Final Report
of
The School-based Klamath River Restoration Project
319h-4

A Collaborative Effort between
the
Siskiyou County Superintendent of Schools Office
and the United States Fish and Wildlife Service

Submitted by Michael Ann Rossi, Ph.D.

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Siskiyou County Superintendent of Schools Office
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School-based Klamath River Restoration Project

Phase III Final Report: October 18,1996, Revised December 18,1996 and April 8,1997

Abstract

The first phase of the School-based Klamath Restoration Project, a cooperative effort between six Siskiyou County schools, the College of the Siskiyous, and the Siskiyou County Superintendent of Schools that is in collaboration with the United States Fish and Wildlife Service, is presented in the report. Objectives include expanding watershed education in schools, creating Klamath River Restoration projects for K-14 students and faculties, and training for students and faculty.

Project tasks that were to be accomplished include: acquiring and maintaining water quality data; evaluating physical characteristics of streams; evaluating riparian condition, identification of riparian restoration sites, and planting vegetation; inventorying biological components at project sites; establishment of KRIS site at the College of the Siskiyous Process Technology Center; and coordination and administration of the sub-contract.

Descriptions of methodology and of completed tasks were included in the report. Although the project time line was extended, tasks continue to be completed as described in the schools' work plans.

Although there has been a substantial amount of excellent work accomplished by the schools, the implementation of projects as scheduled became a challenge because of teachers' lack of experience and skill with equipment usage. More training and support for teachers is needed. Completing reports in an appropriate manner and in a timely matter is another area for improvement.

Schools may need to reconsider how committed they can be to a project such as School-based Klamath Restoration Project that holds them accountable for scientific data production.

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Introduction

The School-based Klamath River Restoration Project is a collaborative effort between the Siskiyou County Superintendent of Schools Office (SCSSO) and the United States Fish and Wildlife Service (USFWS). The three program objectives of the project are:

A. To expand watershed education in Siskiyou County Schools.

B. To create school-based Klamath Restoration Program projects that will involve K-12 students and teachers.

C. To train students and faculty in KRIS use and maintenance.

The Phase III School-based Klamath River Restoration Project participants include two elementary schools, four high schools, and the local community college. The efforts of these schools are supported by the Siskiyou County Superintendent of Schools Office (SCSSO) who acts as the grantee. The SCSSO provides technical support, manages the program, and monitors the budgets of the participant schools.

The tasks of the project that the schools were to initiate and implement include:

1. Acquiring and maintaining water quality.

2. Evaluation of physical characteristics of streams associated with project sites.

3. Evaluation of riparian condition and identification of riparian restoration sites and plant riparian vegetation.

4. The inventory of biological components at project sites.

5. Establishment of KRIS site at the College of the Siskiyous Process Technology Center.

6. Coordination and administration of the sub-contract.

Although the project grant period was originally from May 1, 1995, to May 15, 1996, the length of the project was extended to October 1, 1996. The reasons for the extension will be discussed in later sections of this report.

Description of Study Area

Because the location of the school site determines the study area for the project, study sites are located throughout Siskiyou County including the Tulelake area, the Scott River sub-basin, the Salmon River sub-basin, the Shasta River sub-basin, and creek tributaries of the Klamath River. The sites also vary depending on tasks.

The study areas for the purpose of acquiring and maintaining water quality data include:

- Mowitz Creek, Scott River and its tributaries, Beaver Creek, Yreka Creek, and Salmon River and its tributaries to monitor stream temperatures.

- Mowitz Creek, Beaver Creek, Yreka Creek, to evaluate water chemistry.

- Boulder Creek, a tributary to the South Fork of the Scott River, Shasta River, and Beaver Creek to evaluate fine sediment volumes.

The study areas for the purpose of evaluating physical characteristics of stream associated with project sites include:

- Mowitz Creek and Shasta River to evaluate bank angles.

- Beaver Creek to measure stream discharge.

The study areas for the purpose of evaluating riparian condition and identifying riparian restoration sites and plant riparian vegetation include:

- Shasta River, Yreka Creek, Mowitz Creek, and Bogus Creek to inventory and map riparian vegetation.

- Bogus Creek at Iron Gate Hatchery to establish riparian restoration demonstration site.

- Selected sites along the Shasta River and Yreka Creek to propagate and plant native species.

The study areas for the purpose of inventorying biological components at project sites include:

- Shasta River, Mowitz Creek, Beaver Creek, Yreka Creek, and Bogus Creek to inventory Macroinvertebrates.

- Scott River to identify salmon spawning ground utilization.

- Mowitz Creek, Yreka Creek, Butte Creek, and Shasta River to inventory vertebrates.

- Beaver Creek to identify summer juvenile Salmonid utilization.

Methods and Materials

Water temperature data will be collected using Hobo Temps, following study design criteria established by 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 will be conducted as described in the above mentioned protocol.

Hobo temps will record data continuously unless they are removed because of high water or are lost. All schools use lap top computers to download the hobo temps in the field. Data are transferred to USFWS repository. Phase III data collection ended in September 30,1996. Hobo temps will remain in the stream until the conclusion of the chinook spawning in early December.

Water chemistry evaluation include the following parameters and project sites:

- Beaver Creek: Dissolved oxygen, pH, conductivity, turbidity measured monthly when feasible.

- Yreka CreeK: Dissolved oxygen, pH, conductivity, turbidity, phosphates, and nitrates measured weekly when feasible.

- Mowitz Creek: Dissolved oxygen measured four times in spring.

Fine sediment monitoring in Beaver Creek, Shasta River, and South Fork of Scott River include measurements during low flows in early September, 1996, using the V* method (Lisle & Hilton, 1993) under the direction of USFS, Oak Knoll RD and Scott River RD.

Physical characteristics of streams use standard measuring techniques under the direction of CRMP coordinator, Dave Webb, on the Shasta River, and with the Lava Beds RCD on Mowitz Creek. Measurements were planned

for four times per year.

Stream discharge measurements use current velocity meters and cross sectional areas to determine volume of water in Beaver Creek and Yreka Creek and occur on a monthly basis.

Riparian vegetation inventory and mapping use accepted field guides and local experts in assisting students with species identification and be measured four times per year. Planting along Mowitz Creek and Yreka Creek was planned to occur in the spring and fall of 1996 depending on conditions.

A riparian restoration demonstration site is planned for development along the south side of Bogus Creek at Iron Gate Hatchery in conjunction with hatchery staff.

Aquatic macroinvertebrate inventories use the California Bioassessment Method with kick net sampling, identifying organisms to order, using keys provided by the Klamath River Education Project. Sampling occurs four times per year.

Chinook salmon spawning utilization is measured by direct observation of redds in tributaries of the Scott River, by students every two weeks during the spawning season, as weather and flows permit, if feasible and landowner permission obtained and in conjunction with the USFS and CDFG, Klamath River Project personnel.

Vertebrate inventories are measured by direct observation four times a year in the spring on Mowitz Creek.

Juvenile salmonid utilization on Beaver Creek employ direct mask and snorkel observation during June and September, 1996.

• Final Report to USFWS by Siskiyou County Superintendent of Schools Office.

Results and Discussion of Project Accomplishments

In its first year, the School-based Klamath River Restoration Project as a collaborative effort between the SCSSO and the USFWS made positive progress toward accomplishing the objectives of the project.

Purchase of equipment was not completed for some of the districts by June 30, 1996. Carry-over monies will be spent by December 15.

The telecommunication system that was to be placed at COS was not completed. Data have been transferred to the repository at USFWS.

Quarterly Reports to Siskiyou County Superintendent of Schools Office by schools for Phase III were not as complete as described in the work plan or submitted in a timely manner. A quarterly report format has been developed and given to the schools for Phase IV (Appendix A). Hopefully, this will give them more guidance in what is required by the project. Also, deadlines are being monitored more closely by the SCSSO.

Although all of the elements of the project work plans were addressed, some were not completely accomplished as described in the work plans. Most of the project activities were initiated in the 1995-1996 school year. Reports by school sites follow.

BOGUS ELEMENTARY SCHOOL

Bogus Creek and Cold Creek: Evaluate Riparian Restoration efforts at Beck Ranch which is immediately downstream of the confluence of Cold Creek and Bogus Creek.

Areas of investigation:

- Temperature: Measurements with Hobo Temps were taken from February, 1996, to the end of the project. Except for a few mistakes downloading the hobos with the lap top computer, data were collected and transferred to the data repository at USFWS. Because Bogus School is a K-6 school, only a few students were taken out to download the hobos. However, all students were included in field trips to sites near the school. Hobos were launched again and are continuing to collect data.

- Macroinvertebrates: In spring, a few trips were taken to identify insects. Informal data have been collected and remain at the school site.

- Vegetation inventory: In spring, a trip to a site near the school allowed students to practice identifying plants to species.

Bogus Elementary School continued to work with staff at Iron Gate Hatchery to develop a riparian restoration demonstration project along the south side of Bogus Creek. The construction and placement of picnic tables and the creation of the pamphlet that would correspond to numbered posts along a trail on Bogus Creek at the hatchery seem to be the priority of Kim Rushton, Manager of the Iron Gate Fish Hatchery. Kermith Walters, the new teacher at the school, submitted a preliminary brochure cover that was drawn by a student, Anna Kimball.

Sample graphs of Average Daily Temperatures from Bogus School Hobo

datalogger sites on Bogus and Gold Creeks are included in Appendix B.

DISCOVERY HIGH SCHOOL

Shasta River/Yreka Creek: Riparian restoration

In direct cooperation with Dave Webb, Shasta River Watershed CRMP, and in part with Bill Chesney, California Department Fish and Game, students propagated and planted native species at selected sites along the Shasta River and Yreka Creek. Cross-Sectional Profile charts and locations of profiles are included in Appendix C.

Areas of investigation:

- Vegetation mapping to identify plants to species at one site is in progress as part of Phase IV work plan.

- The macroinvertebrates utilization study using the California Stream Bioassessment Method was not completed.

- Water quality (DO, Temp, turbidity, pH, conductivity) data are included in this report as Appendix D.

- Only notes have been made regarding the vertebrate utilization study of birds, mammals, herptiles, and fish. When the study is more complete, the notes will be compiled into a report.

Beaver Creek:

In cooperation with Steve Fox, US Forest Service, Klamath National Forest, students were to install and monitor instream structures in a stream enhancement activity. This work was not completed.

Areas of investigation:

- The stream discharge investigation was initiated and will continue into Phase IV.

- There was training for the sedimentation study, but no data were received. Data will be compiled.

- Of the water quality information requested in the work plan, only the temperature data were collected. Those measurements have been transferred to USFWS and are included in Appendix E. Dissolved oxygen, turbidity, pH, conductivity measurements will be completed in Phase IV.

- The fish utilization study scheduled for June was canceled because of poor conditions.

FORKS OF SALMON SCHOOL

Salmon River: Temperature monitoring to evaluate the riparian efforts in conjunction with the US Forest Service, Klamath National Forest.

The following sections of the Forks of Salmon report are included in this report as submitted by the school.

Forks of Salmon School met the agreed upon commitments for 1995-1996. These included: 1) equipment purchase; 2) implemented the work plan; 3) documented project activities; 4) and provided reports. We maintained records/inventory of project equipment. Support was provided to teachers for integrating the work plan within the science curriculum to all of the students in the program. The school site teacher worked cooperatively with the Project Administrator, Project Field Specialist, and resource personnel for implementation of the work plan.

The Salmon River Restoration Council provided technical assistance and enlisted volunteers from the community to provide general assistance in the project activities. The Siskiyou County Superintendent of Schools Office provided our school with the process and time frames for purchasing and accounting for equipment. The Superintendent of Schools Office also provided support for the implementation of our site's school work plan.

Throughout this project, the schools and communities are identifying water temperature conditions in the Salmon River and its tributaries. Through the data collection and scientific methods the participants will identify and track where waters with high temperatures are located. Through this process the schools with support from the community will use scientific process to formulate hypotheses for what the causes for these high temperatures are. Students will be monitoring for the effects of existing restoration efforts on water temperatures and will also identify where further efforts may be appropriate.

WORK PLAN ACTIVITIES

1) TEMPERATURE STUDY

A) Methods - Water temperature data was collected using Hobo Temps, following study design criteria established by the 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 the units was conducted as described in the above mentioned protocol by students, site teacher, and community members working with the SRRC. All Hobo Temp data was sent Mr. Jeff Weiss who is performing quality control. He will provide the US Fish and Wildlife with his data product.

B) Location - The Forks School coordinated with specialists from the North Coast Regional Quality Control Board, the Salmon River, Happy Camp and Ukonom Ranger Districts - Forest Service, the California Department of fish and Game, the Salmon River Restoration Council (SRRC), KRIS staff,

and others to identify where the Hobo-Temp water temperature monitoring devices should be placed in the Salmon River sub-basin's tributaries and in the main channel of the Salmon River. The program students deployed the Hobo Temp Units at the agreed upon locations throughout the Salmon River Sub-basin. Several of the instruments are located in the river and tributaries within close proximity of private residences. Some students resided at these residences. This enhanced the relationship that students, parents, and neighbors have with tributaries and portions of the river where the participants live.

The Forks of Salmon School (Forks School) calibrated, deployed and maintained 23 Hobo Temps at various locations to identify water temperatures of the Salmon River sub-basin. The Forks School coordinated the deployment and maintenance of 5 of the 23 Hobo Temps with participants (teachers, students and community members) from Junction and Sawyers Bar Elementary Schools.

C) Activities Schedule

Planning and coordination sessions occurred throughout Phase III. In the fall of 1995, the site teacher attended a workshop on Hobo Temp calibration, launching, deployment, and data export.

1995 Field Season

During the months of August and September of 1995, eleven Hobo Temps were deployed in tributaries and in the main river. This activity was performed by students, teachers, community members, and agency specialists. Calibration of these instruments was performed by the AmeriCorps personnel and the students. The Hobo Temps were retrieved in early October, prior to the fall rainy season. No Hobo Temps washed away and all stayed underwater. The information was exported to the lap top computer by the Forks School students, teacher, and assistants. The students examined the data that was collected in this field season. An evaluation of this seasons activities was done in order to improve the project in subsequent years.

1996 Field Season

During 1996 various project activities and planning meetings occurred. The meetings focused on where to locate Hobo Temps for on-going Phases and the logistics involved for managing the equipment. This years field activities included Hobo Temp: servicing - battery replacement, calibration, deployment, placement checking, exporting data, and relaunching on the lap top computer. Several students recorded site information in logbooks, such as: Hobo Temp location photos, written description, and hand-drawn maps. They also took manual water and air temperatures and recorded other site characteristics. A schedule for Hobo Temp maintenance was developed. Twenty-five Hobo Temps were deployed. There were in Salmon River streams and tributaries. Two were deployed at the site and visited attended to by the students.

D) Participation

During Phase III of the KRIS participation in the programs activities included: current students from Forks, Sawyers, and Junction Schools, recent graduates of these schools who have been part of the KRIS and SEAMS projects, students from Humboldt State University (HSU) and Evergreen College. The teachers and aides from these schools also participated in Phase III. Technical assistance and support was provided by the Salmon River Restoration Council, parent volunteers, community volunteers, school board members, various government agencies, a GIS graduate student from Humboldt State University and others. KRIS staff also provided services.

2) GEOGRAPHIC INFORMATION SYSTEM DEVELOPMENT (GIS)

We have used the digital and 35 mm cameras to document the project sites and related activities. We will be utilizing the scanning equipment to enter photo documentation into KRIS in Phase IV. KRIS will be installed into the Forks Schools computer system during Phase IV. The existing school computer dedicated to this project was updated this year with 8 mg of RAM to accommodate expanded computer memory needs.

3) RELATED ACTIVITIES

The students performed observations and took measurements on various aspects associated with water quality and habitat conditions. Some of the tools used were clinometer, penetrometer, and a water quality test kit. Students measured slope, soil compaction, water-PH, dissolved oxygen, and other aspects related to the water. In Phase IV students will be looking at various restoration sites that exist on the Salmon River. Photo documentation is being incorporated at many of the sites. This information will be incorporated into KRIS at the schools.

4) CONCLUSION

The students are directly involved in asking water temperature questions critical to water quality assessment in the salmon river sub-basins. Power of observation, scientific data collection, recording, and reporting for the development of future hypothesis related to watershed health are incorporated activities. The students are not only participating in a water temperature study, but are developing skills for future professional applications. The techniques being applied will teach the students ways to scientifically investigate natural resource conditions. The students are utilizing data and learned skills in their curriculum. This project is also providing the students with the ability to improve watershed conditions on the Salmon River.

A Hobo Site Location List and Map are included as Appendix F. Sample graphs of temperatures are included in Appendix G.

SCOTT RIVER HIGH SCHOOL

Boulder Creek, tributary to South Fork Scott River:

- Evaluate volume of fine sediment with V* (Lisle &Hilton, 1993) - With US Forest Service personnel, students participated in V* work at Boulder Creek. Work was completed and submitted to USFWS in October, 1996.

Scott River Tributaries:

- Hobo Temps - In coordination with Siskiyou RCD and Quartz Valley School, temperature evaluation with hobo temps continued with data retrieval and relaunching at sites on Scott River and on tributaries of the upper watershed. Data have been transferred to USFWS data repository and are included in Appendix H.

- Coho Spawning Ground Utilization - In coordination with California Department of Fish and Game, students participated in electroshocking fish on French Creek with US Forest Service personnel. Students also participated in white water training on Kelsey Creek in preparation for the Chinook Salmon Spawning Count Survey. Because of the sensitivity of the coho salmon, studies will focus on the chinook salmon. No data have been submitted.

- Students classified insects gathered at three different sites.

TULELAKE HIGH SCHOOL

The study site is located at the Mowitz Creek over a 3.5 mile stretch.

Mowitz Creek: Evaluate riparian health

- Water Quality - Dissolved oxygen and temperature measurements have been taken throughout the spring and fall of 1996. Data have been transferred to USFWS data repository and are included in Appendix I.

- Vegetation Mapping - Preliminary work with plant transects along the creek has begun.

- Species Diversity - Invertebrates and plants have been identified.

Two reports that were written by groups of students are included in the appendices. Mowitz Creek Field Study is Appendix J and the report which is untitled is Appendix K. Both reports describe protocol and include samples of data but do not include data analysis. It is hoped that future reports by students will include data analysis.

YREKA HIGH SCHOOL - NATURAL RESOURCE OCCUPATIONS (ROP) CLASS

The project on the Shasta River that was to evaluate the fenced riparian project at Don Meamber's property, corner of Oberlin Road and Montague-Grenada Road, in collaboration with Dave Webb, Shasta River CRMP, was begun. Cross-sections of Shasta River were made by Discovery High School students and are included in Appendix C. Webb suggested this program and having students focus on propagation of native plants.

Siskiyou County Superintendent of Schools Office

The Siskiyou County Superintendent of Schools Office coordinated and administered the sub-contract. Activities performed by the Office for Phase III included:

- Development of project agreements with each school district.
- Management of fiscal aspects of program.
- Writing of quarterly and annual reports, as determined by sub-contract.
- Coordination of training workshops for methodology and calibration.
- Coordination and administration of the sub-contract.

In June, a manager was appointed to administer the grant. Duties of SCSSO personnel are included in Appendix L. The report of Jeff Weiss, the computer consultant, is Appendix M.

Summary and Conclusions

In conclusion, it appears that many of the tasks of the project that the schools were to initiate and to implement were not accomplished as planned. The reasons for the lack of completion need to be determined and remedied if possible. Reporting format, deadlines, and data transferral are areas where schools need to meet the requirements of the site agreements. Standardization of forms and procedures will be an asset to schools as they collect data and for SCSSO for reporting to USFWS.

Acquiring water quality measurements seems to be an activity that most schools have completed in an adequate manner. Data transfer in a accurate and timely matter continues to be a challenge.

The evaluation of physical characteristics of streams associated with project sites has been initiated at some sites. More work and possibly more training seem to be needed.

Evaluation of riparian condition and identification of riparian restoration sites and plant riparian vegetation have begun. Propagation of native species has been successful. Continual planting will be scheduled.

The inventory of biological components at project sites is an investigative area that needs some assistance. Data collection is rather subjective and thus not very useful at present.

Teacher training on a continual basis is needed for teachers. Personnel changes in the individual schools cause problems with commitment and ability to perform the data collection at a level appropriate for the requirements of the project.

At the site level schools should access data so that their students are involved in data analysis in addition to the collection process. For example, the schools that have Hobo temps could decide if the site that was selected for monitoring is an appropriate one for the study. Student reports should include all steps of the scientific method.

Schools need to understand that the commitment to USFWS is formal contractual agreement, and thus binds them to complete the work. At this time, it might be appropriate to ask each school to decide if it can fulfil its commitment to the tenets of its agreement, or if it wishes to modify the agreement in such a way that its commitment can be fulfilled, or if it wishes to decline to enter into an agreement.

The value of this project extends beyond the data collection process. Both students and their families have been impacted to some extent because of their involvement in the project. Responsibility for local community and stewardship values of students are enhanced by participation in field studies such as the ones described in the work plans.

Summary of Expenditures

Major expenditures were to purchase Hobo temps and four lap top computers as requested in the school site budget plans. Lap tops are utilized to download data from the Hobo Temps at field sites. They are also used for word processing and data analysis. Inventory of equipment are kept at school sites and SCSSO.

SELECTED REFERENCES

Hilton, S; Lisle, T. 1993. *Measuring the fraction of pool volume filled with fine sediment.* Res. Note PSW-RN-414. Albany, CA: Pacific Southwest Research Station, Forest Service, U.S. Department of Agriculture; 11 p.

Stevens, H.; Ficke, J.; Smoot, G. 1975. *Techniques of water-resources investigations of the United States Geological Survey: Water temperature - Influential factors, field measurement, and data presentation* . Washington D.C.: U.S. Government Printing Office; 65 p.

Appendices

Appendix A: KRIS Project Quarterly Report Form

Appendix B: Bogus School Temperature Graphs

Appendix C: Discovery High School Stream Profiles

Appendix D: Discovery High School Water Quality Charts

Appendix E: Discovery High School Temperature Graphs

Appendix F: Forks of Salmon School Hobo Temp Location List and Map

Appendix G: Forks of Salmon School Temperature Graphs

Appendix H: Scott River High School Temperature Graphs

Appendix I: Tulelake High School Temperature Graphs

Appendix J:Tulelake High School Mowitz Creek Field Study - 1995

Appendix K: Tulelake High School Untitled Report

Appendix L: KRIS Personnel Scope of Responsibilities

Appendix M: Jeff Weiss Report

Appendix A

KRIS PROJECT QUARTERLY REPORT FORM

School_____

Quarter _____ Date _____

Name _____ Grade Level _____

Area of Investigation: _____

1. What activities did you do?

2. Dates of activities?

3. Who and how many people participated? Teachers? Administrator? Paraprofessionals? Parents? Community members? Students?

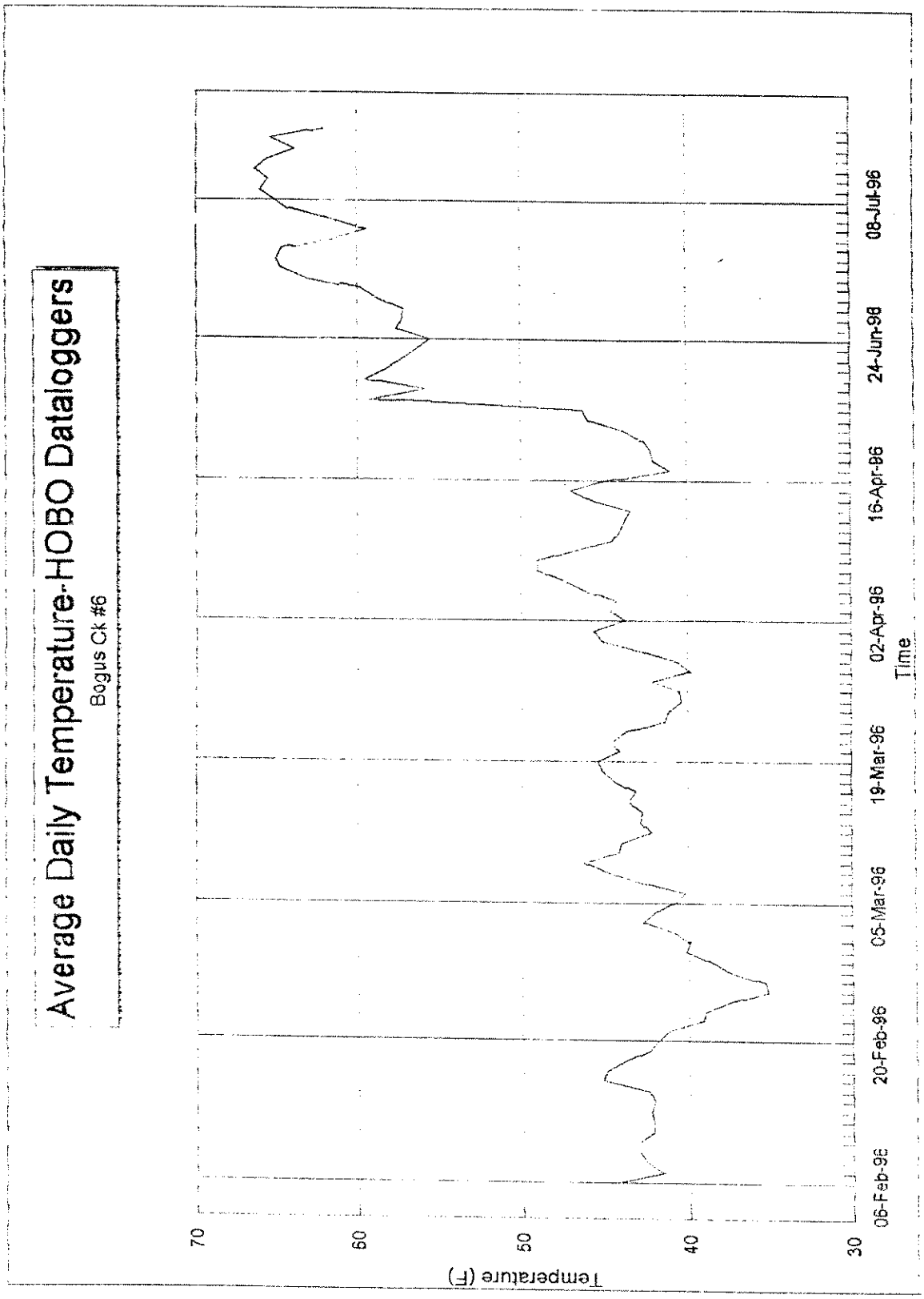
4. Where was the activity?

5. Pre-activities relating to area of investigation activity?

6. Planned post-activities relating to area of investigation?

7. What do you expect to do next quarter?

Please answer the questions in complete sentences and in a style so that someone who is unfamiliar with the project could understand what data are being collected and what your students are learning. Write narrative descriptive paragraphs for questions 3, 4 , 5, 6 and 7. All reports should be typed.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Bogus Ck #6
Temperature (F)
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60
50
40
30
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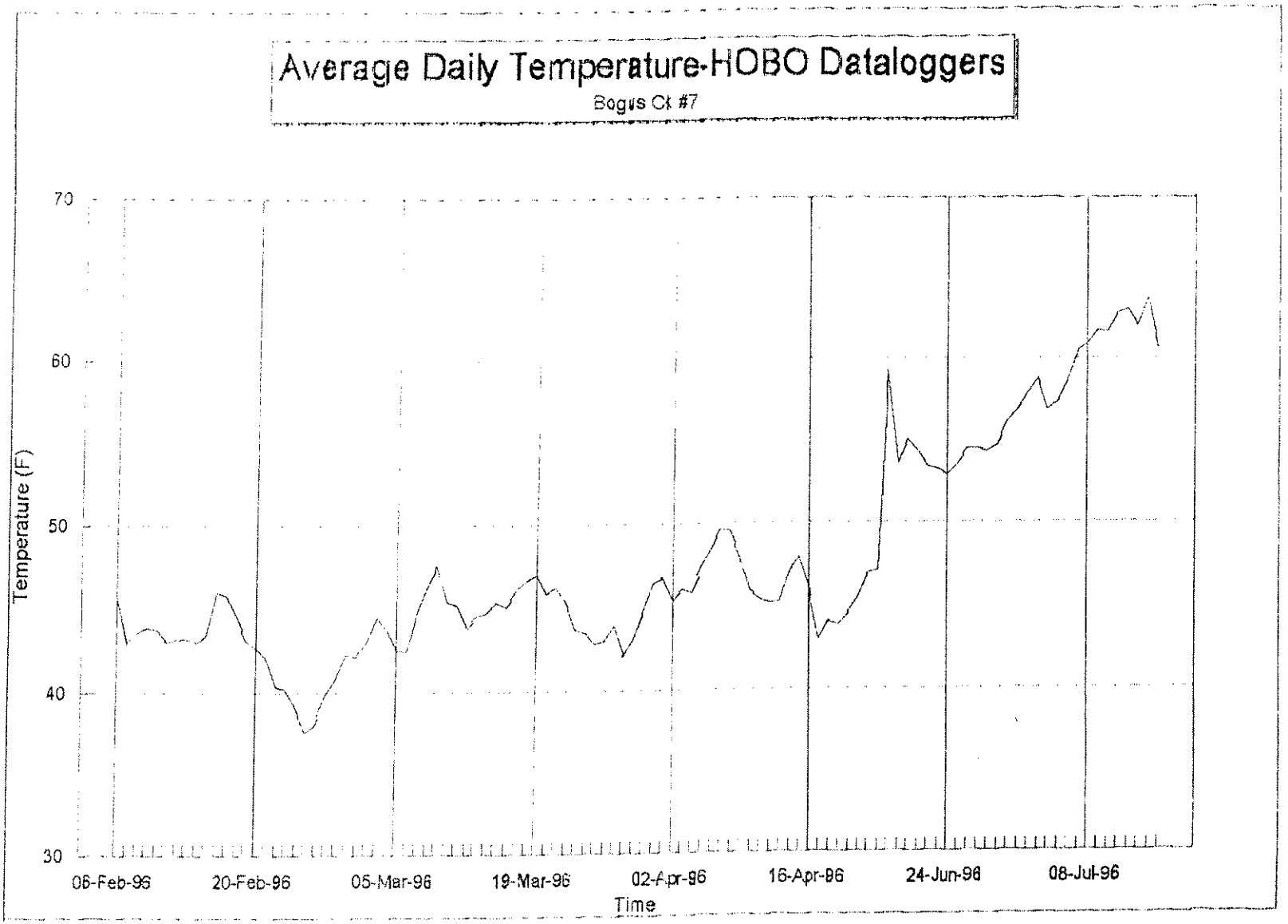
20-Feb-96
05-Mar-96
19-Mar-96
02-Apr-96
16-Apr-96
24-Jun-96
08-Jul-96
Time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Bogus Ck #7
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60
50
40
30
Temperature (F)
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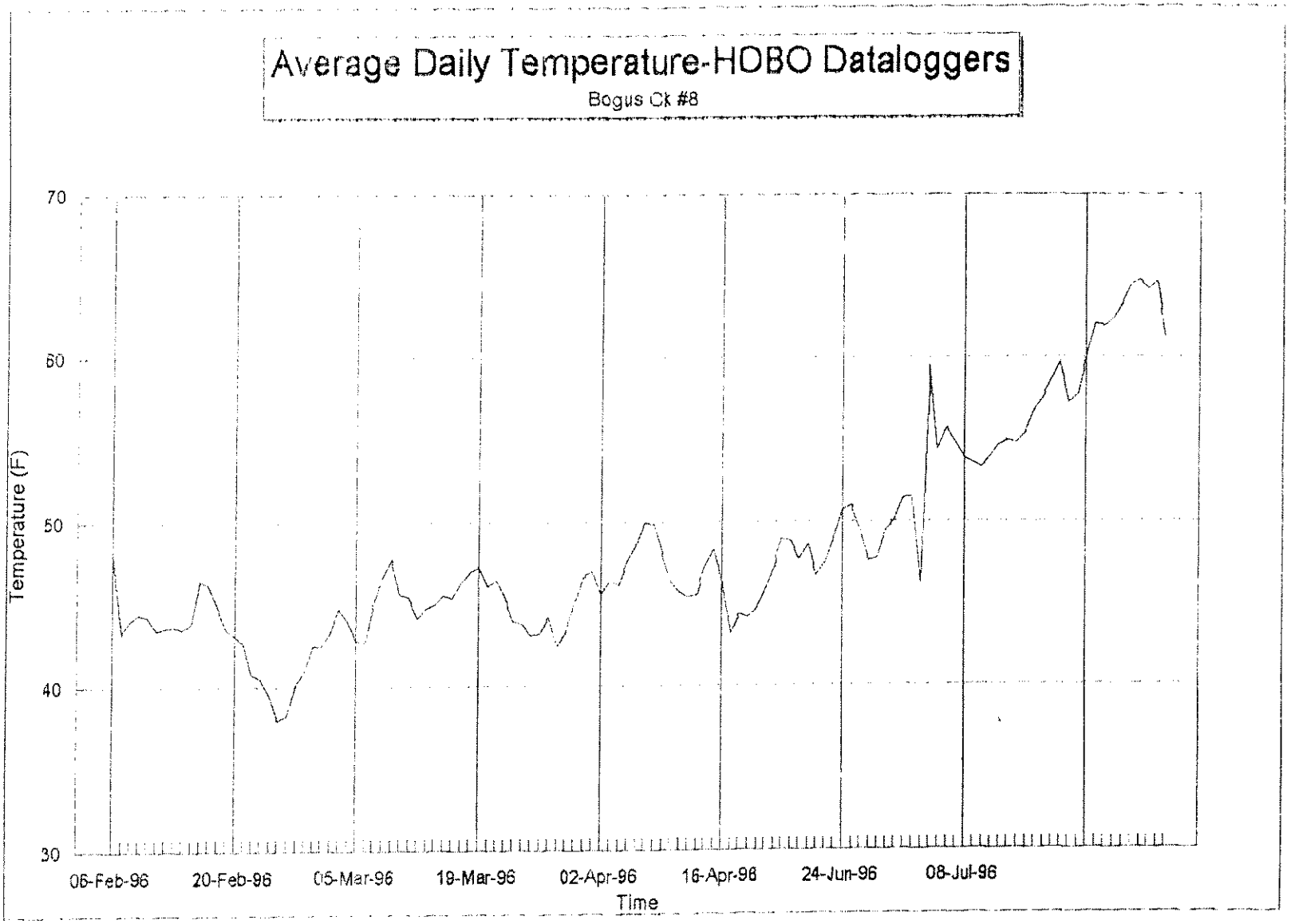
Time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Bogus Ck #8
Temperature (F)
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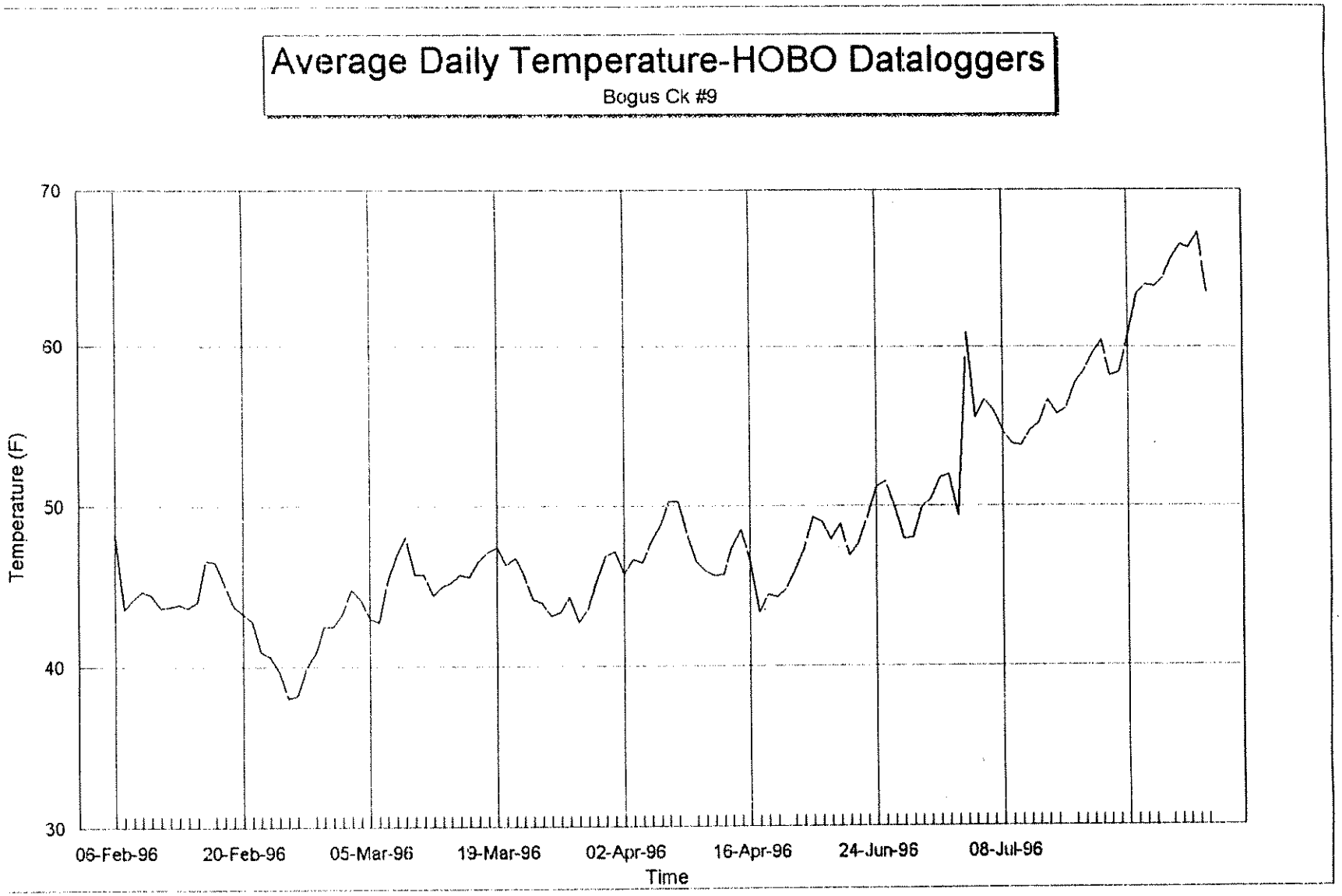
Time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Bogus Ck #9
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60
50
40
30
Temperature (F)
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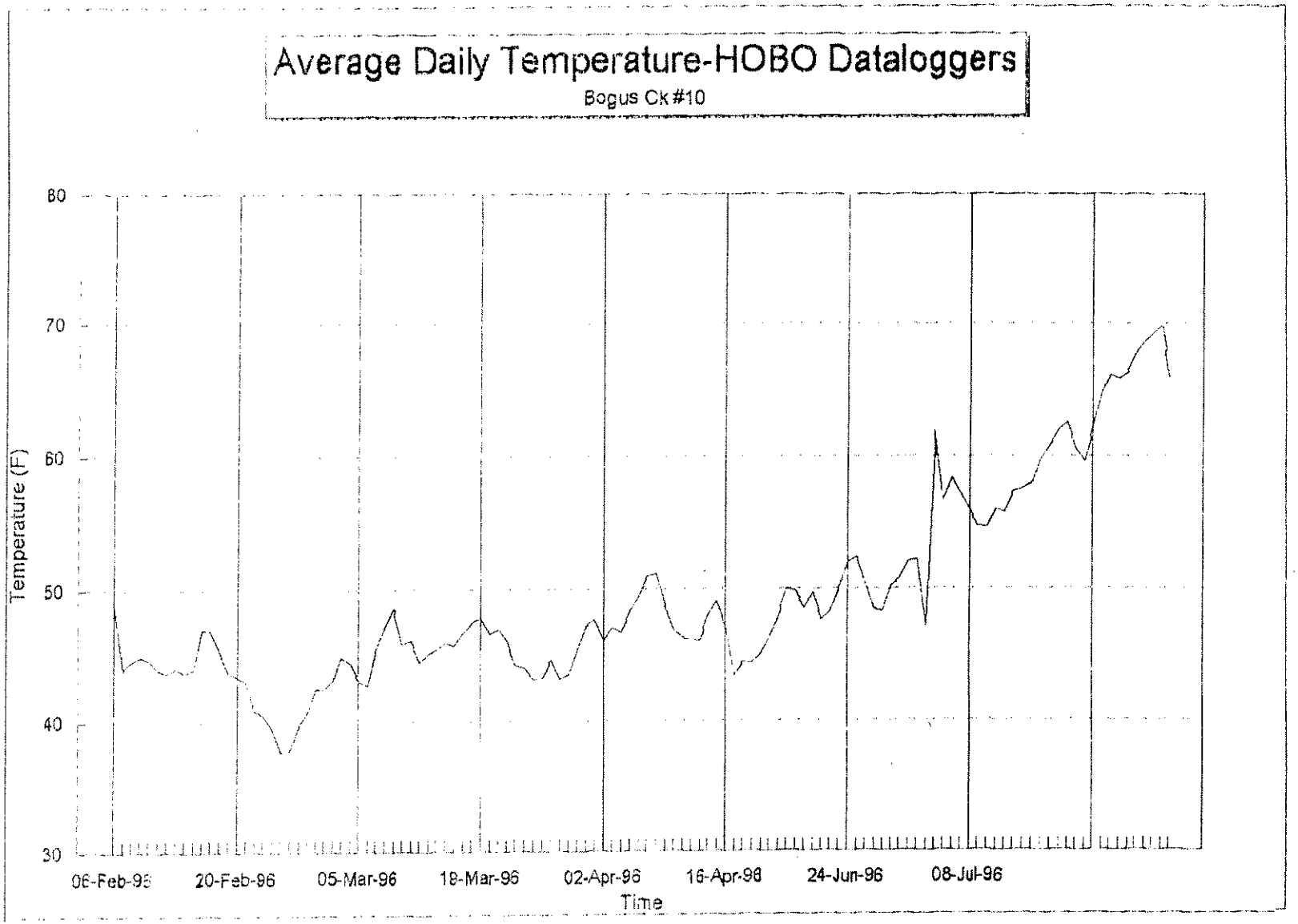
24-Jun-96
08-Jul-96
Time


Average Daily Temperature-HOBO Dataloggers
Bogus Ck #10
Temperature (F)
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70
60
50
40
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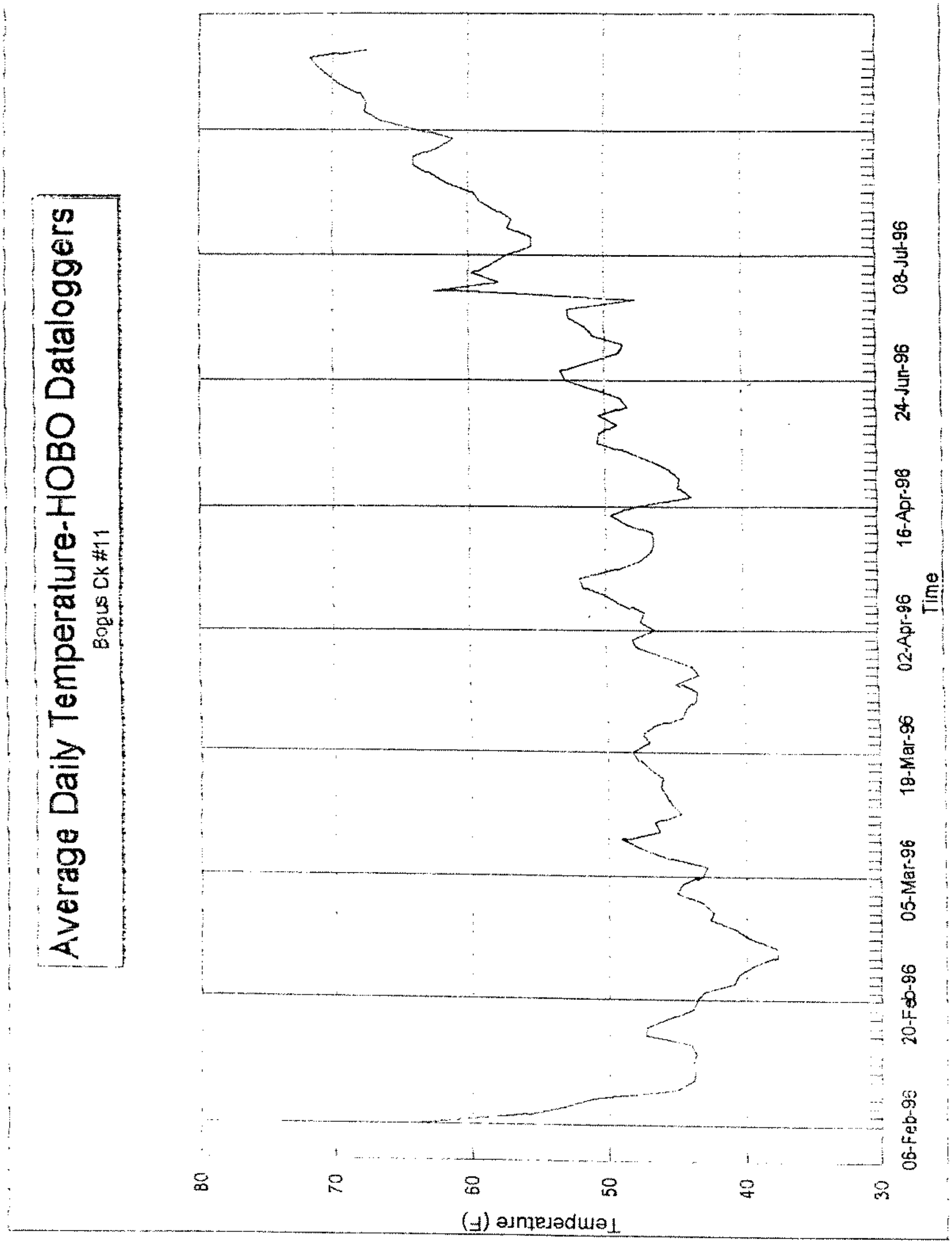
Time



Average Daily Temperature-HOBO Dataloggers
Bogus Ck #11
Temperature (F)
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60
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40
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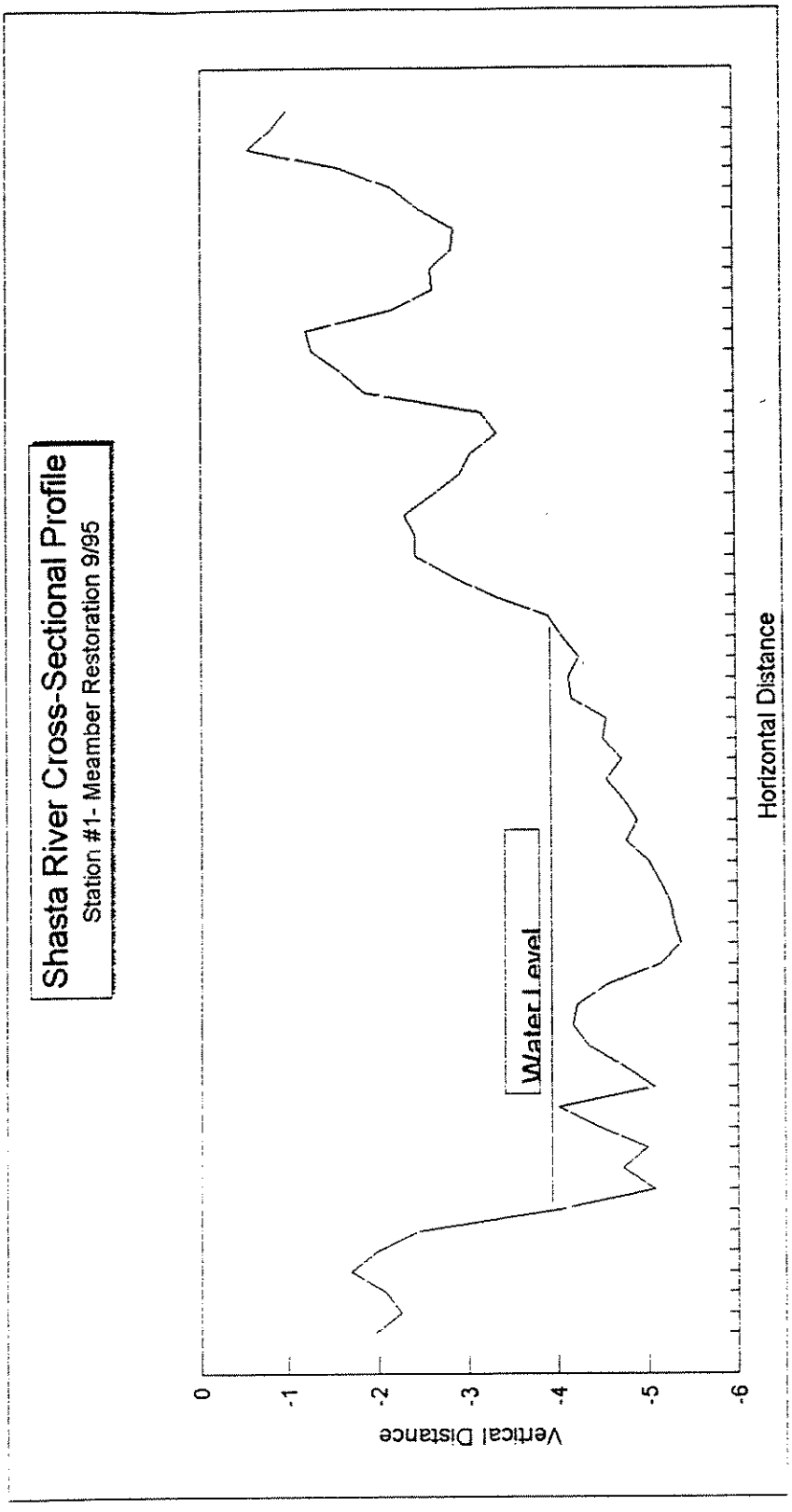
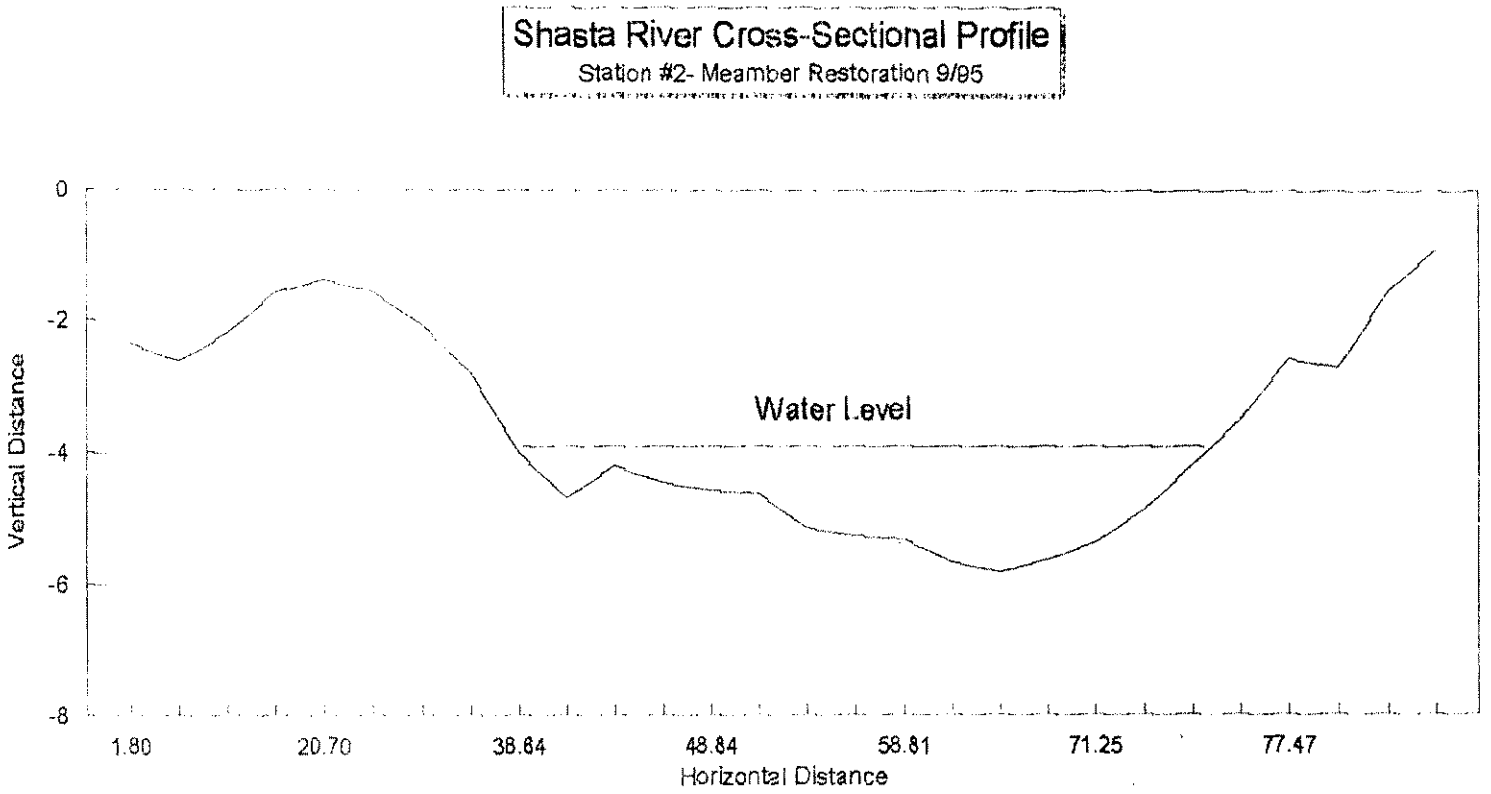
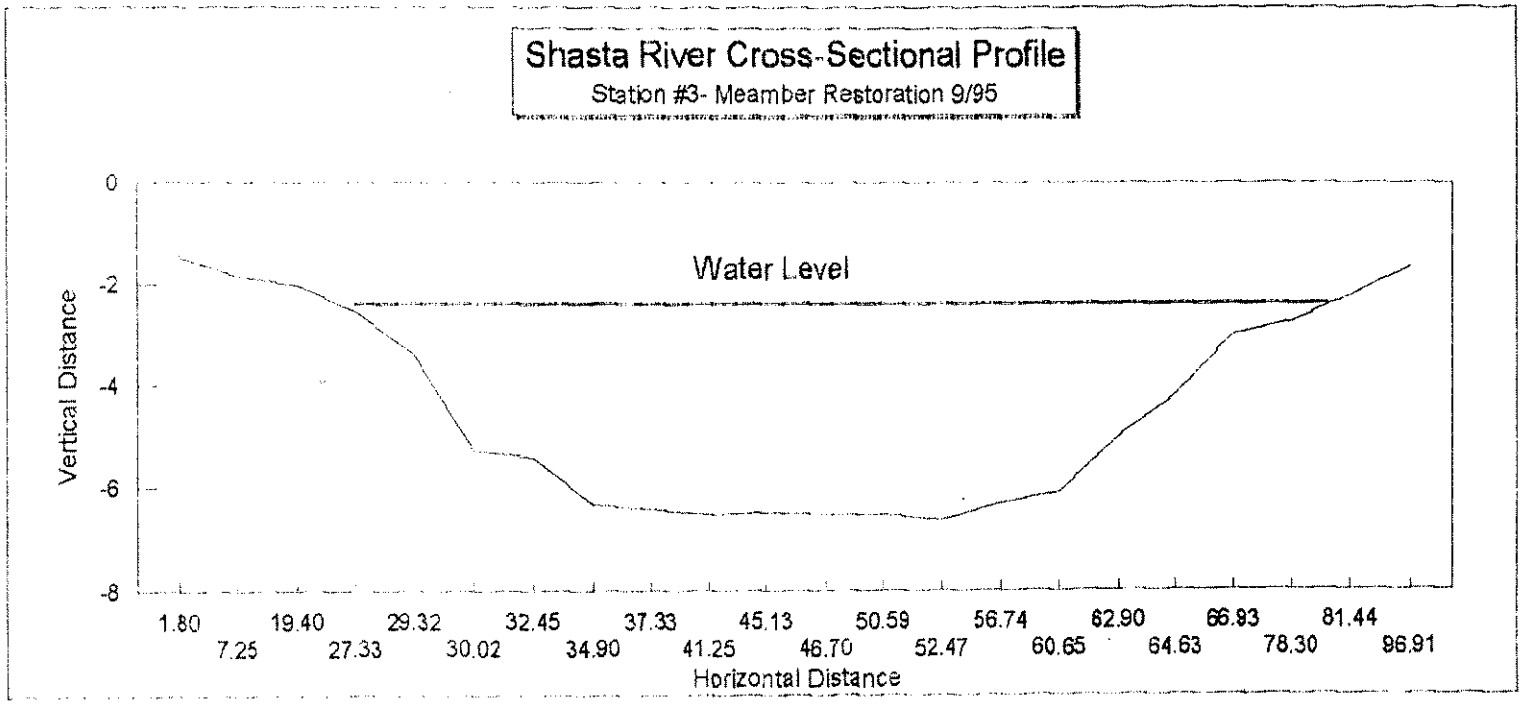
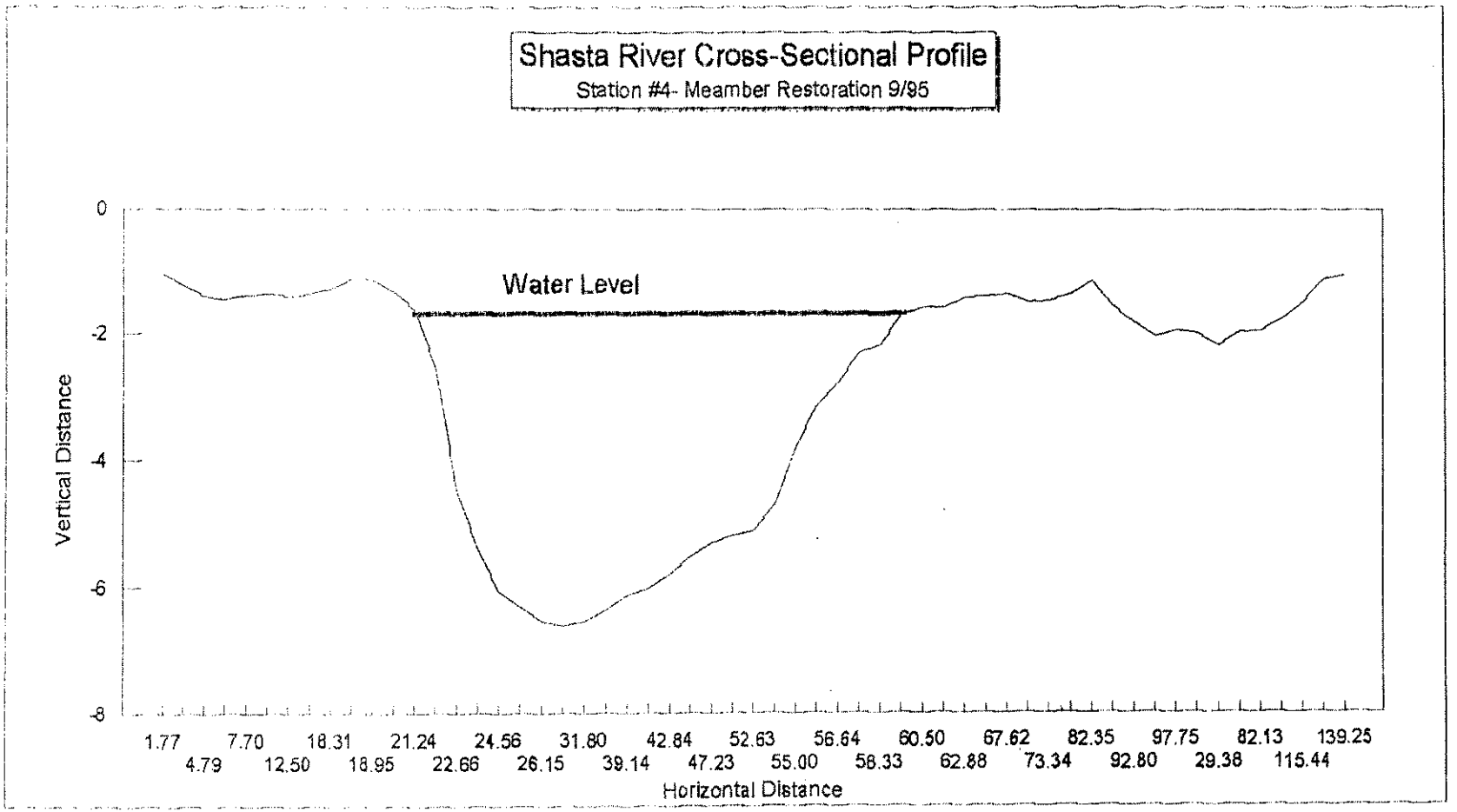
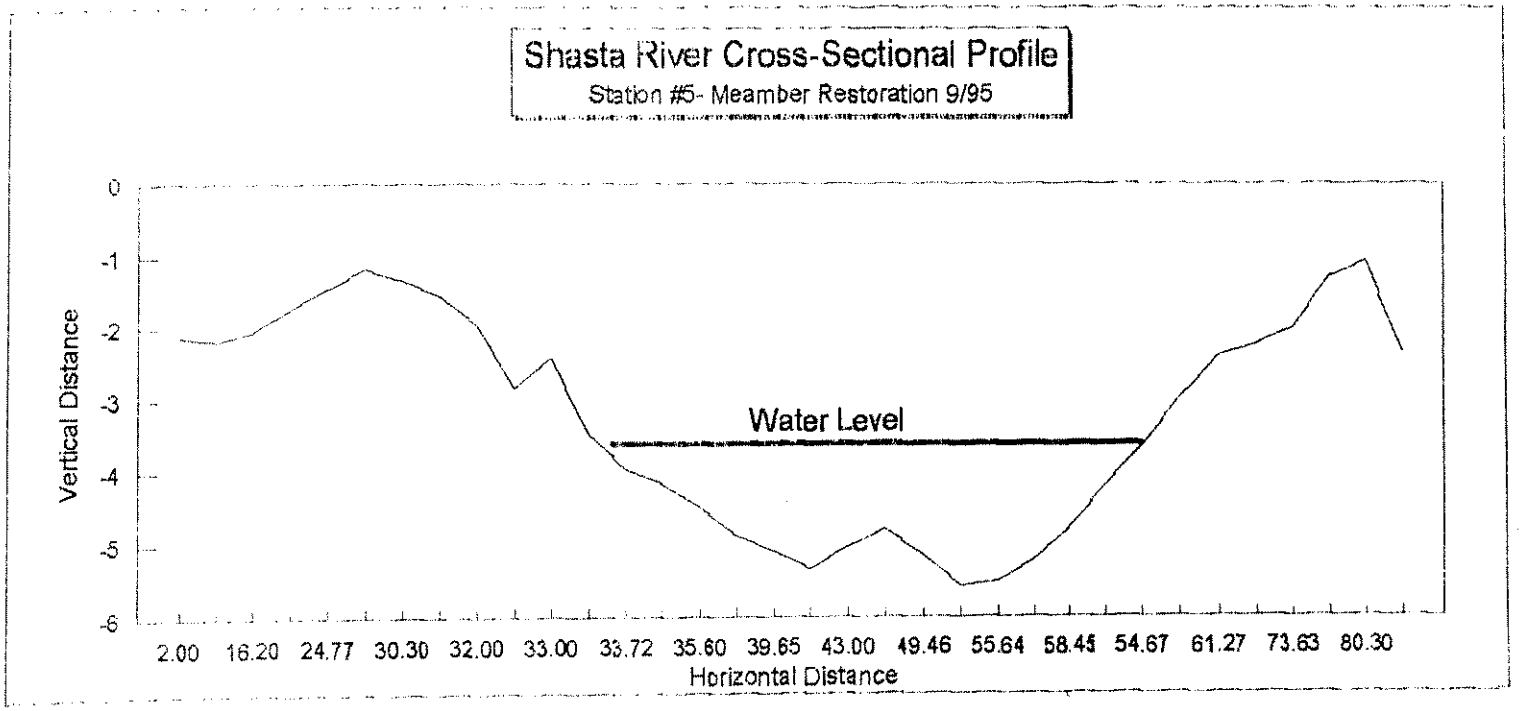
24-Jun-96
08-Jul-96
Time


Shasta River Cross-Sectional Profile
Station #1- Meamber Restoration 9/95
Water Level
Vertical Distance
0
-1
-2
-3
-4
-5
-6
Horizontal Distance


Shasta River Cross-Sectional Profile
Station #2- Meamber Restoration 9/95
Water Level
Vertical Distance
0
-2
-4
-6
-8
1.80
20.70
38.64
48.84
58.81
71.25
77.47
Horizontal Distance


Shasta River Cross-Sectional Profile
Station #3- Meamber Restoration 9/95
Water Level
Vertical Distance
0
-2
-4
-6
-8
1.80
7.25
19.40
27.33
29.32
30.02
32.45
34.90
37.33
41.25
45.13
46.70
50.59
52.47
56.74
60.65
62.90
64.63
66.93
78.30
81.44
96.91
Horizontal Distance


Shasta River Cross-Sectional Profile
Station #4- Meamber Restoration 9/95
Water Level
Vertical Distance
0
-2
-4
-6
-8
1.77
4.79
7.70
12.50
18.31
18.95
21.24
22.66
24.56
26.15
31.80
39.14
42.84
47.23
52.63
55.00
56.64
58.33
60.50
62.88
67.62
73.34
82.35
92.80
97.75
29.38
82.13
115.44
139.25
Horizontal Distance


Shasta River Cross-Sectional Profile
Station #5- Meamber Restoration 9/95
Vertical Distance
0
-1
-2
-3
-4
-5
-6
Water Level
2.00
16.20
24.77
30.30
32.00
33.00
35.60
39.65
43.00
49.46
55.64
58.45
54.67
61.27
73.63
80.30
Horizontal Distance

Water Quality Report by Location
Work Contributed by Discovery High School

Appendix D

udy Location:Anderson Grade, Yreka Creek.

port Date:10/10/1996

DO

Year	Month	Average/Month
1994	December	9.50
1995	January	10.00
	February	10.27
	March	9.97
	April	10.80
	May	9.60
	September	8.60
	October	8.80
	December	9.85
1996	January	10.40
	February	11.20
	March	10.50
	April	11.40

H2O TEMP

Year	Month	Average/Month
1994	December	10.00
1995	January	10.00
	February	8.17
	March	8.68
	April	10.38
	May	12.75
	September	14.33
	October	10.00
	December	10.13
1996	January	8.00
	February	7.50
	March	9.25
	April	9.50

NITRATE

Year	Month	Average/Month
1994	September	0.93
	December	0.70
1995	January	0.74
	February	0.60
	March	0.59
	April	0.69
	August	1.10
	September	1.34
1996	February	0.53
	April	0.48

Water Quality Report by Location
Work Contributed by Discovery High School

udy Location:Fairgrounds, Yreka Creek.

oort Date:10/10/1996

DO

Year	Month	Average/Month
1992	December	10.24
1993	January	12.80
	February	10.90
	March	10.20
	April	10.27
	May	8.63
	June	10.20
	September	8.60
	October	6.87
	November	9.27
	December	9.27
1994	January	10.13
	February	8.73
	March	9.50
	April	9.82
	May	8.50
	September	2.40
	December	4.20
1995	January	5.40
	February	9.60
	March	10.33
	April	9.85
	May	9.15
	September	7.73
	October	7.60
	November	8.00
	December	9.30
1996	January	11.10
	February	10.90
	March	10.30
	April	11.20

H2O TEMP

Year	Month	Average/Month
1992	December	6.66
1993	January	5.63
	February	7.44
	March	9.67
	April	12.40
	May	14.23
	June	16.80
	September	15.67
	October	14.00
	November	10.67
	December	8.63

Water Quality Report by Location
Work Contributed by Discovery High School

udy Location:Anderson Grade, Yreka Creek.

port Date:10/10/1996

pH

Year	Month	Average/Month
1994	August	7.40
	December	7.00
1995	January	7.00
	March	8.00
	April	8.10
	September	8.20
	October	7.90
	December	7.90
1996	January	7.90
	February	8.00
	March	8.20
	April	7.95

PHOSPHATE

Year	Month	Average/Month
1994	August	0.07
	September	4.56
	December	1.49
1995	January	0.23
	February	0.33
	March	0.35
	April	0.40
	September	0.72
1996	February	0.12
	April	0.23

Water Quality Report by Location
Work Contributed by Discovery High School

udy Location:Fairgrounds, Yreka Creek.

port Date:10/10/1996

NITRATE

Year	Month	Average/Month
1996	March	0.22
	April	0.26

pH

Year	Month	Average/Month
1992	December	5.60
1993	January	7.17
	February	7.00
	March	7.00
	April	7.00
	May	6.83
	September	7.00
	October	7.05
	November	7.00
	December	7.00
1994	January	7.00
	February	7.00
	March	7.20
	April	7.27
	May	7.20
	September	7.00
	December	6.80
1995	April	8.10
	September	8.05
	October	7.80
	November	7.60
	December	7.90
1996	January	8.00
	February	8.20
	March	8.25
	April	8.15

PHOSPHATE

Year	Month	Average/Month
1992	December	0.60
1993	March	4.45
	April	0.40
	May	0.23
	June	0.07
	October	0.12
	November	0.78
	December	0.13
1994	January	0.36

Water Quality Report by Location
Work Contributed by Discovery High School

udy Location:Fairgrounds, Yreka Creek.

port Date:10/10/1996

PHOSPHATE

Year	Month	Average/Month
1994	February	2.36
	March	0.06
	April	0.24
	May	0.13
	August	0.07
	September	0.39
	December	0.55
1995	January	0.07
	February	90.44
	March	0.58
	September	0.23
1996	February	0.04
	March	0.17
	April	0.12

Water Quality Report by Location
Work Contributed by Discovery High School

udy Location:Fairgrounds, Yreka Creek.

port Date:10/10/1996

H2O TEMP

Year	Month	Average/Month
1994	January	8.50
	February	8.60
	March	11.76
	April	13.63
	May	15.83
	September	20.50
	December	10.00
1995	January	11.00
	February	7.75
	March	6.83
	April	9.38
	May	12.75
	September	15.00
	October	11.00
	November	10.00
	December	10.00
1996	January	7.00
	February	7.25
	March	10.00
	April	9.50

NITRATE

Year	Month	Average/Month
1992	December	1.03
1993	February	0.70
	March	4.44
	April	0.28
	May	0.21
	October	0.51
	November	0.56
		0.37
	December	0.31
1994	January	0.61
	February	0.29
	March	0.26
	April	0.25
	May	0.35
	September	1.00
	December	0.00
1995	January	0.53
	February	63.93
	March	0.57
	April	0.50
	September	0.70
1996	February	0.45

Water Quality Report by Location
Work Contributed by Discovery High School

udy Location:LOWER SHASTA

port Date:10/10/1996

DO

Year	Month	Average/Month
1994	December	8.30
1995	January	6.80
	February	10.63
	March	10.13
	April	9.90
	May	8.70
	September	8.30
	December	10.25
1996	January	11.70
	February	10.90
	March	10.15
	April	10.80

H2O TEMP

Year	Month	Average/Month
1994	December	9.00
1995	January	9.80
	February	9.67
	March	9.50
	April	10.25
	May	14.25
	September	18.00
	December	7.63
1996	January	8.00
	February	7.25
	March	10.75
	April	11.50

NITRATE

Year	Month	Average/Month
1994	December	0.94
1995	January	0.64
	February	0.23
	March	0.66
	April	0.22
	September	1.73
	December	0.00
1996	February	0.13

pH

Year	Month	Average/Month

Water Quality Report by Location
Work Contributed by Discovery High School

ıdy Location:LOWER SHASTA

ɔort Date:10/10/1996

pH

Year	Month	Average/Month
1994	December	7.00
1995	January	7.00
	April	8.10
	September	8.40
	December	7.85
1996	January	8.40
	February	8.05
	March	7.80
	April	8.10

PHOSPHATE

Year	Month	Average/Month
1994	December	1.25
1995	January	0.48
	February	0.30
	March	0.30
	April	0.40
	September	0.60
	December	0.90
1996	February	0.13
	March	0.30
	April	0.32

Water Quality Report by Location
Work Contributed by Discovery High School

dy Location:Nursery, Yreka Creek.

ort Date:10/10/1996

DO

Year	Month	Average/Month
1992	December	8.76
1993	January	10.47
	February	11.25
	March	9.75
	April	8.85
	May	8.70
	June	9.00
	September	7.07
	October	5.90
	November	7.87
	December	7.00
1994	January	10.53
	February	10.33
	March	9.38
	April	10.55
	May	8.80

H2O TEMP

Year	Month	Average/Month
1992	December	9.20
1993	January	5.58
	February	8.13
	March	9.90
		10.00
	April	12.13
	May	14.33
	June	16.00
	September	17.33
	October	14.25
	November	11.67
	December	9.33
1994	January	9.00
	February	9.40
	March	12.40
	April	15.15
	May	17.38

NITRATE

Year	Month	Average/Month
1992	December	1.75
1993	February	1.57
	March	47.18
	April	0.62

Water Quality Report by Location
Work Contributed by Discovery High School

dy Location:Nursery, Yreka Creek.

ort Date:10/10/1996

NITRATE

Year	Month	Average/Month
1993	May	0.70
	October	1.29
	November	0.99
	December	0.87
1994	January	0.52
	February	0.49
	March	0.83
	April	0.90
	May	1.01

pH

Year	Month	Average/Month
1992	December	7.00
1993	January	7.17
	February	7.00
	March	7.00
	April	6.88
	May	7.00
	June	7.00
	September	7.00
	October	6.96
	November	6.87
	December	6.87
1994	January	6.93
	February	6.93
	March	7.12
	April	7.33
	May	7.20

PHOOSPHATE

Year	Month	Average/Month
1994	January	0.64

PHOSPHATE

Year	Month	Average/Month
1992	December	1.63
1993	February	0.07
	March	0.07
	April	1.28
	May	0.67
	June	0.48

Water Quality Report by Location
Work Contributed by Discovery High School

dy Location:Nursery, Yreka Creek.

ort Date:10/10/1996

PHOSPHATE

Year	Month	Average/Month
1993	October	2.05
	November	0.88
	December	0.86
1994	January	0.36
	February	0.51
	March	2.86
	April	0.98
	May	1.98

Water Quality Report by Location
Work Contributed by Discovery High School

udy Location:UPPER SHASTA

port Date:10/10/1996

DO

Year	Month	Average/Month
1994	December	10.40
1995	January	9.20
	February	10.50
	March	9.75
	April	9.15
	May	9.35
	September	8.50
	October	9.00
	December	9.98
1996	January	10.00
	February	10.60
	March	9.90
	April	9.60

H2O TEMP

Year	Month	Average/Month
1994	December	9.00
1995	January	9.00
	February	8.50
	March	8.08
	April	10.13
	May	15.00
	September	18.00
	October	11.50
	December	10.00
1996	January	7.00
	February	6.50
	March	10.75
	April	11.50

NITRATE

Year	Month	Average/Month
1994	December	0.59
1995	January	0.53
	February	0.13
	March	0.37
	September	0.76

pH

Year	Month	Average/Month
1994	December	7.00

Water Quality Report by Location
Work Contributed by Discovery High School

idy Location:UPPER SHASTA

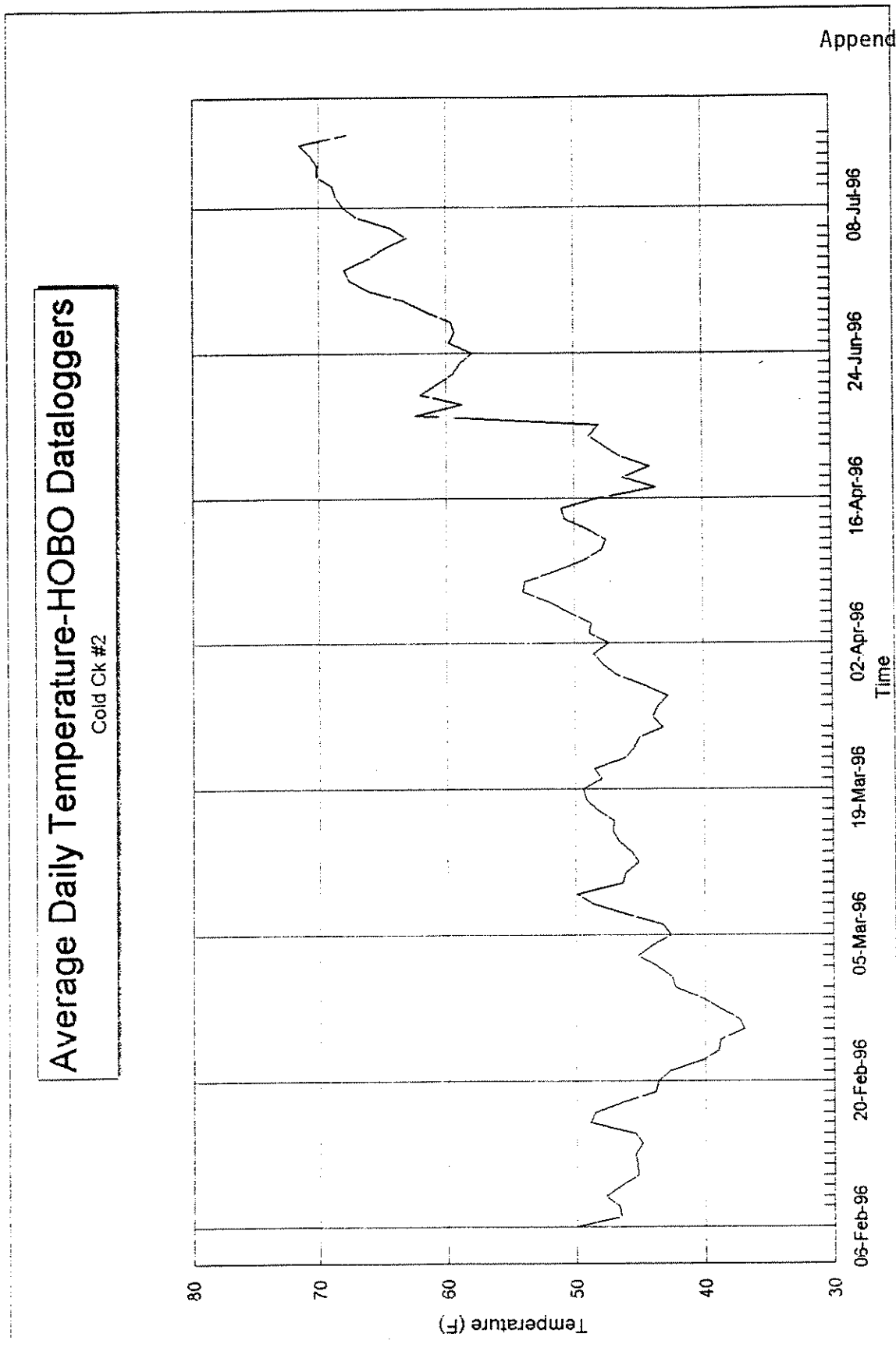
ort Date:10/10/1996

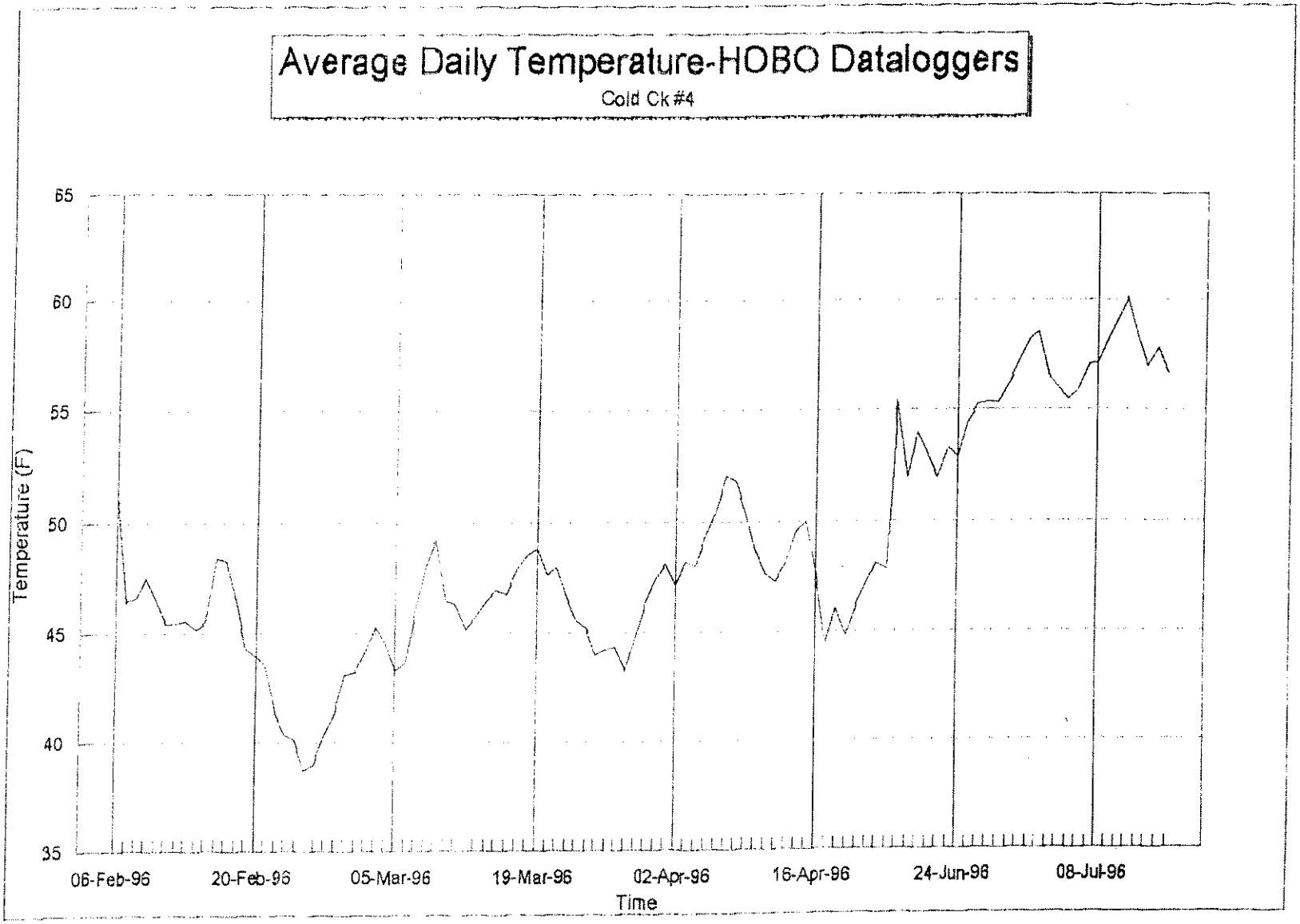
pH

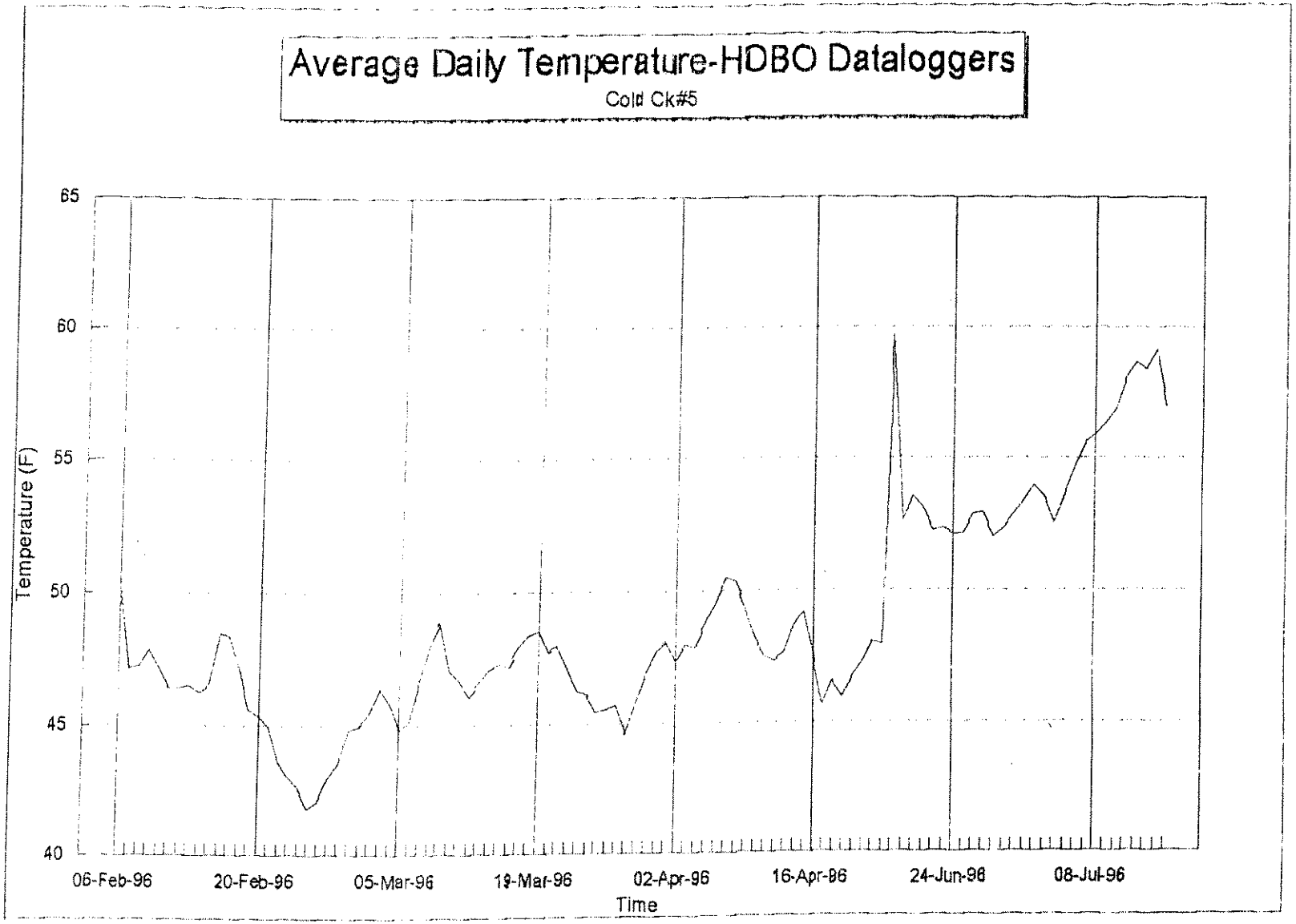
Year	Month	Average/Month
1995	January	7.50
	April	8.10
	September	8.10
	October	8.00
	December	8.10
1996	January	7.90
	February	7.95
	March	8.00
	April	0.00

PHOSPHATE

Year	Month	Average/Month
1994	December	0.08
1995	January	0.44
	February	0.51
	March	0.28
	April	0.36
	September	0.49
1996	February	0.10
	March	0.11
	April	0.32


Average Daily Temperature-HOBO Dataloggers
Cold Ck #2
Temperature (F)
80
70
60
50
40
30
06-Feb-96
20-Feb-96
05-Mar-96
19-Mar-96
02-Apr-96
16-Apr-96
24-Jun-96
08-Jul-96
Time


Average Daily Temperature-HOBO Dataloggers
Cold Ck #4
65
60
55
50
45
40
35
Temperature (F)
06-Feb-96
20-Feb-96
05-Mar-96
19-Mar-96
02-Apr-96
16-Apr-96
24-Jun-96
08-Jul-96
Time

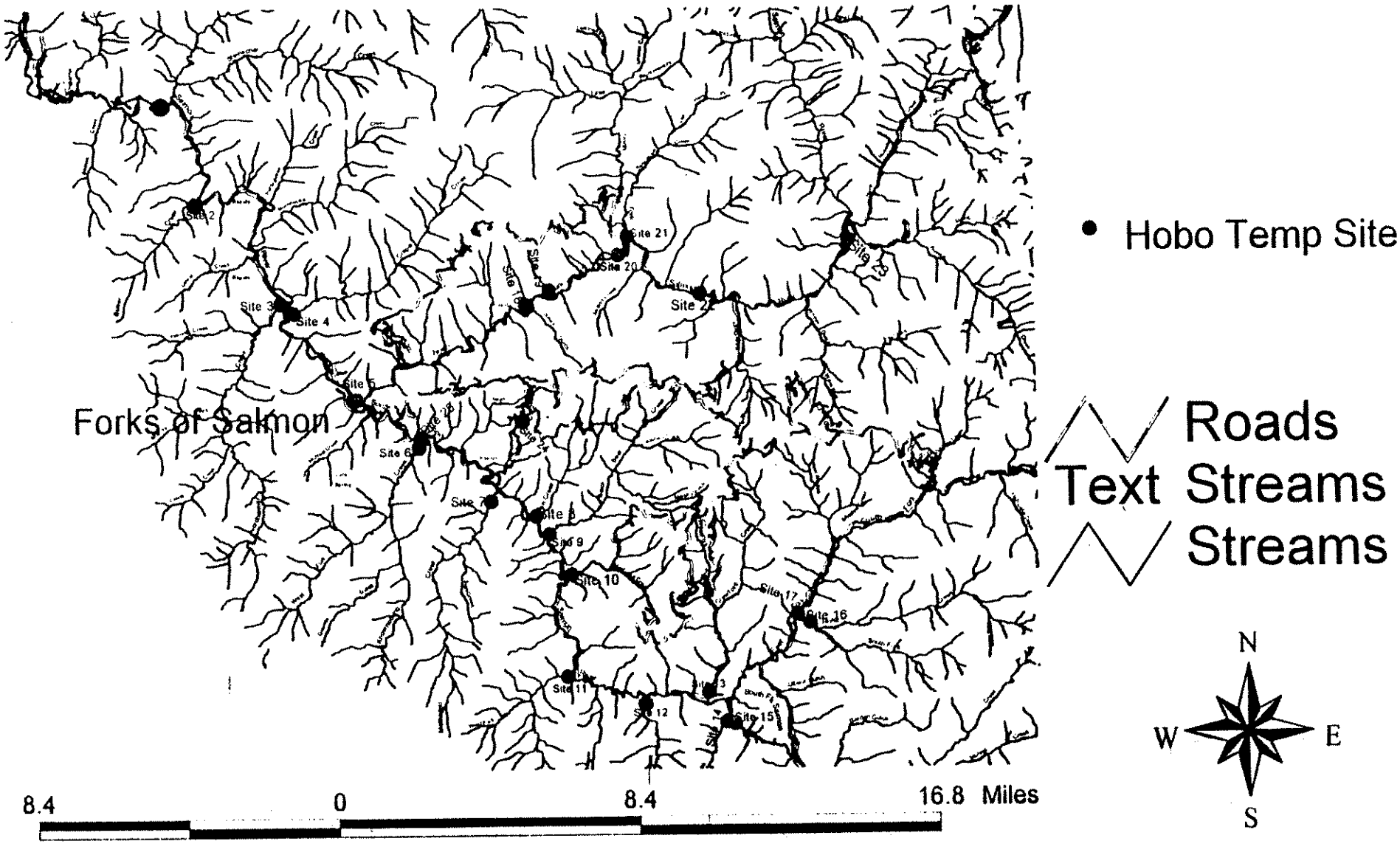

Average Daily Temperature-HOBO Dataloggers
Cold Ck#5
65
60
55
50
45
40
Temperature (F)
06-Feb-96
20-Feb-96
05-Mar-96
19-Mar-96
02-Apr-96
16-Apr-96
24-Jun-96
08-Jul-96
Time

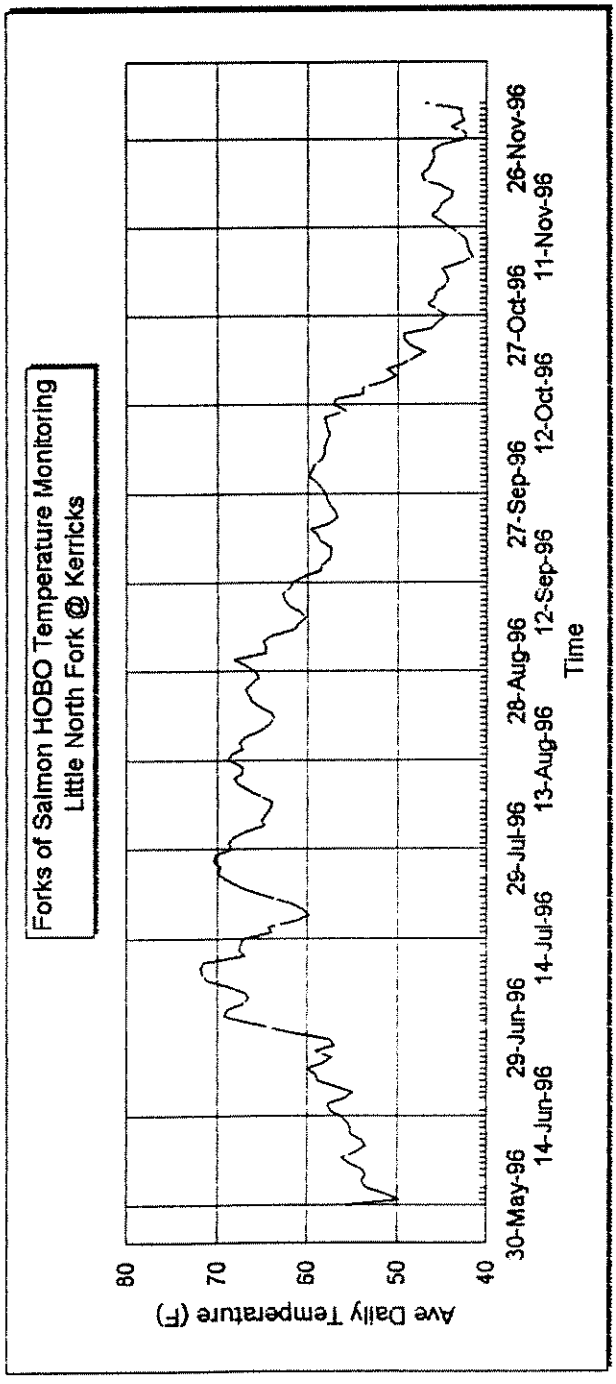
Hobo Site Location List

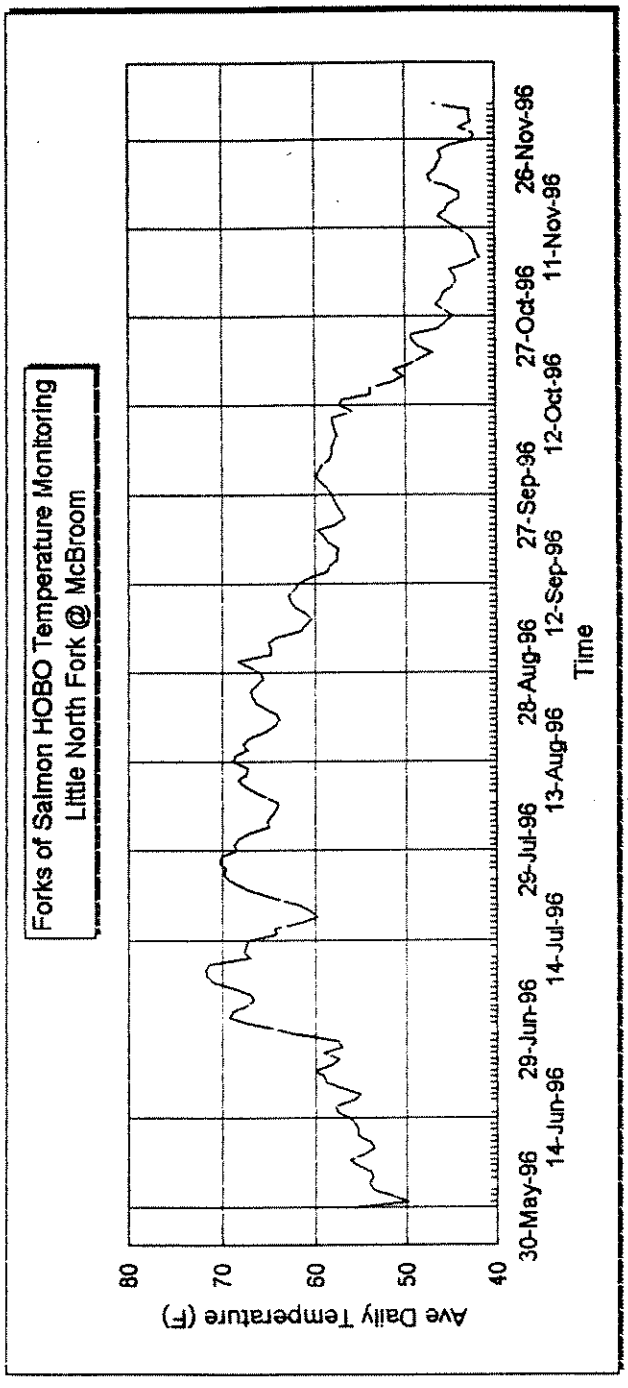
Location	GIS site #	Hobo #	
Salmon River bel. Wooly Creek	Site 1	18603	
Butler Creek	Site 2	18604	
Norheimer Creek	Site 3	18605	
Crapo Creek	Site 4	18606	
Salmon River bel. Forks	Site 5	18607	
Knownothing Creek	Site 6	18608	
Methodist Creek	Site 7	18609	
Indian Creek	Site 8	18610	
Black Bear Creek	Site 9	18611	
Matthews Creek	Site 10	18612	
Plummer Creek	Site 11	18613	
St. Claire creek	Site 12	18616	
Crawford Creek	Site 13	18615	
Cecil Creek	Site 14	18614	
South Fork below East fork	Site 15	17698	
Taylor Creek	Site 16	17693	
East Fork above Taylor	Site 17	17699	
Olson Creek	Site 18	17694	
Kanaka Creek	Site 19	17695	
North Fork below Little north Fork	Site 20		
Little North Fork	Site 21	17701	

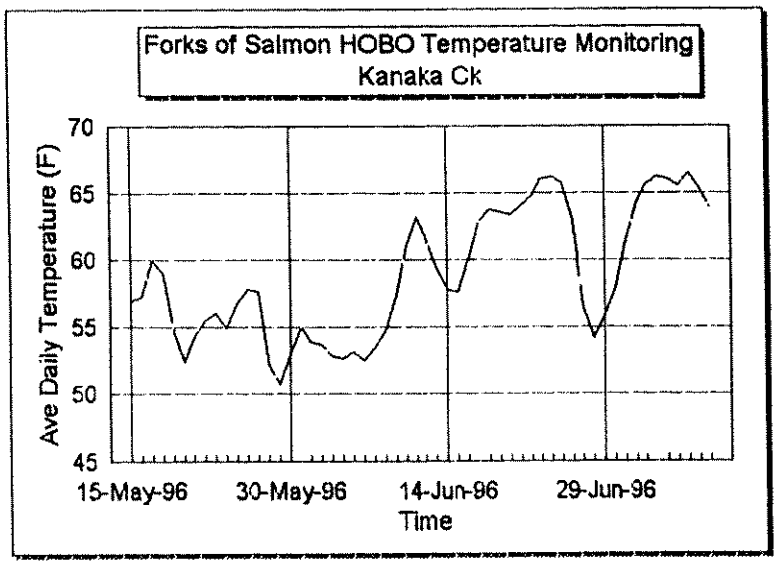
North Fork at Sawyer's Bar	Site 22	17702	
North Fork below N. Russian Creek	Site 23	17703	
Godfrey "Air"	Site 24	7483	
Knownothing "Air"	Site 25	7485	
Backup	Hobo 26		

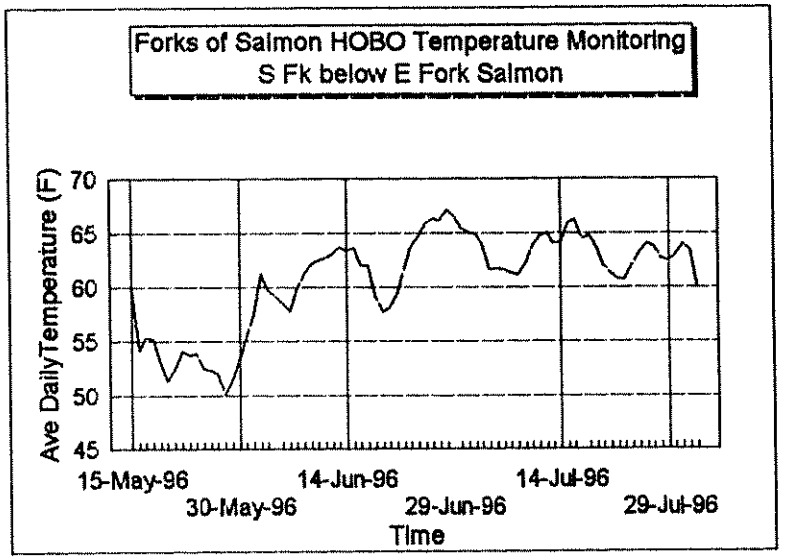
Salmon River Overview
Monitoring Site Location Map

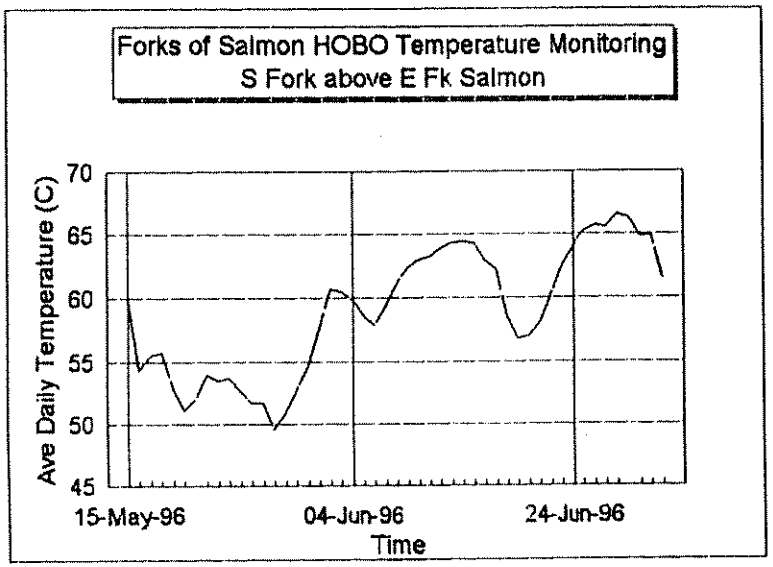


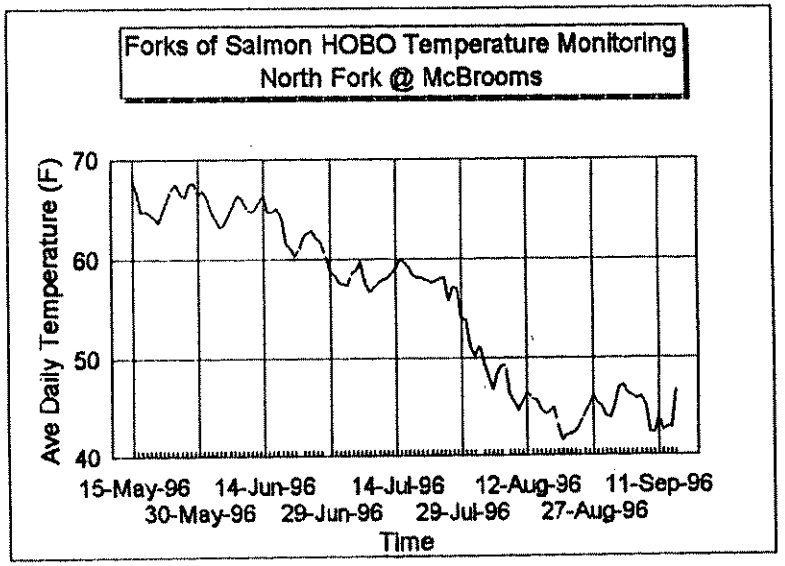

Forks of Salmon HOBO Temperature Monitoring
Little North Fork @ Kerricks
Ave Daily Temperature (F)
80
70
60
50
40
30-May-96
14-Jun-96
29-Jun-96
14-Jul-96
29-Jul-96
13-Aug-96
28-Aug-96
12-Sep-96
27-Sep-96
12-Oct-96
27-Oct-96
11-Nov-96
26-Nov-96
Time

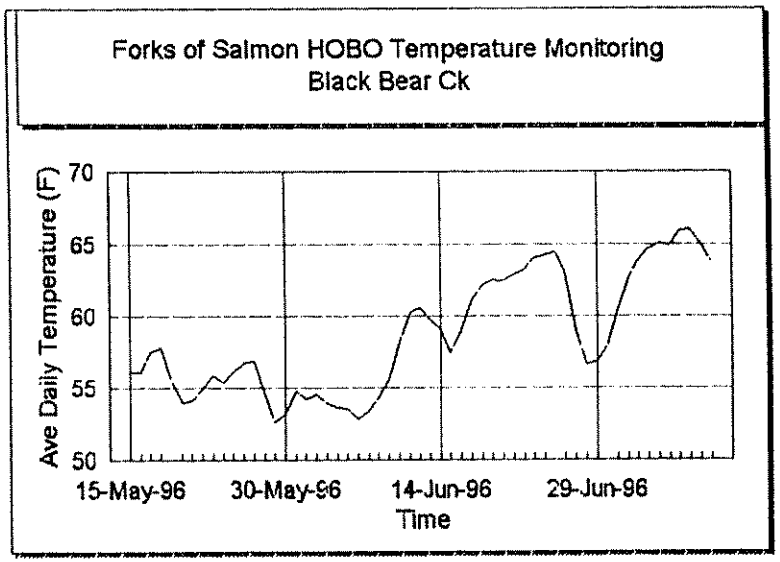

Forks of Salmon HOBO Temperature Monitoring
Little North Fork @ McBroom
Ave Daily Temperature (F)
80
70
60
50
40
30-May-96
14-Jun-96
29-Jun-96
14-Jul-96
29-Jul-96
13-Aug-96
28-Aug-96
12-Sep-96
27-Sep-96
12-Oct-96
27-Oct-96
11-Nov-96
26-Nov-96
Time

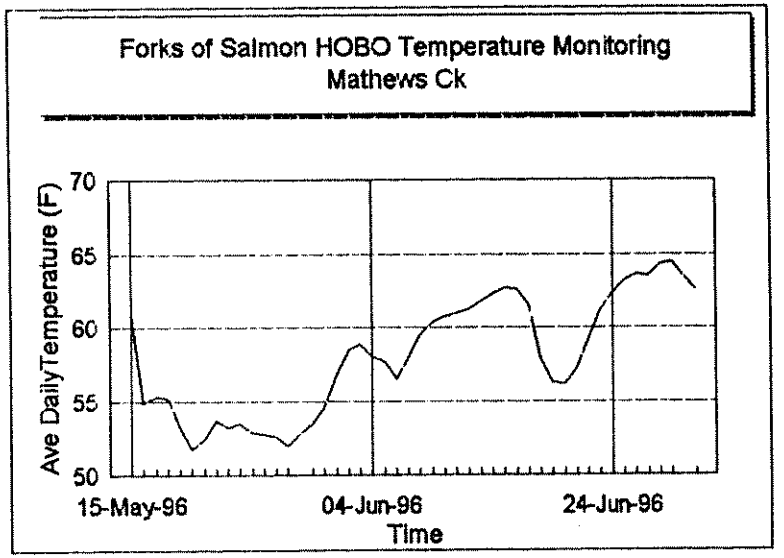

Forks of Salmon HOBO Temperature Monitoring
Kanaka Ck
Ave Daily Temperature (F)
70
65
60
55
50
45
15-May-96
30-May-96
14-Jun-96
29-Jun-96
Time

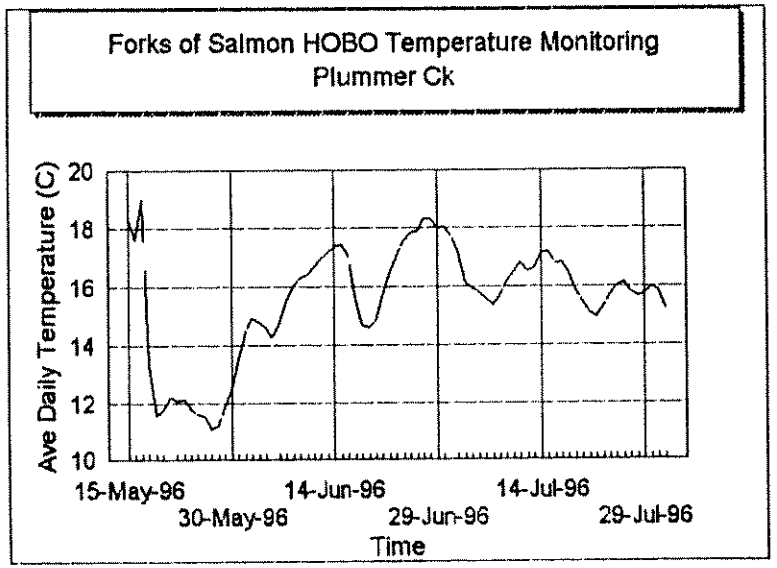

Forks of Salmon HOBO Temperature Monitoring
S Fk below E Fork Salmon
Ave DailyTemperature (F)
70
65
60
55
50
45
15-May-96
30-May-96
14-Jun-96
29-Jun-96
14-Jul-96
29-Jul-96
Time

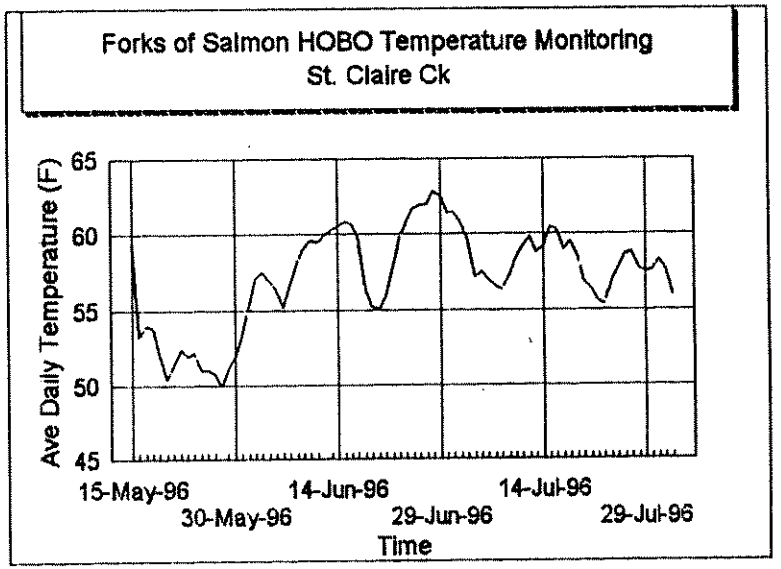

Forks of Salmon HOBO Temperature Monitoring
S Fork above E Fk Salmon
Ave Daily Temperature (C)
70
65
60
55
50
45
15-May-96
04-Jun-96
24-Jun-96
Time

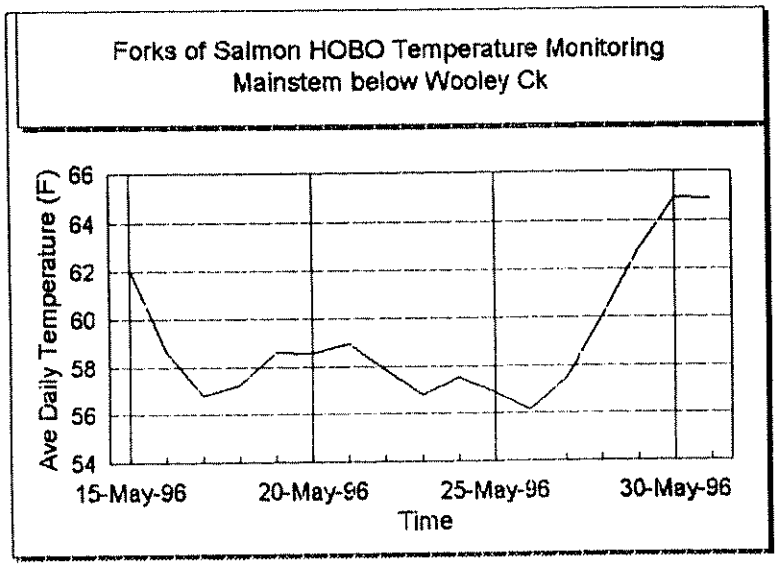

Forks of Salmon HOBO Temperature Monitoring
North Fork @ McBrooms
Ave Daily Temperature (F)
70
60
50
40
15-May-96
30-May-96
14-Jun-96
29-Jun-96
14-Jul-96
29-Jul-96
12-Aug-96
27-Aug-96
11-Sep-96
Time

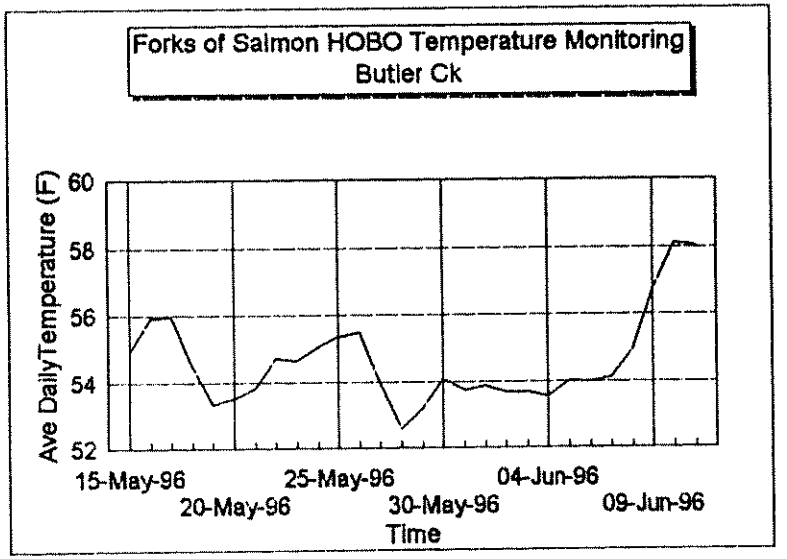

Forks of Salmon HOBO Temperature Monitoring
Black Bear Ck
Ave Daily Temperature (F)
70
65
60
55
50
15-May-96
30-May-96
14-Jun-96
29-Jun-96
Time

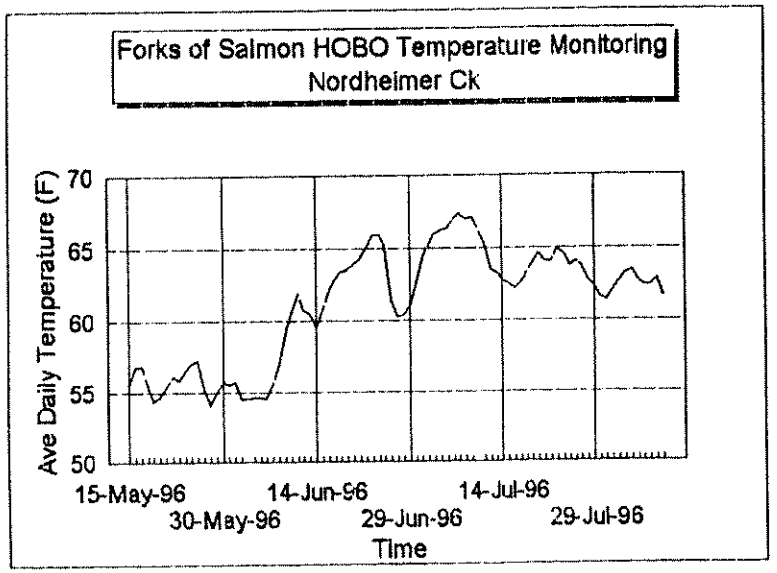

Forks of Salmon HOBO Temperature Monitoring
Mathews Ck
Ave DailyTemperature (F)
70
65
60
55
50
15-May-96
04-Jun-96
24-Jun-96
Time

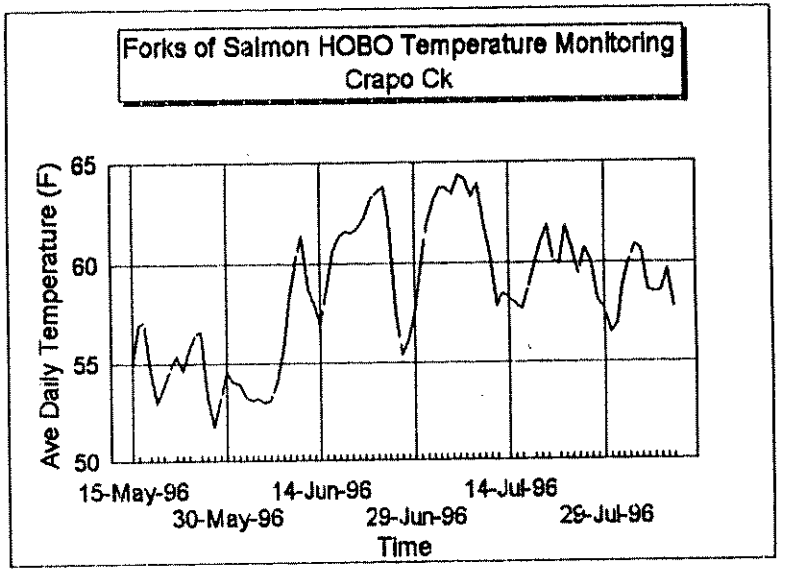

Forks of Salmon HOBO Temperature Monitoring
Plummer Ck
Ave Daily Temperature (C)
20
18
16
14
12
10
15-May-96
30-May-96
14-Jun-96
29-Jun-96
14-Jul-96
29-Jul-96
Time

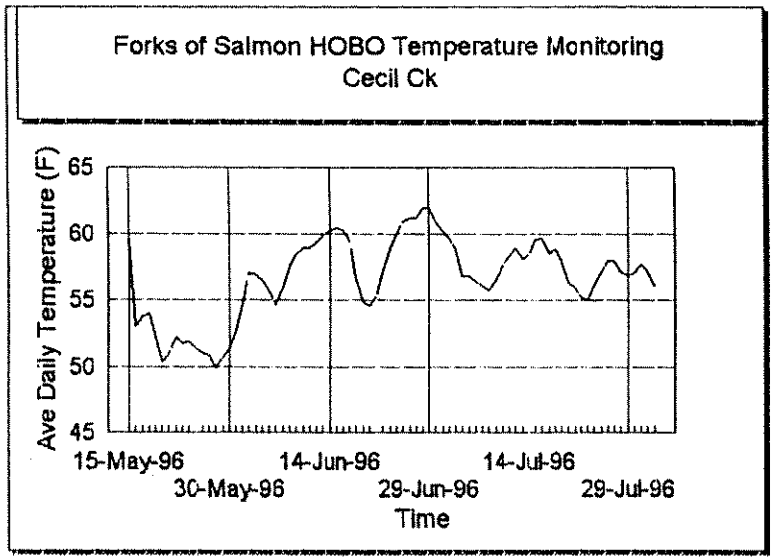

Forks of Salmon HOBO Temperature Monitoring
St. Claire Ck
Ave Daily Temperature (F)
65
60
55
50
45
15-May-96
30-May-96
14-Jun-96
29-Jun-96
14-Jul-96
29-Jul-96
Time

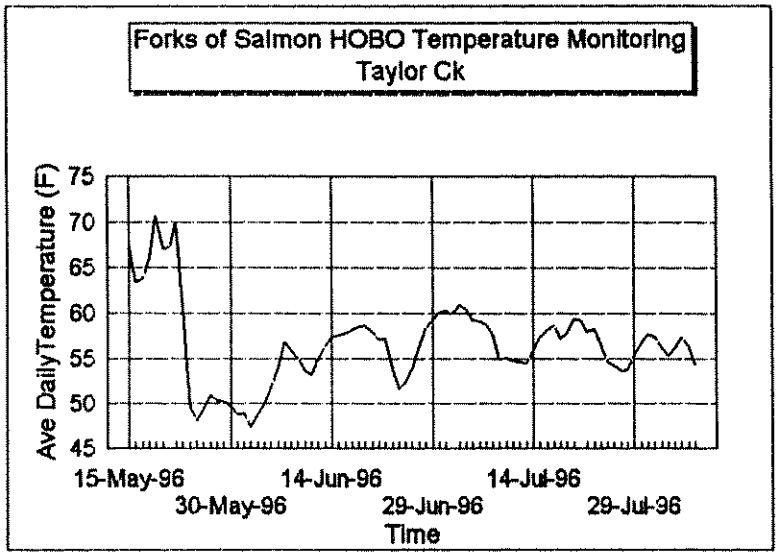

Forks of Salmon HOBO Temperature Monitoring
Mainstem below Wooley Ck
Ave Daily Temperature (F)
66
64
62
60
58
56
54
15-May-96
20-May-96
25-May-96
30-May-96
Time

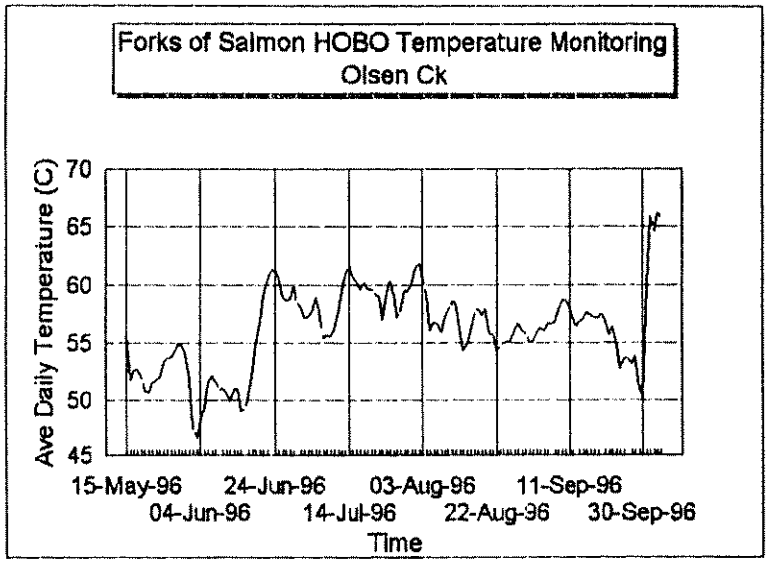

Forks of Salmon HOBO Temperature Monitoring
Butler Ck
Ave DailyTemperature (F)
60
58
56
54
52
15-May-96
20-May-96
25-May-96
30-May-96
04-Jun-96
09-Jun-96
Time

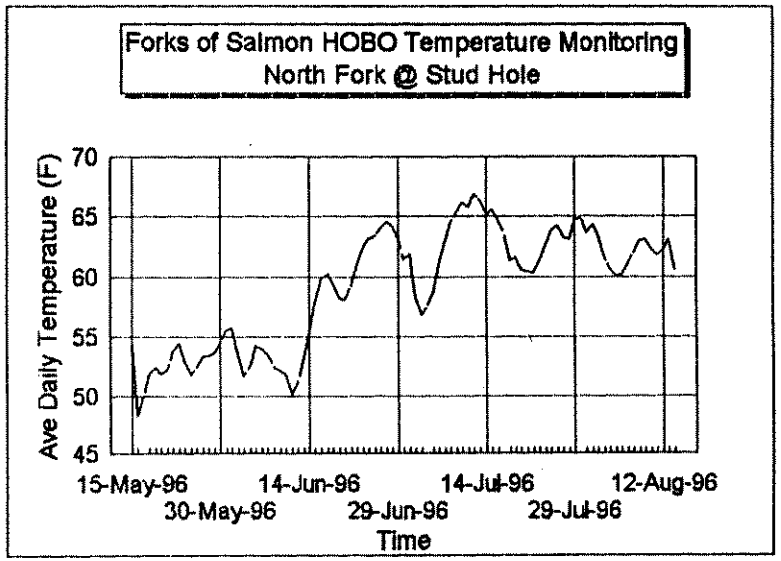

Forks of Salmon HOBO Temperature Monitoring
Nordheimer Ck
Ave Daily Temperature (F)
70
65
60
55
50
15-May-96
30-May-96
14-Jun-96
29-Jun-96
14-Jul-96
29-Jul-96
Time

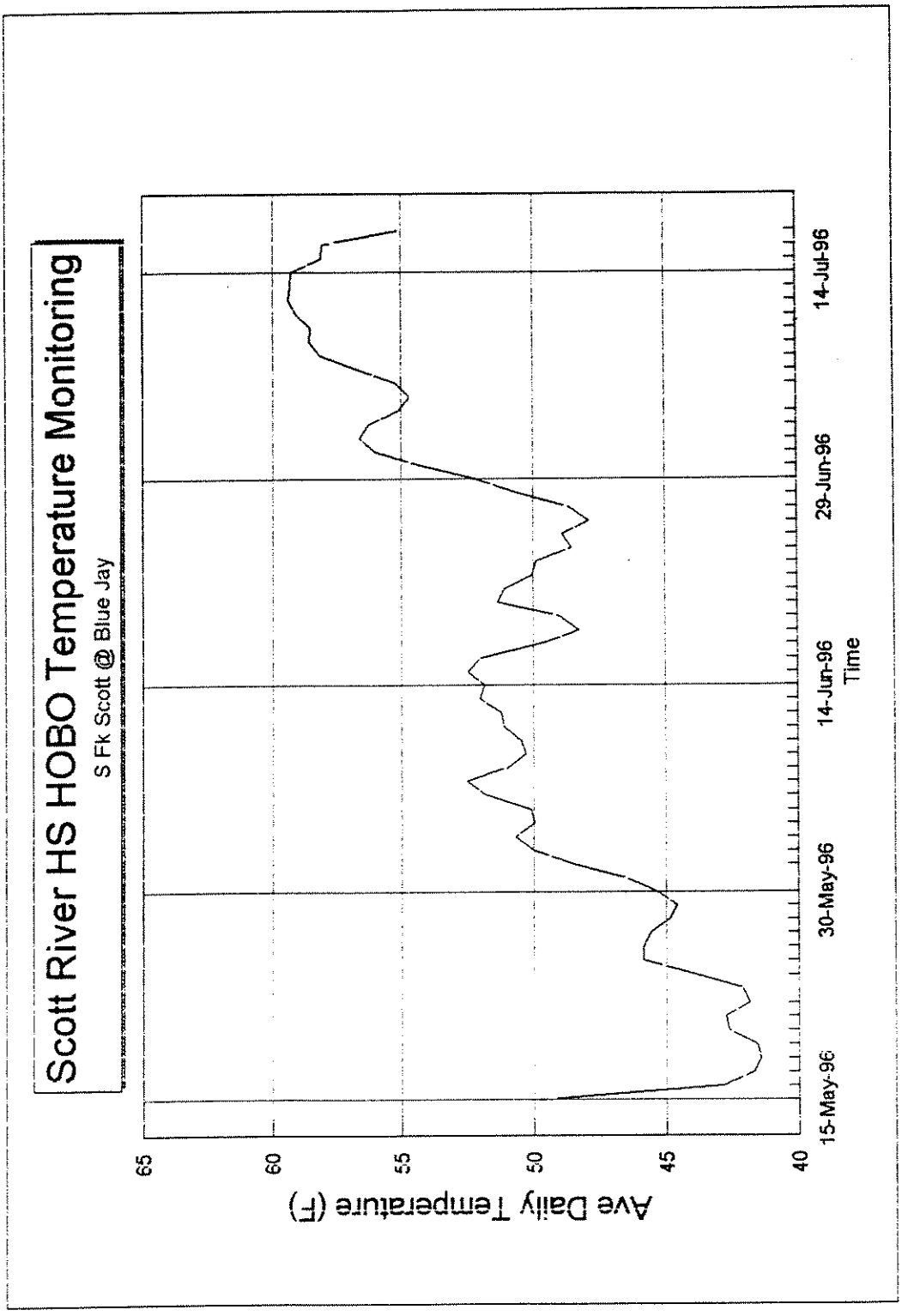

Forks of Salmon HOBO Temperature Monitoring
Crapo Ck
Ave Daily Temperature (F)
65
60
55
50
15-May-96
30-May-96
14-Jun-96
29-Jun-96
14-Jul-96
29-Jul-96
Time

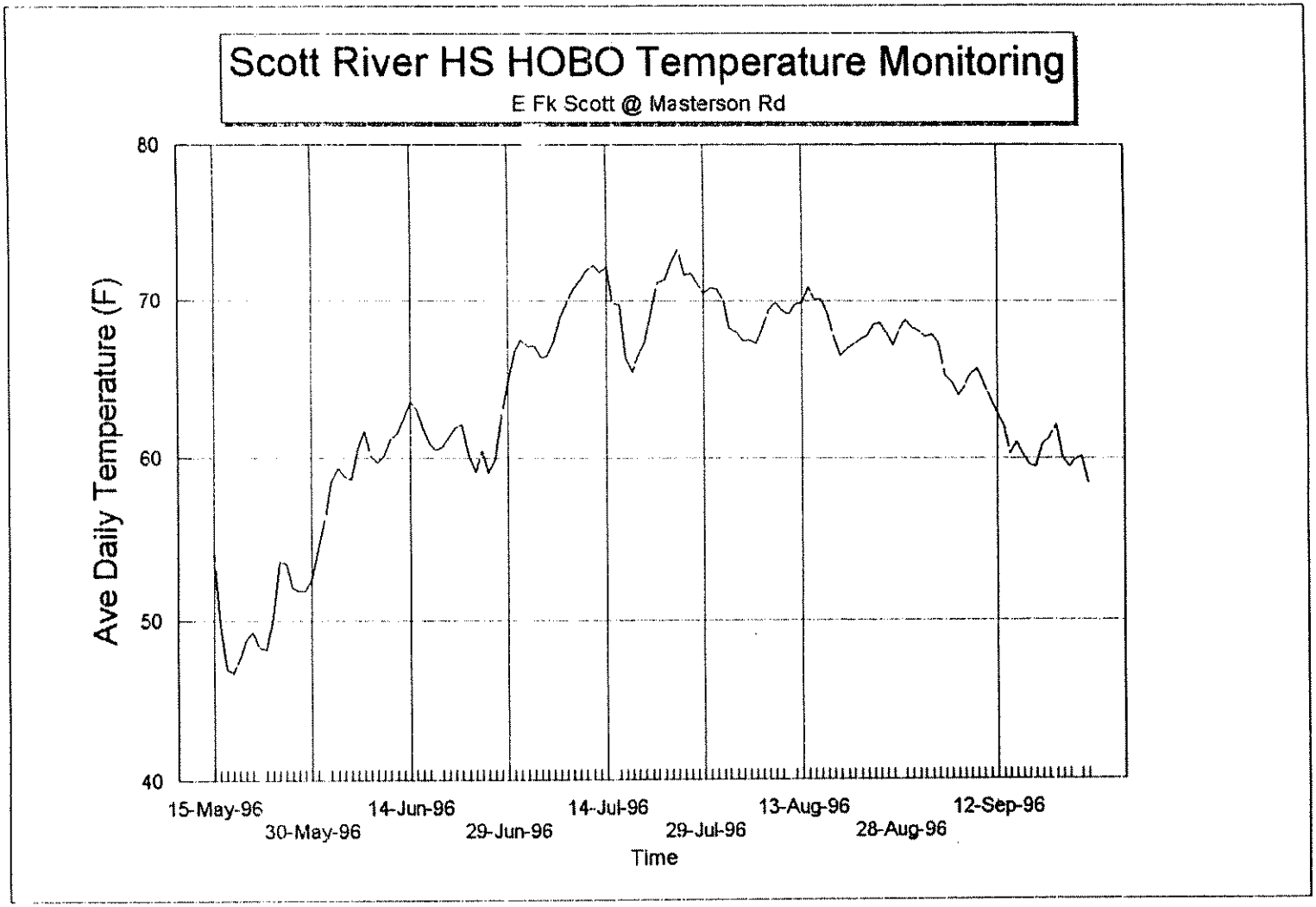

Forks of Salmon HOBO Temperature Monitoring
Cecil Ck
Ave Daily Temperature (F)
65
60
55
50
45
15-May-96
30-May-96
14-Jun-96
29-Jun-96
14-Jul-96
29-Jul-96
Time

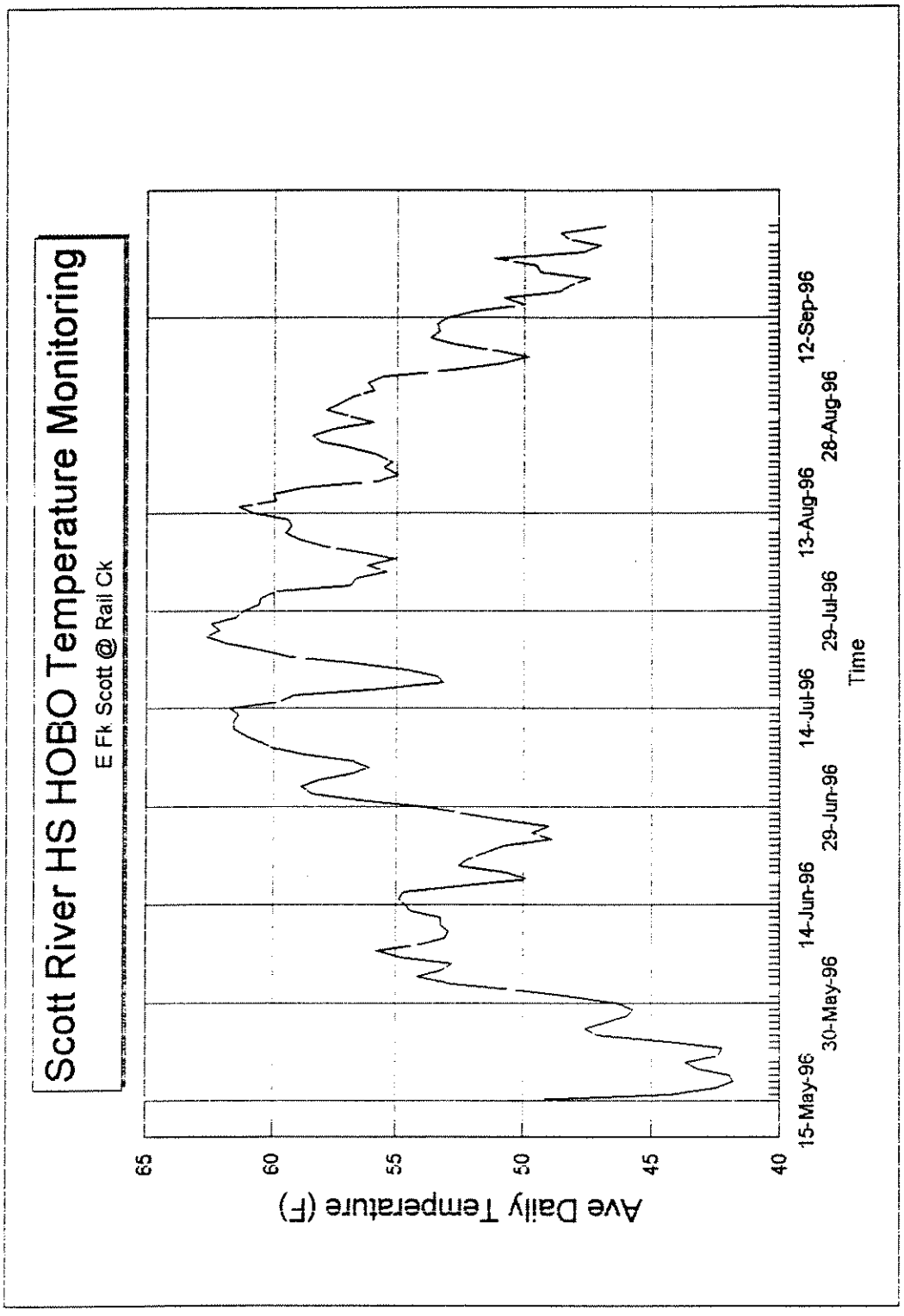

Forks of Salmon HOBO Temperature Monitoring
Taylor Ck
Ave DailyTemperature (F)
75
70
65
60
55
50
45
15-May-96
30-May-96
14-Jun-96
29-Jun-96
14-Jul-96
29-Jul-96
Time

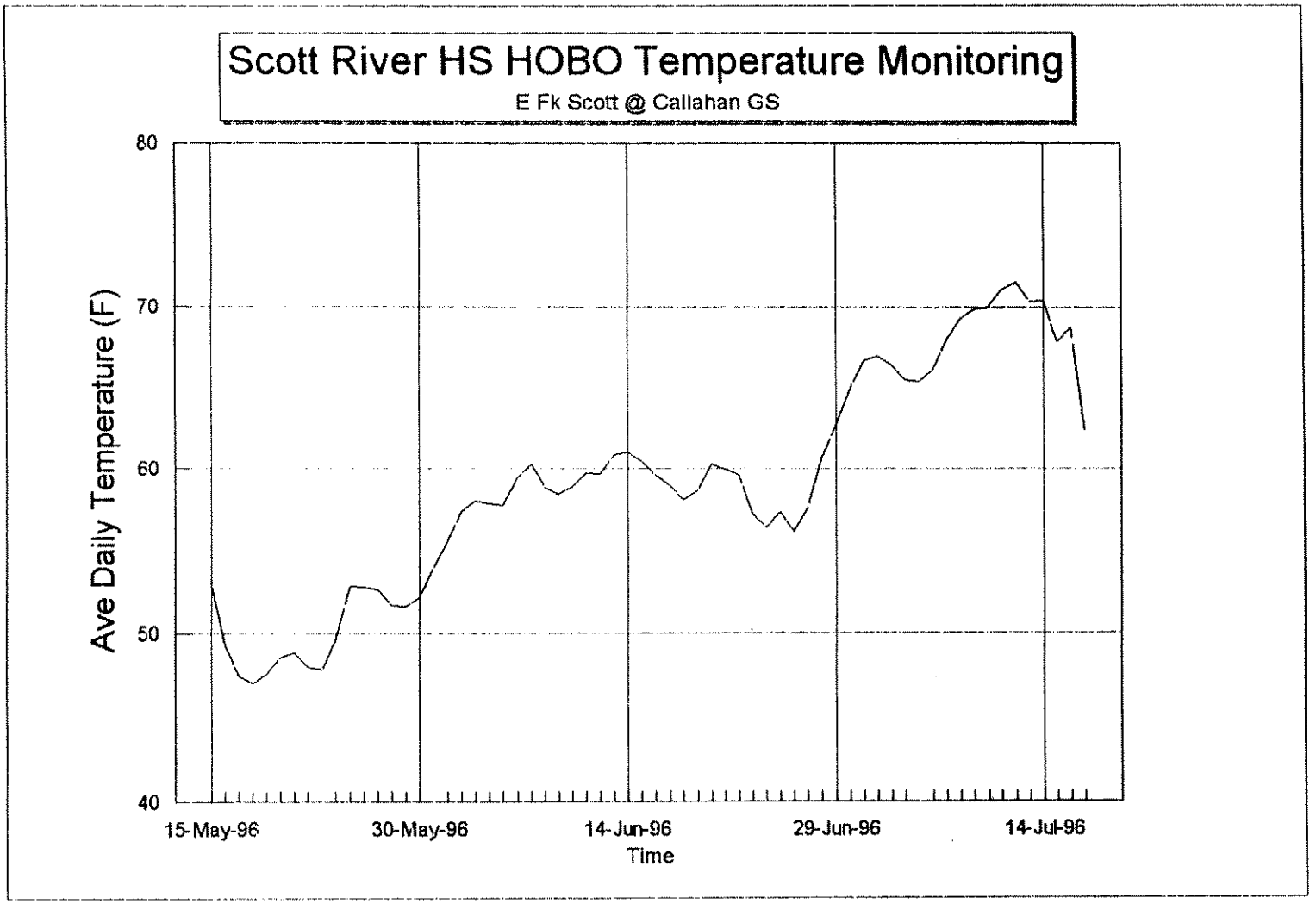

Forks of Salmon HOBO Temperature Monitoring
Olsen Ck
Ave Daily Temperature (C)
70
65
60
55
50
45
15-May-96
04-Jun-96
24-Jun-96
14-Jul-96
03-Aug-96
22-Aug-96
11-Sep-96
30-Sep-96
Time

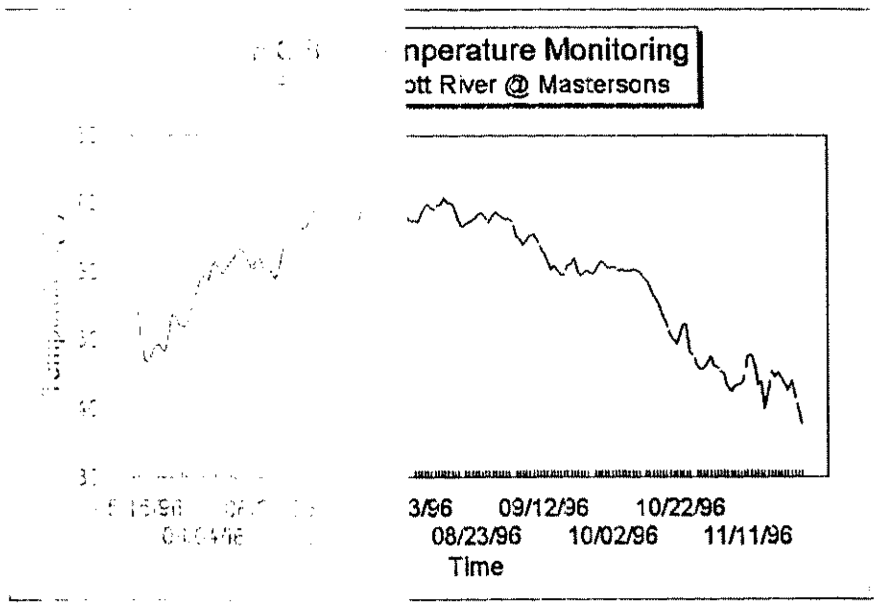

Forks of Salmon HOBO Temperature Monitoring
North Fork @ Stud Hole
Ave Daily Temperature (F)
70
65
60
55
50
45
15-May-96
30-May-96
14-Jun-96
29-Jun-96
14-Jul-96
29-Jul-96
12-Aug-96
Time


Scott River HS HOBO Temperature Monitoring
S Fk Scott @ Blue Jay
Ave Daily Temperature (F)
65
60
55
50
45
40
15-May-96
30-May-96
14-Jun-96
29-Jun-96
14-Jul-96
Time

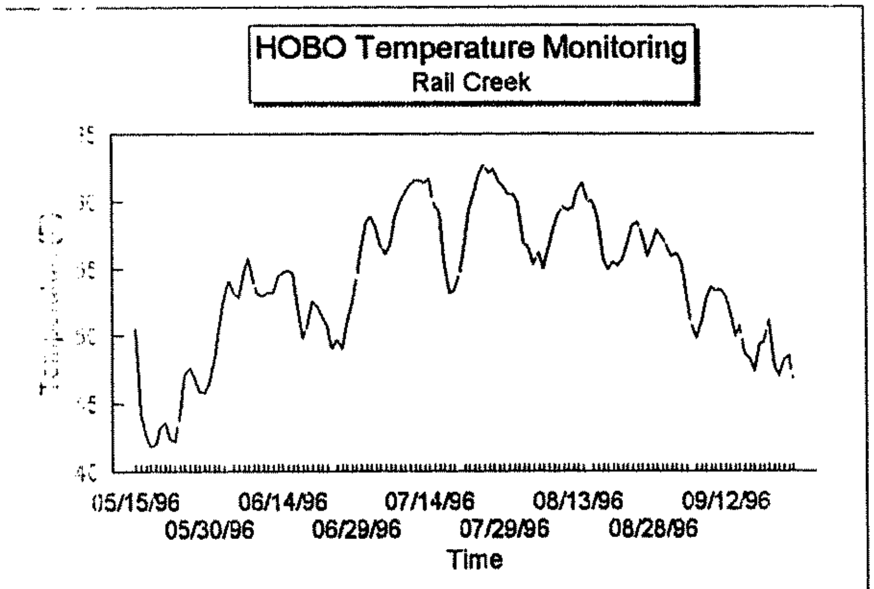

Scott River HS HOBO Temperature Monitoring
E Fk Scott @ Masterson Rd
Ave Daily Temperature (F)
80
70
60
50
40
15-May-96
30-May-96
14-Jun-96
29-Jun-96
14-Jul-96
29-Jul-96
13-Aug-96
28-Aug-96
12-Sep-96
Time


Scott River HS HOBO Temperature Monitoring
E Fk Scott @ Rail Ck
Ave Daily Temperature (F)
65
60
55
50
45
40
15-May-96
30-May-96
14-Jun-96
29-Jun-96
14-Jul-96
29-Jul-96
13-Aug-96
28-Aug-96
12-Sep-96
Time

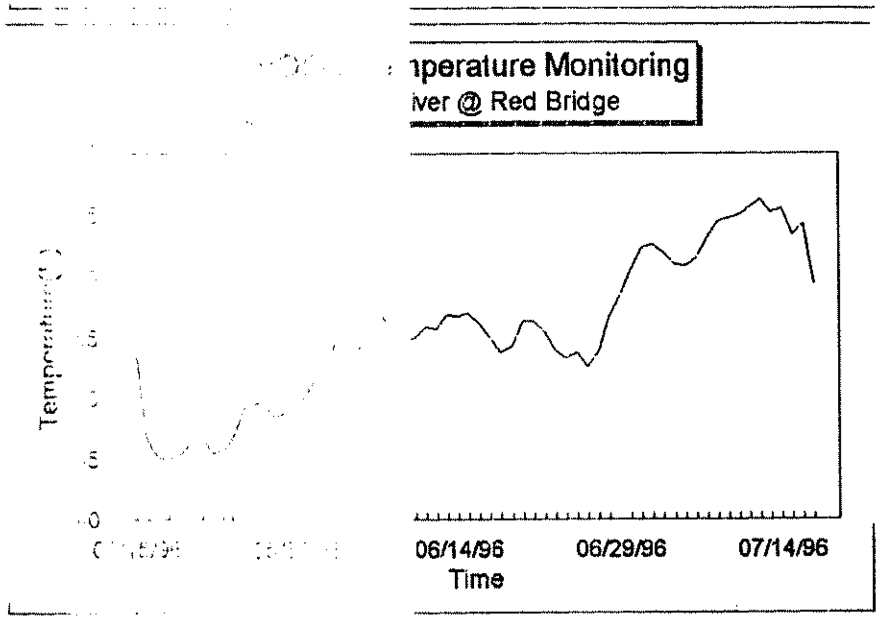

Scott River HS HOBO Temperature Monitoring
E Fk Scott @ Callahan GS
Ave Daily Temperature (F)
80
70
60
50
40
15-May-96
30-May-96
14-Jun-96
29-Jun-96
14-Jul-96
Time



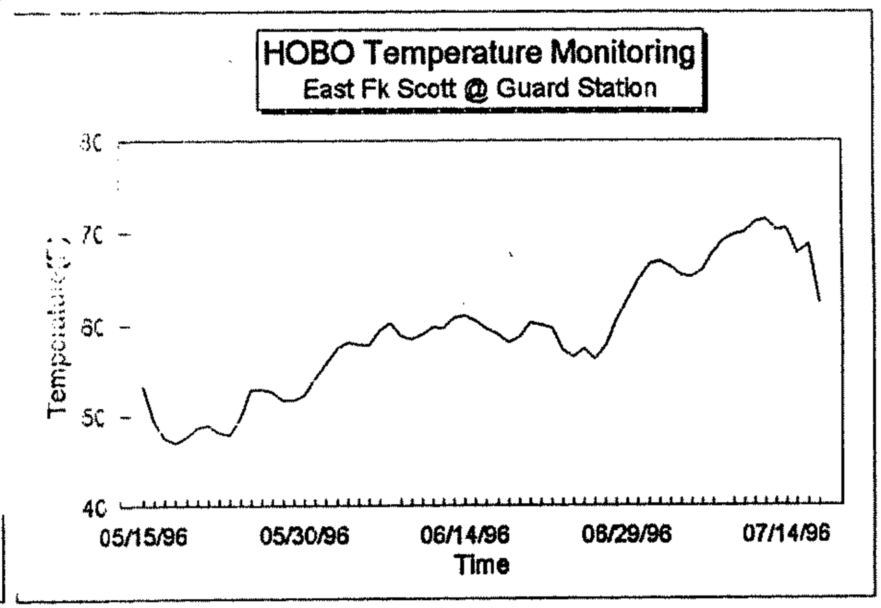
nperature Monitoring
ott River @ Mastersons
3/96
09/12/96
10/22/96
08/23/96
10/02/96
11/11/96
Time



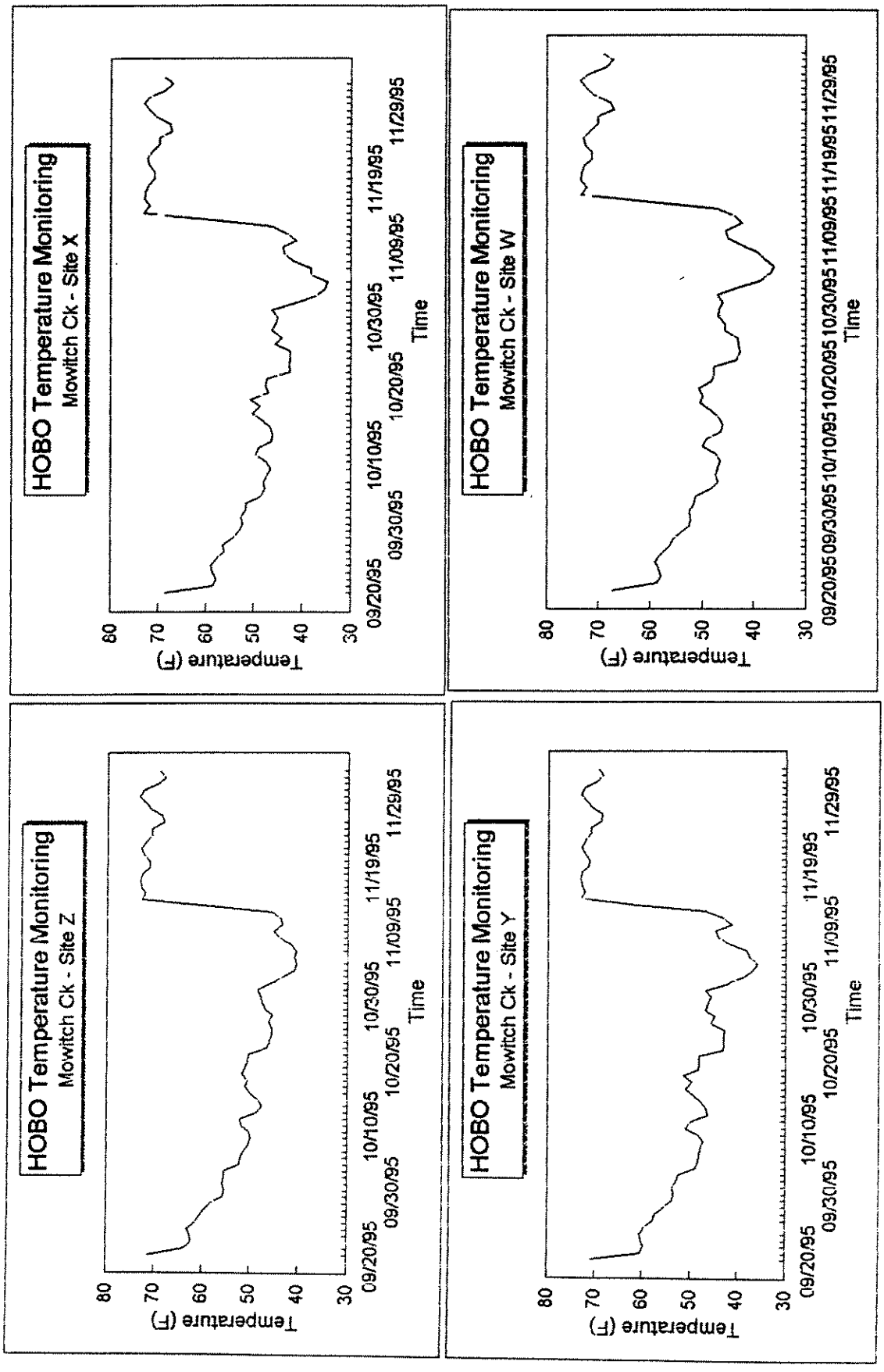
HOBO Temperature Monitoring
Rail Creek
40
05/15/96
06/14/96
07/14/96
08/13/96
09/12/96
05/30/96
06/29/96
07/29/96
08/28/96
Time

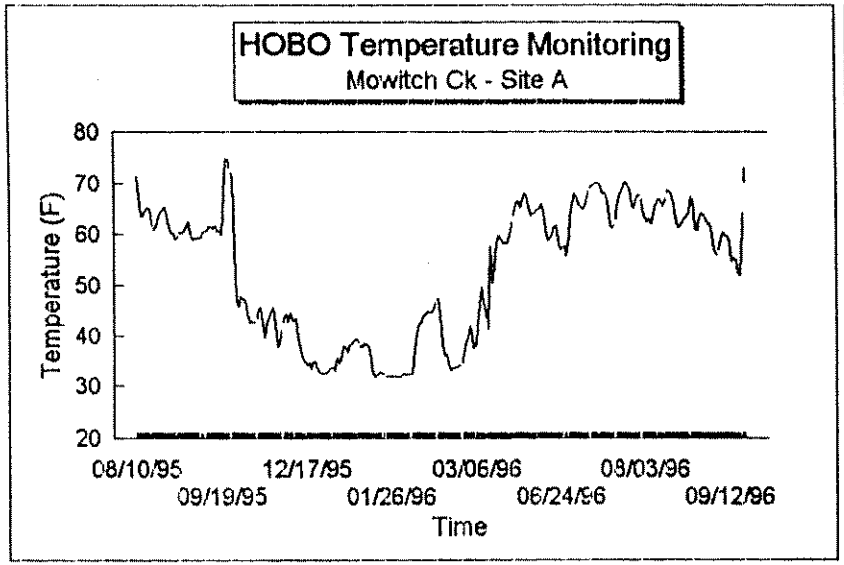


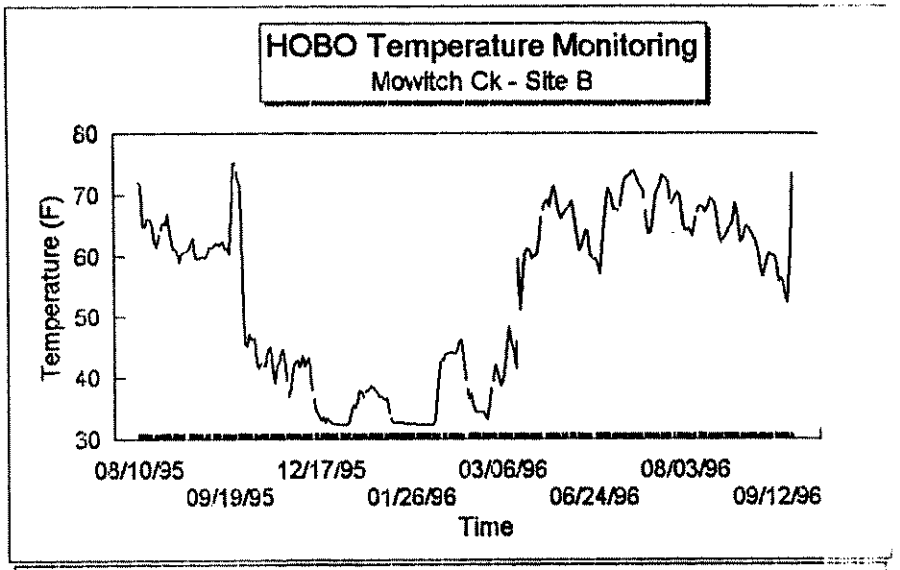
nperature Monitoring
iver @ Red Bridge
06/14/96
06/29/96
07/14/96
Time

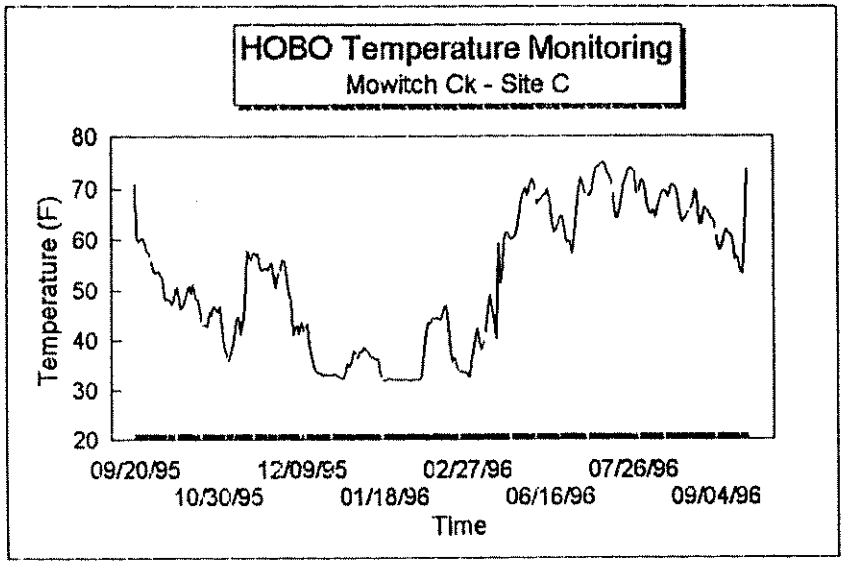


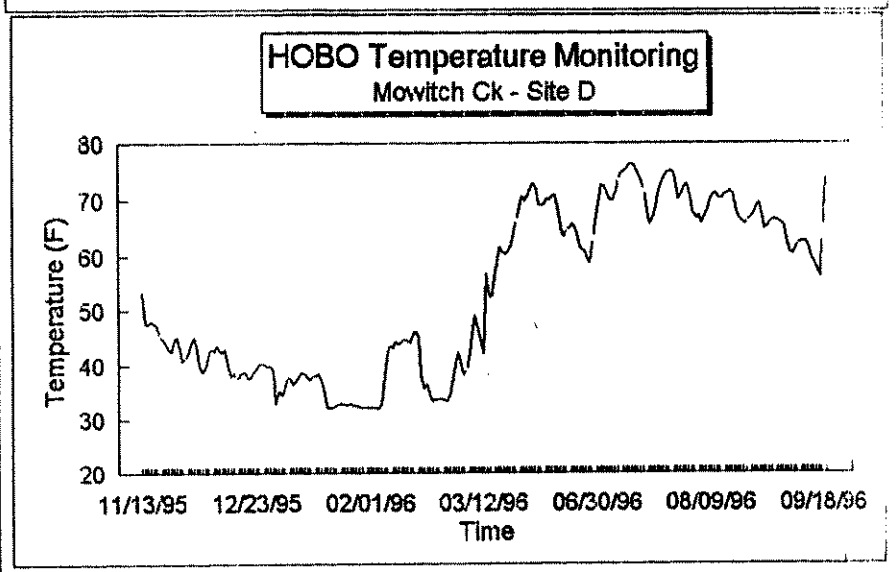
HOBO Temperature Monitoring
East Fk Scott @ Guard Station
80
70
60
50
40
05/15/96
05/30/96
06/14/96
06/29/96
07/14/96
Time

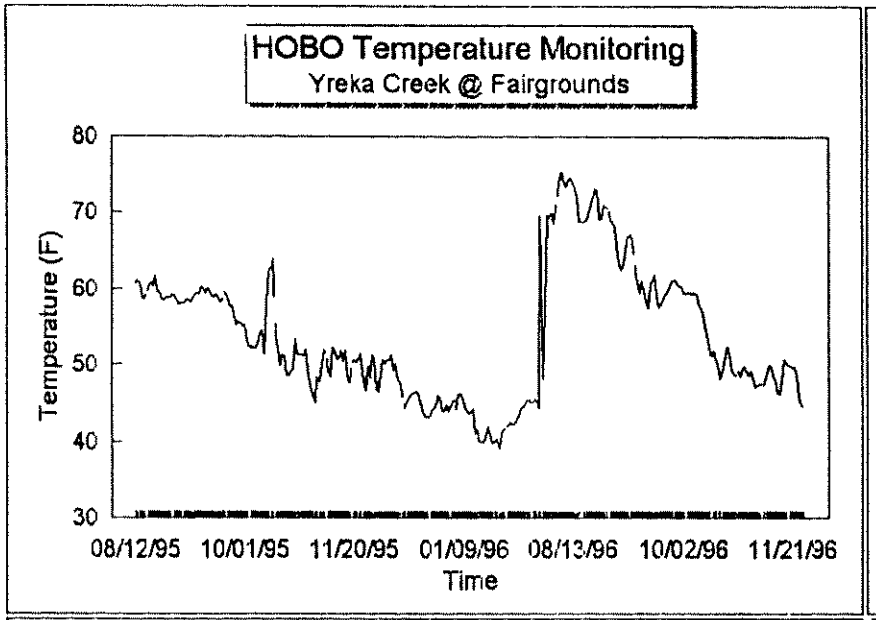

HOBO Temperature Monitoring
Mowitch Ck - Site X
Temperature (F)
80
70
60
50
40
30
09/20/95
09/30/95
10/10/95
10/20/95
10/30/95
11/09/95
11/19/95
11/29/95
Time
HOBO Temperature Monitoring
Mowitch Ck - Site W
Temperature (F)
80
70
60
50
40
30
09/20/95
09/30/95
10/10/95
10/20/95
10/30/95
11/09/95
11/19/95
11/29/95
Time
HOBO Temperature Monitoring
Mowitch Ck - Site Z
Temperature (F)
80
70
60
50
40
30
09/20/95
09/30/95
10/10/95
10/20/95
10/30/95
11/09/95
11/19/95
11/29/95
Time
HOBO Temperature Monitoring
Mowitch Ck - Site Y
Temperature (F)
80
70
60
50
40
30
09/20/95
09/30/95
10/10/95
10/20/95
10/30/95
11/09/95
11/19/95
11/29/95
Time

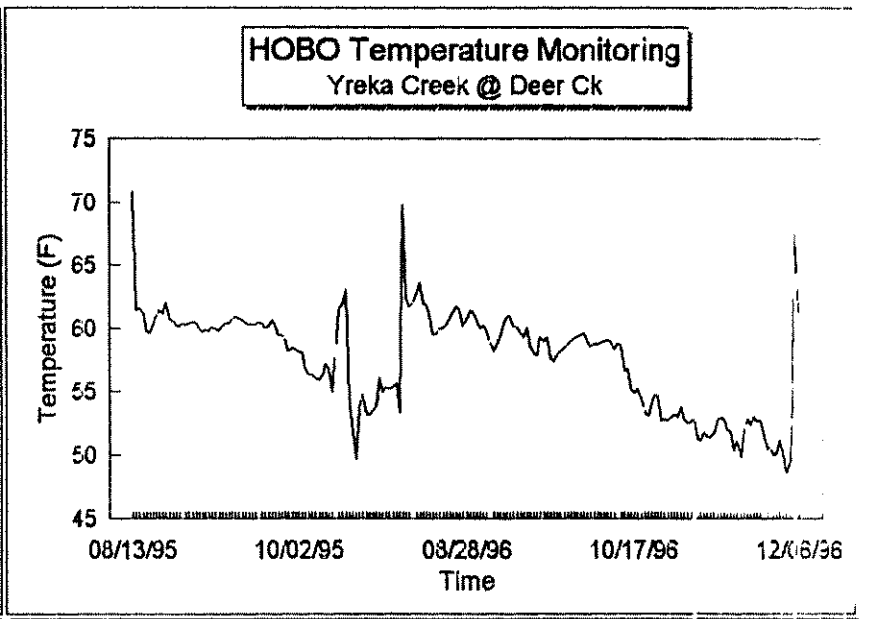

HOBO Temperature Monitoring
Mowitch Ck - Site A
Temperature (F)
80
70
60
50
40
30
20
08/10/95
09/19/95
12/17/95
01/26/96
03/06/96
06/24/96
08/03/96
09/12/96
Time

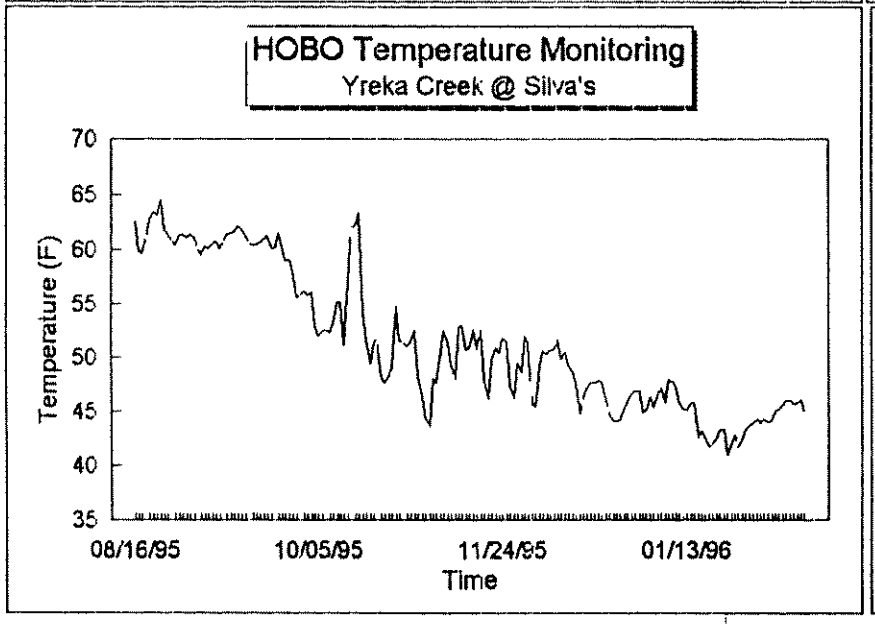

HOBO Temperature Monitoring
Mowitch Ck - Site B
Temperature (F)
80
70
60
50
40
30
08/10/95
09/19/95
12/17/95
01/26/96
03/06/96
06/24/96
08/03/96
09/12/96
Time

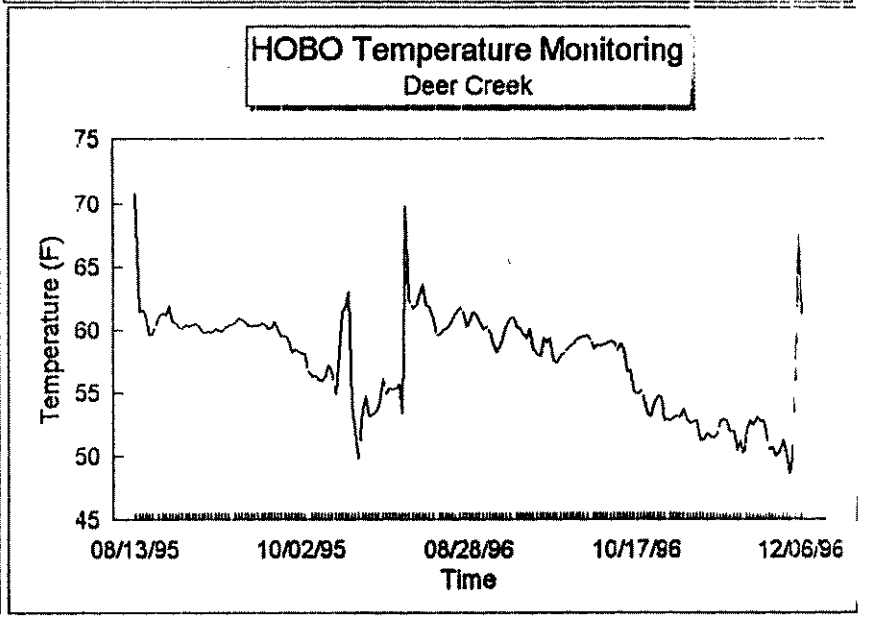

HOBO Temperature Monitoring
Mowitch Ck - Site C
Temperature (F)
80
70
60
50
40
30
20
09/20/95
10/30/95
12/09/95
01/18/96
02/27/96
06/16/96
07/26/96
09/04/96
Time

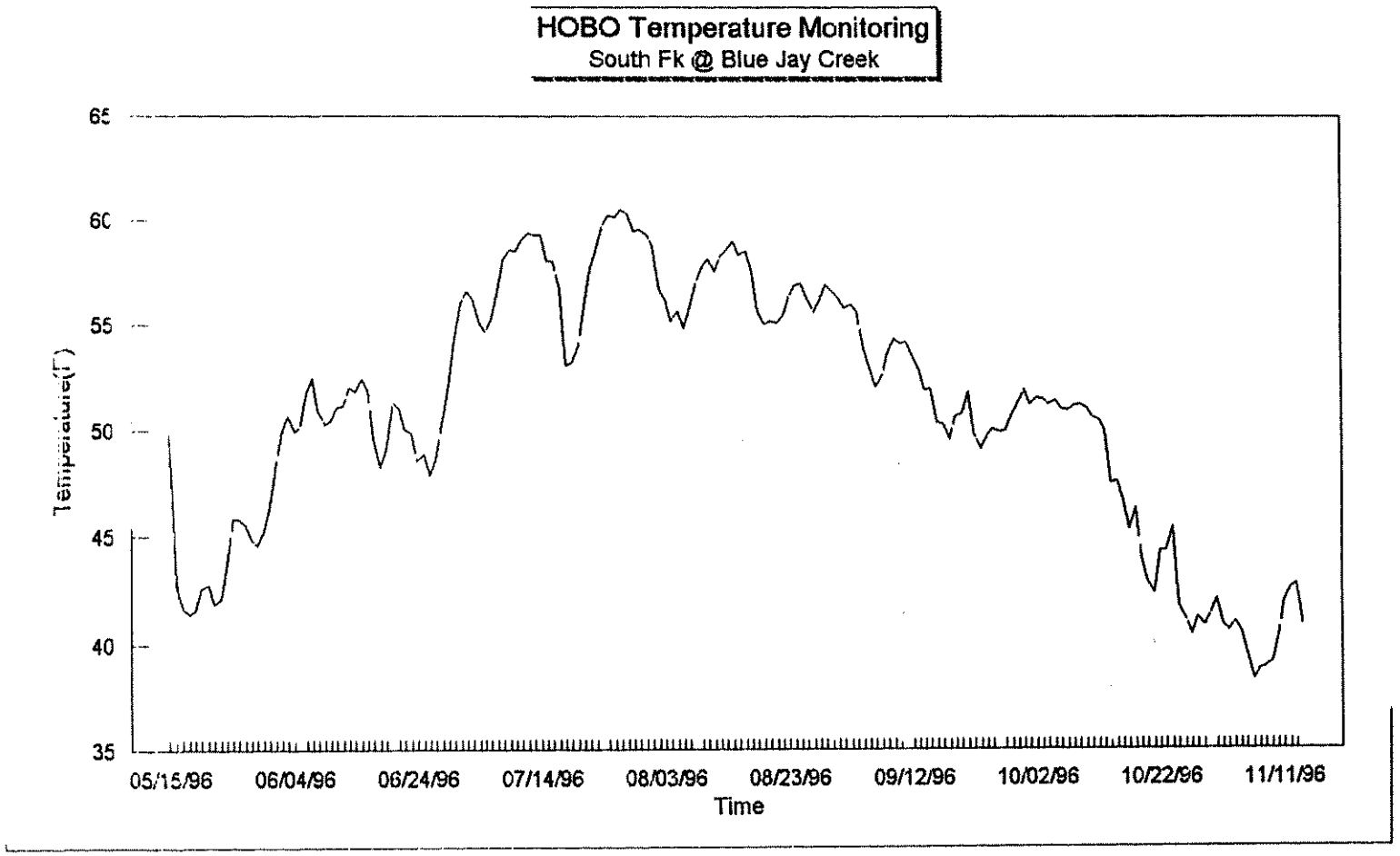

HOBO Temperature Monitoring
Mowitch Ck - Site D
Temperature (F)
80
70
60
50
40
30
20
11/13/95
12/23/95
02/01/96
03/12/96
06/30/96
08/09/96
09/18/96
Time


HOBO Temperature Monitoring
Yreka Creek @ Fairgrounds
Temperature (F)
80
70
60
50
40
30
08/12/95
10/01/95
11/20/95
01/09/96
08/13/96
10/02/96
11/21/96
Time


HOBO Temperature Monitoring
Yreka Creek @ Deer Ck
Temperature (F)
75
70
65
60
55
50
45
08/13/95
10/02/95
08/28/96
10/17/96
12/06/96
Time


HOBO Temperature Monitoring
Yreka Creek @ Silva's
Temperature (F)
70
65
60
55
50
45
40
35
08/16/95
10/05/95
11/24/95
01/13/96
Time


HOBO Temperature Monitoring
Deer Creek
Temperature (F)
75
70
65
60
55
50
45
08/13/95
10/02/95
08/28/96
10/17/96
12/06/96
Time


HOBO Temperature Monitoring
South Fk @ Blue Jay Creek
65
60
55
50
45
40
35
Temperature(F)
05/15/96
06/04/96
06/24/96
07/14/96
08/03/96
08/23/96
09/12/96
10/02/96
10/22/96
11/11/96
Time

Mowitz Creek Field Study- 1995

Klamath Resource Information System Project-319h Grant

Goals: The goals of this project are to collect information on stream temperatures, pH,D.O.,vegetation, stream banks,and aquatic invertebrates. This will take place on Mowitz Creek. We will upload this data on the computer.

Objectives: We will collect data at sites A, B, C, and D. This will take place along the Creek.

Temperatures: Take the temperature with a thermometer, and record them for each point. Main temperature readers are the hobo temps. They will be set for 120 day intervals which will take readings every 4.6 hours.

pH: read and record the pH from each point.

Dissolved Oxygen: Using a D.O. reader, collect the data, and record it for the depths you desire.

Plant Transects: Do on each side of creek, and record every 100 feet.

Collect samples of plants.

Identify and collect Aquatic invertebrates.

Make a map of the area, and a vegetative map of specific areas.

Analyze data and share with others.

Management Plan

We will go over all the uses of the equipment, and what we need to accomplish, in class.

Go to site A

*Temperature, pH, D.O., and change hobo temps will be done by group 1

*Plant transcects, and Collecting samples of plants will be done by group 2

*Group 3 will collect aquatic invertebrates, and record the description of the bank.
*Group 4 will do the mapping of the whole area, and the vegetation.

- Site B
Groups will rotate, Group 1 will do group 4 job, 4 will do 3's, 3 will do 2's, 2 will do 1's.

Stop for Lunch

Site C
Groups will rotate, 1 will do 3's, 4 will do 2's, 3 will do 1's, and 2 will do 4's.

Site D
Groups will rotate, 1 will do 2's, 4 will do 1's, 3 will do 4's, and 2 will do 3's.

Report on Mowitz Creek

On our first trip to Mowitz Creek we intended to collect information regarding the following:

Stream temperatures
pH
D.O.
Vegetation
Stream banks
Aquatic Invertebrates

We found the following: At point A: Temp: 15C
D.O: 33C
pH: 7.7

At point B: NA

At point C: Temp: 13C
D.O.: 29C
pH: 6.9

At point D: NA

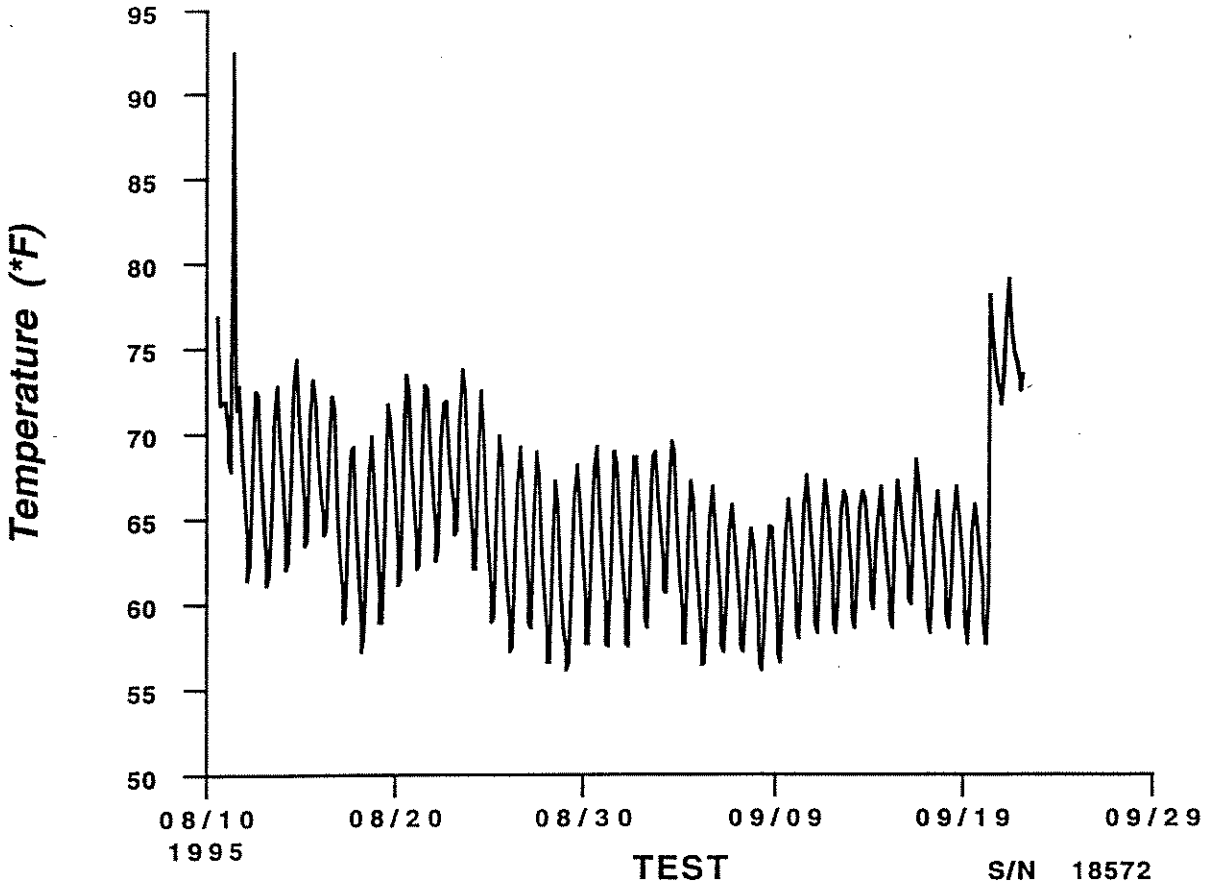
Stream Banks:

At point A: Shallow and full of tall poa
At point B: Same as A but wider
At point C: Erect banks with soil from trampled cows in creek
At point D: One side was lightly sloped, opposite side was steeper like C

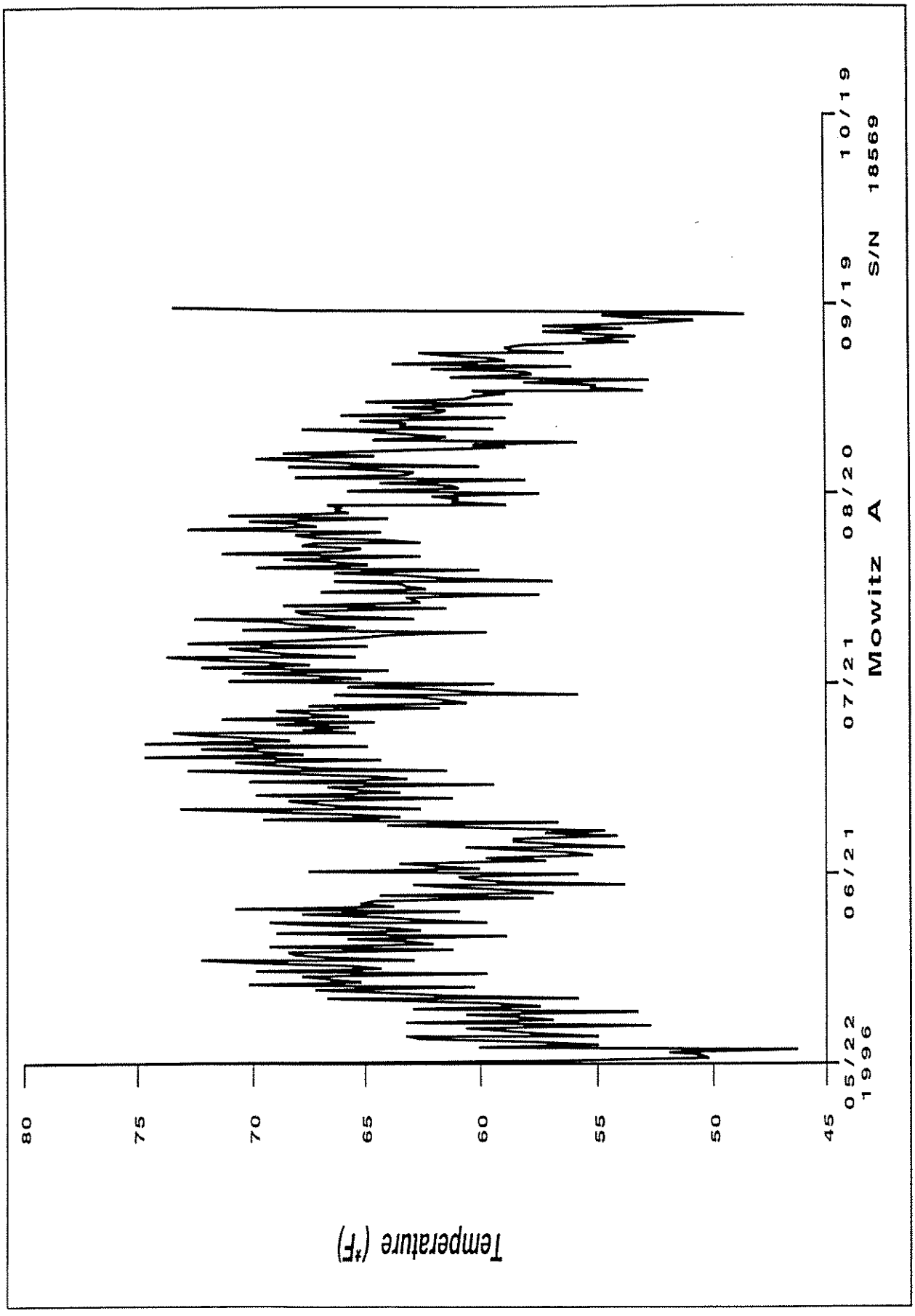
We collected aquatic invertebrates and plant samples which we brought back to study. A graph of the aquatic invertebrates will be attached. We collected the Hobo temps and replaced them for further temperature analysis. From Point A's Hobo temp we collected a graph. Our management plan was not completely followed as well as we would have liked, therefor preventing us from obtaining Soils.

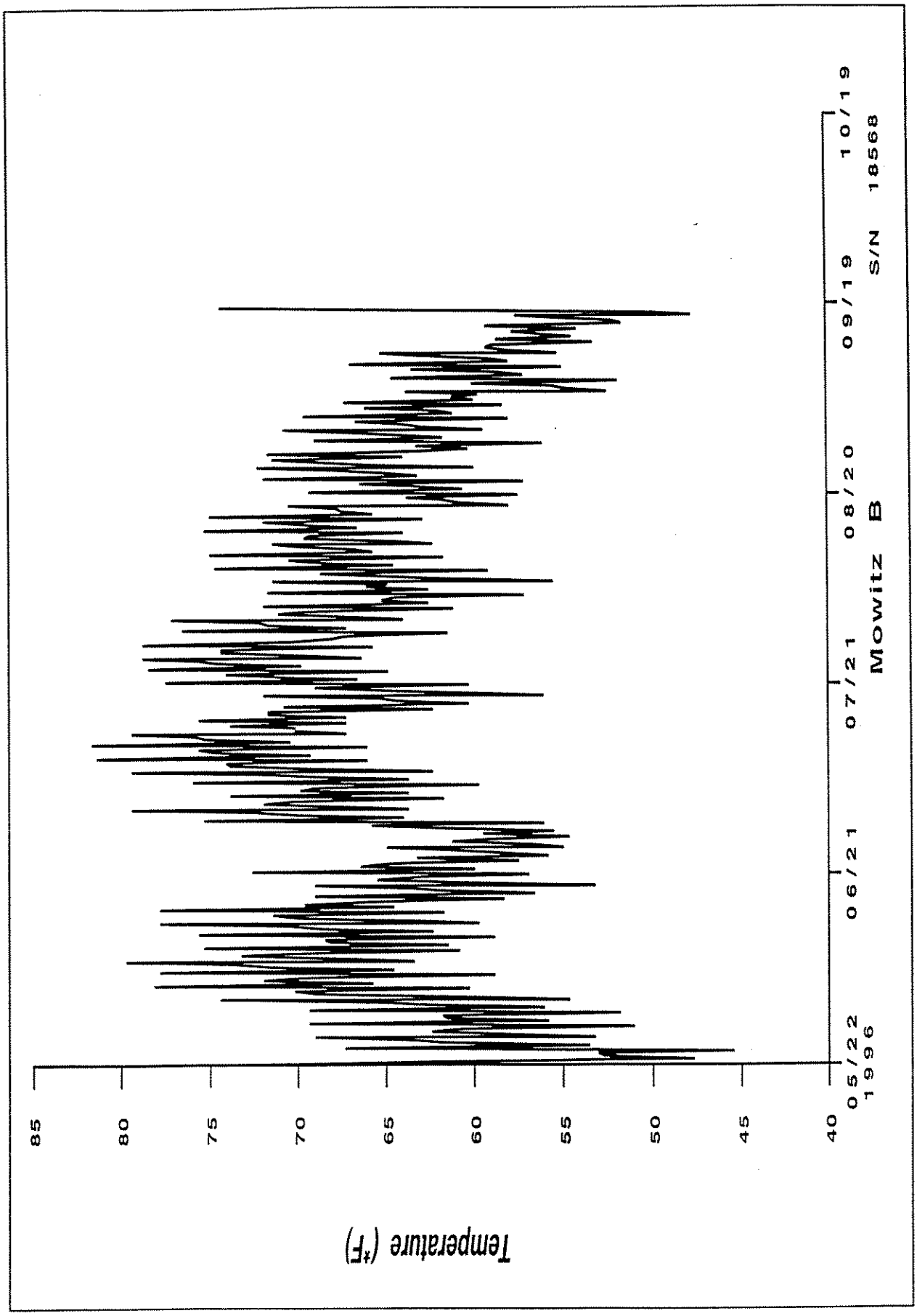
Next time, being more experienced, our trip shall be even more successful with abundant data.

Amanda Hickman & Melissa Wedmore & Xochitl Pineda

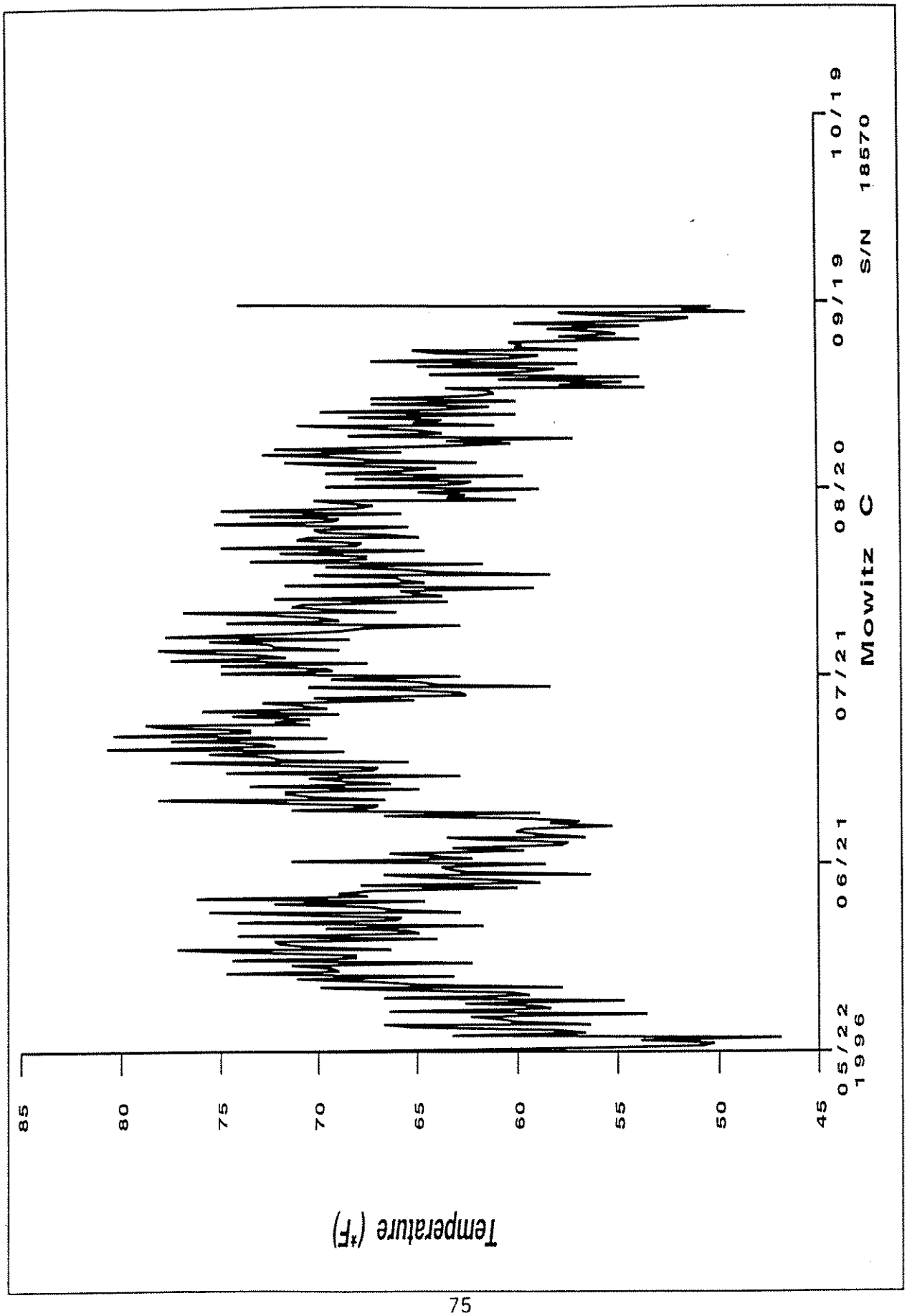

Temperature (*F)
95
90
85
80
75
70
65
60
55
50
08/10
1995
08/20
08/30
09/09
09/19
09/29
TEST
S/N 18572

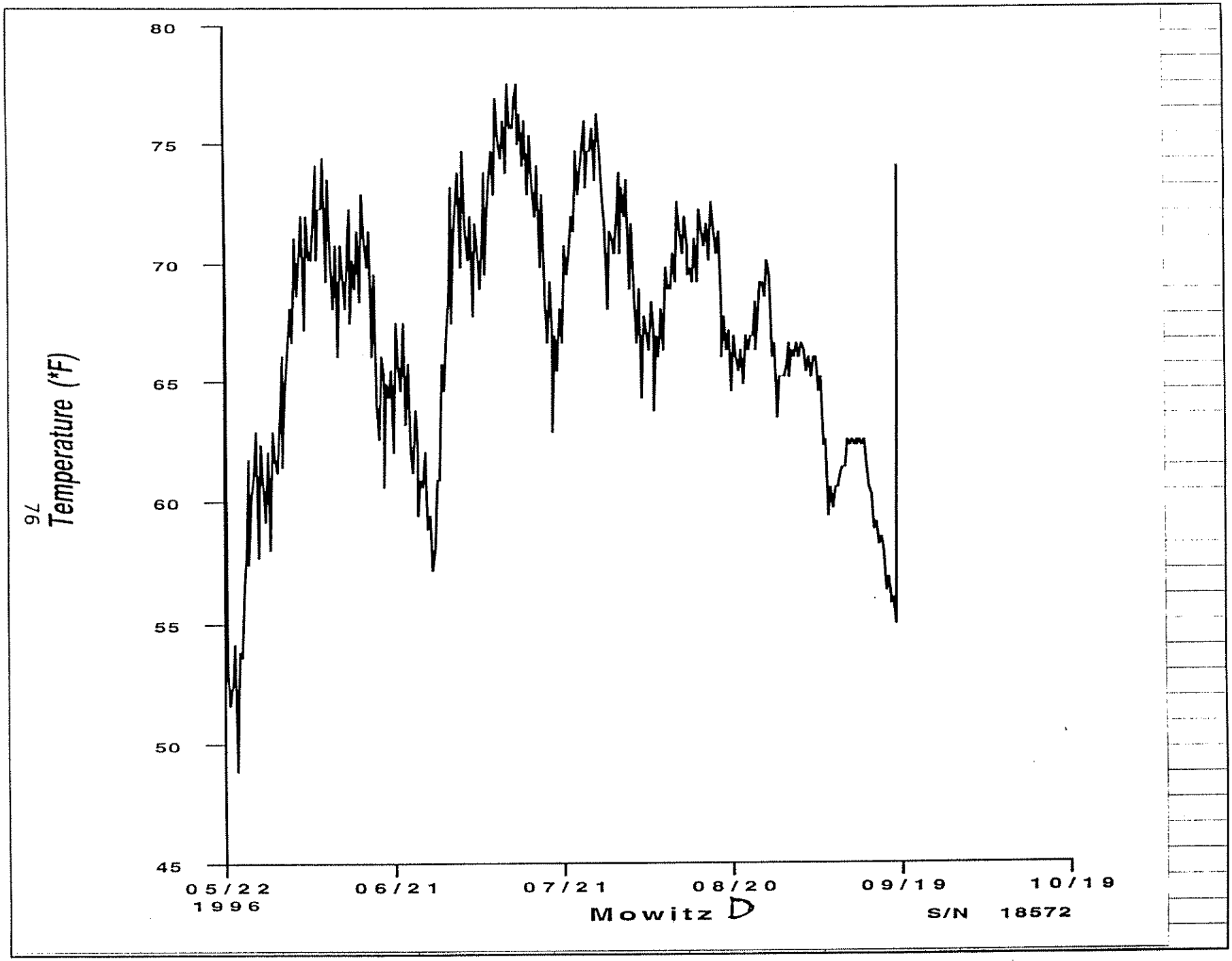
- What students have learned from the Mowitz Creek Project
  - Plant Transects
  - Aquatic Invertabrates
  - Temperature Data
- Plant Transects
  - Plant Transects teach students how to gather information on the vegetation in a specific area. They learn how to gather the data and then process the data into comparative graph
- Aquatic Invertabrates
  - Aquatic invertabrates are very important. The different kinds of insects can tell you how healthy the water is.
- Temperature Data
  - To take the temperature data, you have to chain a temperature probe into the water. That way the temperature probe will take temperatures every now and then.


Temperature (°F)
80
75
70
65
60
55
50
45
05/22
1996
06/21
07/21
08/20
09/19
10/19
Mowitz A
S/N 18569


Temperature (°F)
85
80
75
70
65
60
55
50
45
40
05/22
1996
06/21
07/21
08/20
09/19
10/19
Mowitz B
S/N 18568

Worksheet4


Temperature (°F)
85
80
75
70
65
60
55
50
45
05/22
1996
06/21
07/21
08/20
09/19
10/19
Mowitz C
S/N 18570


80
75
70
65
60
55
50
45
Temperature (*F)
05/22
1996
06/21
07/21
08/20
09/19
10/19
Mowitz D
S/N 18572

Mowitz Creek Monitoring
by
Tulelake High School

.parian Vegetative Point Transect - Upstream from the Clear Lake Road.

..	W	26.	W
:.	F	27.	W
).	W	28.	CANE
+.	F	29.	CANE
5.	CANE	30.	CANE
6.	CANE	31.	CANE
7.	CANE	32.	CANE
8.	W	33.	W
9.	F	34.	CANE
0.	CANE	35.	W
1.	CANE	36.	W
2.	CANE	37.	W
3.	CANE	38.	CANE
4.	CANE	39.	CANE
5.	F	40.	JUBA
6.	F	41.	CANE
7.	W	42.	JUBA
8.	CANE	43.	CANE
9.	CANE	44.	CANE
0.	CANE	45.	CANE
1.	CANE	46.	CANE
2.	CANE	47.	CANE
3.	CANE	48.	W
4.	Datum NOT Recorded	49.	CANE
5.	CANE	50.	W

OTE: Datum NOT recorded, thus sample size is only 49!

odes	Category/Scientific Name	Common Name
	Water	water
ANE	Carex nebrascensis	Nebraska sedge
UBA	Juncus balticus	Baltic rush
	Forb	unknown forb

Riparian Vegetative Point Transect - Downstream from the Clear Lake Road.

1.	BG	26.	F
2.	CANE	27.	W
3.	W	28.	CANE
4.	CANE	29.	BG
5.	JUBA	30.	W
6.	CANE	31.	POA
7.	W	32.	POA
8.	CANE	33.	Datum NOT Recorded
9.	CANE	34.	Datum NOT Recorded
10.	CANE	35.	Datum NOT Recorded
11.	BG	36.	JUBA
12.	CANE	37.	JUBA
13.	CANE	38.	POA
14.	BG	39.	BG
15.	F	40.	L
16.	JUBA	41.	POA
17.	JUBA	42.	L
18.	CANE	43.	JUBA
19.	BG	44.	POA
20.	JUBA	45.	BG
21.	CANE	46.	POA
22.	JUBA	47.	CANE
23.	BG	48.	POA
24.	JUBA	49.	POA
25.	BG	50.	JUBA

NOTE: Three data points NOT recorded, thus sample size is only 47!

Codes	Category/Scientific Name	Common Name
BG	Bare Ground	bare ground
L	Litter	litter
W	Water	water
POA	Poa sp.	bluegrass
CANE	Carex nebrascensis	Nebraska sedge
JUBA	Juncus balticus	Baltic rush
F	Forb	unknown forb

.and Vegetative Point Transect - Upstream from the Clear Lake Road.

.	ARTR4	26.	BROMU
.	BG	27.	ELCA
.	ARTR4	28.	POA
.	PEBO	29.	PEBO
.	BG	30.	PEBO
.	PEBO	31.	PEBO
.	POA	32.	ELCA
.	ELCA	33.	BROMU
.	POA	34.	ELCA
.	BG	35.	PEBO
.	PEBO	36.	ARTR4
.	ARTR4	37.	ELCA
.	PEBO	38.	ELCA
.	PEBO	39.	ARTR4
.	ELCA	40.	ELCA
.	ELCA	41.	ELCA
.	ELCA	42.	ELCA
.	ARTR4	43.	SIHY
.	ARTR4	44.	SIHY
.	PEBO	45.	BROMU
.	POA	46.	BG
.	POA	47.	BROMU
.	PEBO	48.	POA
.	BG	49.	ARTR4
.	ELCA	50.	ELCA

TE: Sample size is 50.

des	Category/Scientific Name	Common Name
:	Bare Ground	bare ground
:TR4	Artemisia tridentata	big sagebrush
:OMU	Bromus sp.	brome (annual)
.CA	Elymus caput-medusae	medusahead wildrye
)A	Poa sp.	bluegrass
:HY	Sitanion hystrix	bottlebrush squirreltail
:BO	Perideridia bolanderi	Yampah

land Vegetative Point Transect - Downstream from the Clear Lake Road.

. POA	26. BG
. HOJU	27. BG
. BG	28. HOJU
. HOJU	29. ARTR4
. ARTR4	30. ARTR4
. BG	31. BG
. BG	32. HOJU
. ARTR4	33. BG
. HOJU	34. BG
. HOJU	35. HOJU
.. HOJU	36. ARTR4
. HOJU	37. HOJU
. ARTR4	38. BG
. ARTR4	39. HOJU
. HOJU	40. HOJU
. HOJU	41. ARTR4
. HOJU	42. HOJU
. ARTR4	43. ARTR4
. ARTR4	44. HOJU
. ARTR4	45. HOJU
. HOJU	46. BG
. HOJU	47. ARTR4
. ARTR4	48. HOJU
. ARTR4	49. ARTR4
. ARTR4	50. HOJU

OTE: Sample size is 50.

odes	Category/Scientific Name	Common Name
G	Bare Ground	bare ground
RTR4	Artemisia tridentata	big sagebrush
OJU	Hordeum jubatum	foxtail barley
OA	Poa sp.	bluegrass

les, Categories/Scientific Names, and Common Names used in all four
;etative Point Transects:

les	Category/Scientific Name	Common Name
	Bare Ground	bare ground
	Litter	litter
	Water	water
TR4	Artemisia tridentata	big sagebrush
)MU	Bromus sp.	brome (annual)
CA	Elymus caput-medusae	medusahead wildrye
JU	Hordeum jubatum	foxtail barley
A	Poa sp.	bluegrass
HY	Sitanion hystrix	bottlebrush squirreltail
NE	Carex nebrascensis	Nebraska sedge
BA	Juncus balticus	Baltic rush
BO	Perideridia bolanderi	Yampah
	Forb	unknown forb

Program by:
Caroline Jenkins
Teresa Todd
Jenna Matthews
Arsenio Ayala

Goals/Procedures

"The Plan"

Our goal will be Educational yet scientific. Thus we will accomplish this by doing water quality monitoring on Mowitz Creek. We should assign groups before we get to each point to do certain jobs at point A .That way, now that we know how to use the equipment, things will move right along. At Point B, we would change jobs, so that no one will do the same job twice. So on and so forth. We will go check the 120 day interval on the Hobo temps.

We will be doing these tests listed below on our next trip to Mowitz Creek:

Temperature readings (By planting Hobo Temps in the deepest parts at each of the Points A, B, C, and D. Then we will take a regular Thermometer and measure 3 inches down every 40 ft.).

pH (We will be reading the pH every 40 ft. so that all our information is consistent).

Dissolved Oxygen (we will be taking readings every 40 ft. and will be doing the Depth of 2 inches).

Depth, Width, and Speed of Current (we will be taking a yard stick and standing in the water to guess the speed of the current).

Plant transects (on each side parallel to creek and perpendicular for 100 ft.)

Collect samples of plants(for herbarium and to later study, collect every 100 ft)

Identify and collect aquatic invertebrates(we will take notes of collecting techniques and proportions found of each group of insects. We will collect every 100 ft.)

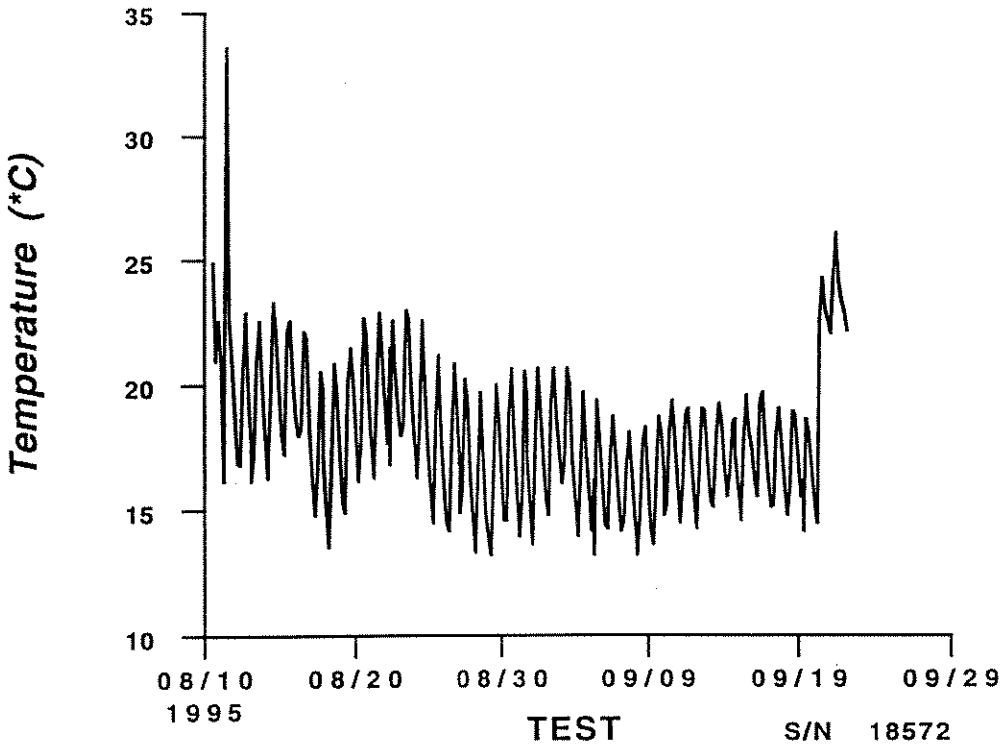
Make a vegetative map of specified area's(surrounding the creek a 100 ft out all around the creek).

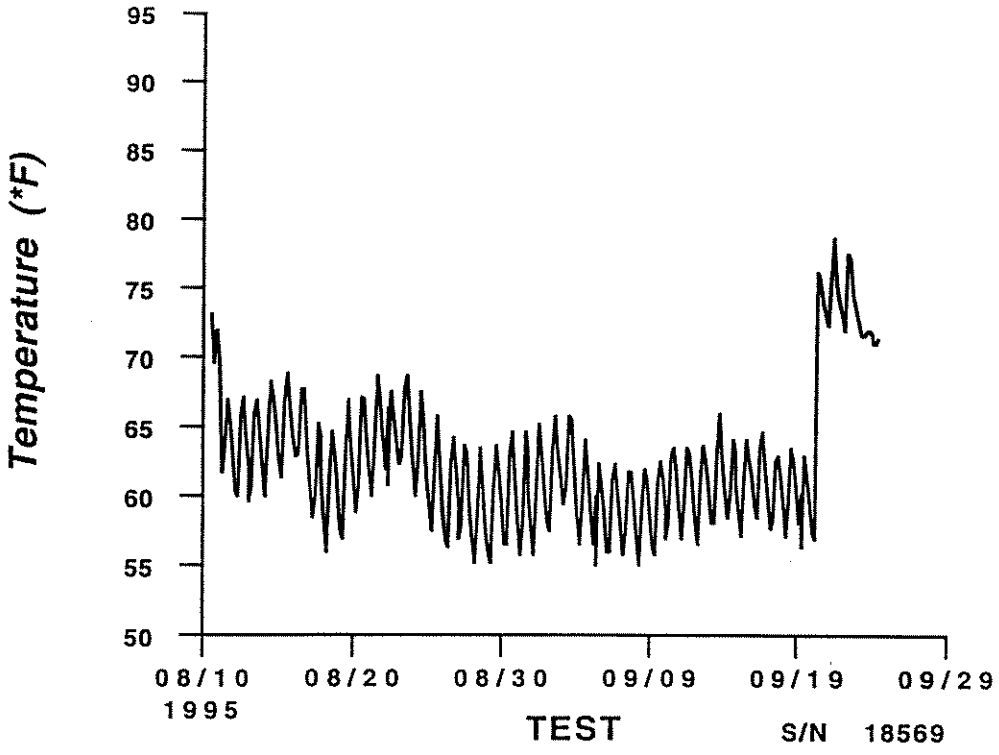
Make a map of the whole area(we will map the vegetation and were the creek comes in).

Bring organization back (to the classroom for further interpretation and use)

Analyze data and share with others(we will be sending out information to different school around the basin that are also involved in the KRISS project. We will also be sharing out information with TID, and the Forest Service, and many others that are interested).

Our final goal will to be successful and to have complete and useful information for the other students and for the basin. We hope that this plan will help, and make Mowitz Creek a better know place for its water and usefulness in the water shed.


Temperature (*C)
35
30
25
20
15
10
08/10
1995
08/20
08/30
09/09
09/19
09/29
TEST
S/N 18572


Temperature (*F)
95
90
85
80
75
70
65
60
55
50
08/10
1995
08/20
08/30
09/09
09/19
09/29
TEST
S/N 18569

Program by:
Caroline Jenkins
Teresa Todd
Jenna Matthews
Arsenio Ayala

Report

"Part II"

Based on our first trip to Mowitz Creek, we did studies of the water quality of the area. These tests were and how we did them:

-Temperature (planting Hobo temps and direct): Hobo temps were planted in white thermos-like containers. They took readings every 4.6 hours, it took 1800 readings over the period of time out there.
-pH: We put the pH tester in the water at random locations, there was no consistancy or record of where used.
-Dissolved Oxygen: We put the D.O. tester in the water, there was too no consistancy or record of where used.
-Depth, Width and Speed of Current: This was not tested.
-Plant Transects on Each Side Parralell to Creek and Perpindicular for 100 ft.: We used a 100 ft. tape, drug it out 100ft. We went along and every 2 feet we took a reading of what plant as there. Types of plants that we encountered were: artemesia (sage), rabbit brush, ceanothus, seagles, rushes, lupine, juniper, elymus, and other grasses such as scivrus, nebrankensis, poa, and satanus.
-Collect Samples of Plants for Herbarium and Later Study.: We didn't collect any live plant samples.
- Identify and Collect Aquatic Invertibreats for Later Analyisis. Take Notes of Collecting Techniques and Porportions Found of Each Group of Insects.: No notes were taken and brought back to THS.
-Bring Organized Data Back.
-Analyze Data and Share with Others

Out of these above tests here were the results....

	Temp	D.O.	pH	Other	Describe
point A	15 d c	33 d c	7.7		
point B	NA	NA	NA		
point C	13 d c	29 d c	6.9		
point D	NA	NA	NA		

Our overall trip was a success, and we all learned alot about new technology and I think that our next trip will be even better!

Respectfully Submitted:

Teresa Todd
Jenna Matthews
Caroline Jenkins
Arsenio Ayala

Goals & Procedures

Our goal is to collect accurate data at Mowitz Creek, we will collect the temperature with Hobotemps. To complete this goal accurately we will have a group of five. Three will be in the water, and two will be on the land. The ones in the water will measure temperature, pH, Dissolved Oxygen. the two on land will record the data. The ones in the water will also change the hobotemps. The rest of the class will split into groups and collect data on the Aquatic Invertebrates, and vegitation mapping. We will collect plant transects and put them into the plant press for further research.

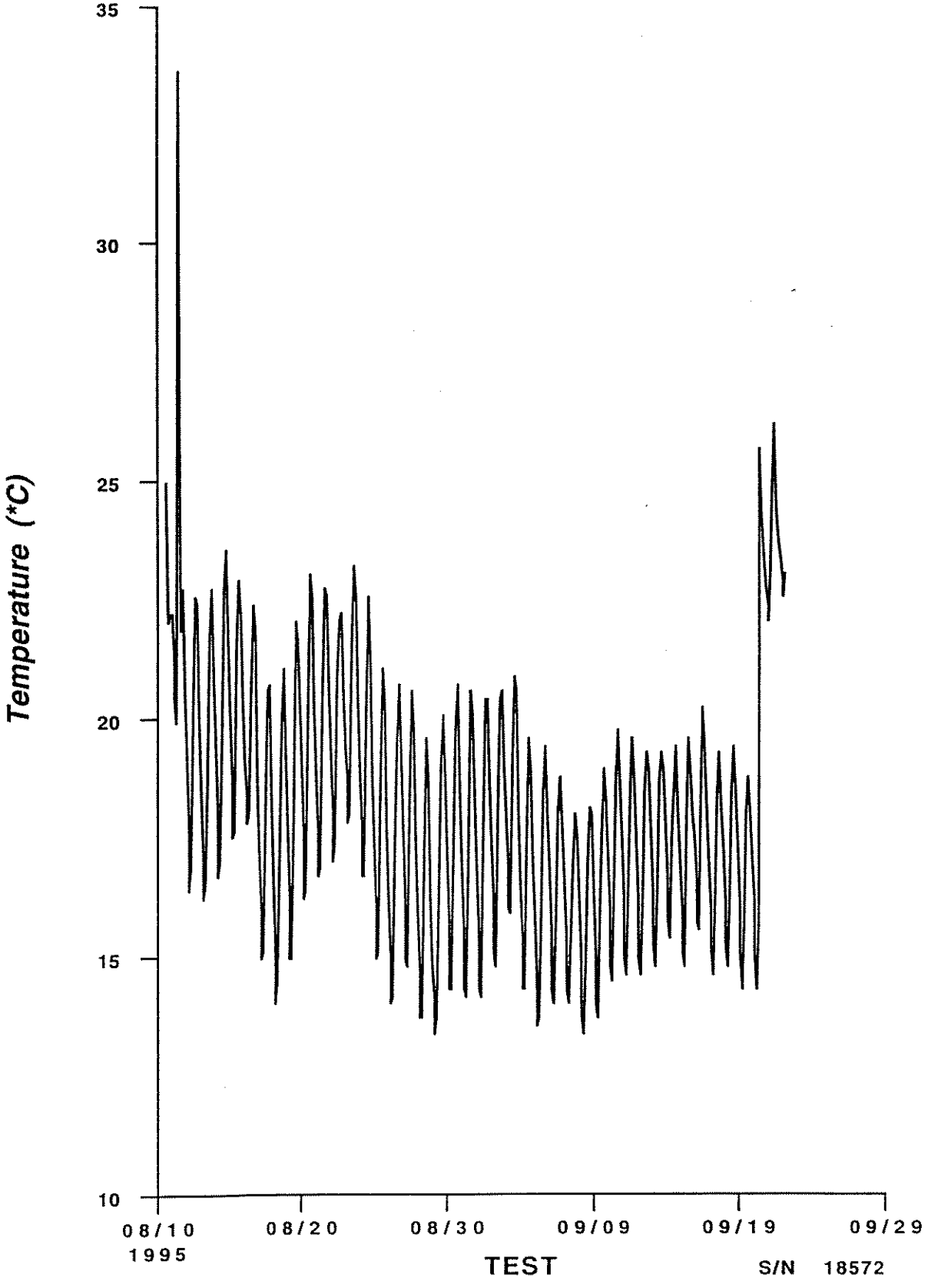
Schedule

The day before the trip we will decide the groups and how the rotation will go.
and what each group will be responsable for. Also the day before we will learn how to use the tools. The day before we will also need to set the Hobotemps at 120 days. We will have to head out to mowtiz creek, at 8:30 am.When we arrive to Mowitz Creek we will get in our groups and get the equipment that is needed to do the proper testing. Then as a class we will head out to point A. When we get to point A we will get in our groups and do the testing your group is responsible for. After everyone has done there testing we will move to point B,C, and then D. Then we will come home. Then the next day the groups will enter their data into the computer and if your group is in charge of insects or plants you must pin or plant press them.

Report

We discussed every procedure that had to be accomplished over the period of time that we were out at Mowitz Creek. We headed out to point A and changed the hobotemps, we split up into groups and group one was to measure the temp, ph, and dissolved oxygen. Group two was to racord the data. A third group took plant transects at 2 foot intervals. A fourth group gathered aquatic invertebrates.

We did a second group of testing on point C. We all rotated and did something that we hadn't already done.


35
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20
15
10
Temperature (*C)
08/10
1995
08/20
08/30
09/09
09/19
09/29
TEST
S/N 18572

Kevin Quillman
Ernie Kucera
George Aguilar
Nicholas Huffman

Mowitz Report

On the first trip that we took to Mowitz Creek we collected the following information: Temperature, pH, D.O., notes on the banks, aquatic invertebrates, plant transects, insects, and soil samples.

At point A we collected the old hobo-temps and replaced them with the new ones, took the temperature in Celcius with thermometers, collected the pH, and the D.O. in the water. On the land we collected plant transects within one hundred feet of the creek, sampling every two feet.

Temperature: 15 Celcius
D.O.: 33 Celcius
pH: 7.7

All that we did at point B was replaced the old hobo-temp with the new one.

All information not available.

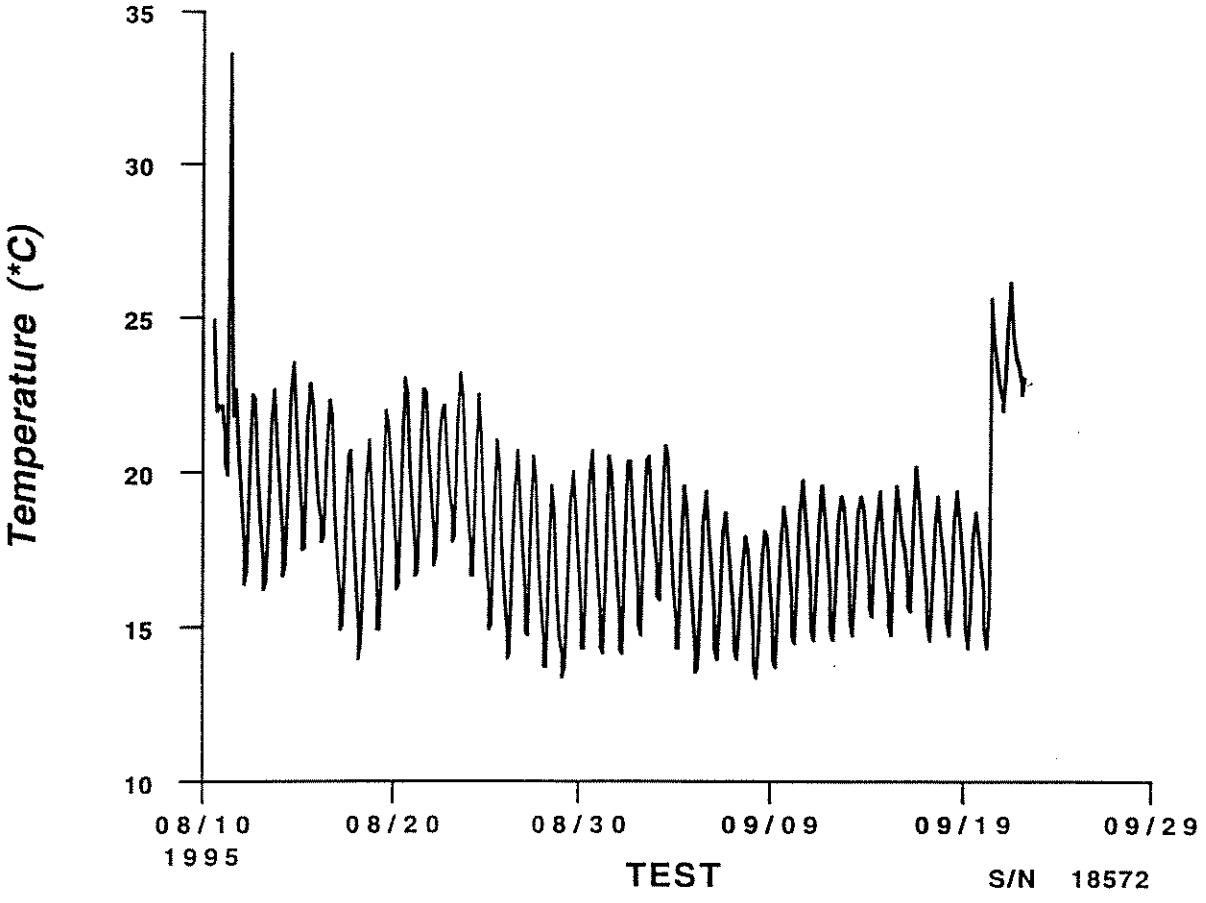
At point C we did everything that we did at point A, along with soil samples and aquatic invertebrates.

Temperature: 13 Celcius
D.O.: 29 Celcius
pH: 6.9

At point D only five people went to collect and replace the old hobo-temp while the rest of the group stayed at point C and collected the information.

All information not available.

From the point A hobo-temp, which took readings over 120 day interval, we have collected the information and made a graph.


Temperature (*C)
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08/30
09/09
09/19
09/29
TEST
S/N 18572

Ernie Kucera
Kevin Quillman
Nicholas Huffman
George Aguilar

Goals and Procedures: To do water quality monitoring on Mowitz Creek and collect temperature, pH, D.O., vegetation, stream banks & flow & aquatic invertebrates.

Site A: We will go to site A and collect the following information:
Temperature: collect temperature with both hobo- temps and thermometers.
pH: Collect pH.
Dissolved Oxygen: Collect D.O.
Depth, Width, Speed of Current: Take notes of these at site A.

Site B & C: We will go to site B and C to collect the following information:
Depth, Width, Speed of Current: Take notes at site B and C of depth, width, and speed of current in the creek.
Plant Transects: Collect plant transects at site B and C within 100 ft. of creek.
Aquatic Invertebrates: Collect at site B and C in water.
Temperature: Collect at site B and C the temperature with both hobo-temps and thermometer.

Site D: We will go to site D and collect the following:
Temperature: Collect at site D the temperature with both hobo-temp and thermometer.

Overall:
Map: Make a map of the area.
Data: Bring back to classroom to organize for further use. Analyze data to share with others.

Oscar Hernandez
Rudy Idrogo
Amy Robison

GOALS AND PROCEDURES:
"THE PLANING OF FURTHER STUDY"

GOALS: Our goal is to do water quality monitoring on Mowitz Creek. We will study temperature, pH, Dissolved Oxygen, vegetation, stream banks and flow, and aquatic invertebrates in 120 day intervals.

OBJECTIVES: We will collect data from sites A, B, C, & D within the fenced area of Mowitz Creek.
From 8-9:30, we will prepare form what we need to accomplish.
From 9:30-11:00, a group of 8 will walk to site A and take D.O., temp, and pH and different plant transacts and other collections.
From 11:00-12:30 the group that went to site A will come back to B to take down similar data.
From 12:30-1:15 we will all eat lunch and review the information we just covered and prepare to leave to the other sites.
From 1:15-2:00 we will cover the sites C & D, and collect further data to help conclude our Klamath River Watershed Project.

All of the other people will go along with the 8 people and be collecting the plant transacts and insects from various locations.

REPORT

We collected temperature, dissolved oxygen, and pH from sites A and C. At point A, the temperature was 15C, and at point C, it was 13C. At point A, the pH was 7.7, and at C, it was 6.9. The dissolved oxygen at point A was 33, and at point C, it was 29. The banks at point A was shallow and full of the tall poa. At point B, it was the same, but wider. At, C, it was erect banks with soil from trampling cows. At site D, the banks were one side was lightly sloped, and the other was steep like at C. We weren't as successful as we all would have liked, so we will return and do better and accomplish more the next time.

Our plan in the future is to collect various data for the Mowitz Creek Field Study-Klamath Resource Information System Project in 1995 and upload it on the internet. We will collect temperatures in 10 different locations and then take the average. Same with pH and Dissolved Oxygen. The depth, width, speed of current, and also including plant transacts on each side parallel to the creek, and perpendicular for 100 ft. We will identify and collect aquatic invertebrates for later analysis, take notes of techniques and proportions found of each group of insects. We will make a vegetative map of specified areas, a map of the whole area,, bring organized data back to the classroom for further interpretation and use, and analyze and share with others. With all of this data, we will come back and make a summarization and graphs of our trip.

KRIS Personnel
Scope of Responsibilities

Administrator: Michael Rossi (842-8415, michael@sisnet.ssku.k12.ca.us)

Setting of budgets
Reports
Contracts with districts
Authorization of expenditures
Tracking of budget by schools
Release of funds for equipment
Monitoring teacher reports
Supervision of secretary, Program Specialist, South County Community Coordinator
Meetings: staff development, USFWS, program specialist on planning
Public relations support
Liaison with USFWS personnel: John Hamilton and Della Smith

Program Specialist: Sue Maurer (842-8429. smaurer@sisnet.ssku.k12.ca.us)

Program facilitation
Consultant on expenditures
Direct support to teachers
Consultant on field work projects
Consultant on connection between technology, pedagogy, and content
Technical support to Community Coordinator
Presentation at County-wide Staff Development Day in September
Organization of staff development

Technology Specialist: Jeff Weiss (459-5109, jweiss@sisnet.ssku.k12.ca.us)

School site support
Development of standardized spreadsheet/database formats for field data
Presentation at County-wide Staff Development Day in September
Linkages with KRIS system

HOBO Data Logger Data Management

Quality Control/Quality Assurance

Handling large amounts of data generated by HOBO automated data loggers can be a demanding task when trying to access the general soundness of the data. Any number of variables can lead to aberrant data. Of particular concern is whether the instrument was positioned correctly in the water during the monitoring period.

From looking at patterns of HOBO data for many loggers at varied locations and given the characteristics of heat transfer in water, it appeared that the variance of the maximum/minimum temperature for a day (diurnal temperature cycle) was an excellent indicator of whether the logger was more measuring a water temperature than an air or mud temperature. It was expected that water readings would show lower variance values than air or mud readings. Examples of very high diurnal fluctuations were found, which directly correlated with field reports of no water, found in a tree due to high water, or displaced by livestock onto a bank. There was also an excellent example of a buried monitor giving almost no daily variance until eventually dislodged back into the water medium and immediately displayed water diurnal fluctuations. An assumption was made that the loggers were properly calibrated and batteries functioning.

Using data base summary techniques it is possible to create on screen user-defined frequency distributions that count the number of days in a month that a range of daily variance fell. If for example one of the ranges was 12-20 and there was a high count to this range, the month this occurred in would warrant closer scrutiny and the field sheets would be consulted for possible mis-positioning of the logger for whatever reason. It is possible to see these user defined ranges by location by month. This not only alerts the data manager about potential problems of the data, but also the placement/monitoring crew as to the possibility of relocating/re-securing/more frequent field inspections, or other information that would help the overall effort.