TEMPERATURE MONITORING ON THE SCOTT RIVER PHASE I

Water Year 95 Report
for
USFWS Agreement # 14-48-001-94522

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For

Siskiyou Resource Conservation District
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ABSTRACT

This project utilized Onset HoboTemp electronic units to monitor water temperatures at selected sites on Scott River, in the Scott Valley (confluence of East Fork Scott River and South Fork Scott River to river mile 22). Data was collected at various sites beginning in January 1995 and extended through September 1995. Graphs were compiled from data sets for comparison of water temperatures at these various sites.

INTRODUCTION

Water temperatures in a steam course are the results of many influences. Bank and stream bed content, soil type, and vegetation all affect the temperature of water flowing past a specific location. Other factors include air temperature, event runoff, tributary inclusion, and weather factors. Changes brought about by natural and man-made activities may have a detrimental collective effect on stream conditions, including temperatures. In an effort to identify where these temperature changes may be located on the Scott River, a consistent pattern of monitoring from year-to-year was started in Water Year '95 (October 1994 to September 30, 1995). A comparison of temperatures from station may indicate some conditions that are adversely affecting the water quality and thereby indicate the need for restoration work. Likewise, some comparisons may indicate a positive aspect of the river in relation to temperatures and can be a model for duplication. Additionally, having a baseline reference of temperatures should indicate positive changes brought about by any restoration efforts. This project was designed to begin the collection of data on a regular basis at a reasonable cost in terms of dollars and time.

Water temperature is an integral part of determining the relative health of a watershed and its ability to provide adequate habitat for specific type of fisheries. A salmonid population needs cooler water to thrive and propagate. Optimum temperatures needed range from about 42° F for chinook salmon spawning in the fall and a 50°F to 59°F ranges for rearing juveniles. Lethal temperatures occur at about 78^0 F -80^0 F[1,2].

OBJECTIVES

The objectives of this project have been as follows:

A. Systematically sample daily and seasonal water temperature conditions in mainstem Scott River and selected main tributaries.

B. Isolate changes in mainstem water temperatures by stream reach.

C. Determine if stream flows from selected tributaries significantly affect water temperatures in the Scott River.

D. Correlate daily temperatures with daily stream flows, precipitation and snowpack data, and official climatic data.

This water quality monitoring effort is supported by the Scott River Watershed Coordinated Resource Management Program (CRMP) in its Water Plan (a.k.a. "Fall Flows Plan"). The Klamath River Fisheries Task Force recommended this project for funding by the U. S. Fish and Wildlife Service.

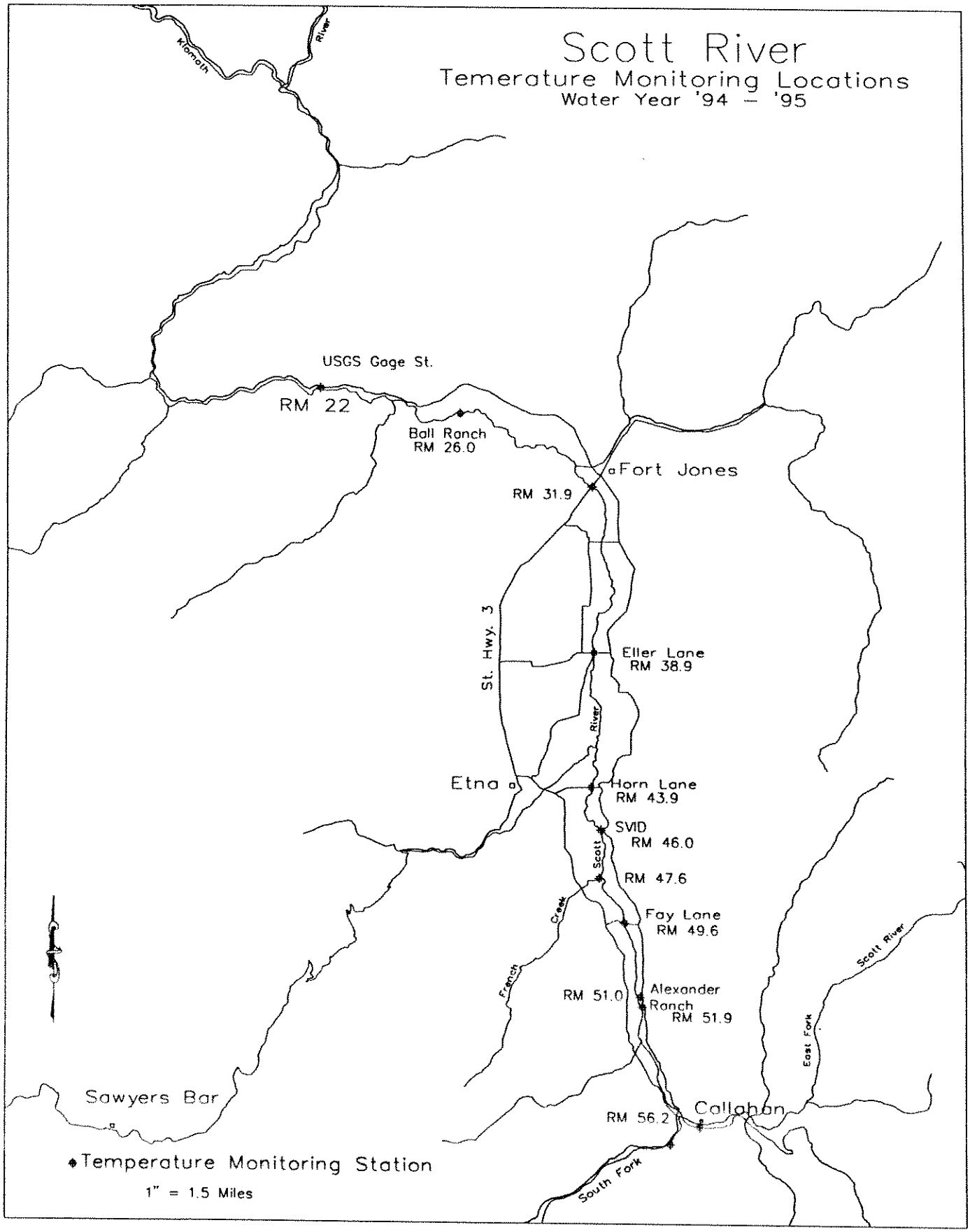
MATERIALS AND METHODS

A. Equipment

HoboTemps (HT) by Onset Computer Corp. were selected as an affordable and reliable unit to record temperatures. These units consist of a thermistor, related micro electronics, and a battery enclosed in a 1 3/4" x 1 1/4" x ½" case. This is enclosed in a 2" diameter, waterproof PVC case. For this project the case was then secured in a 7" long, 3"diameter steel pipe. When required, the case was chained to a structure or stake to prevent transportation during high water. Water appeared to flow freely through the case and did not appear to affect the data collected. The HoboTemp units have recording capacity of 120 days when set to log at 1.6 hours. Each unit is equipped with a plug and the stored information can be downloaded to a personal computer through a 9-pin connector. Software to download and start the recording was provided by Onset. Six additional units were requested from and provided by Siskiyou County through the Siskiyou County Fish and Game Commission. An Inex 4150 Notebook Computer was purchased for use with the Boxcar and DataLogger software. This facilitated data collection and saved time by allowing the HoboTemps to be launched and downloaded in the field and did not have to be removed and brought in to a central location for downloading/launching.

B. Calibration

Each HoboTemp (HT) was calibrated at 0^0 C (32^0 F) at least once during its utilization. This was accomplished by immersing the HT in an ice water bath and maintained as long as possible. The HT was set to record at fifteen minute intervals in order to establish as many readings within the time frame as possible. All the HTs used were found to meet the +-.5^0 C tolerance as indicated in Techniques of Water-Resources Investigations of the USGS, Book 1[3]. Under the Project Quality Assurance Project Plan by California Department of Fish and Game (CDFG)[4], two water baths, one at 5^0 C and one at 20^0 C were indicated for calibration. As no laboratory is locally available for completing this type of calibration, and data is used for comparison purposes only, this level of precision was not employed.


Scott River
Temerature Monitoring Locations
Water Year '94 – '95
Klamath River
USGS Gage St.
RM 22
Ball Ranch
RM 26.0
Fort Jones
RM 31.9
St. Hwy. 3
Eller Lane
RM 38.9
Scott River
Etna
Horn Lane
RM 43.9
SVID
RM 46.0
RM 47.6
Scott
Creek
Fay Lane
RM 49.6
French
RM 51.0
Alexander
Ranch
RM 51.9
Scott River
East Fork
Sawyers Bar
RM 56.2
Callahan
South Fork
Temperature Monitoring Station
1" = 1.5 Miles

C. Site Selection

Sampling sites were recommended by the Ad Hoc Water Quality Sub-Committee of the Scott River Watershed Coordinated Resource Management Program (CRMP) [members include CDFG, U.S. Forest Service, Regional Water Quality Control Board, Audubon Society, and (RCD)] at a meeting on December 16, 1994. Each site was evaluated for its access and physical characteristics. As most of the locations are on private land, permission for access was required for most all the proposed sites. A number of landowners denied access this year and the author was reluctant to pursue further because of the political climate in the valley. Alternate sites were considered but the high water late in the spring added time constraints to develop sampling sites at these locations. A listing and description of each site is included in Appendix A.

D. Data Collection

HTs were place at each location as soon as access was permitted. Temperature data was logged every 1.6 hours and downloaded at periodic intervals. All sites were monitored on a regular basis to insure that the HTs were still in place. When data sets were downloaded, air and water temperatures were collected using hand-held thermometers. On a few occasions the HT was moved to insure that it would remain in the main flow of water at the site. Data determined to be extraneous (out of water, pre/post placement in water, etc.) was not included in the data set. Chart B-1 (Appendix B) indicates when data was collected from each location.

Weather data consisting of precipitation and air temperature was downloaded from the California Data Exchange Center (CDEC) maintained by the California Department of Water Resources, Division of Flood Management. This data is recorded from the station located near Callahan, which was selected as being most central to the watershed. This data is presented as an overlay as chart B-2.

E. Data Processing

Data was downloaded using Boxcar or Data Logger software provided by Onset Computer Corp. This data is in raw form and must be transferred to another program for graphing and printing. The author utilized Quattro Pro spreadsheet program for processing and graphing data. Data from CDEC was downloaded in Standard Hydrological Exchange Format (SHEF) and imported as text into the spreadsheet program. The data was divided into calendar months and is listed in Appendix C by site location.

RESULTS

As a result of seven to eight years of drought conditions in California, the Scott River has experienced periods of low or no flow. Water Year 95 (October 1, 1994 - September 30, 1995) was a normal or above normal water year with only short periods of time with no water flowing

in the upper reaches of Scott Valley (above Fay Lane). Temperatures ranged from a low of near 40^0 F in the East Fork of Scott River to highs in the 74^0 F to 76^0 F range for all sites with surface flow. Collection of water temperatures through the Scott Valley (confluence of East and South Forks to River Mile 22) have only been done on a random basis previously. This project has begun what is hoped to be a consistent, year to year temperature data collection system at a reasonable cost in man-hours and financial resources.

Most of the selected sites were systematically sampled during late spring and summer flows through the end of the water year (Objective A). Although some of the desired sites were not sampled, those that were provided an initial data set to base comparison in the future. Differences in temperatures from site to site are presented in graphic form and can be numericaly evaluated by comparing the data sets for each site (Objective B). An evaluation of tributary vs. mainstem temperatures by agency professionals will determine if those tributaries do significantly affect the water temperatures in the Scott River (Objective C). The data collected during this initial year should provide a basis for that evaluation. As stream flows are not available, a correlation could not be established between flows and temperature. Likewise, snow pack data is collected periodically during the winter months and should be related to stream temperatures over a longer period than this one year. Precipitation and daily temperatures are compared by use of an overlay in Appendix B, Chart B-2 (Objective D).

Comparison of daily averages are presented in graphical form in Appendix B. These charts were prepared using the Moving Average method with the interval set at fifteen, the number of temperatures logged each twenty-four hour period. Related areas of the river are plotted on the same graph for comparison. Placing all the stations on one graph would be confusing. Numeric analysis of each data set is presented with each month's data for each station, including mean, mode, maximum, minimum, and frequency. This should provide quick reference for initial examination of temperature conditions at each location. If additional analytical comparisons are desired, please contact the author or the Siskiyou Resource Conservation District Office.

DISCUSSION

Water temperatures collected in a systematic fashion can provide useful information about the condition of a watershed. The Scott River drainage is subject to many use and management activities, both private and agency. This project has been an initial attempt to provide temperature data from locations that can be utilized year after year. Data sets will be included in the KRIS data base, a Geographical Information System, and will be available to any interested party. The author fully expect fish and hydrological professionals to analyze the data and relate their findings as appropriate.

Some of the difficulties encountered this first year include; 1) loss or theft of some HT units, 2) locations where HTs needed to be moved to stay in the main flow after high water had dropped, and 3) reduced number of locations due to private property concerns. The consultant will encourage the participation of landowners through the Resource Conservation District Board

members and the use of local media. Moving some locations away from high public use areas, such as local swimming holes and high use bridges, should reduce the risk of tampering or removing HTs. This will also enable downloading more often where attention is not drawn to the HTs which are within sight of the general public.

REFERENCES

1. Long Range Plan for the Klamath River Basin Conservation Area Fishery Restoration Program, Klamath River Basin Fisheries Task Force, 1991.

2. Influences of Forest and Rangeland Management on Salmonid Fishes and Their Habitats, USDA Forest Service, William R. Meehone, 1991.

3. Techniques of Water-Resource Investigations of the United States Geological Survey, Water Temperature-Influential Factors, Field Measurement, and Data Presentation, Book 1, Chapter D1, Herbert H. Stevens, John F. Ficke, and George F. Smoot, 1978.

4. Quality Assurance Project Plan for Water Temperature Monitoring on the Scott River, Jane Vorpagel, CDFG, 1995.

APPENDIX A
SITE DESCRIPTIONS

SITE DESCRIPTIONS

East Fork Scott River, Lat. 41° 18' 30.00"N, Long. 122° 47' 52.06"W; West side of USFS Callahan Station, Approx. .5 miles from the confluence with South Fork Scott River [River mile 56.2].

South Fork Scott River, Lat. 41° 17' 48.04"N, Long. 122° 48' 18.60"W; North side of South Creek Road, on USFS. Approx. 1.5 miles from confluence with East Fork [River mile 56.2].

Alexander Ranch-One, Lat. 41° 21' 29.65" N, Long. 122 49' 18.04"W; South end of Alexander Ranch land at river mile 51.9.

Alexander Ranch -Two, Lat. 41° 21' 46.23"N, Long. 122° 49' 26.36"W; North end of Alexander Ranch land at river mile 51.0

Fay Lane Bridge, Lat. 41° 23' 45.61"N, Long. 122° 49' 57.17"W; Under bridge in main channel. Hobo Temp removed by unauthorized party sometime after 11/1/95. Loss of data from 8/26/95. River mile 49.6

French Creek -One, Lat. 41° 30' 29.76"N, Long. 122° 50' 07.78"W; In Scott River approx.200 yds. Above confluence with French Creek. River mile 47.6.

French Creek, Lat. 41° 30' 29.95"N, Long. 122° 50' 07.80"W; In French Creek approx. 150 yds. Upstream of confluence with Scott River.

French Creek -Three, Lat. 41° 30' 29.83"N, Long. 122° 50' 07.70"W; In Scott River approx. 200 yds. Downstream on confluence with French Creek. River mile 47.6.

Scott Valley Irrigation Diversion, Lat. 41° 26' 18.19"N, Long. 122° 50' 43.75"W; In Scott River approx. 50' below diversion dam. River mile 46.0

Horn Lane Bridge, Lat. 41° 27' 28.48"N, Long.122° 51' 03.27"W; In Scott River under bridge. River mile 43.9. Hobo Temp unit removed sometime before 8/26/95. Loss of data to that date.

Eller Lane Bridge, Lat. 41° 31' 09.62"N, Long. 122° 51' 05.15"W; In Scott River on west end of bridge. One Hobo Temp is missing from this site. Replacement was moved and later found. Loss of data prior to 8/26/95. River mile 39.9.

Highway 3-One, Lat. 41° 35' 42.05"N, Long. 122° 51' 06.59"W; In Scott River approx. 100 yds. Upstream from Highway 3 bridge. River mile 31.9.

Highway 3-Three , Lat. 41° 35' 42.05"N, Long. 122° 51' 06.59"W; In Scott River 50' downstream from highway bridge. River mile 31.9.

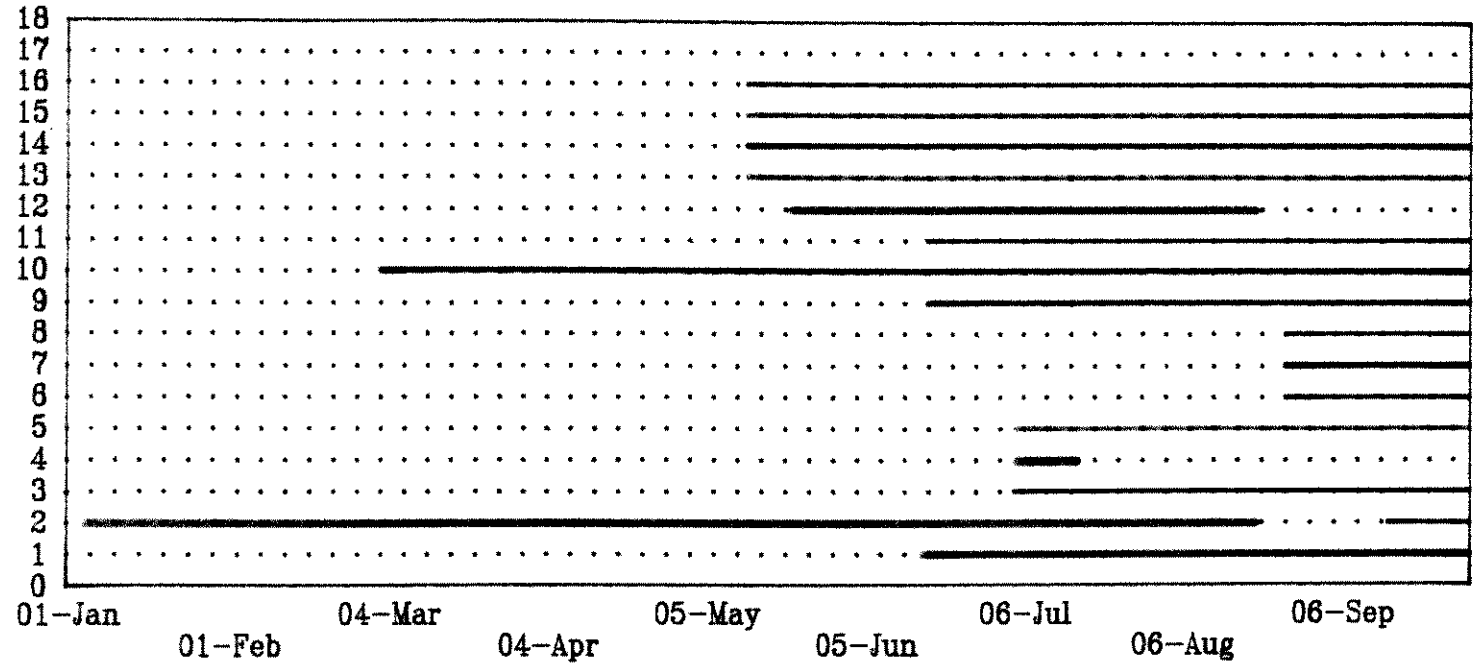
Ball Ranch, Lat. 41° 37' 50.85"N, Long. 122 ° 56' 05.93"W; In main channel of Scott River at east end of Ball property. River mile 26.0

USGS Gaging Station, Lat. 42° 34' 29.99"N, Long. 123° 46' 19.41"W; USFS deployed unit. River mile 21.0.

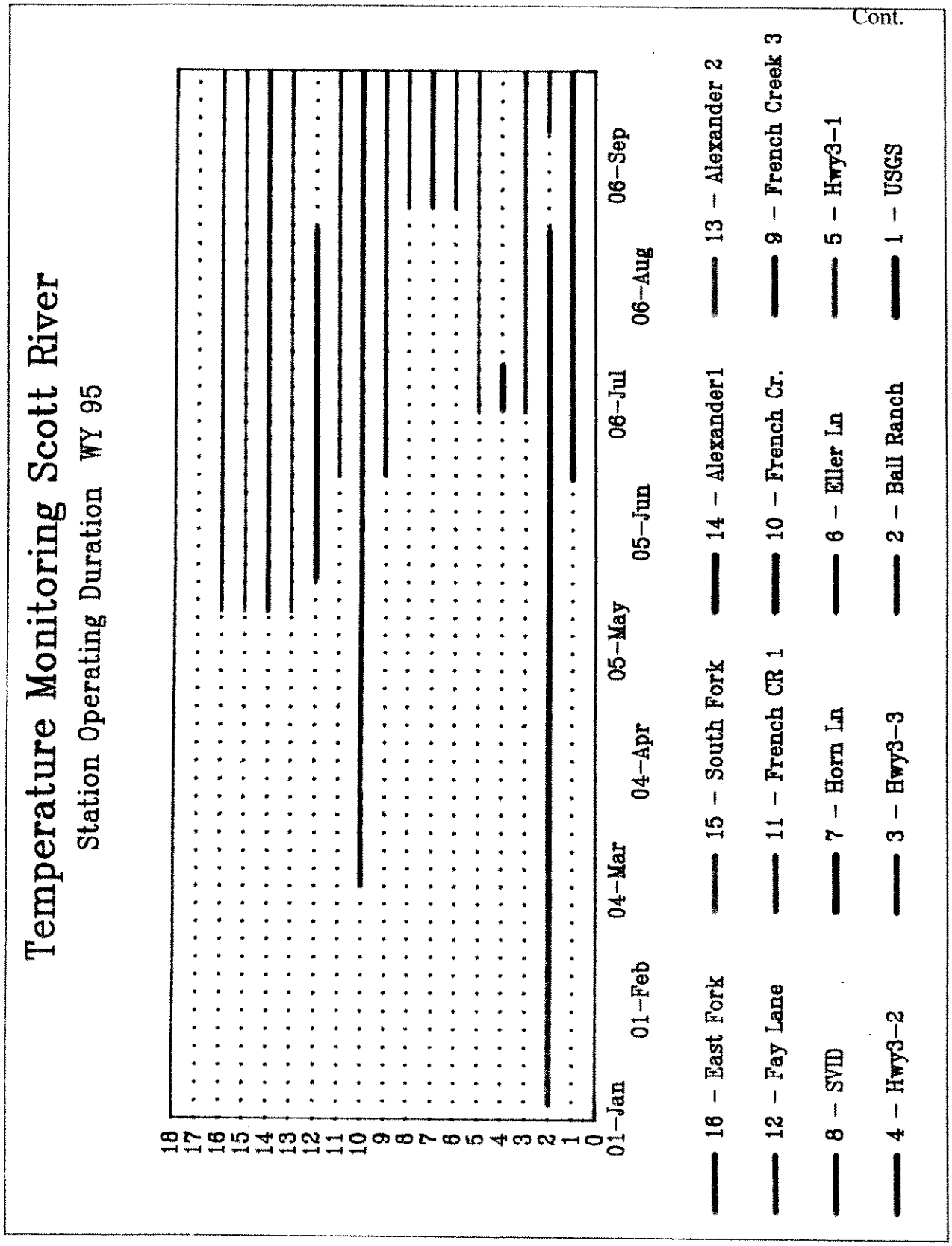
Callahan Remote Weather Station, Lat. 41° 19' 58.80"N, Long. 122° 49' 58.80" W

Temperature Monitoring Scott River

Station Operating Duration WY 95



16 – East Fork
15 – South Fork
14 – Alexander1
13 – Alexander 2
12 – Fay Lane
11 – French CR 1
10 – French Cr.
9 – French Creek 3
8 – SVID
7 – Horn Ln
6 – Eller Ln
5 – Hwy3-1
4 – Hwy3-2
3 – Hwy3-3
2 – Ball Ranch
1 – USGS


Temperature Monitoring Scott River
Station Operating Duration WY 95
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06-Jul
06-Aug
06-Sep
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15 - South Fork
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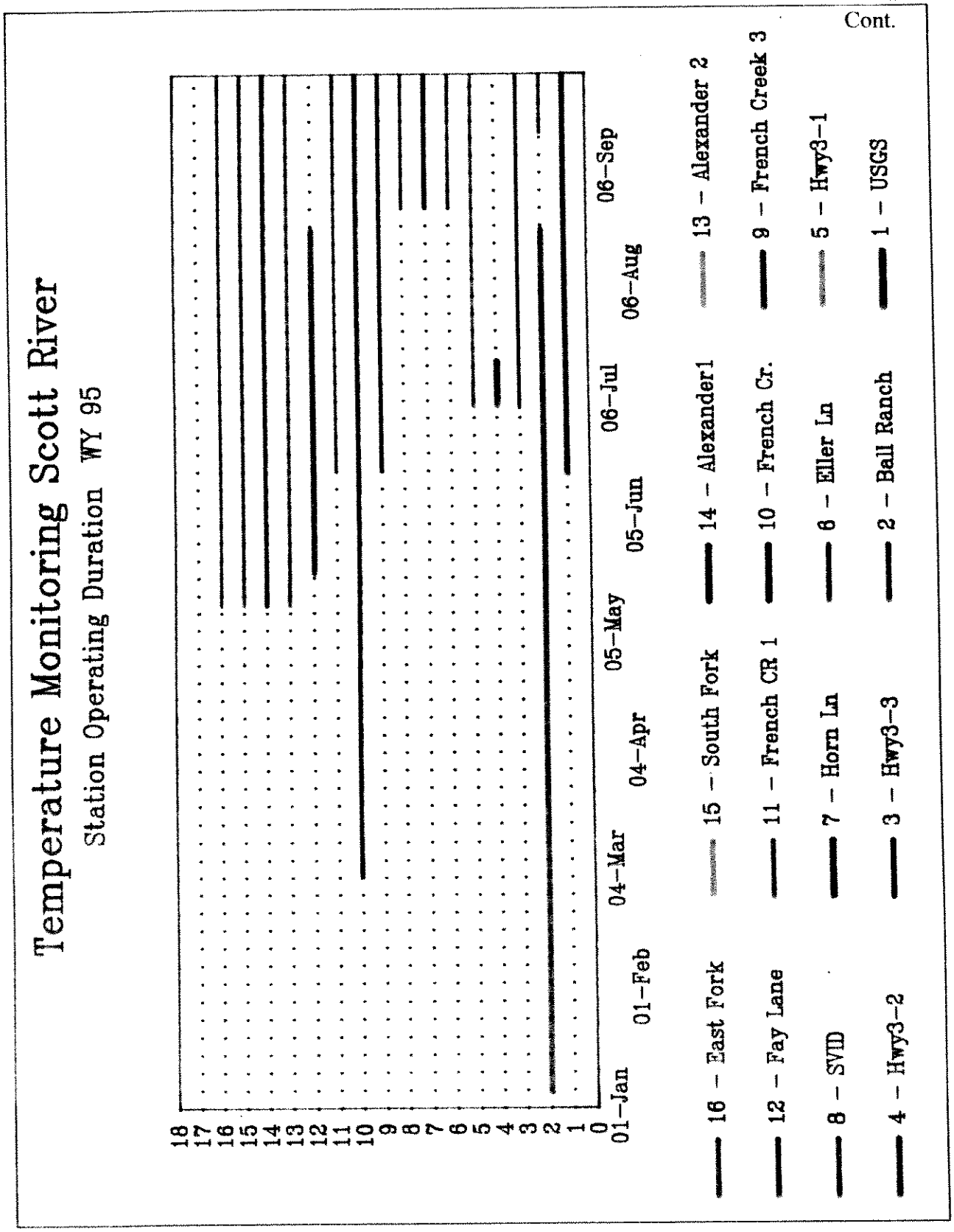
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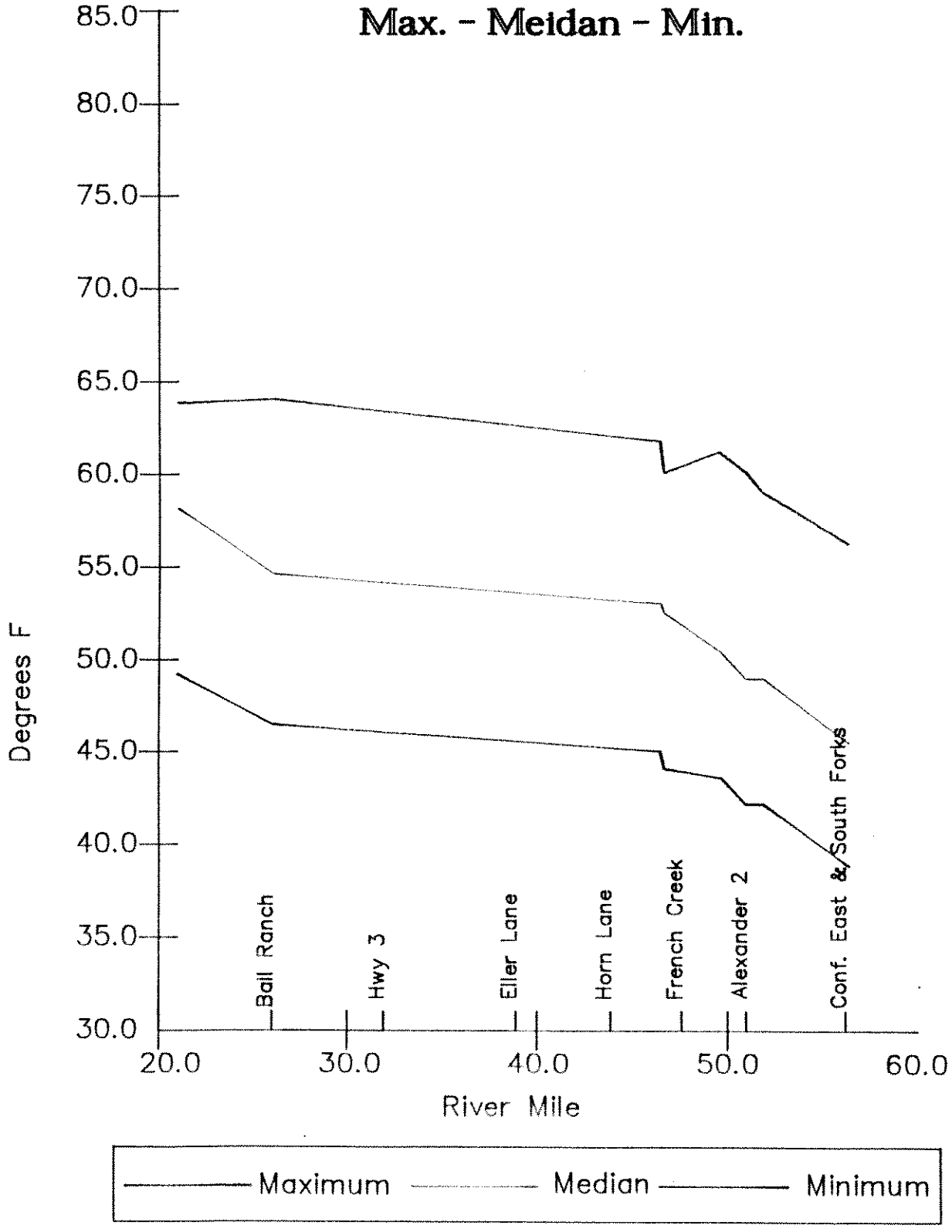
4 - Hwy3-2
3 - Hwy3-3
2 - Ball Ranch
1 - USGS

APPENDIX B
COMPARISON GRAPHS

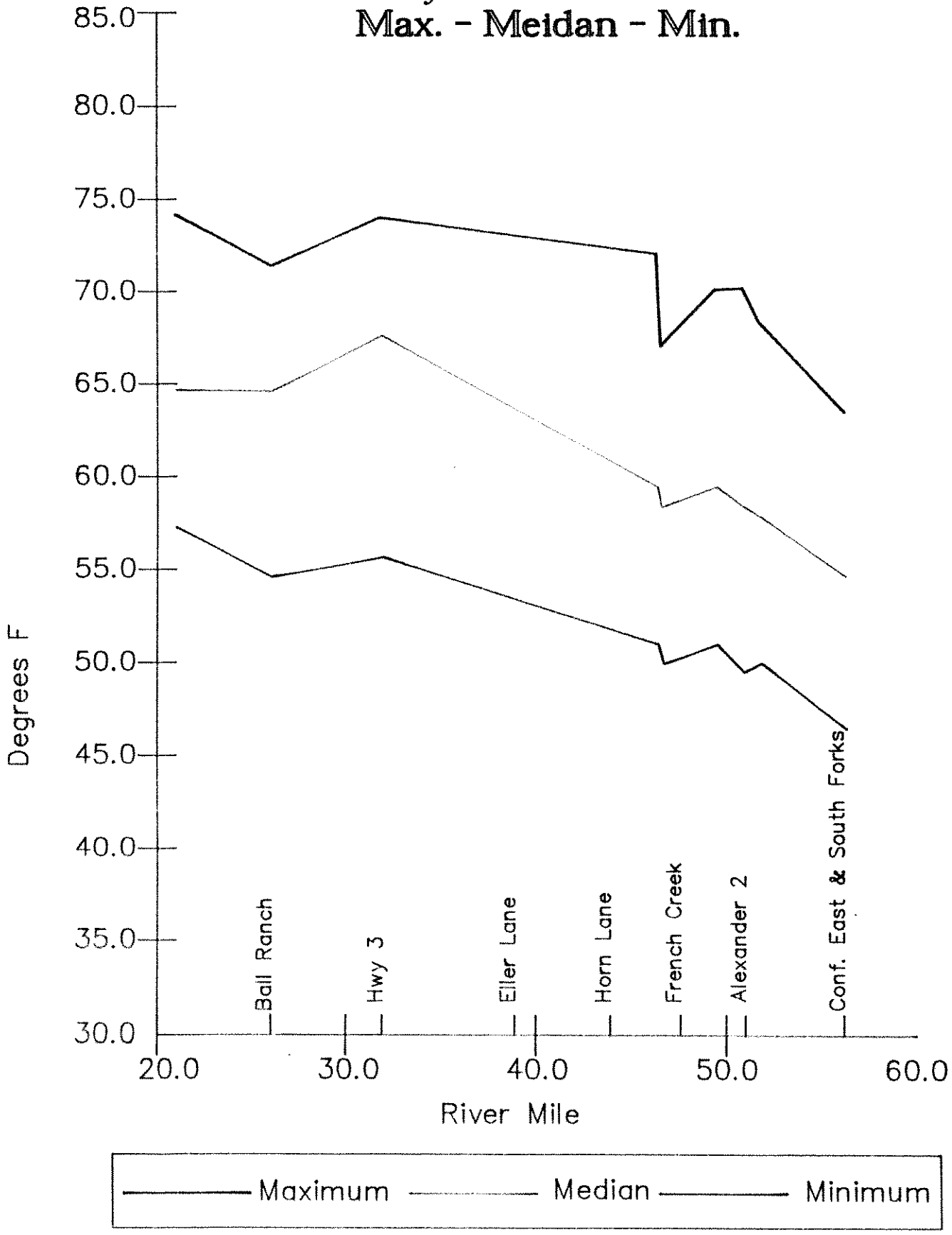
Scott River
Temperature Monitoring
June 1995
Max. - Meidan - Min.



Scott River Temperature Monitoring

July 1995

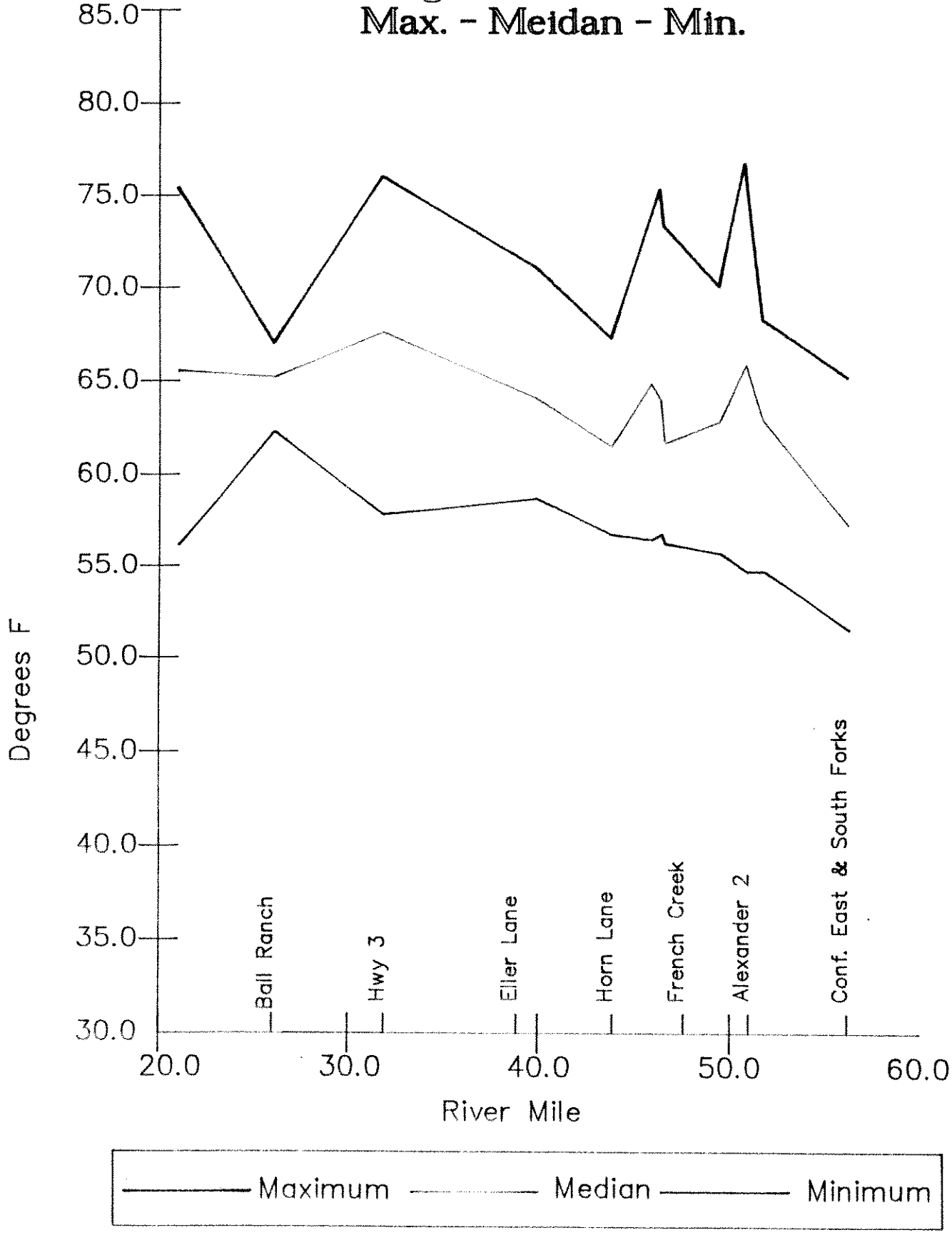
Max. - Meidan - Min.



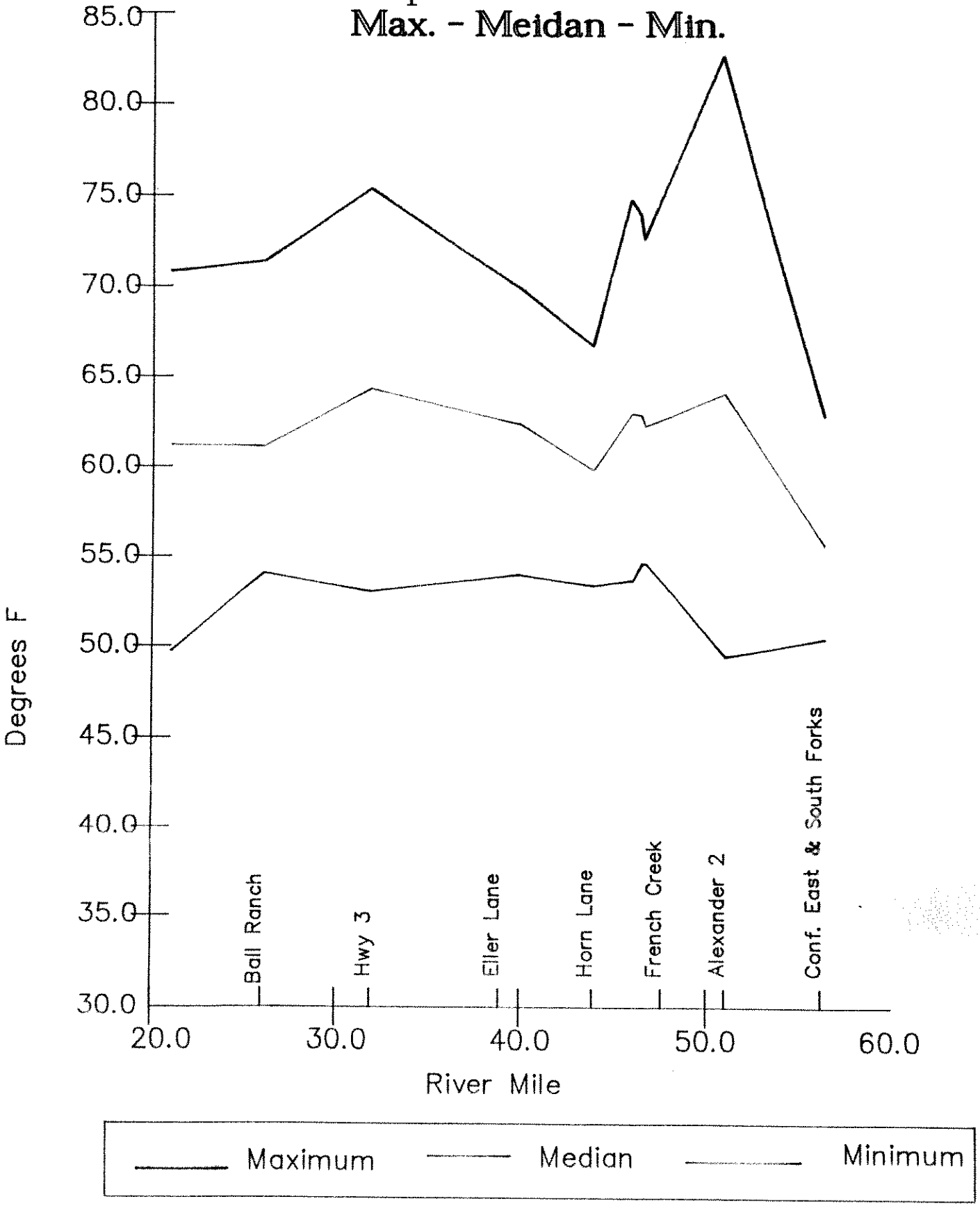
Scott River Temperature Monitoring

August 1995

Max. - Meidan - Min.

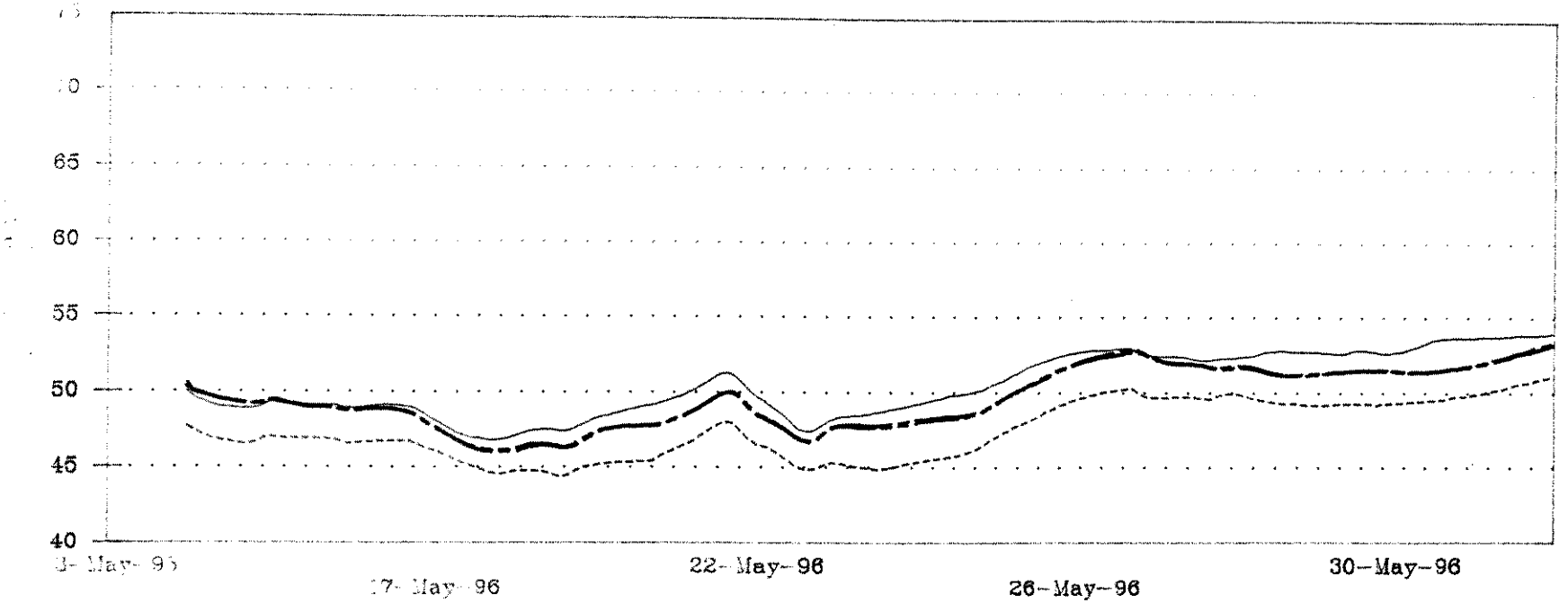


Scott River
Temperature Monitoring
September 1995
Max. - Meidan - Min.



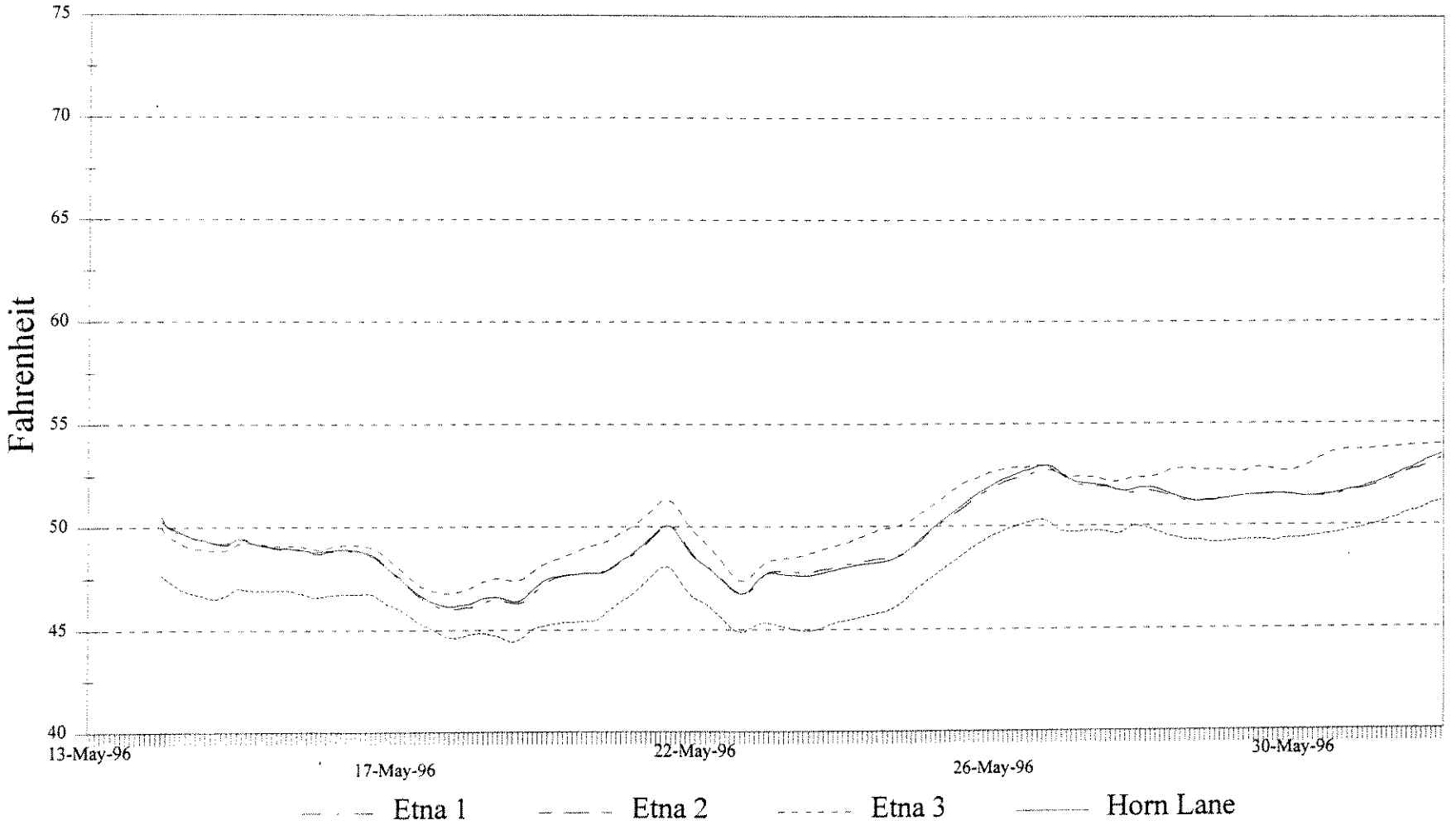
Daily Average Temperatures

Scott River - May 1996



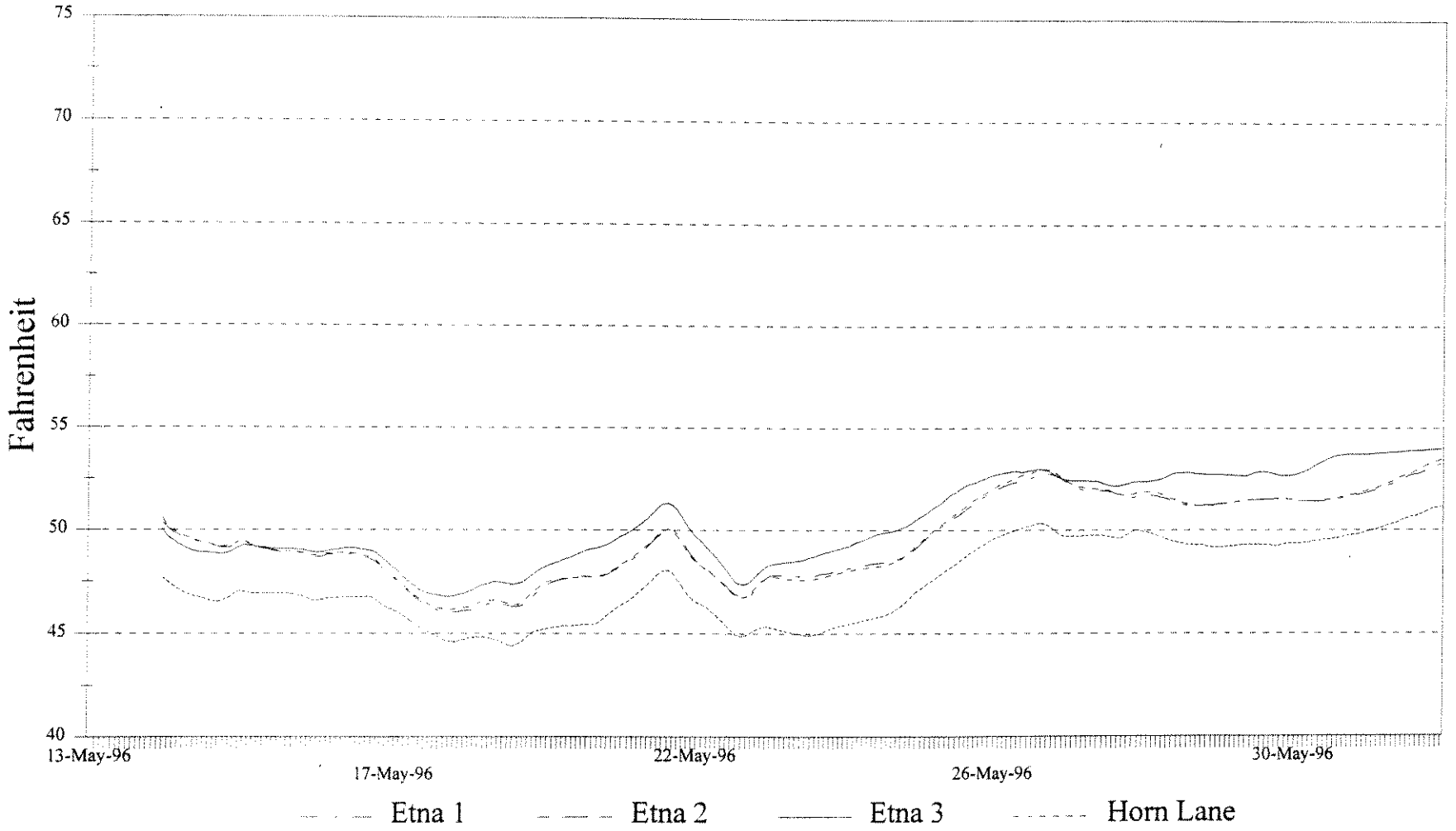
Daily Average Temperatures

Scott River - May 1996



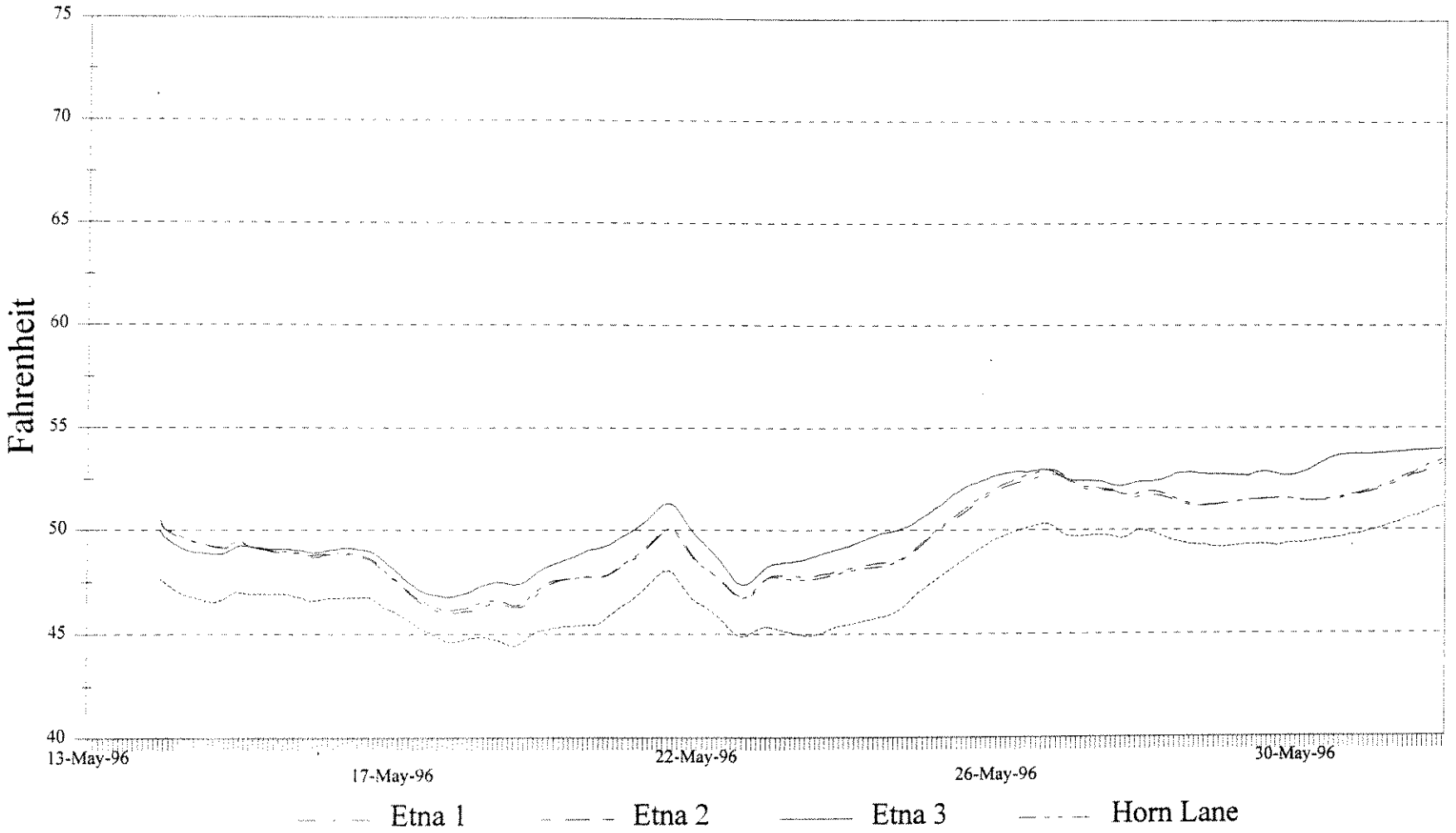
Daily Average Temperatures

Scott River - May 1996



Daily Average Temperatures

Scott River - May 1996



APPENDIX C
DATA TABLES