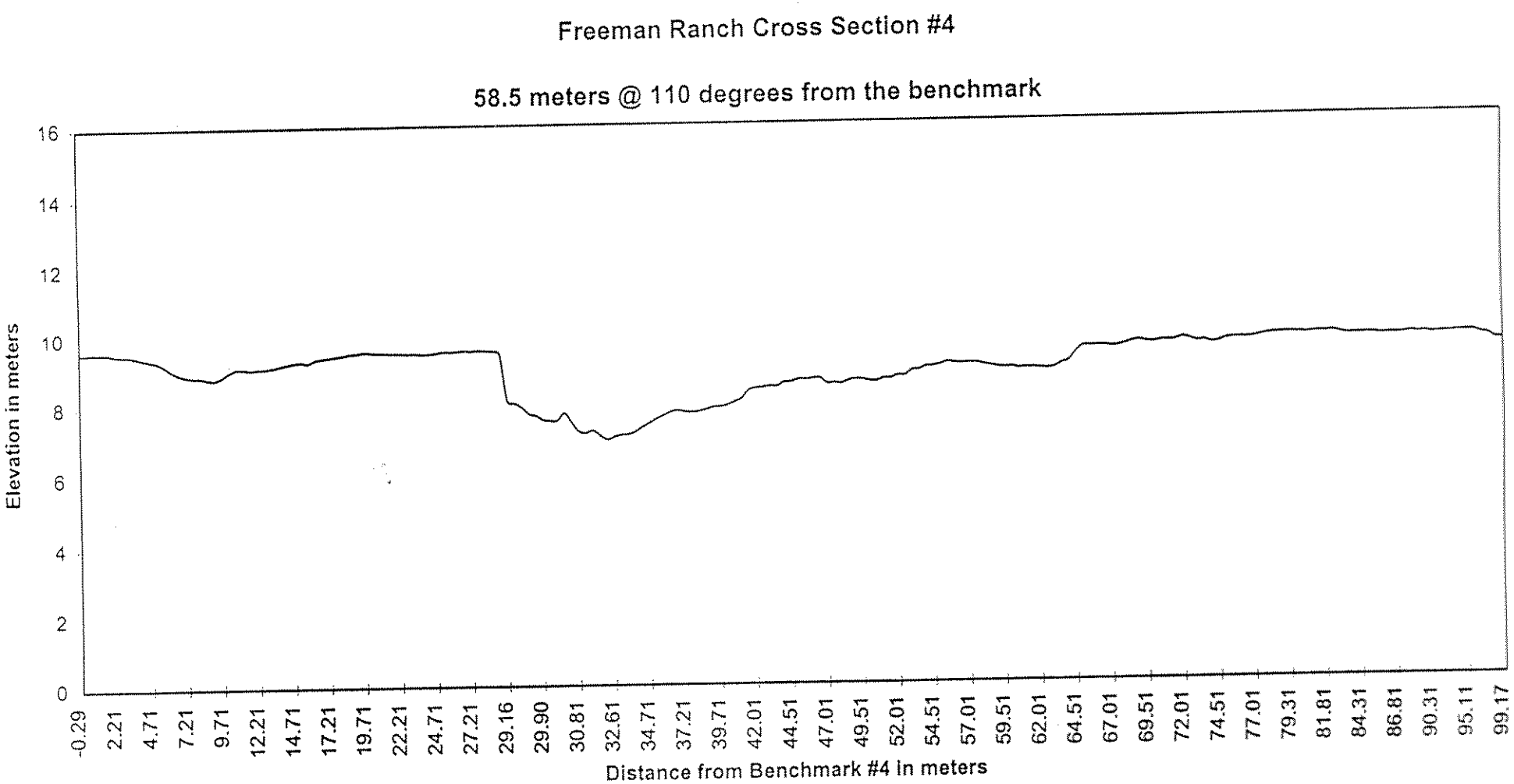
Grasses & wildflowers	18.21		1.466	9.497
Grasses & wildflowers	18.71		1.423	9.540
Grasses & wildflowers	19.21		1.418	9.545
Grasses & wildflowers	19.71		1.387	9.576
Grasses & wildflowers	20.21		1.408	9.555
Grasses & wildflowers	20.71		1.409	9.554
Grasses & wildflowers	21.21		1.416	9.547
Grasses & wildflowers	21.71		1.430	9.533
Grasses & wildflowers	22.21		1.432	9.531
Grasses & wildflowers	22.71		1.447	9.516
Grasses & wildflowers	23.21		1.442	9.521
Grasses & wildflowers	23.71		1.462	9.501
Grasses & wildflowers	24.21		1.453	9.510
Grasses & wildflowers	24.71		1.433	9.530
Grasses & wildflowers	25.21		1.397	9.566
Grasses & wildflowers	25.71		1.407	9.556
Grasses & wildflowers	26.21		1.394	9.569
Grasses & wildflowers	26.71		1.380	9.583
Grasses & wildflowers	27.21		1.393	9.570
Grasses & wildflowers	27.71		1.372	9.591
Grasses & wildflowers	28.21		1.383	9.580
Grasses & wildflowers	28.71		1.400	9.563
Edge of bank	29.11		1.481	9.482
	29.16		2.848	8.115
	29.29		2.905	8.058
	29.31		3.028	7.935
	29.56		3.217	7.746
	29.81		3.273	7.690
	29.90		3.395	7.568
	30.21		3.423	7.540
	30.30		3.423	7.540
	30.39		3.210	7.753
Fairly solid bottom	30.71		3.473	7.490
Top of drop	30.81		3.738	7.225
rocky	31.11		3.787	7.176
	31.49		3.716	7.247
	31.66		3.859	7.104
rocky	32.11		3.980	6.983
	32.61		3.910	7.053
	33.31		3.850	7.113
	32.91		3.835	7.128
	33.71		3.757	7.206
gravel	34.21		3.635	7.328
gravel	34.71		3.523	7.440
gravel	35.21		3.402	7.561
gravel	35.71		3.298	7.665
gravel	36.21		3.200	7.763
gravel	36.71		3.164	7.799

58.5 Meters @ 110 degrees from the benchmark

	61.01		2.054	8.909
	61.51		2.051	8.912
	62.01		2.068	8.895
	62.51		2.080	8.883
	63.01		2.057	8.906
	63.51		1.950	9.013 meters
	64.01		1.877	9.086
	64.51		1.648	9.315
	65.01		1.469	9.494
	65.51		1.460	9.503
	66.01		1.456	9.507
	66.51		1.452	9.511
	67.01		1.484	9.479
	67.51		1.470	9.493
	68.01		1.418	9.545
	68.51		1.355	9.608
	69.01		1.330	9.633
	69.51		1.370	9.593
	70.01		1.380	9.583
	70.51		1.344	9.619
	71.01		1.335	9.628
	71.51		1.331	9.632
	72.01		1.264	9.699
	72.51		1.310	9.653
	73.01		1.375	9.588
	73.51		1.355	9.608
	74.01		1.419	9.544
	74.51		1.401	9.562
	75.01		1.325	9.638
	75.51		1.296	9.667
	76.01		1.291	9.672
	76.51		1.299	9.664
	77.01		1.276	9.687
	77.51		1.234	9.729
	78.01		1.201	9.762
	78.35		1.180	9.783
	78.81		1.171	9.792
	79.31		1.166	9.797
	79.81		1.174	9.789
	80.31		1.186	9.777
	80.81		1.178	9.785
	81.31		1.160	9.803
	81.81		1.165	9.798
	82.31		1.154	9.809
	82.81		1.186	9.777
	83.31		1.235	9.728
	83.81		1.231	9.732

58.5 Meters @ 110 degrees from the benchmark

	84.31			1.233	9.730
	84.81			1.221	9.742
	85.31			1.234	9.729
	85.81			1.260	9.703
	86.31			1.242	9.721
	86.81			1.246	9.717
	87.31			1.234	9.729
	87.81			1.207	9.756
	88.31			1.228	9.735
	89.31			1.215	9.748
	90.31			1.251	9.712
	91.31			1.234	9.729
	92.31			1.225	9.738
	93.11			1.220	9.743
	94.11			1.199	9.764
	95.11			1.211	9.752
	96.11			1.210	9.753
	97.11			1.275	9.688
	98.11			1.314	9.649
	98.71			1.435	9.528
	99.17			1.435	9.528
Top of low metal stake				1.294	9.669
	Turning Point	0.967	10.636		
	for closure			0.641	9.995 meters
			Closing difference		0.005 meters


Freeman Ranch Cross Section #4
58.5 meters @ 110 degrees from the benchmark
Elevation in meters
16
14
12
10
8
6
4
2
0
-0.29
2.21
4.71
7.21
9.71
12.21
14.71
17.21
19.71
22.21
24.71
27.21
29.16
29.90
30.81
32.61
34.71
37.21
39.71
42.01
44.51
47.01
49.51
52.01
54.51
57.01
59.51
62.01
64.51
67.01
69.51
72.01
74.51
77.01
79.31
81.81
84.31
86.81
90.31
95.11
99.17
Distance from Benchmark #4 in meters

171.0 meters @ 350 degrees from the benchmark

Cross sectional data crew:	Ruben Alvarado, John Aviani, Jeff DeRoss, Holli Howard, Lance Toms				
Date & conditions:	15-May-97	Clear warm day, about 79 degrees F. with a light breeze.			
River left:	A lot of grass with about ten willow trees near the river.				
River right:	Grasses, clover and wildflowers.				
	A few willows about 40 m east of the river.				
Heading & distance:	81.18 meters @ 6 degrees from benchmark #5.				
Tape measure offset:	.422 meters				
Comments	**Station**	**Backsight**	**Height of Inst.**	**Foresight**	**Elevation**
Duplex nail thru reflector	Benchmark		10.672	0.672	10.000 meters
on the telephone pole		1.325			9.347
Turning Point			10.209	0.862	
Grass	-0.42	meters		0.944	9.265
Grass	0.08			0.935	9.274
Grass	0.58			0.949	9.260
Grass	1.08			0.953	9.256
Grass	1.58			0.946	9.263
Grass	2.08			0.954	9.255
Grass	2.58			0.974	9.235
Grass	3.08			1.009	9.200
Grass	3.58			1.048	9.161
Grass	4.08			1.078	9.131
Grass	4.58			1.144	9.065
Grass	5.08			1.225	8.984
Grass	5.58			1.363	8.846
Grass	6.08			1.428	8.781
Grass	6.58			1.531	8.678
Grass	7.08			1.626	8.583
Grass	7.58			1.679	8.530
Grass	8.08			1.757	8.452
Grass	8.43			1.735	8.474
Grass	8.93			1.717	8.492
Grass	9.43			1.703	8.506
Grass	9.93			1.672	8.537
Grass	10.43			1.626	8.583
Grass	10.93			1.608	8.601
Grass	11.43			1.606	8.603
Grass	11.93			1.550	8.659
Grass	12.43			1.530	8.679
Grass	12.93			1.517	8.692
Grass	13.43			1.550	8.659
Grass	13.93			1.580	8.629
Grass	14.43			1.596	8.613
Grass	14.58			1.597	8.612
Grass	15.08			1.623	8.586
Grass	15.58			1.634	8.575
Grass	16.08			1.644	8.565
Grass	16.58			1.642	8.567

171.0 meters @ 350 degrees from the benchmark

Grass	17.08		1.607	8.602
Grass	17.58		1.563	8.646
Grass	18.08		1.525	8.684
Grass	18.58		1.466	8.743
Grass	19.08		1.468	8.741
Grass	19.58		1.468	8.741
Grass	20.08		1.432	8.777
Grass	20.58		1.446	8.763
Grass	21.08		1.458	8.751
Grass	21.58		1.482	8.727
Grass	22.08		1.494	8.715
Grass	22.58		1.553	8.656
Grass	22.93		1.627	8.582
Sand	23.43		1.646	8.563
Sand	23.93		1.608	8.601
Sand	24.43		1.585	8.624
Sand	24.58		1.582	8.627
Grass	25.08		1.528	8.681
Grass	25.58		1.513	8.696
Grass	26.08		1.488	8.721
Grass	26.58		1.474	8.735
Grass	27.08		1.485	8.724
Willow 5m S.E. Nettle/Treeli	27.58		1.491	8.718
Grass	28.08		1.461	8.748
Grass	28.58		1.456	8.753
Grass	29.08		1.517	8.692
Grass	29.58		1.538	8.671
Grass	30.08		1.602	8.607
Grass	30.58		1.577	8.632
Grass	31.08		1.522	8.687
Grass	31.58		1.489	8.720
Grass	32.08		1.454	8.755
Grass	32.58		1.450	8.759
Grass	33.08		1.426	8.783
Grass	33.58		1.423	8.786
Grass	34.08		1.388	8.821
Grass	34.58		1.387	8.822
Grass	35.08		1.374	8.835
Grass	35.58		1.373	8.836
Grass	36.08		1.554	8.655
Grass	36.58		1.341	8.868
Grass	37.08		1.351	8.858
Grass	37.58		1.368	8.841
Grass	38.08		1.348	8.861
Grass	38.58		1.374	8.835
Grass	39.08		1.392	8.817
Grass	39.58		1.414	8.795
Grass	40.08		1.378	8.831

171.0 meters @ 350 degrees from the benchmark

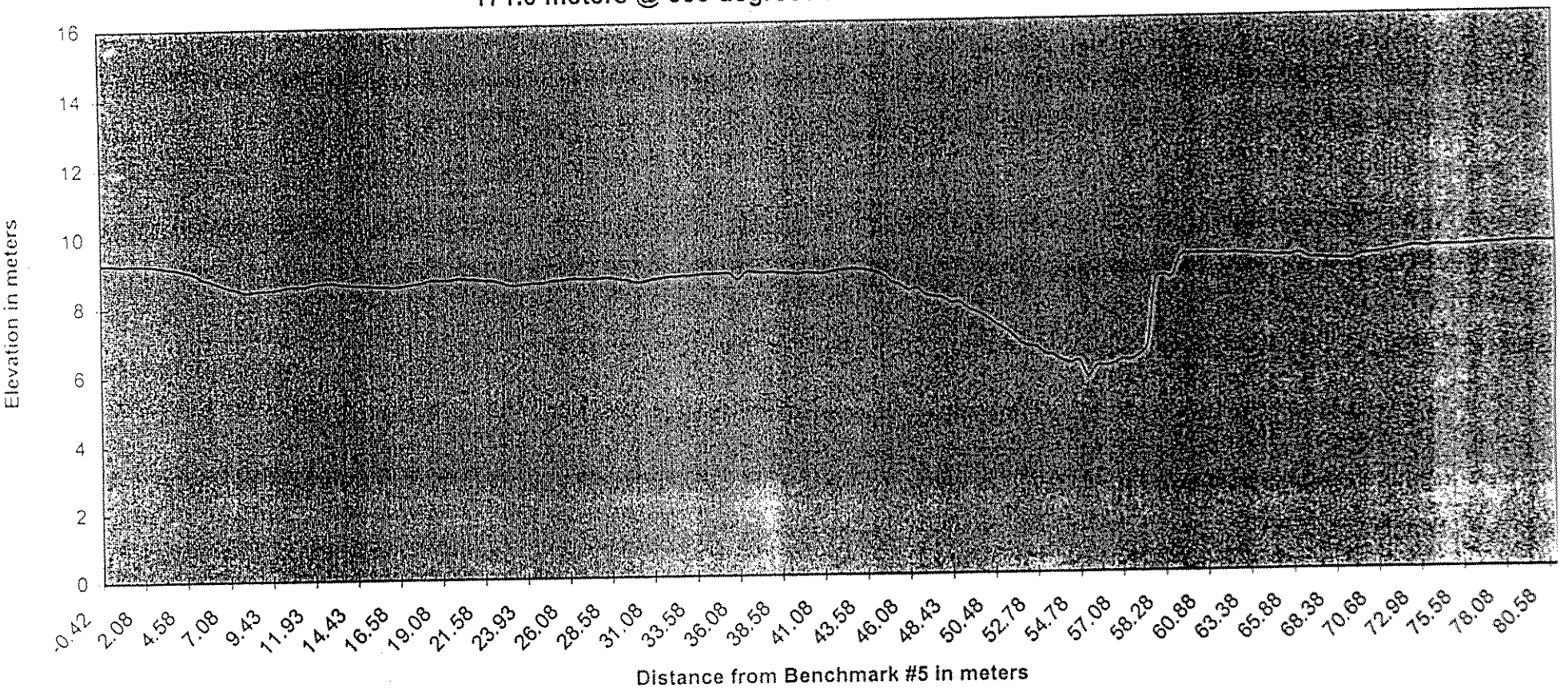
Grass	40.58		1.396	8.813
Grass	41.08		1.407	8.802
Grass	41.58		1.344	8.865
Grass	42.08		1.310	8.899
Grass	42.58		1.286	8.923
Grass	43.08		1.284	8.925
Grass	43.58		1.321	8.888
Grass	44.08		1.372	8.837
Grass	44.58		1.460	8.749
Grass	45.08		1.668	8.541
Sand	45.58		1.756	8.453
Sand	46.08		1.910	8.299
Sand	46.58		1.863	8.346
Sand	47.08		2.041	8.168
Sand	47.58		2.116	8.093
Sand	48.08		2.147	8.062
Sand	48.43		2.287	7.922
Mud/Water	48.58		2.267	7.942
Mound of mud	49.08		2.461	7.748
water	49.53		2.572	7.637
Start of slope	49.98		2.691	7.518
Middle of incline	50.48		2.875	7.334
Muddy with plants	50.98		3.030	7.179
	51.43		3.195	7.014
Rocky	52.03		3.427	6.782
	52.58		3.552	6.657
	52.78		3.584	6.625
	53.48		3.780	6.429
Drop off	53.75		3.830	6.379
Drop off	54.25		3.985	6.224
	54.58		4.045	6.164
	54.78		4.015	6.194
	55.23		4.455	5.754
Coming up bank	55.88		4.155	6.054
Bottom of steep incline	56.18		4.150	6.059
	56.58		4.105	6.104
Embankment	57.08		3.985	6.224
	57.48		3.990	6.219
(hole) Tree & stuff	57.78		3.857	6.352
	57.93		3.568	6.641
	58.08		1.705	8.504
	58.28		1.570	8.639
Top of mound	58.58		1.615	8.594
	58.88		1.035	9.174
edge	59.38		0.977	9.232
Grass	59.88		0.973	9.236
Grass	60.88		0.972	9.237
Grass	61.38		0.985	9.224

171.0 meters @ 350 degrees from the benchmark

Grass	61.88			0.984	9.225
Grass	62.38			0.980	9.229
Grass	62.88			0.988	9.221
Grass	63.38			1.000	9.209
Grass	63.88			1.032	9.177
Grass	64.38			1.032	9.177
Grass	64.88			1.060	9.149
Grass	65.38			1.056	9.153
Grass	65.88			1.060	9.149
Grass	66.38			1.010	9.199
Grass	66.88			1.133	9.076
Grass	67.38			1.139	9.070
Grass	67.88			1.161	9.048
Grass	68.38			1.177	9.032
Grass	68.88			1.175	9.034
Grass	69.38			1.180	9.029
Grass	69.88			1.086	9.123
Grass	70.38			1.054	9.155
Grass	70.68			1.037	9.172
Grass	71.18			1.007	9.202
Grass	71.68			0.973	9.236
Grass	72.18			0.928	9.281
Grass	72.48			0.869	9.340
Grass	72.98			0.864	9.345
Grass	73.68			0.882	9.327
Grass	74.08			0.849	9.360
Grass	74.58			0.860	9.349
Grass	75.08			0.845	9.364
Grass	75.58			0.845	9.364
Grass	76.08			0.843	9.366
Grass	76.58			0.826	9.383
Grass	77.08			0.814	9.395
Grass	77.58			0.805	9.404
Grass	78.08			0.796	9.413
Grass	78.58			0.779	9.430
Grass	79.08			0.768	9.441
Grass	79.58			0.765	9.444
Grass	80.08			0.766	9.443
Grass	80.58			0.780	9.429
Grass	81.18			0.774	9.435
	Turning point	0.860			9.349
	for closure		10.729	1.380	
		0.731			9.998
			closing difference		0.002 meters

Freeman Ranch Cross Section #5

171.0 meters @ 350 degrees from the benchmark



274.5 meters @ 308 degrees from the benchmark

Cross sectional data crew:	Arturo Robles, Janet Arellano, Jesus Fernandez, Tiffany Heckman,				
	John Aviani, Trudy Rilling, Jason Singleton & Lynn Lujan.				
Date & conditions:	Sept. 24, 1997 very warm day, about 80 degrees F. with almost no wind				
River left:	Grasses, thistles, tules, star thisles, lamb' quarters, clover, a few cattails				
River right:	Tules at the water's edge with grasses behind. Cattails about 8 meters				
	downstream.				
Heading & distance:	274.5 meters @ 308 degrees from the benchmark.				
Comments	**Station**	**Backsight**	**Height of Inst.**	**Foresight**	**Elevation**
Duplex nail thru reflector	Benchmark		10.507	0.507	10.000 meters
on the telephone pole	Turning Point	0.780			9.727
			10.581	0.854	
Top of low metal benchmark	Turning Point	0.884			9.697
post			11.103	1.406	
Grasses & Star Thistle	-0.28	meters		1.390	9.713
Grasses & Star Thistle	0.22			1.438	9.665
Grasses & Star Thistle	0.52			1.433	9.670
Grasses & Star Thistle	0.72			1.508	9.595
Grasses & Star Thistle	0.92			1.551	9.552
Grasses & Star Thistle	1.22			1.638	9.465
Grasses & Star Thistle	1.52			1.698	9.405
Grasses & Star Thistle	1.72			1.775	9.328
Grasses & Star Thistle	2.22			1.933	9.170
Grasses & Star Thistle	2.72			2.061	9.042
Grasses & Star Thistle	3.22			2.173	8.930
Grasses & Star Thistle	3.72			2.261	8.842
Clover	4.02			2.301	8.802
Clover and grasses	4.22			2.451	8.652
Grasses	4.72			2.503	8.600
Grasses	5.22			2.688	8.415
Grasses	5.52			2.785	8.318
Grasses	5.72			2.858	8.245
Grasses	5.92			2.836	8.267
Grasses	6.22			2.901	8.202
Grasses	6.62			2.935	8.168
Grasses	6.72			3.014	8.089
Grasses	7.22			2.950	8.153
Grasses	7.52			3.095	8.008
Grasses	7.72			3.054	8.049
Grasses	8.32			3.142	7.961
Grasses	8.72			3.104	7.999
Grasses	9.22			3.115	7.988
Grasses	9.72			3.067	8.036
Grasses	10.22			3.127	7.976
Grasses	10.72			3.207	7.896
Grasses	10.92			3.365	7.738
Muddy	11.22			3.705	7.398
Muddy	11.52			4.222	6.881

274.5 meters @ 308 degrees from the benchmark

Gravel	11.73		5.041	6.062
Gravel	12.37		4.720	6.383
Gravel	12.83		4.990	6.113
Gravel	13.32		5.030	6.073
Gravel	13.84		5.110	5.993
Gravel	14.32		5.160	5.943
Gravel	14.75		5.200	5.903
Gravel	15.07		5.205	5.898
Gravel	15.52		5.220	5.883
Sandy	16.45		5.196	5.907
Sandy	17.06		5.145	5.958
Sandy	17.67		5.090	6.013
Sandy	18.16		5.025	6.078
Sandy	18.65		4.945	6.158
Mucky	19.15		4.860	6.243
Mucky	19.65		4.790	6.313
Mucky	20.17		4.710	6.393
Mucky	20.65		4.660	6.443
Mucky	21.16		4.610	6.493
Edge of the tules	21.65		4.530	6.573
	22.12		4.480	6.623
	22.62		4.350	6.753
	23.12		4.065	7.038
Edge of the water	23.72		3.430	7.673
Grass	23.42		3.580	7.523
Grass	23.72		3.390	7.713
Grass	24.22		3.127	7.976
Grass	24.72		3.201	7.902
Grass	25.02		3.111	7.992
Grass	25.52		2.901	8.202
Grass	26.02		2.916	8.187
Grass	26.52		2.930	8.173
Grass	27.02		2.930	8.173
Grass	27.52		2.866	8.237
Grass	28.02		2.884	8.219
Grass	28.52		2.845	8.258
Grass	29.02		2.815	8.288
Grass	29.52		2.779	8.324
Grass	30.02		2.728	8.375
Grass	30.52		2.716	8.387
Grass	31.02		2.750	8.353
Grass	31.52		2.664	8.439
Grass	32.02		2.695	8.408
Grass	32.52		2.670	8.433
Grass	33.02		2.670	8.433
Grass	33.52		2.675	8.428
Grass	34.02		2.690	8.413
Grass	34.52		2.600	8.503

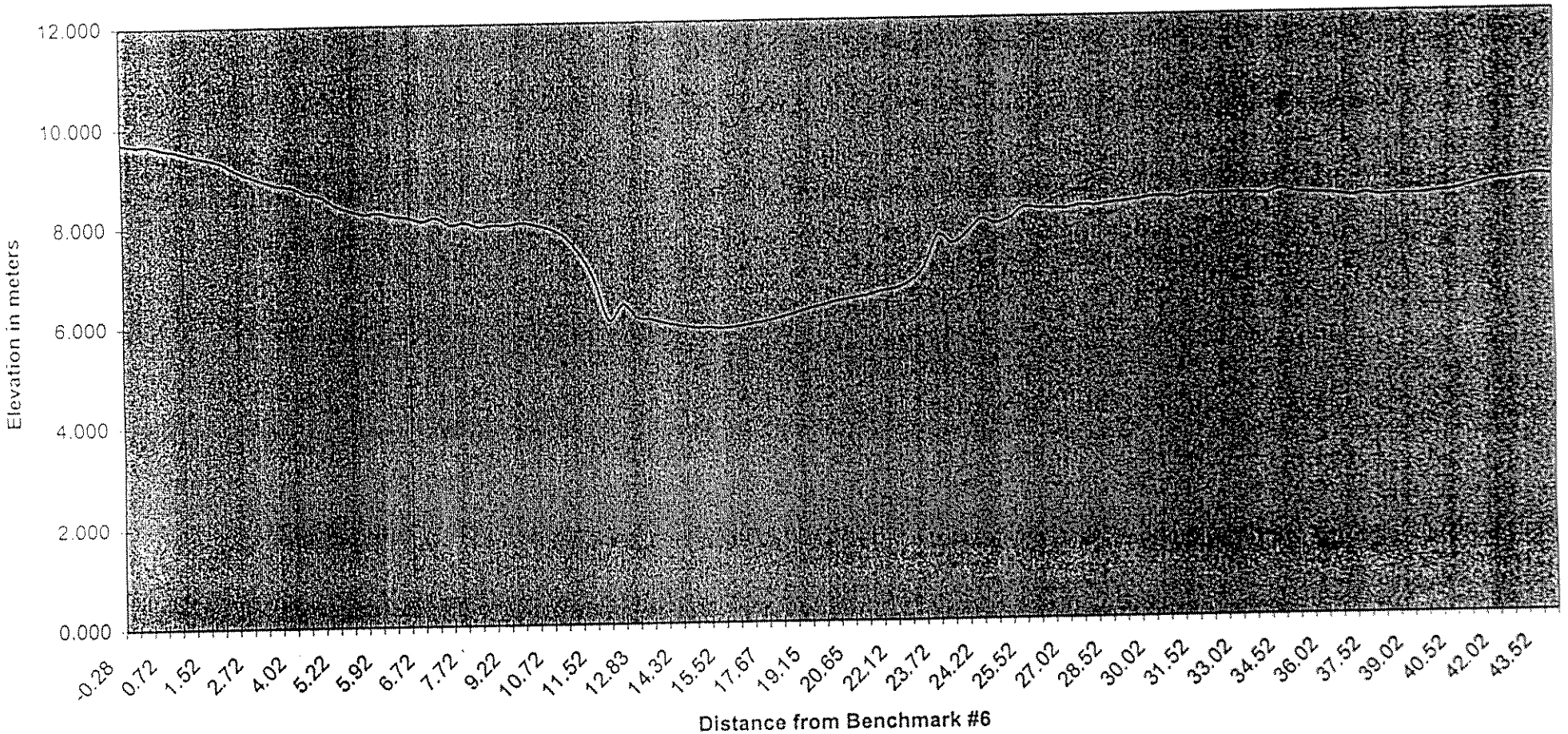
Freeman Ranch Cross Section #6

274.5 meters @ 308 degrees from the benchmark

Grass	35.02			2.666	8.437
Grass	35.52			2.690	8.413
Grass	36.02			2.701	8.402
Grass	36.52			2.725	8.378
Grass	37.02			2.763	8.340
Grass	37.52			2.718	8.385
Grass	38.02			2.765	8.338
Grass	38.52			2.744	8.359
Grass	39.02			2.749	8.354
Grass	39.52			2.738	8.365
Grass	40.02			2.701	8.402
Grass	40.52			2.683	8.420
Grass	41.02			2.610	8.493
Grass	41.52			2.532	8.571
Grass	42.02			2.467	8.636
Grass	42.52			2.438	8.665
Grass	43.02			2.395	8.708
Grass	43.52			2.366	8.737
Grass	43.77			2.395	8.708
closing survey				1.403	9.700
	Turning point	1.180	10.880		
				0.875	10.005
			Closing Difference		**0.005 meters**

Freeman Ranch Cross Section #6

274.5 meters @ 308 degrees from the benchmark



Stream name [illegible] Location: [illegible]

Crew Members Arturo Robles, Janet Arellano, Jesus Fernand[illegible] [illegible] [illegible], John Aviani, Trudy Rillins, [illegible] Singleton, Lynn Lujan

Method & Equipment: Leitz Engineering Transit

Location & Description of Cross Section and Benchmarks: Cross Section #6

.28 m offset 43.77 m @ 344° cross section heading

River left: Grass, thistles, tules, [illegible] [illegible], lamb's quarters, clover, few cattails

River right: tules, grasses few cattails ~ 8 m downstream

274.5 m at 308° from the benchmark

Comments	Station	Backsight	Height of Inst.	Foresight	Elevation
[illegible]	Benchmark		10.507	[illegible]	[illegible]
	step over	0.780			9.727
	"		10.581	0.857	
Top of low metal benchmark post	step [illegible]	0.884			9.697
			11.103	[illegible]	
	0			1.350	
	.50			[illegible]	
	.80			1.433	
	1			[illegible]	
	1.20			[illegible]	
	1.50			[illegible]	
	1.80			[illegible]	
				1.795	
	2.50			[illegible]	

Comments	Station (X)	Backsight	Height of Inst.	Foresight (Y)	Elevation
	3.0				
	3.50				
	4.0				
	4.30				
	4.50				
	5.0			2.503	
	5.50			2.688	
	5.80				
	6.0				
	6.20				
	6.50				
	6.90				
	7.0				
	7.50				
	7.80				
				.954	
	9.0				
	9.50				
	10.0				
	10.50				
	11.0				
	11.20				
muddy	.50				
muddy	11.80				
gravel	12.01				
	12.65				
	13.11				

Comments	Station (X)	Backsight	Height of Inst.	Foresight (Y)	Elevation
Arrival	13.6			5.03	
	14.12			5.1	
	14.60			5.15	
	15.03			5.20	
	15.35			5.205	
	15.8			5.22	
Sanding	16.73			5.196	
	17.34			5.145	
	17.95			5.09	
	18.44			5.03	
	17.73			[illegible]	
Hill	19.47			[illegible]	
	[illegible]			[illegible]	
	20.45			4.31	
	20.93			4.66	
	[illegible]			4.31	
Tilling	[illegible]			[illegible]	
	[illegible]			4.49	
	[illegible]			4.35	
	23.40			4.065	
plant water	24.0			3.43	
	23.70			[illegible]	
	24.0			3.39	
	24.5			3.127	
	25.0			3.201	
	25.30		recording errors no hole	3.111	
	25.80			3.101	
	26.30			[illegible]	

Comments	Station (y)	Backsight	Height of Inst.	Foresight (y)	Elevation
	26.50			2.930	
	27.30			[illegible]	
	27.80			2.814	
	28.30			2.854	
	28.80			[illegible]45	
	29.30			2.815	
	29.80			2.779	
	30.30			2.775	
	30.80			2.71[illegible]	
	31.30			2.757	
	31.80			2.664	
	32.30			2.695	
	32.80			2.670	
	33.30			2.670	
	33.80			2.675	
	[illegible]			[illegible]	
	34.80			[illegible]	
	[illegible]			[illegible]	
	35.80			2.630	
	36.30			2.701	
	36.80			2.725	
	[illegible]			2.763	
	[illegible]			2.718	
	38.30			2.765	
	38.80			[illegible]	
	39.30			[illegible]	
	39.80			[illegible]	
	40.30			2.701	

Problems and Comments

The weather during the 1997-98 school year was particularly wet due to the phenomenon known as "El Niño." In fact, 1997-98 was the wettest year in recorded weather history for Siskiyou County. As a result, several field trips were scheduled and postponed due to inclement weather conditions. The Leitz engineering transit would be damaged by the rain and during severe storms the river rises and becomes too dangerous to survey.

The unpredictable weather made scheduling especially difficult because each trip was organized and supervised by John Aviani, a Weed High School mathematics and computer instructor, who needed to arrange for a substitute teacher for each outing. Substitute teachers must be reserved several days ahead of time, so spontaneity is out of the question. Waking to a beautiful morning and deciding "This would be a great day to survey the river" sounds simple and easy. But, in reality each trip takes several days of advance preparation for permission slips, lesson plans for the students who will still be in class, and arranging for a substitute teacher.

As a result, no surveying was accomplished during the spring of 1998. We had hoped to complete this report by May 1998, but due the uncooperative weather the completion date was delayed until November.

However, during the summer of 1998, Weed High School upgraded our operating system and software. We are now using Windows 95, Microsoft Excel 97, and Microsoft Word 97 for Windows. All of these documents, except for the aerial photo, were prepared using this software. This is the silver lining to the endless clouds of wet weather we received last spring.

58.5 Meters @ 110 degrees from the benchmark

gravel	37.21		3.203	7.760
gravel	37.71		3.222	7.741
gravel	38.21		3.194	7.769
gravel	38.71		3.149	7.814
still gravel	39.21		3.082	7.881
	39.71		3.071	7.892
muddy	40.24		3.024	7.939
	40.71		2.937	8.026
out of water	41.19		2.845	8.118
	41.55		2.605	8.358
	42.01		2.547	8.416
	42.51		2.527	8.436
	43.01		2.493	8.470
	43.51		2.495	8.468
	44.01		2.382	8.581
	44.51		2.373	8.590
	45.01		2.309	8.654
	45.51		2.309	8.654
	46.01		2.284	8.679
	46.51		2.277	8.686
	47.01		2.435	8.528
	47.51		2.423	8.540
	48.01		2.441	8.522
	48.51		2.364	8.599
	49.01		2.319	8.644
	49.51		2.334	8.629
	50.01		2.379	8.584
	50.51		2.384	8.579
	51.01		2.311	8.652
	51.51		2.311	8.652
	52.01		2.226	8.737
	52.51		2.232	8.731
	53.01		2.083	8.880
	53.51		2.065	8.898
	54.51		1.985	8.978
	54.51		1.977	8.986
	55.01		1.925	9.038
	55.51		1.860	9.103
	56.01		1.890	9.073
	56.51		1.896	9.067
	57.01		1.891	9.072
	57.51		1.893	9.070
	58.01		1.940	9.023
	58.51		1.975	8.988
	59.01		2.015	8.948
	59.51		2.037	8.926
	60.01		2.029	8.934
	60.51		2.068	8.895

Phase VI 319h
KRIS Project Participants

Bogus Elementary School	Janness Harris, Teacher/Principal
Butte Valley High School	Dave Van Scoyoc, Teacher
Discovery High School	Rick Meredith, Teacher Kevin Velarde, Teacher
Forks of the Salmon Elementary	Joel Kurtzman, Teacher/Principal
Sawyers Bar Elementary School	Denise Bearding, Teacher
Tulelake High School	Kirk Heims, Teacher
Yreka High School	Mark O'Connor, Teacher

Phase VII 319h
KRIS Project Participants

Bogus Elementary School	Janness Harris, Teacher/Principal
Butte Valley High School	Dave Van Scoyoc, Teacher
Discovery High School	Rick Meredith, Teacher Kevin Velarde, Teacher Mark O"Connor, Teacher
Forks of the Salmon Elementary	Joel Kurtzman, Teacher/Principal
Sawyers Bar Elementary School	LeAnna Carson-Hansen, Teacher/Principal
Tulelake High School	Kirk Heims, Teacher

Phase V 319h
KRIS Project Participants

Bogus Elementary School	Janness Ferwerda, Teacher/Principal
Butte Valley High School	Dave Van Scoyoc, Teacher
Discovery High School	Rick Meredith, Teacher
Forks of the Salmon Elementary	Joel Kurtzman, Teacher/Principal
Sawyers Bar Elementary School	Liz Manatowa, Teacher
Tulelake High School	Kirk Heims, Teacher
Yreka High School	Mark O'Connor, Teacher
Weed High School	John Aviani, Teacher

Comments	Station X	Backsight	Height of Inst.	Foresight	Elevation
	1			2	
	41.30				
	41		recording error		
	42.30	should be 2.534, there was no note!			
	4				
	43.20				
	43.50				
	44.25				
	closing		11.63		10.700
		1.1			
			11.880	0.875	10.005