(F-78-R-4)

#85465

REGION 2

MONTANA DEPARTMENT OF FISH WILDLIFE AND PARKS
FISHERIES DIVISION
JOB COMPLETION REPORT

State:Montana Title:Statewide Fisheries Investigations
Project:F-46-R-4 Title:Bitterroot Forest Inventory
Job:Ij
Period Covered:July 1, 1997 to June 30, 1998

ABSTRACT

Westslope cutthroat and bull trout populations, in general, were stable at most sites on the Bitterroot National Forest. However, larger westslope cutthroat have declined at some sites. A large database of water temperature in many streams in the Bitterroot Valley has been compiled. Genetic testing of westslope cutthroat continues. Overwhich Creek contains hybrid Yellowstone x westslope cutthroat. This is the first documentation of hybridization of westslope cutthroat above Painted Rocks Reservoir. This situation has likely been present for many years.

Rainbow trout in the Bitterroot River have declined lately, but westslope cutthroat have increased at all sites in the river. It appears that catch-and-release regulations have been successful in protecting large rainbow trout in some reaches of the river. Water temperature in the Bitterroot River is similar to mid-1980's levels. The tributaries seem to have little effect on the mainstem water temperatures. The overall length of the Bitterroot River appears to be similar in 1990 to 1937.

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BACKGROUND

Monitoring of fish populations in the Bitterroot drainage has been accomplished through cooperation between the Bitterroot National Forest (BNF) and the Montana Fish, Wildlife and Parks (MFWP) since 1989.

Presently, the project has been focused on the following issues:

1. Maintaining a long term monitoring program for the fisheries of the BNF.

2. Assessing the genetic purity of westslope cutthroat and bull trout on the BNF.

3. Collecting and analyzing water temperature data throughout the Bitterroot basin.

4. Studying the trout populations of the Bitterroot River and assessing the effects of fishing regulations.

The Bitterroot National Forest (BNF) encompasses 1.6 million acres, 71% of which lies in Montana. Three mountain ranges, the Bitterroots to the west, the Sapphires to the east and the Anaconda-Pintlars to the southeast comprise the BNF. Water flowing within the BNF is excellent in quality and most is considered soft, a result of basin geology. Streams originating from the Bitterroot Mountains are unusually low in hardness and dissolved solids because of the resistant igneous and metamorphic rocks. The streams draining the Sapphire range tend to have higher dissolved solids because of slightly less resistant and more soluble background geology (Garn and Malmgren 1973). Within Montana, the BNF contains streams which are the headwaters of the Bitterroot River.

The Bitterroot River flows in a northerly direction from the confluence of the East and West Forks near Conner, Montana. The river flows 84 miles through irrigated crop and pastureland to it's confluence with the Clark Fork River near Missoula, Montana. Urbanization and associated development of the floodplain is increasing in the Bitterroot Valley (Javorsky 1994). Five major diversions and numerous smaller canals remove substantial quantities of water from the river during the irrigation season (Spoon 1987). In addition, many of the tributaries which originate on the BNF are diverted for irrigation during the summer months and contribute little streamflow to the river during that time. Therefore, many tributaries and the mainstem of the Bitterroot River are chronically dewatered during the irrigation season. Streamflow characteristics vary along the Bitterroot River with the most critically dewatered reach between Hamilton and Stevensville (Spoon 1987). To help alleviate the mainstem dewatering, the MFWP annually supervises the release of 15,000 acre-feet of water from Painted Rocks Reservoir on the West Fork of the Bitterroot River

and 3,000 acre-feet of water from Lake Como.

The Bitterroot River is an important sport fishery for trout fishermen in Western Montana. Pressure estimates from the statewide survey indicate that angling pressure on the Bitterroot River during 1995 was 69,951 fisherman days (McFarland 1996). Fishing regulations on the Bitterroot River have become more restrictive in recent years because of concern for the quality of the fishery. A five year management plan was written in 1991 to guide fishing regulations until 1996 (MDFWP 1991).

The impact of fishing on the populations of trout in the Bitterroot River is being studied. A creel census was conducted in 1992 and 1993 to assess these impacts. Overall, it indicated that fishing harvest is not having serious impacts on the populations, but that monitoring of fish populations should continue (Clancy 1993).

Since the waters of the BNF are so important to the Bitterroot River, this project was initiated to study fisheries throughout the drainage without regard to administrative boundary.

Fisheries information within the Bitterroot valley is available from a variety of sources. The Bitterroot River has been studied in relation to dewatering and the impacts of releases of Painted Rocks Reservoir water (Spoon 1987). Some midvalley tributaries that have dewatering problems, and spawning runs by Bitterroot River fish have been studied (Good 1985, Good et al 1984, Clancy 1991). Dewatering of tributary streams and the introduction of exotic species of trout were identified as being the highest risk to the recovery of bull trout in the Bitterroot drainage (MBTSG 1995).

Most of the work has been on or near the Bitterroot National Forest. Fish populations at the forest boundary, relationships between salmonids and habitat have all been addressed to some degree (Clancy 1991, 1993, Hoth 1979, Jakober 1995, Munther 1986, Odell 1985, Peters 1987, 1988, Vadeboncouer et al 1989).

OBJECTIVES AND DEGREE OF ATTAINMENT

1. Collect trout population estimates on at least 6 Bitterroot National Forest streams. These will be used as baseline monitoring data for future comparisons. Data included in this report.

3. Collect trout population estimates on 3 sections of the Bitterroot River to assess the impacts of restrictive fishing regulations. Data included in this report.

METHODS

Bitterroot National Forest

Streams for monitoring were selected based on several factors. Basin geology and degree of human development were considered so that fish populations could be studied under different levels of land management. Several streams were selected from an earlier study and were included in this study (Peters 1987, 1988, Munther 1986).

Before any fieldwork was completed the stream gradient and order were mapped from USGS 1:24,000 contour maps. Based on gradient, the general area of study was selected and approximately a 1 mile reach of this area was surveyed in the field on most streams. This primary survey consisted of counting habitat types and woody debris. Based on this survey, an 800 or 1000 foot section was selected for further intensive fish population and habitat measurements. All surveys were completed between July 15 and September 15.

When the final survey sections were selected, fish populations were enumerated on sections either 800 or 1000 feet in length. Electrofishing was conducted on some streams with a Coffelt Mark-10 backpack electrofisher, but a bank electrofishing unit was used on larger streams. Continuous DC is used at all times. A mark-recapture method was used, with the recapture run occurring within 7-14 days following marking. Mark-recapture was selected as the population estimator since it generally is more accurate than the removal method (Peterson and Cederholm 1984, Riley and Fausch 1992, Rodgers et al 1992). Individual fish were measured, weighed and marked, and larger fish were tagged with individually numbered dart tags in some streams.

Population estimates were calculated using the Mark-Recapture program which is based on the Chapman modification of the Petersen estimate (Ricker 1975).

Westslope cutthroat were collected for electrophoretic analysis on some streams. All fish were sent to the University of Montana for analysis.

The BNF Plan recommends monitoring 6 streams annually to meet the Forest objectives (USDA 1987). We have set a goal of monitoring trout populations for at least 3 years in each stream we select, to serve as a baseline for future population studies. This "pulsed" monitoring technique is necessary for assessing long term changes in fish populations (Bryant 1995). Water temperature was assessed during midsummer at numerous sites in 1993-1997. HOBO Temp temperature loggers were set out throughout the summer and fall months. At most monitoring sites, two or three summers of data were collected. Data was charted and summarized in degree days for comparison between sites. All of the known fish and habitat data that have been collected in the Bitterroot drainage (excluding Lolo Creek) have been summarized in computer databases on IBM compatible PC's.

Bitterroot River

Fish population estimates on the Bitterroot River were collected on several reaches over the past 14 years. Study reaches were selected based on historical data, flow patterns and fishing regulations. The reaches are 2.2-5.1 miles in length. Electrofishing was conducted from a 14-foot long aluminum drift boat fitted with a boom shocking system. The Petersen mark-recapture method was used to calculate population estimates (Ricker 1975). Several mark and recapture runs were required to obtain sufficient sample size to estimate fish populations. Some of the collections occurred at night to facilitate handling of more fish. The population estimates were collected during September and October each year. Brown trout may be migrating by October, therefore, their estimates may be inflated.

All data was compiled and analyzed on PC compatible computers. The software we used was DBase IV, Mark-Recapture, Harvard Graphics 2.1, WordPerfect 5.1 and Statgraphics 5.0 Plus.

RESULTS AND DISCUSSION

The study site names reflect the number of river miles from the mouth of the stream that the study site is located. For example, Gold Creek 0.3 is a study site located on Gold Creek 0.3 river miles from it's confluence with the Burnt Fork of the Bitterroot. This number has changed since previous reports at some sites. The mileages are now calculated by computer GIS files and should be more consistent. I will note any changes in reaches discussed in this report.

Stevensville District

The Burnt Fork Bitterroot River and Gold Creek were monitored within the last two years. From the data collected, the populations of westslope and bull trout are stable (Figures 1 and 2).

Burnt Fork Bitterroot River 19.2

A long term monitoring site was established at the end of the road (Burnt Fork 19.2). Population estimates have been collected during 1994 and 1996. Both westslope cutthroat and bull trout declined slightly between 1994 and 1996. At least one more population estimate should be collected to establish a baseline for this site.

Gold Creek 0.3

Gold Creek was sampled during 1990, 1991 and 1996. The 1996 westlope cutthroat estimate was similar to 1991 (Figure 1). A bull trout estimate was not collected in 1996.

Darby district

Fish were monitored in Rye, North Rye, Skalkaho, Sleeping Child and Divide Creeks on the Darby District during 1996 and 1997 (Figure 3 and 4) . The exact locations of these sites and other monitoring sites are discussed and mapped in a previous report (Clancy 1991, 1993).

Rye Creek 12.4 and North Rye Creek 1.7

Both of these sites were sampled from 1989-1991 and in 1996-1997.

The Rye Creek site is well upstream of the North Fork, and it is dominated by westslope cutthroat. Bull trout are present but very rare and one brook trout was captured in 1996. The fish at

WESTSLOPE CUTTHROAT

Stevensville Ranger District

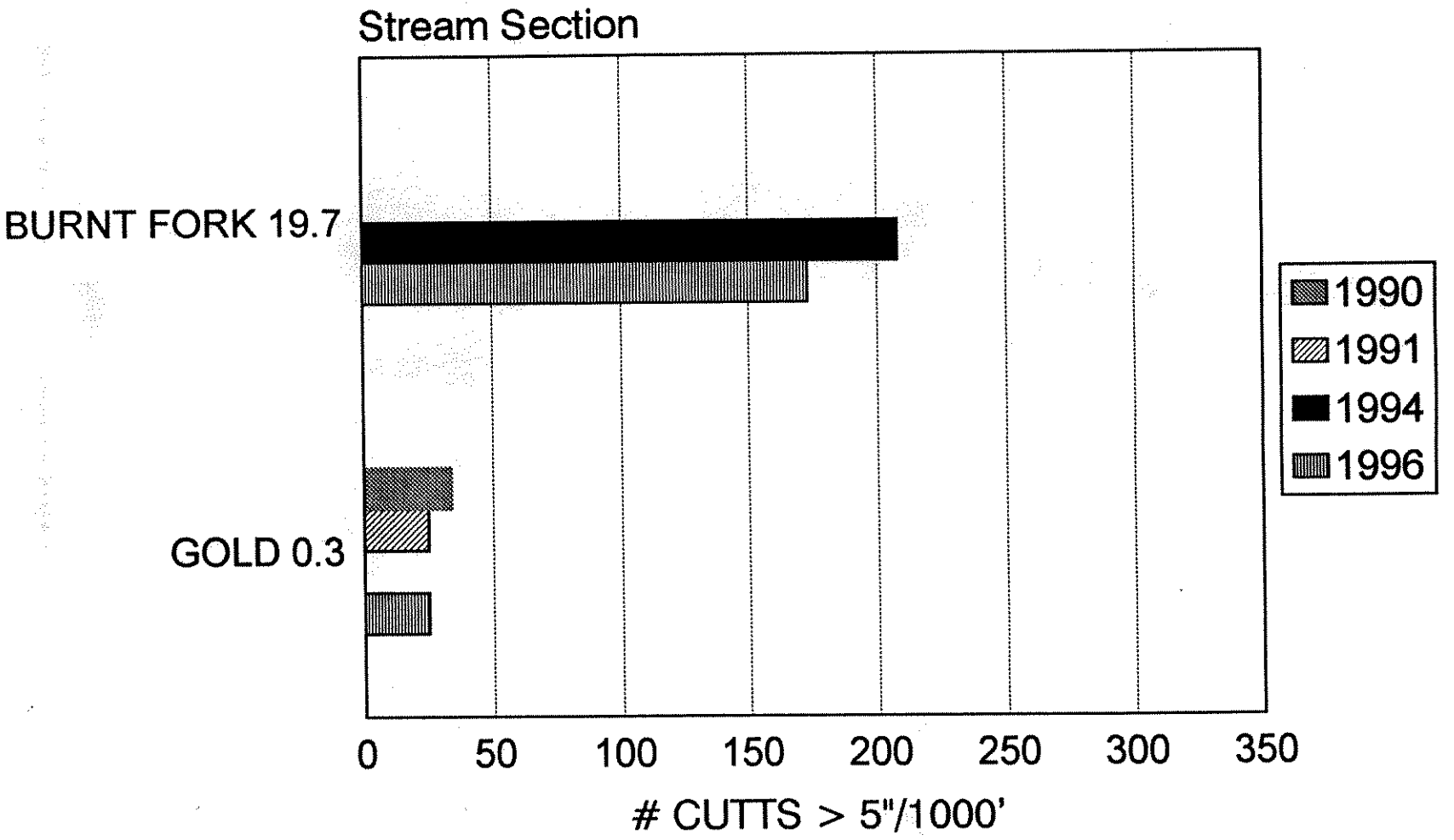


Figure 1. Population estimates of westslope cutthroat on monitoring sites on the Stevensville District.

BULL TROUT

Stevensville Ranger District

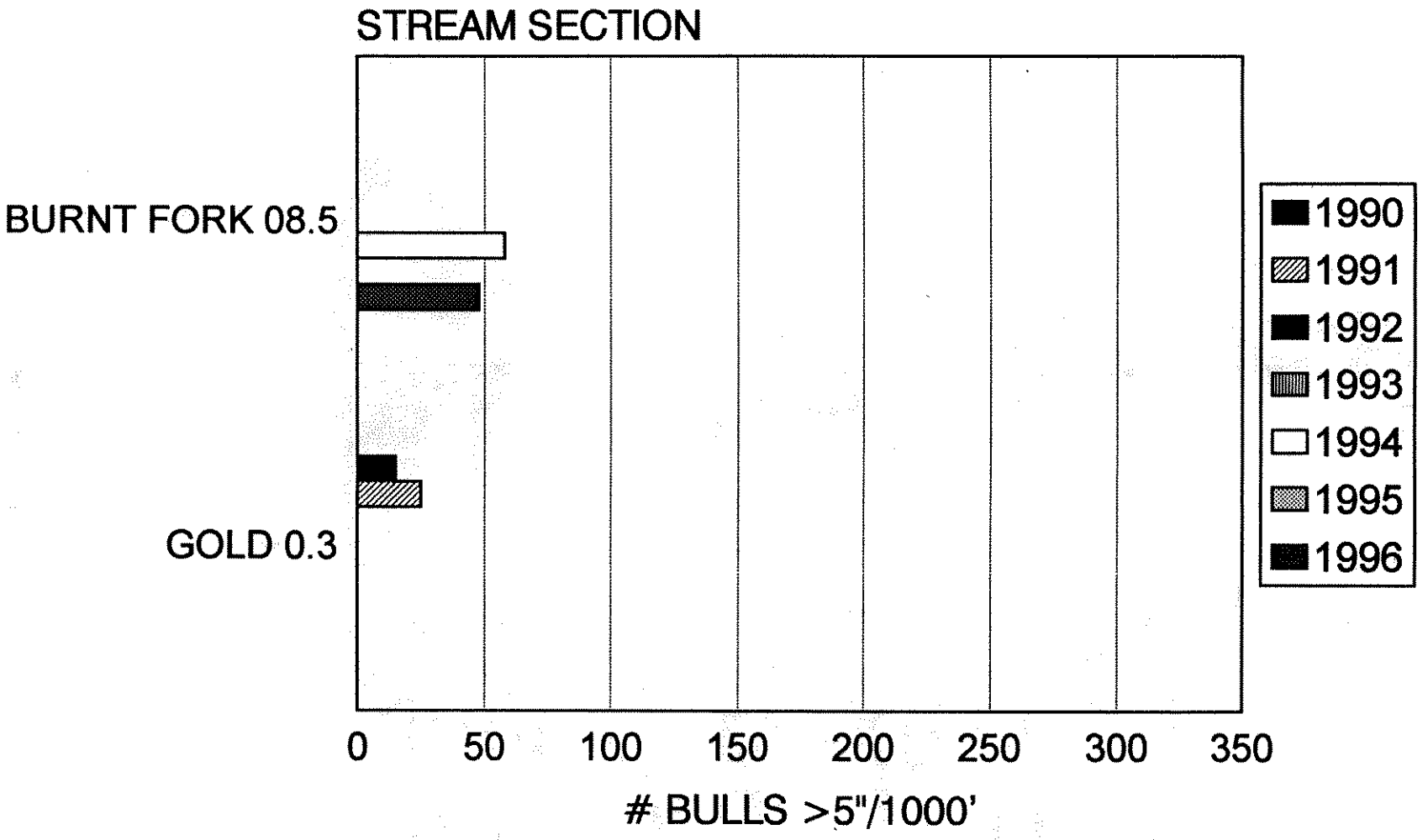


Figure 2. Population estimates of bull trout on monitoring sites on the Stevensville District.

WESTSLOPE CUTTHROAT
DARBY RANGER DISTRICT

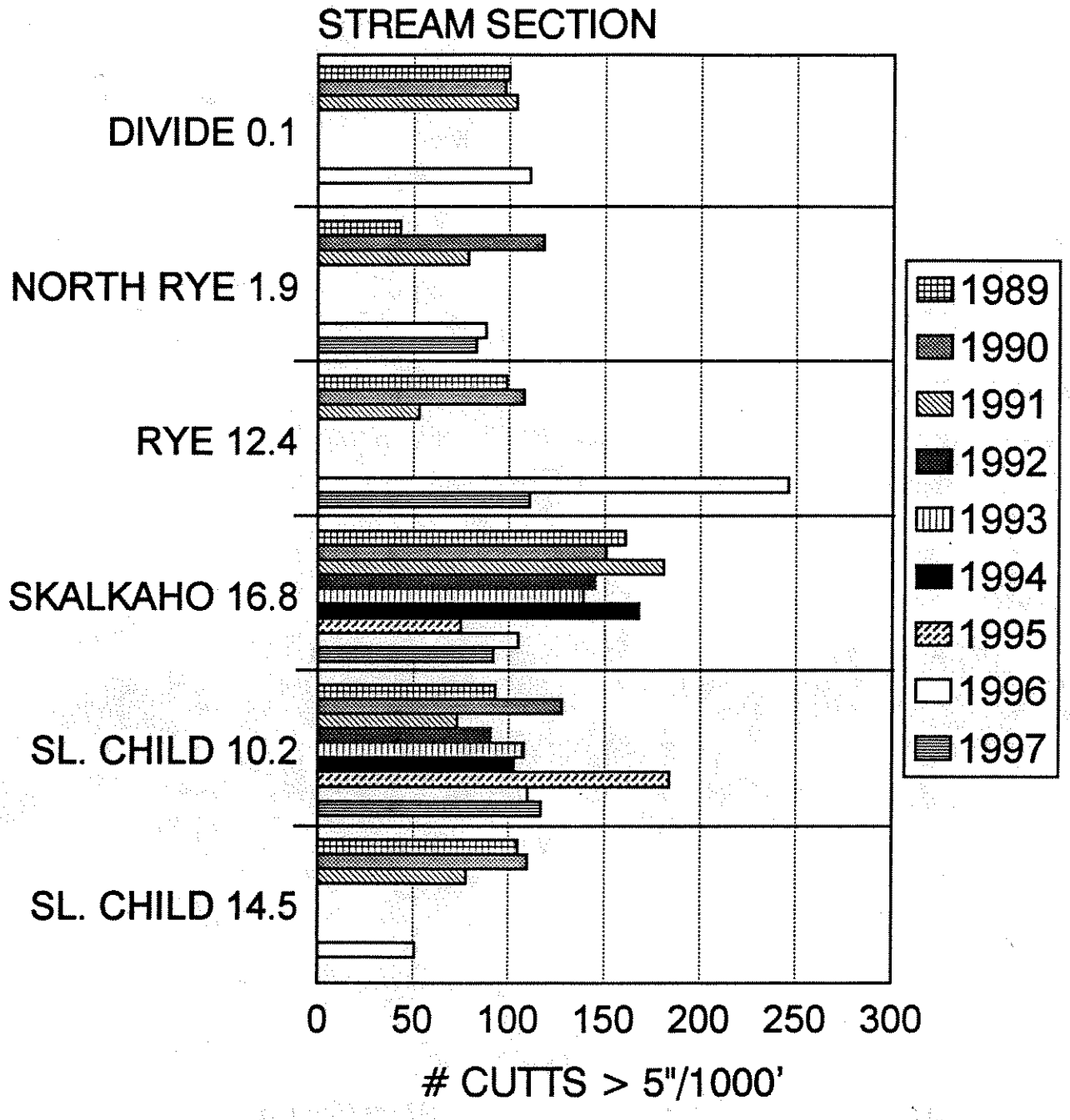


Figure 3. Population estimates of westslope cutthroat on monitoring sites on the Darby District.

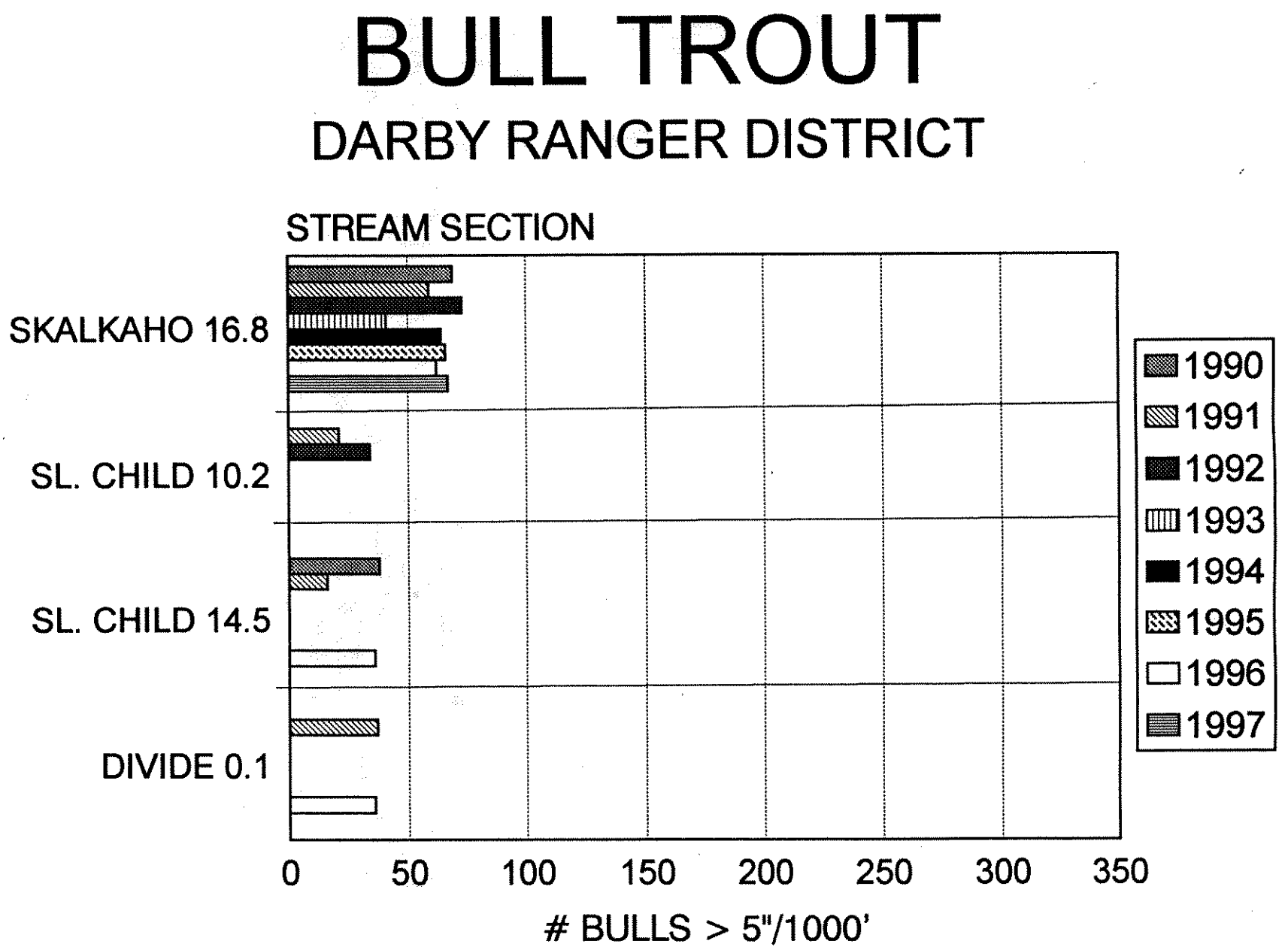


Figure 4. Population estimates of bull trout on monitoring sites on the Darby District.

this site are small with none over 7 inches. While there have been large fluctuations in the westslope cutthroat population, there is no apparent trend in the population (Figure 3).

The North Rye Creek site is dominated by westslope cutthroat but brook trout are also abundant. There is no apparent trend since monitoring began in 1989 (Figures 3 and 5).

Skalkaho Creek 16.8

A long term monitoring site (Skalkaho Creek 16.8 which was previously 15.8 in earlier reports) has been established on one site in Skalkaho Creek about 1 mile above the confluence with Daly Creek. This site has been sampled since 1989 and the populations of cutthroat trout were stable until 1995 when it was lower than any previous year (Figure 3). The population increased slightly in 1996 and 1997, but remains low in comparision with previous years. Beginning in 1998 this stream is catch-and-release for westslope cutthroat. The population of bull trout has been stable since sampling began in 1989.

Sleeping Child and Divide Creeks

A long term monitoring site has been established at Sleeping Child Creek 10.2, immediately upstream of the hot springs (Sleeping Child 9.3 in previous reports). There is no apparent trend in the total number of westslope cutthroat at this site, but the number of larger fish has decreased (Figure 6). This may be due to fishing harvest. Due to the low number of bull trout in this reach, statistically valid population estimates have only been collected in two years, 1991 and 1992.

Monitoring sites on Divide Creek and Sleeping Child Creek just above the mouth of Divide Creek were censused in 1996. These sites had not been censused since 1991 (Figure). At both sites the bull trout population estimate is similar to the previous estimates. The westslope cutthroat estimate on Divide Creek is similar to previous estimates, but the estimate on Sleeping Child 14.5 is lower than previous estimates. The reason for this decline is unknown.

Sula District

Streams where fish populations were monitored during 1996 and 1997 on the Sula District were Martin Creek, Moose Creek, Meadow Creek and Tolan Creek. Population estimates at these monitoring sites on the Sula District are summarized in Figures 7 and 8.

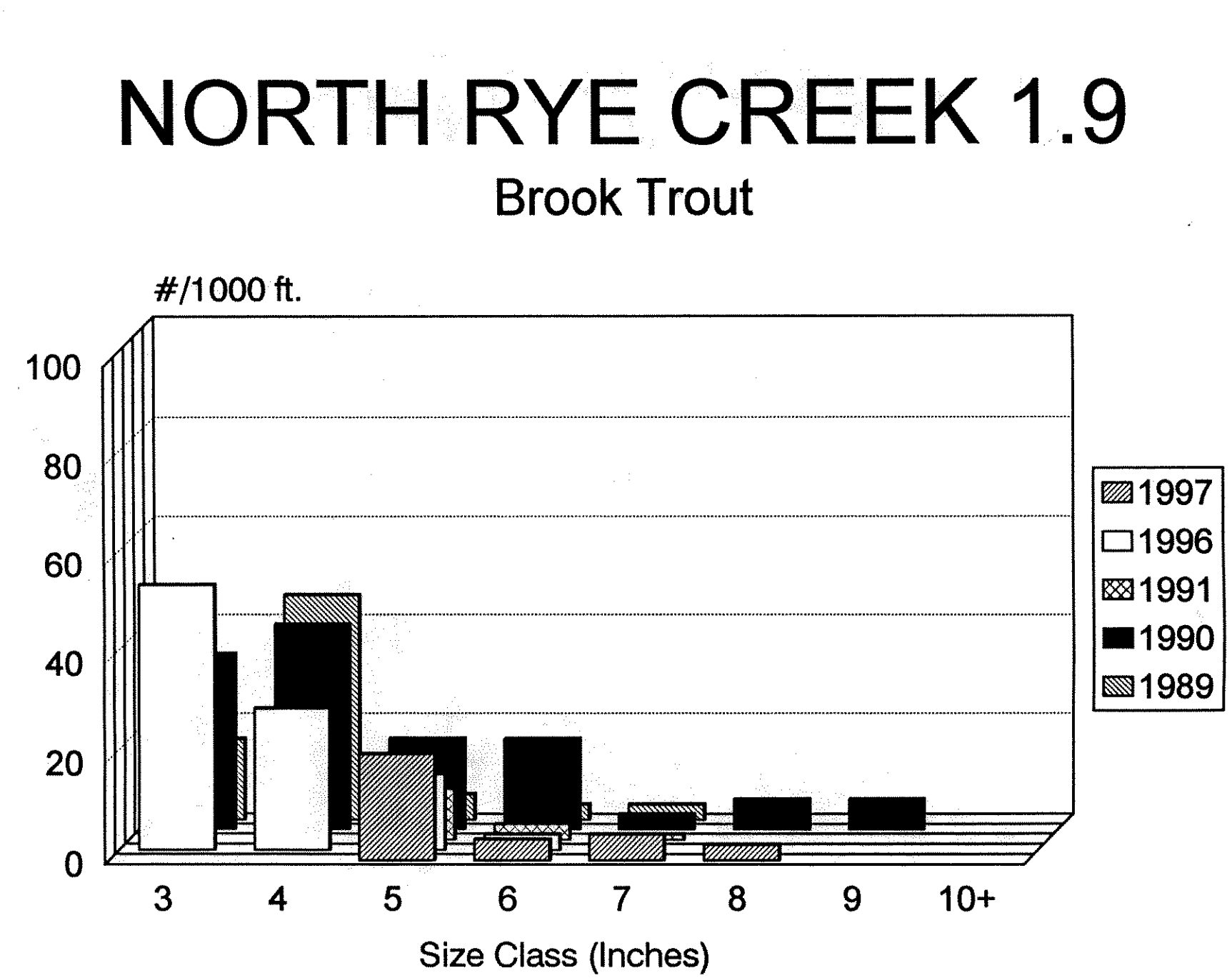


Figure 5. Brook trout population estimates by inch class on the North Rye Creek monitoring site.

SLEEPING CHILD CREEK 10.2

WESTSLOPE CUTTHROAT

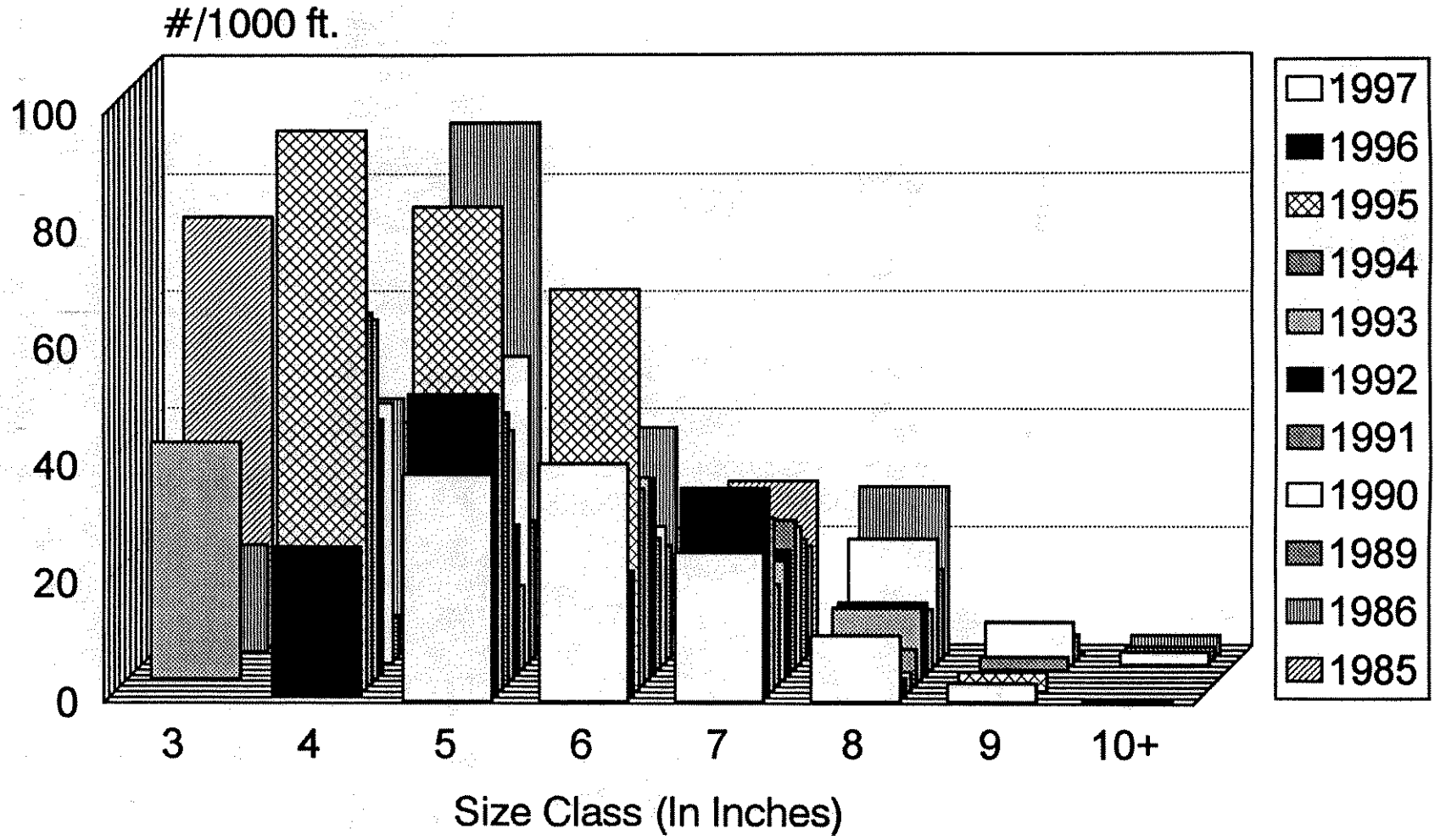


Figure 6. Population estimates by inch class on the Sleeping Child Creek 10.2 monitoring site.

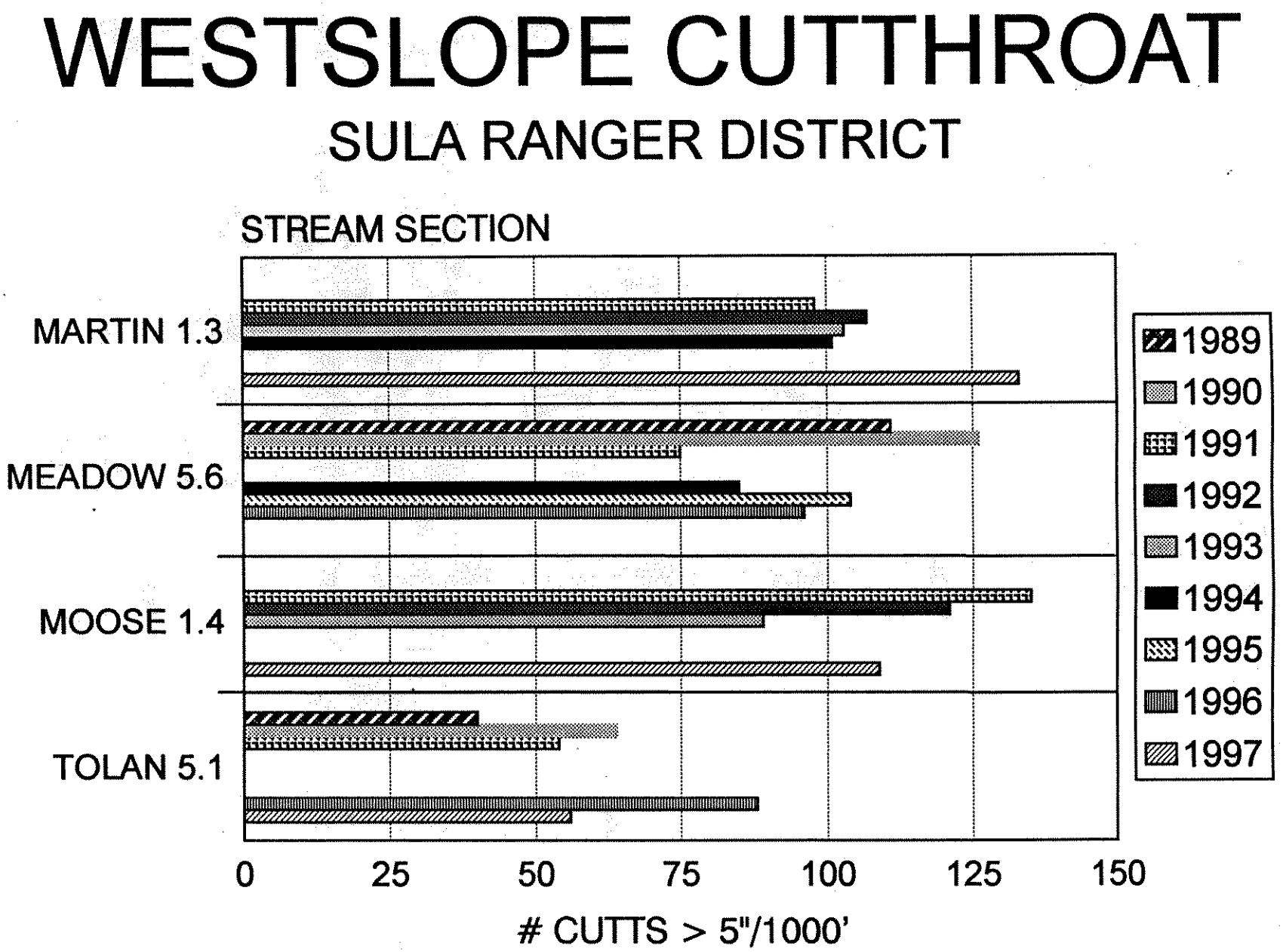


Figure 7. Population estimates of westslope cutthroat on monitoring sites on the Sula District.

BULL TROUT

SULA RANGER DISTRICT

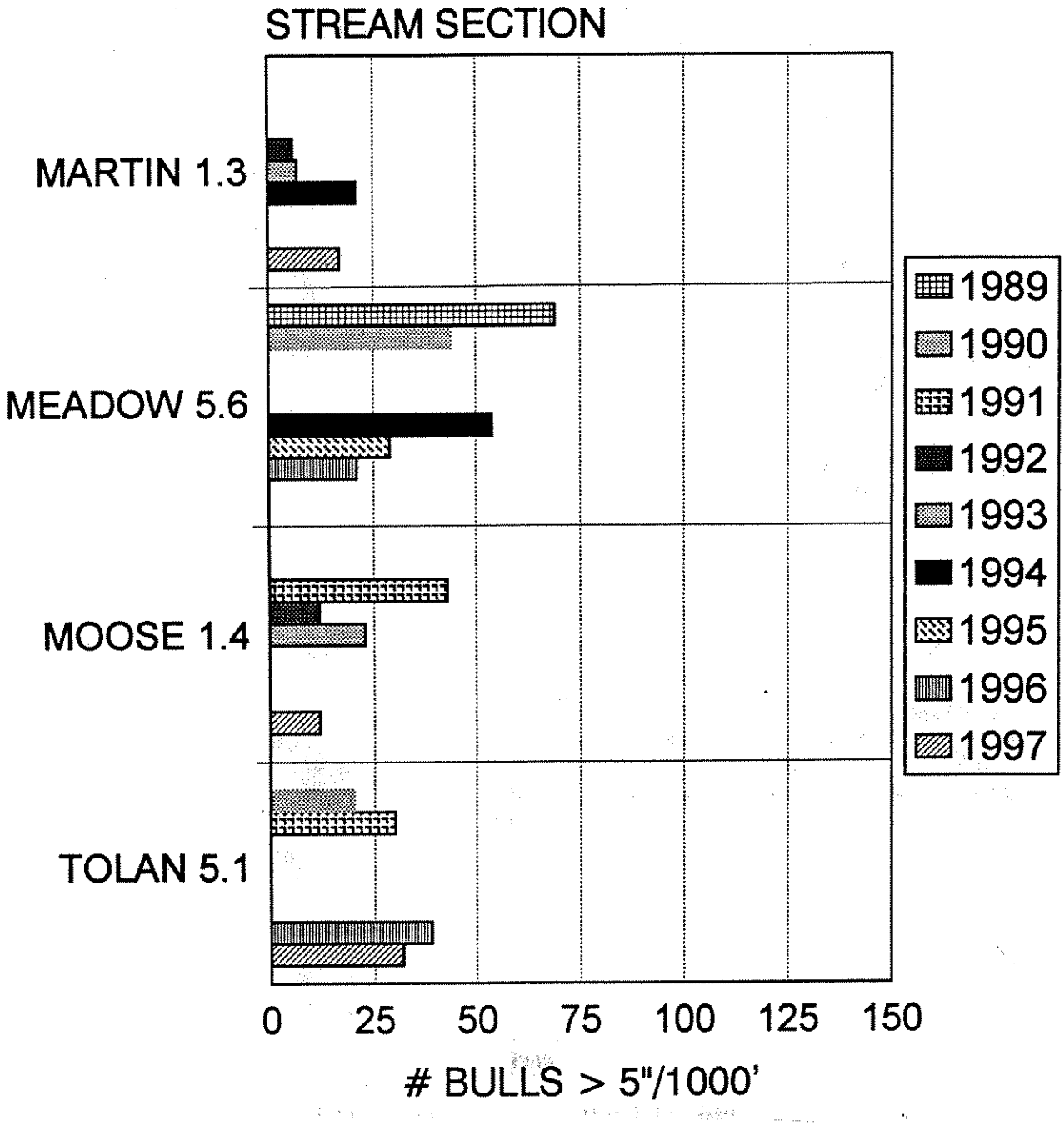


Figure 8. Population estimates of bull trout on monitoring sites on the Sula District.

Martin Creek 1.3

The 1997 population estimate at this site for westslope cutthroat trout was higher than the three previous estimates collected in 1991-1994. The number of larger (7"+) was higher than previous estimates. The bull trout estimate in 1997 was above the mean of the three previous estimates.

Moose Creek 1.4

The population estimate for westslope cutthroat trout in 1997 was near the mean of the three previous estimates in 1991-1993, however the number of larger fish is lower than in previous estimates. The bull trout estimates have fluctuated.

Tolan Creek 5.1

The overall population of westslope cutthroat was similar in 1996-1997 to previous estimates during 1989-1991. The number of larger westslope cutthroat was within the normal range in 1996, but much lower in 1997. The population of bull trout has not changed significantly since sampling began.

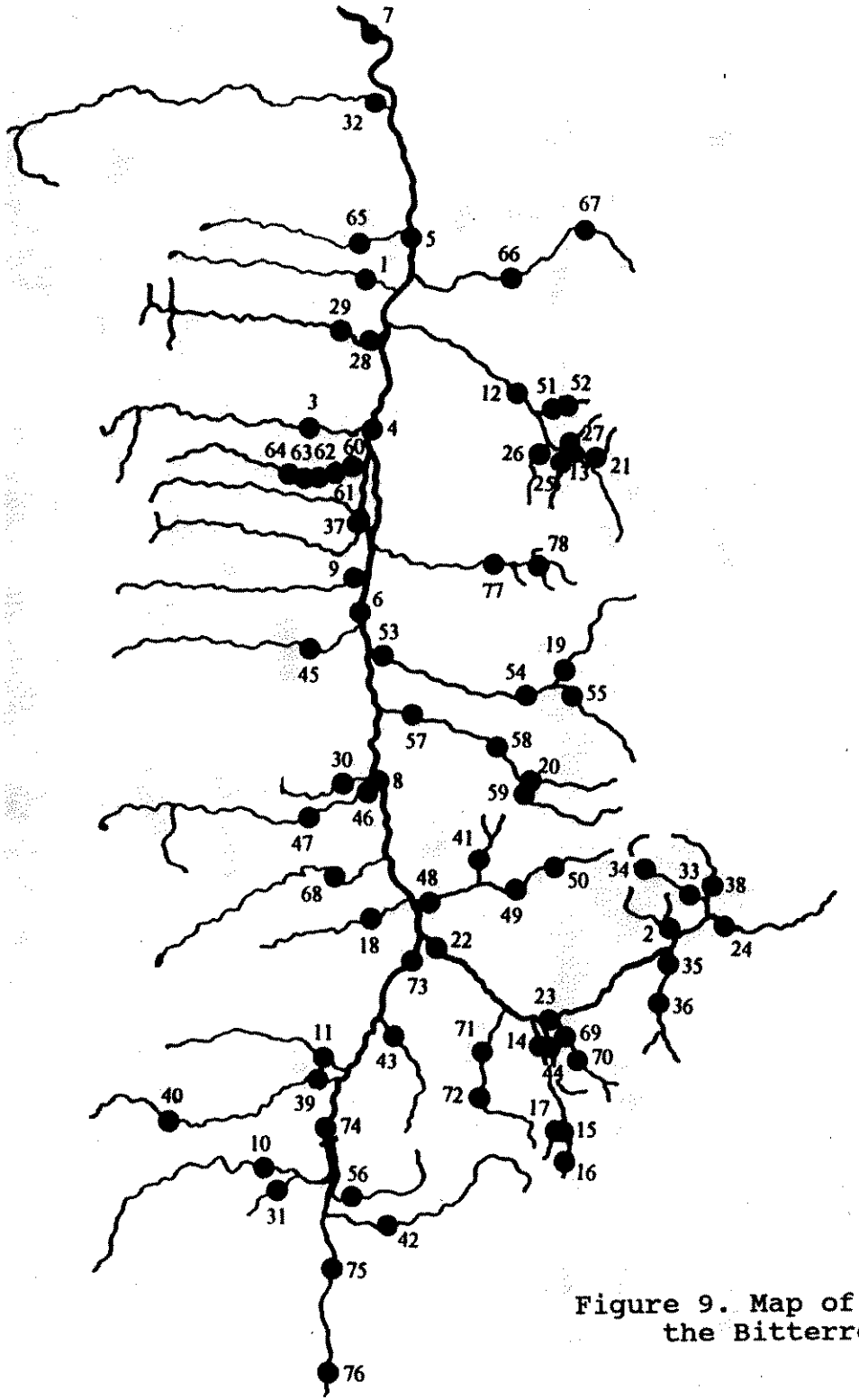
West Fork district

No long term monitoring sites were censused in 1996 or 1997 on the West Fork District.

Water Temperature

During the summer of 1993-1997 we recorded water temperature with HOBO Temp temperature loggers and Optic Stowaways at between 17and 60 sites each year. Most of the sites were on the BNF, but in the past two years, additional sites on private land have been measured (Figure 9). During all years temperature was monitored between mid-July and mid-October. These temperature recorders will be useful for monitoring long term trends in water temperature on Bitterroot drainage streams.

One way to compare the water temperature at the different sites is to use a measure called degree days. Degree days are calculated for each day by averaging the temperature for that day. For example, if the average temperature for a certain day is 12 degrees C, then that days measurement is 12 degree days. The degree days between July 19 and October 15 were summed (Table 1). This data will serve as a baseline for comparisons in the future.



1 Bass Creek 3.2
2 Bertie Lord Creek 0.1
3 Big Creek 6.1
4 Bitterroot River (@ Bell Xing)
5 Bitterroot River (@ Florence)
6 Bitterroot River (@ Hamilton)
7 Bitterroot River (@ Missoula)
8 Bitterroot River (@ Wally Crawford)
9 Blodgett Creek 0.1
10 Blue Joint Creek 05.9
11 Boulder Creek 2.0
12 Burnt Fork Bitterroot River 11.0
13 Burnt Fork Bitterroot River 19.7
14 Camp Creek 2.0
15 Camp Creek, East Fork 0.1
16 Camp Creek, East Fork 4.3
17 Camp Creek, West Fork 0.1
18 Chaffin Creek 3.1
19 Daly Creek 0.7
20 Divide Creek 0.1
21 Eagle Point Creek 0.1
22 East Fork Bitterroot River 00.5
23 East Fork Bitterroot River 17.8
24 East Fork Bitterroot River 31.4
25 Flat Rock Creek 0.1
26 Gold Creek 0.3
27 Grizzly Creek 0.1
28 Kootenai Creek 0.4
29 Kootenai Creek 3.1
30 Lick Creek 1.9
31 Little Blue Joint Creek 1.5
32 Lolo Creek 1.2
33 Martin Creek 1.3
34 Martin Creek 7.5
35 Meadow Creek 0.3
36 Meadow Creek 5.6
37 Mill Creek 0.1
38 Moose Creek 1.4
39 Nez Perce Fork 01.7
40 Nez Perce Fork 11.0
41 North Rye Creek 1.9
42 Overwhich Creek 05.0
43 Piquett Creek 1.3
44 Reimel Creek 2.3
45 Roaring Lion Creek 4.3
46 Rock Creek 0.2
47 Rock Creek 7.7
48 Rye Creek 0.3
49 Rye Creek 09.1
50 Rye Creek 12.4
51 Sawmill Creek 0.9
52 Sawmill Creek 1.3
53 Skalkaho Creek 00.6
54 Skalkaho Creek 13.1
55 Skalkaho Creek 16.8
56 Slate Creek 1.6
57 Sleeping Child Creek 01.8
58 Sleeping Child Creek 10.2
59 Sleeping Child Creek 14.5
60 Sweathouse Creek 0.1
61 Sweathouse Creek 2.3
62 Sweathouse Creek 3.6
63 Sweathouse Creek 4.7
64 Sweathouse Creek 5.7
65 Sweeney Creek 4.8
66 Threemile Creek 05.7
67 Threemile Creek 12.4
68 Tincup Creek 05.0
69 Tolan Creek 2.1
70 Tolan Creek 5.1
71 Warm Springs Creek 03.5
72 Warm Springs Creek 07.4
73 West Fork Bitterroot River 01.2
74 West Fork Bitterroot River 22.2
75 West Fork Bitterroot River 34.0
76 West Fork Bitterroot River 40.0
77 Willow Creek 12.0
78 Willow Creek 14.1

Figure 9. Map of water temperature monitoring sites in streams of the Bitterroot Valley between 1993-1997.

DEGREE DAYS

Table 1. Degree days between 7/18 and 10/1 in monitored streams during 1993-1997.

STREAM	DEGDAY93	DEGDAY94	DEGDAY95	DEGDAY96	DEGDAY9
BASS CREEK 3.2	0	0	0	760	0
BERTIE LORD CREEK 0.2	0	0	762	707	0
BIG CREEK 6.1	0	0	0	846	0
BITTERROOT RIVER, BELL XING	0	0	0	946	1,208
BITTERROOT RIVER, FLORENCE	0	0	0	1,230	1,222
BITTERROOT RIVER, HAMILTON	0	0	1,153	1,038	0
BITTERROOT RIVER, MISSOULA	0	0	0	745	1,249
BITTERROOT RIVER, WALLY CRAWFORD	0	0	0	1,056	1,100
BLODGETT CREEK 0.1	0	0	0	0	1,052
BLUE JOINT CREEK 05.9	0	826	739	702	774
BOULDER CREEK 2.0	0	873	0	0	0
BURNT FORK BITTERROOT RIVER 00.0	0	0	709	0	0
BURNT FORK BITTERROOT RIVER 08.5	0	684	564	573	632
CAMP CREEK 2.0	0	0	0	852	915
CAMP CREEK, EAST FORK 0.1	0	0	0	677	717
CAMP CREEK, EAST FORK 4.3	0	0	0	0	426
CAMP CREEK, WEST FORK 0.1	0	0	0	610	662
CHAFFIN CREEK 3.2	0	831	0	0	0
DALY CREEK 0.7	0	676	602	590	629
DIVIDE CREEK 0.1	0	718	686	593	0
EAGLE POINT CREEK 0.1	0	0	0	0	581
EAST FORK BITTERROOT RIVER 00.5	0	0	1,031	1,012	1,061
EAST FORK BITTERROOT RIVER 17.8	0	998	880	828	869
EAST FORK BITTERROOT RIVER 31.4	608	762	674	617	0
FLAT ROCK CREEK 0.1	0	0	0	0	510
GOLD CREEK 0.3	0	0	0	0	542
GRIZZLY CREEK 0.1	0	0	0	0	581

DEGREE DAYS

Total Degree Days for 74 days from 7/18 to 10/1

STREAM	DEGDAY93	DEGDAY94	DEGDAY95	DEGDAY96	DEGDAY9
KOOTENAI CREEK 0.4	0	0	0	0	966
KOOTENAI CREEK 3.1	0	0	0	796	0
LICK CREEK 1.9 (DARBY RD)	553	871	0	0	0
LITTLE BLUE JOINT CREEK 1.5	0	0	616	0	0
LOLO CREEK 1.2	0	0	0	0	1,042
LOST HORSE CREEK 01.9	0	0	0	995	0
LOST HORSE CREEK 09.7	0	0	0	867	0
MARTIN CREEK 1.3	621	812	699	655	706
MARTIN CREEK 7.5	0	675	0	0	0
MEADOW CREEK 0.3	0	765	671	641	0
MEADOW CREEK 5.6	0	623	535	503	554
MILL CREEK 0.1	0	0	0	0	1,134
MOOSE CREEK 1.4 (SULA RD)	593	772	658	617	678
NEZ PERCE FORK 01.7	0	0	0	789	0
NEZ PERCE FORK 11.0	0	0	0	682	0
NORTH RYE CREEK 1.9	660	816	768	742	822
OVERWHICH CREEK 05.0	0	0	687	0	0
PIQUETT CREEK 1.3	0	799	0	0	0
REIMEL CREEK 3.8	0	756	0	0	0
ROCK CREEK 0.1 (DARBY RD)	0	0	0	0	1,057
ROCK CREEK 7.7 (DARBY RD)	0	0	0	855	0
RYE CREEK 0.3	0	0	0	0	1,123
RYE CREEK 09.1	0	0	792	0	800
RYE CREEK 12.4	561	755	655	620	700
SAWMILL CREEK 0.9	0	0	0	0	765
SAWMILL CREEK 1.3	0	0	0	0	722
SKALKAHO CREEK 00.6	0	0	1,038	1,022	1,077

DEGREE DAYS

Total Degree Days for 74 days from 7/18 to 10/1

STREAM	DEGDAY93	DEGDAY94	DEGDAY95	DEGDAY96	DEGDAY
SKALKAHO CREEK 13.1	599	767	657	661	688
SKALKAHO CREEK 16.8	0	705	631	615	0
SKALKAHO CREEK 20.6	514	0	0	0	0
SLATE CREEK 1.6	0	717	0	0	0
SLEEPING CHILD CREEK 00.1	0	0	0	0	998
SLEEPING CHILD CREEK 01.9	0	1,118	973	938	0
SLEEPING CHILD CREEK 10.2	656	884	757	742	801
SLEEPING CHILD CREEK 14.5	0	0	622	653	0
SWEATHOUSE CREEK 0.1	0	0	1,145	1,081	1,123
SWEATHOUSE CREEK 2.3	0	0	0	938	0
SWEATHOUSE CREEK 3.6	0	0	0	824	0
SWEATHOUSE CREEK 4.7	0	0	0	748	0
SWEATHOUSE CREEK 5.7	0	850	0	688	0
SWEENEY CREEK 4.8	0	0	0	771	0
THREEMILE CREEK 03.9	0	1,083	0	0	0
THREEMILE CREEK 12.4	0	0	643	0	0
TINCUP CREEK 07.2	0	981	0	808	856
TOLAN CREEK 2.1	0	680	0	0	0
TOLAN CREEK 5.1	449	575	0	481	546
WARM SPRINGS CREEK 03.5	0	793	687	654	727
WARM SPRINGS CREEK 07.4	0	671	603	594	0
WEST FORK BITTERROOT RIVER 01.2	0	0	1,001	939	1,018
WEST FORK BITTERROOT RIVER 22.2	0	0	922	825	0
WEST FORK BITTERROOT RIVER 34.0	0	912	769	699	761
WEST FORK BITTERROOT RIVER 40.0	0	656	563	542	602
WILLOW CREEK 12.1	0	0	652	0	0
WILLOW CREEK 14.1	0	0	556	0	0

Genetic testing

Westslope cutthroat trout from 72 sites on 55 streams have been tested for genetic purity at the University of Montana (Table 2). Of the 72 sites, westslope cutthroat from 55 have been pure strain. This testing will continue as we attempt to identify the locations of pure strain populations of westslope cutthroat. Bull trout are not being tested, but are identified visually (Clancy 1993). While most of the sample sizes are too small for absolute statistical certainty, data indicates most of the populations in the Sapphire range on the east side of the valley and in the East and West Fork drainages are pure westslope cutthroat. The introgressed populations are typically located in the Bitterroot range on the west side of the valley. The occurrence of Yellowstone Cutthroat hybrids in Overwhich Creek is the first example of introgression above Painted Rocks Reservoir.

Very few fish from the Bitterroot River have been sampled. During field sampling in 1998, we will collect more samples from the Bitterroot River.

Table 2. Results of electrophoretic testing of westslope cutthroat trout populations in selected streams.

Stream	Location	Sample Size	Year	Status
Ambrose Creek	T9N,R18W,S18	6	1994	1
Bass Creek	T10N,R20W,S33	11	1984	3
	T10N,R21W,S34	2	1995	1,3*
Bear Creek	T7N,R21W,S7	11	1991	2
Beaver Creek	T4S,R22W,S4	4	1992	1
	T4S,R22W,S5	11	1995	1**
Big Creek	T8N,R21W,S10	5	1992	2
Bitterroot River	T4N,R20W,S35	4	1996	1**
Blodgett Creek	T6N,R21W,S17	6	1994	2
	T6N,R22W,S13	9	1994	2
	T6N,R22W,S16	12	1994	2
Bluejoint Creek		5	1987	1
	T2S,R23W,S2	10	1994	1
	T2S,R23W,S4	6	1994	1
Boulder Creek	T1N,R21W,S18	12	1994	1**
	T1N,R22W,S3	17	1996	1**
Burnt Fork Bitt.	T8N,R19W,S14	8	1994	1
	T7N,R18W,S5	14	1994	1
Cameron Creek	T2N,R19W,S11	7	1994	1
Camp Creek	T1S,R19W,S21	5	1994	1
Canyon Creek	T6N,R21W,S29	10	1994	?
Chaffin Creek	T2N,R21W,S3	15	1990	1
Chicken Creek	T2S,R23W,S36	10	1995	1
Coal Creek	T2S,R22W,S16	15	1990	1
	T2S,R22W,S16	11	1994	1
Daly Creek	T5N,R18W,S19	10	1994	1
E. Fk. Bitterroot	T2N,R18W,S24	6	1995	1***
Fred Burr	T7N,R21W,S21	12	1991	1
	T7N,R22W,S14	7	1991	1
Gold Creek	T7N,R19W,S1	30	1985, 1990	1
Hughes Creek	T3S,R22W,S2	12	1994	1
Kootenai Creek	T9N,R21W,S14	10	1994	1
Laird Creek	T1N,R20W,S10	8	1995	1
Lick Creek	T4N,R21W,S21	1	1992	1
Little Bluejoint Ck	T2S,R22W,S5	8	1994	1
	T2S,R22W,S4	10	1995	1
Little Boulder Ck	T1S,R22W,S26	4	1994	1
Lost Horse Creek	T4N,R22W,S11	12	1994	2
Martin Creek	TN2,R17W,S16	25	1985	1
Maynard Creek	T1N,R19W,S18	10	1995	2
Meadow Creek	T1N,R18W,S10	21	1989	1
Mill Creek	T6N,R21W,S4	14	1991	2
Moose Creek	T2N,R17W,S17	25	1985	1
Nez Perce Fork	T1S,R22W,S7	6	1994	1
	T1S,R22W,S18	6	1994	1
North Rye Creek	T3N,R20W,S24	8	1990	1

Overwhich Creek	T2S,R20W,S34	9	1996	3
Piquett Creek	T1N,R21W,S10	15	1990	1
Railroad Creek	T5N,R18W,S29	1	1992	1
Reimel Creek	T1N,R19W,S15	2	1992	1
	T1N,R19W,S35	3	1992	1
Roaring Lion Creek	T5N,R21W,S16	11	1994	1
Rye Creek	T3N,R20W,S31		1985	1
	T3N,R20W,S25	10	1994	1
Sawtooth Creek	T5N,R21W,S9	10	1994	1
Sheafman Creek	T7N,R21W,S30	21	1991	3
Skalkaho Creek	T5N,R18W,S19	15	1991	1
	T5N,R19W,S27	10	1994	1
Slate Creek	T2S,R22W,S1	13	1991	1
	T2S,R22W,S1	11	1994	1
Sleeping Child Ck.	T4N,R19W,S2			
	T4N,R19W,S28	42	1985, 1989	1
So. Fk. Lost Horse	T4N,R22W,S14	12	1994	2
Sweathouse Creek	T8N,R21W,S19	12	1991	3
Threemile Creek	T10N,R18W,S18	10	1994	1
Tincup Creek	T3N,R21W,S17	50	1982	2
	T3N,R22W,S32	10	1992	2,3
Trapper Creek	T2N,R21W,S21	13	1992	2
Warm Springs Creek	T1N,R20W,S14	5	1990	2
	T1N,R20W,S27	11	1994	1
West Creek	T2S,R22W,S27	10	1995	1
West Fk. Bitt.	T3S,R22W,S9	3	1992	1
	T3S,R22W,S9	13	1991	1
	T2S,R22W,S27	16	1994	1
Willow Creek	T6N,R19W,S10	5	1990	1
Woods Creek	T3S,R22W,S21	10	1995	1

1 = pure westslope cutthroat
2 = hybridized with rainbow trout
3 = hybridized with Yellowstone cutthroat
* = Bass Creek 1995 - one pure westslope and one pure Yellowstone
**= 1 locus characteristic of westslope and rainbow - assume pure westslope until further sampling
***= East Fork Bitterroot 1995 - 5 pure westslope and 1 pure rainbow

Bitterroot River

During 1996 and 1997, population estimates were collected on the Stevensville, Bell Crossing, Wally Crawford, Darby and Hannon Memorial sections of the Bitterroot River, the Conner section of the West Fork and the Below Maynard section of the East Fork (Figure 10). The following discussion focuses on rainbow trout and westslope cutthroat and not brown trout because population estimates are collected in September, at which time brown trout appear to be migrating. Since this migration causes inaccuracies in the estimates, I will not use them for analysis.

The population estimates of rainbow trout per mile in four sections of the Bitterroot River indicate a general decline in the past few years (Figure 11). For westslope cutthroat, population estimates are not available for as many years, so a rough comparison over the years can be made by comparing the % of each species handled during sampling. In the Bell Crossing and Darby sections, the number of westslope cutthroat handled has been increasing since about 1990 when the catch and release regulation took effect (Figures 12 and 13). In 1996 population estimates of westlope cutthroat were collected on 4 of the Bitterroot River monitoring sections. The data show that the Darby section supports the highest number of westslope cutthroat of all the sections (Figure 14).

Bell Crossing and Stevensville

The catch and release regulations may be having a positive impact on rainbow trout in the Bell Crossing area. Since the regulation became more restrictive in 199 , the population of rainbow trout has been stable through 1996. During the same period of time, rainbow trout on the Stevensville section have declined in number. The population estimate in 1996 on the Bell Crossing section is higher per mile than the Stevensville section (Figure 11).

Wally Crawford

This section begins at the Wally Crawford Fishing Access Site and ends 4.6 miles downstream. The fish populations in this reach are similar to the Darby reach, however, we have never sampled both reaches in the same year to get a more direct comparison. This site was sampled in 1994 and 1997. Between 1994 and 1997 the westslope cutthroat population increased considerably (Figure 15). The population of rainbow trout over 12 inches remained about the same and the population of smaller rainbow trout decreased (Figure 16).

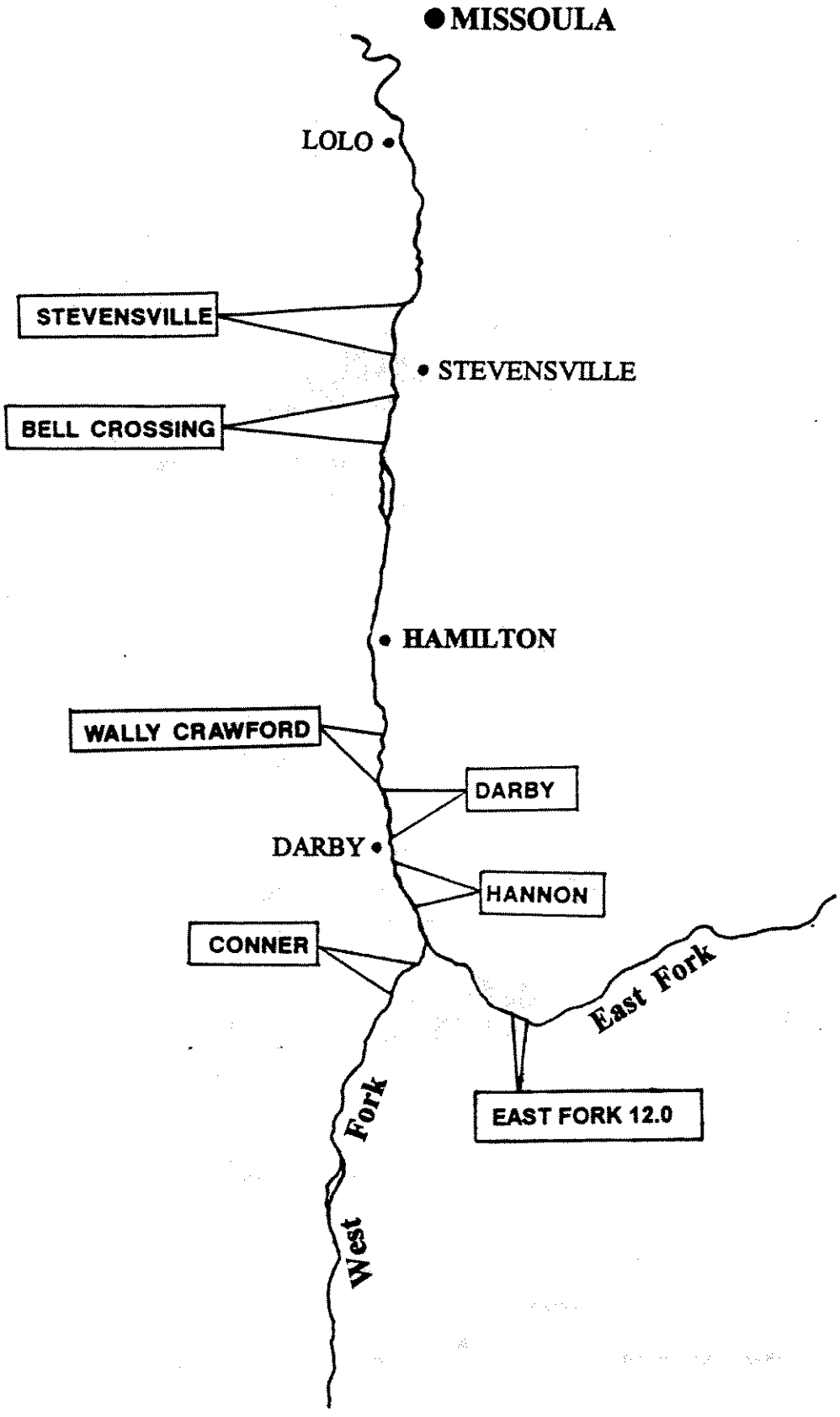


Figure 10. Map of electrofishing section sampled during 1996 or 1997.

BITTERROOT RIVER

Rainbow Trout > 14"/Mile

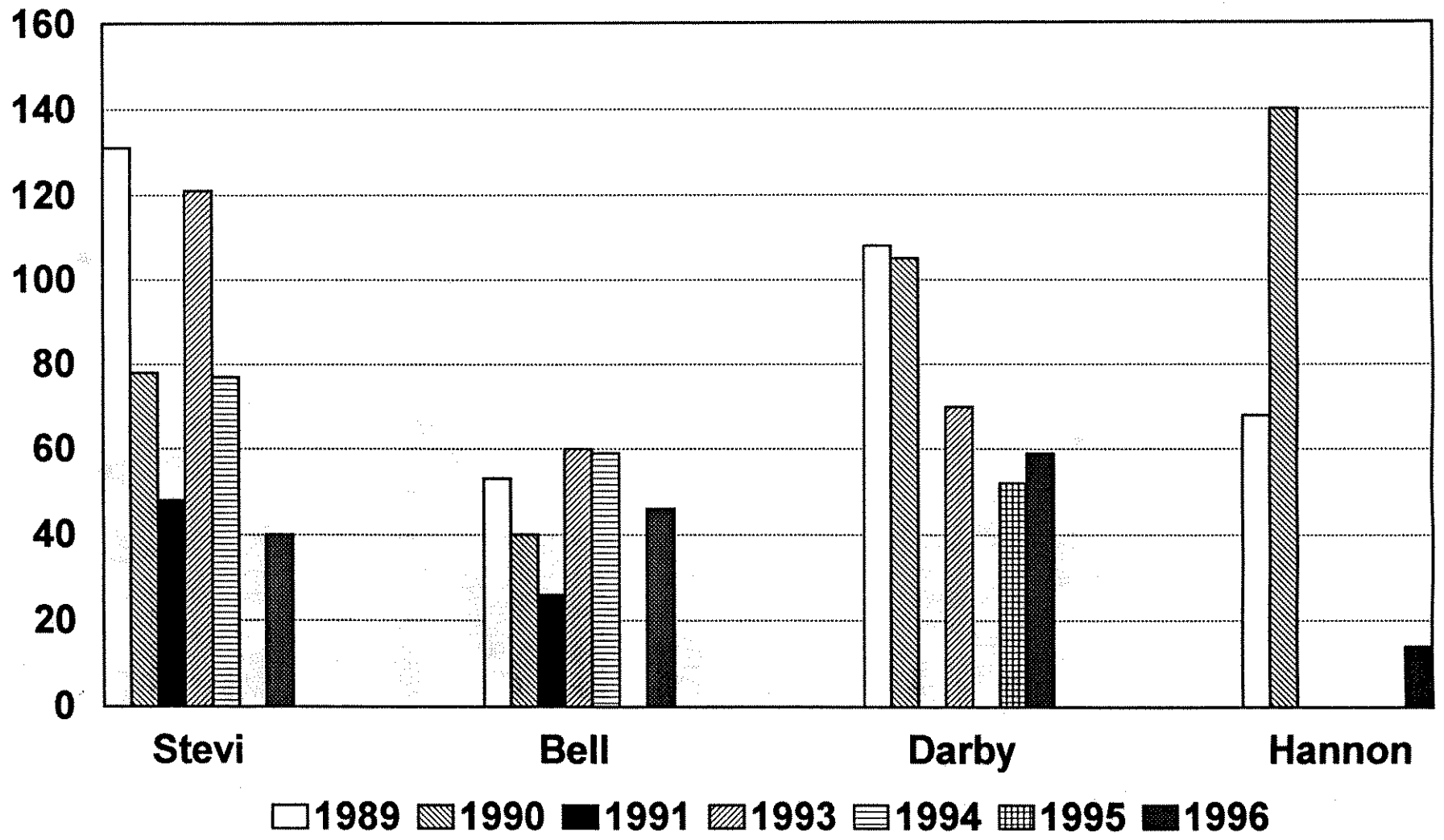


Figure 11. Rainbow trout per mile in four monitoring sections of the Bitterroot River.

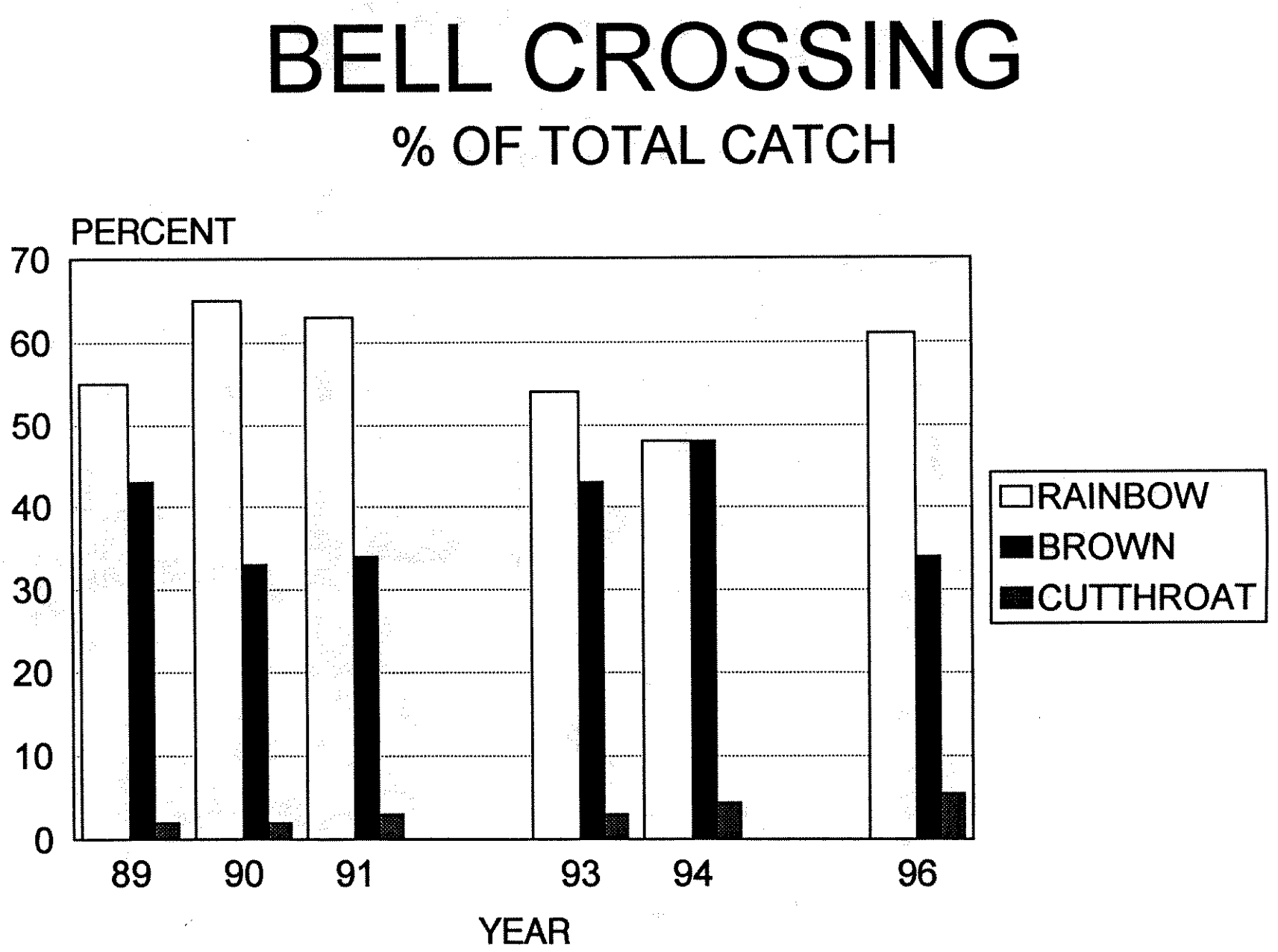


Figure 12. Percent catch of rainbow, brown and westslope cutthroat in the Bell Crossing section.

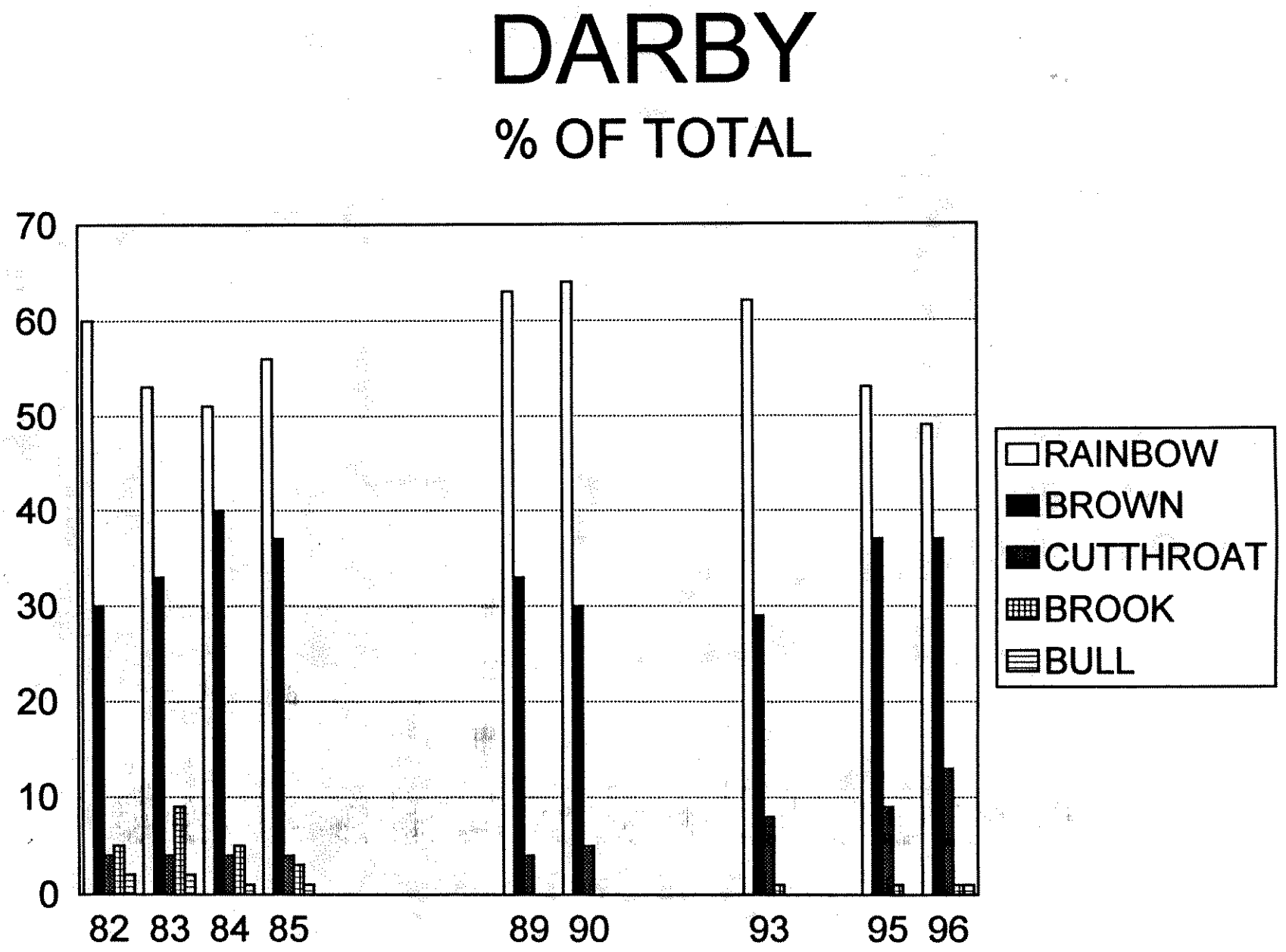


Figure 13. Percent catch of rainbow, brown and westslope cutthroat in the Darby section.

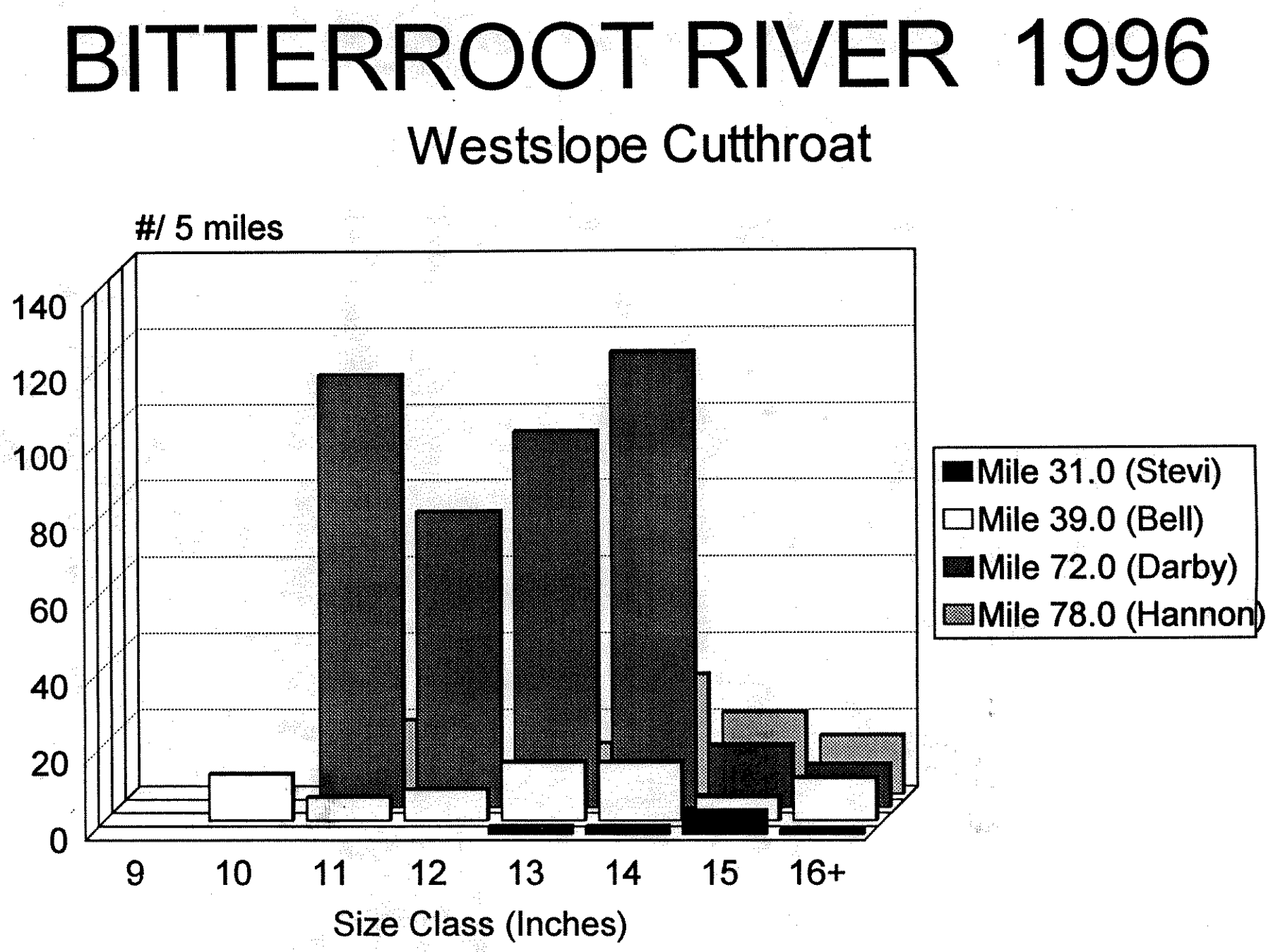


Figure 14. Population estimates of westslope cutthroat by inch class in four monitoring sections of the Bitterroot River.

WALLY CRAWFORD

WESTSLOPE CUTTHROAT

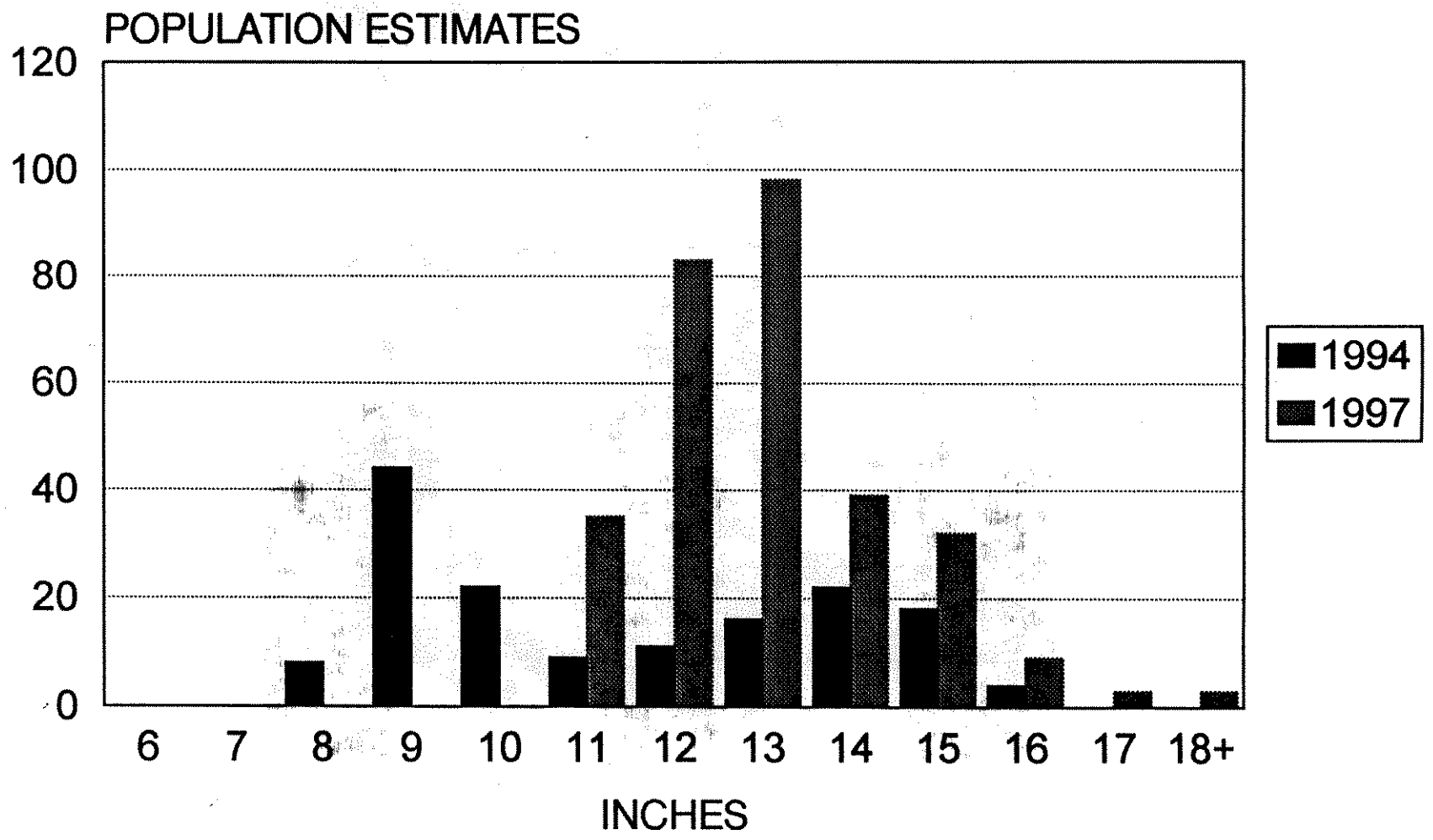


Figure 15. Population estimates of westslope cutthroat by inch class in the Wally Crawford section during 1994 and 1997.

WALLY CRAWFORD

RAINBOW TROUT

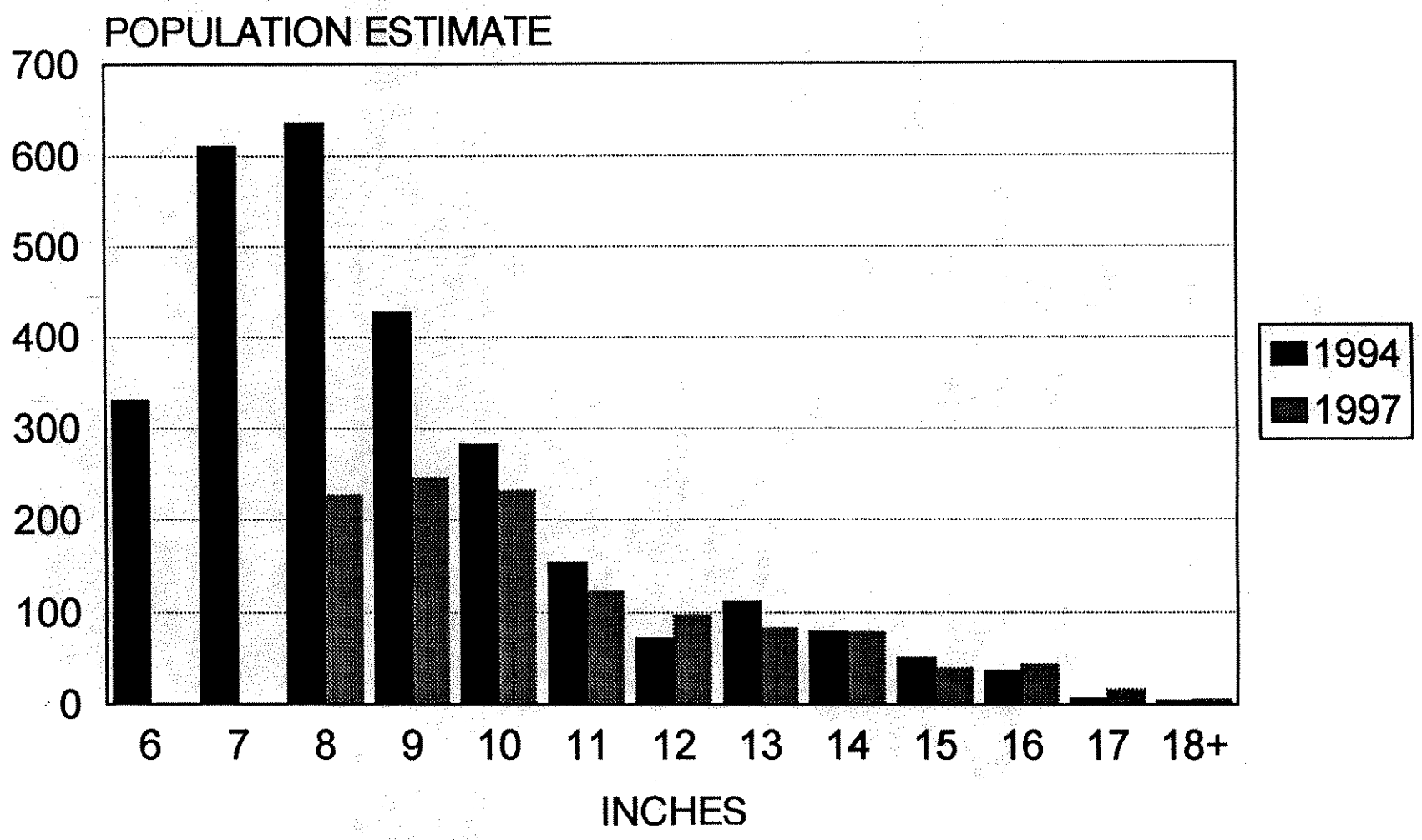


Figure 16. Population estimates of rainbow trout by inch class in the Wally Crawford section during 1994 and 1997.

Darby and Hannon Memorial

Overall, there has been a decline in the number of rainbow trout in the upper river. Although the number of rainbow trout in the Darby section increased between 1995 and 1996, the number of fish is lower than in 1989-1990 (Figure 11). This section of river is catch-and-release and fishing harvest is playing less of a role than in the Hannon section. Larger rainbow trout on the Hannon section have declined considerably since sampling began in 1989. A significant cause of this decline may be angler harvest (Figure 17).

The population estimate of westslope cutthroat has increased each year since 1990 in the Darby section (Figure 18).

Conner (West Fork Bitterroot River)

Population estimates have been collected on the Conner section in 1986, 1995 and 1997. The population of westslope cutthroat has increased during this time (Clancy 1996). The population estimate during 1997 for rainbow trout was similar to 1986 (Figure 19).

Below Maynard (East Fork Bitterroot River)

This section begins a short distance downstream of the mouth of Maynard Creek and extends about 1/2 mile. Rainbow trout is the most prevalent salmonid in this reach with brown trout, westslope cutthroat, bull trout, mountain whitefish and longnose suckers present in small numbers.

Population estimates of rainbow trout in 1995 and 1997 were 162 and 169 over 8 inches, respectively.

Bitterroot River Water Temperature

Water temperature was measured at 5 sites during 1996 and 1997 in the Bitterroot River. Due to various problems, only 2 and 4 of the sites collected valid data for the entire measuring period in 1996 and 1997, respectively. The 1997 data is better for looking at relationships between sites. So far, the data does not indicate any unusual thermal situations in the river (Figure 20). The warmer temperatures in the lower river are slightly higher than the physiological optimum for salmonid growth.

Water temperature near the mouth of several tributaries to the Bitterroot River was measured in 1997. We were attempting to learn whether the tributaries are having a cooling or warming effect on the Bitterroot River. To describe the impact of tributaries on Bitterroot River water temperature, streamflow would have to be measured. We did not measure streamflow, but were interested in relative temperatures between the river and tributaries.

At the confluence of the East and West Forks, the West Fork tends to be cooler during the warmest summer months (Figures 21 and 22). We measured water temperature near the mouth of 9 tributaries during 1997. It appears that Kootenai and Lolo Creeks have cooler

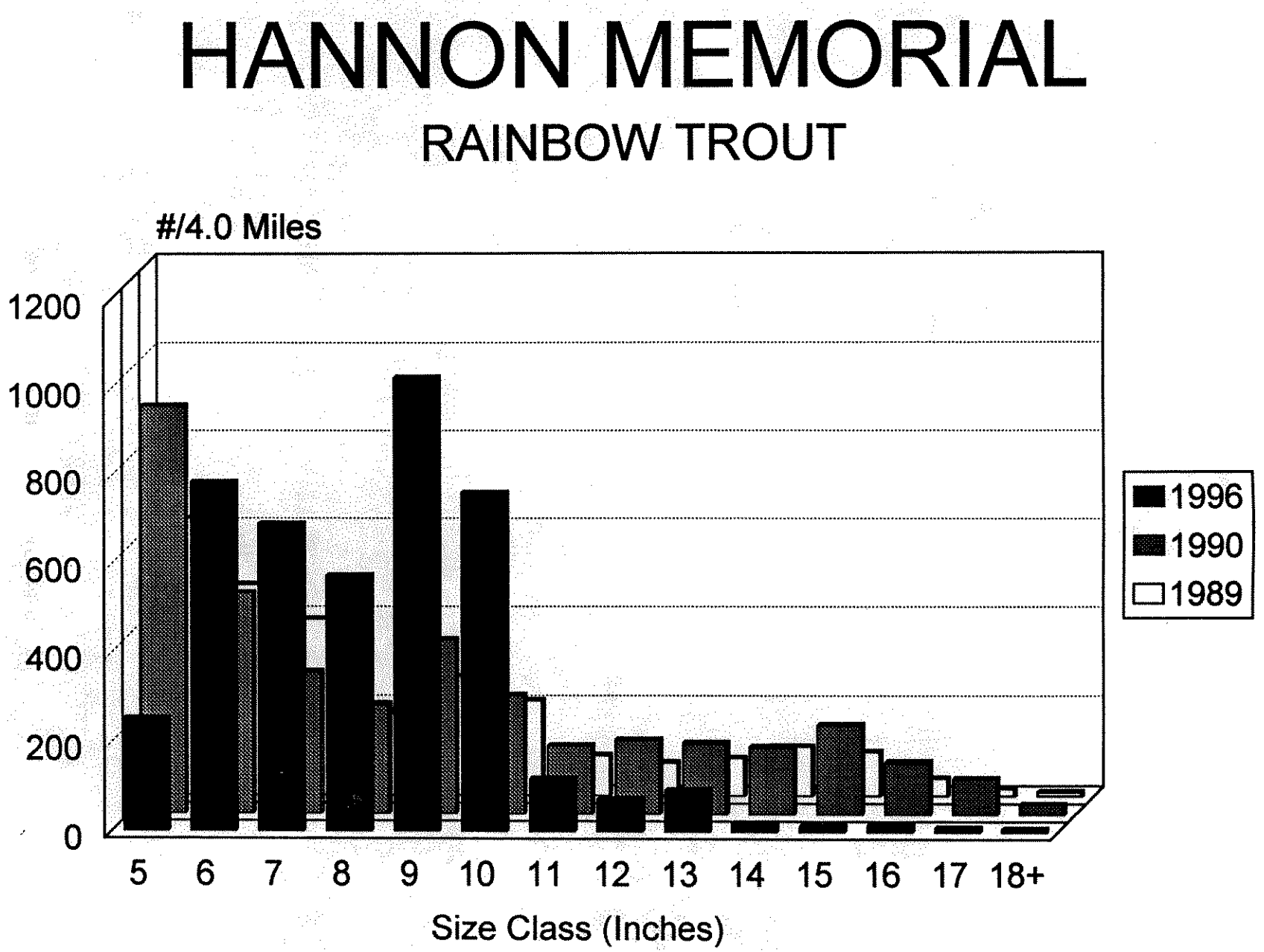


Figure 17. Population estimates of rainbow trout by inch class in the Hannon Memorial section during 1989, 1990 and 1996.

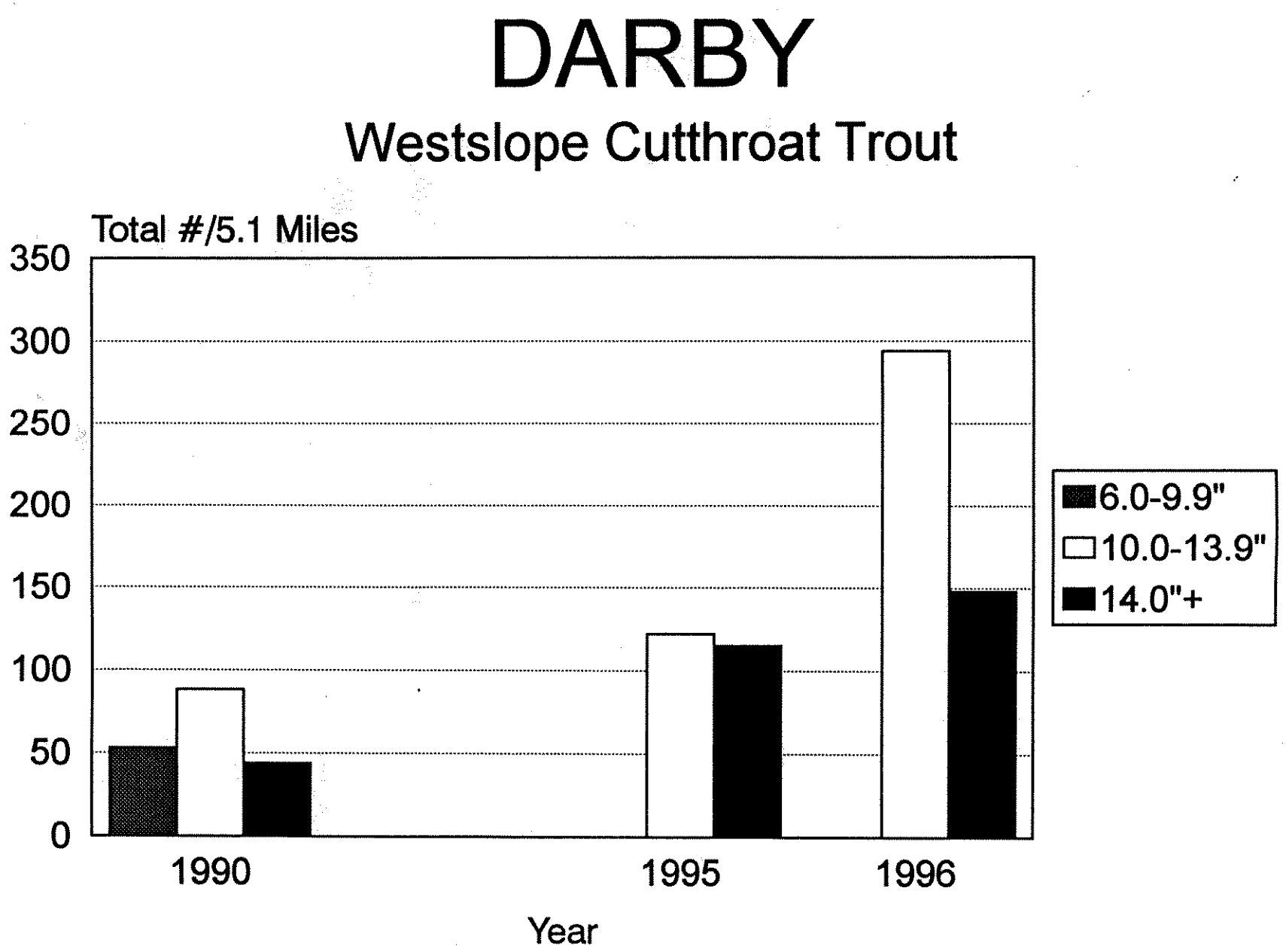


Figure 18. Population estimates of westslope cutthroat in the Darby section during 1990, 1995 and 1996.

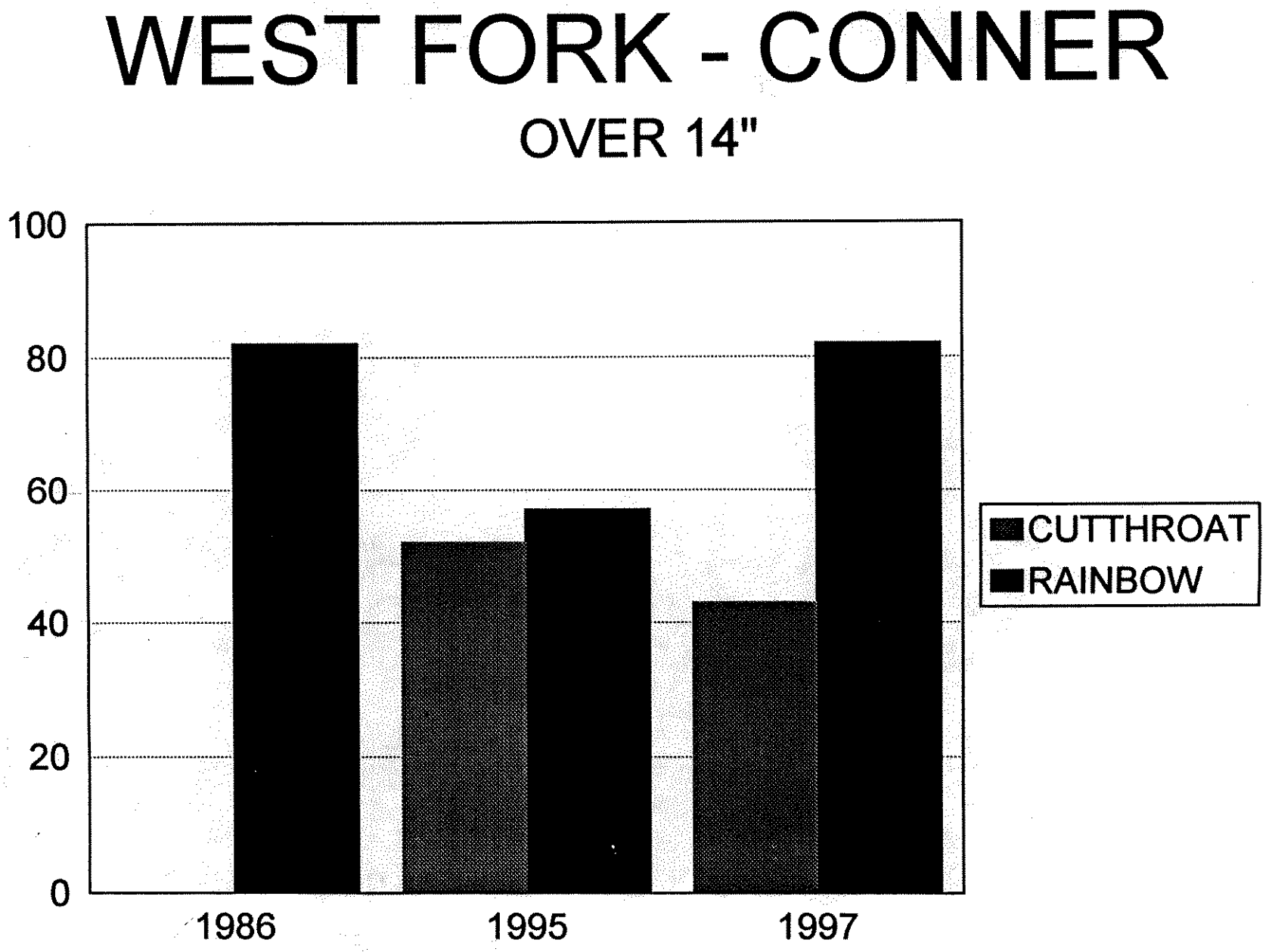


Figure 19. Population estimates of rainbow trout and westslope cutthroat on the Conner Section during 1986, 1995 and 1997.

BITTERROOT RIVER 1997

Temperature Summaries at Several Sites

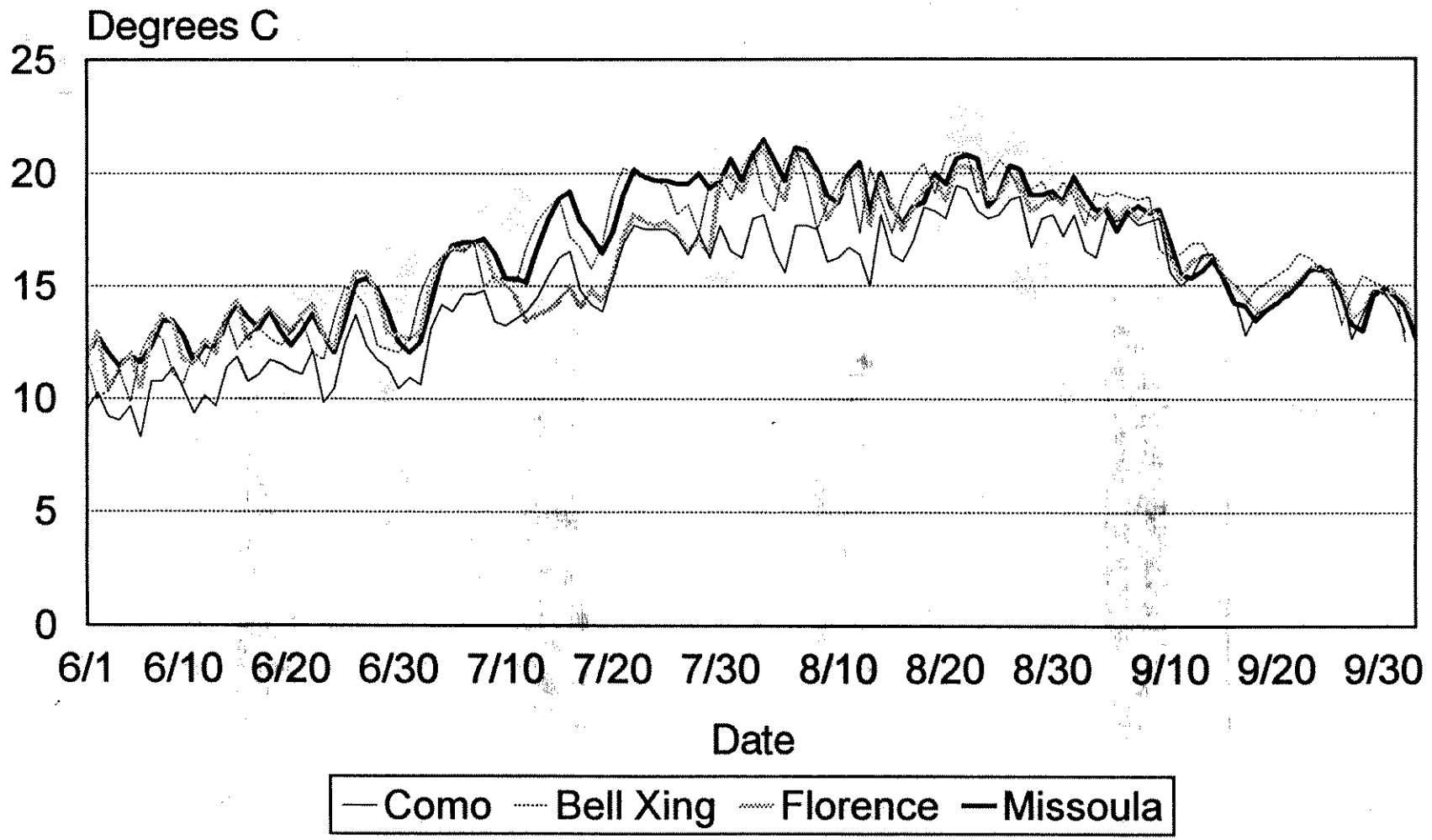


Figure 20. Daily maximum water temperature at four sites on the Bitterroot River during 1997.

WEST FORK BITTERROOT RIVER 1.2

Temperature Summaries

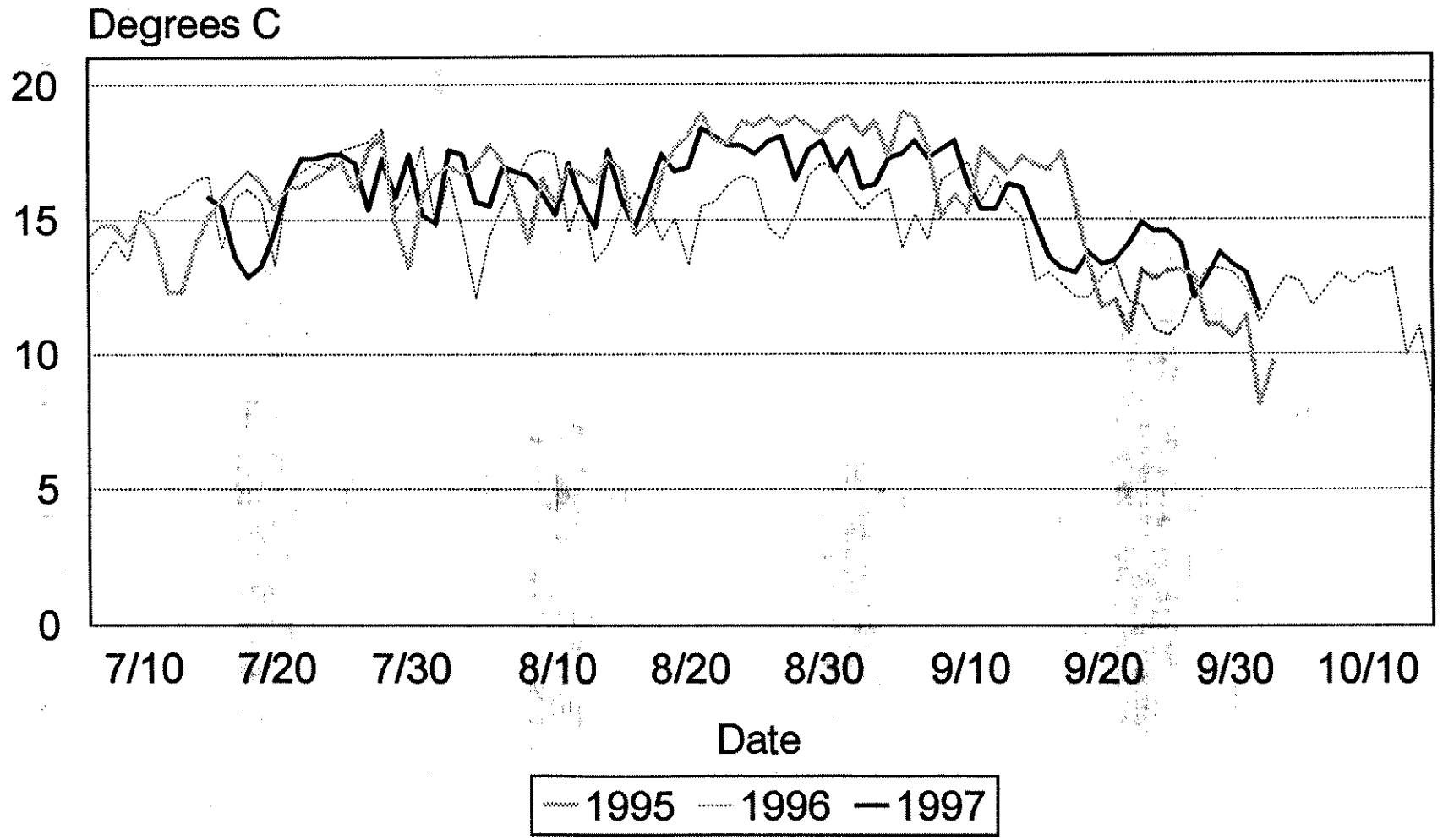


Figure 21. Daily maximum water temperature at Conner on the West Fork Bitterroot during 1995, 1996 and 1997.

EAST FORK BITTERROOT RIVER 0.5

Temperature Summaries

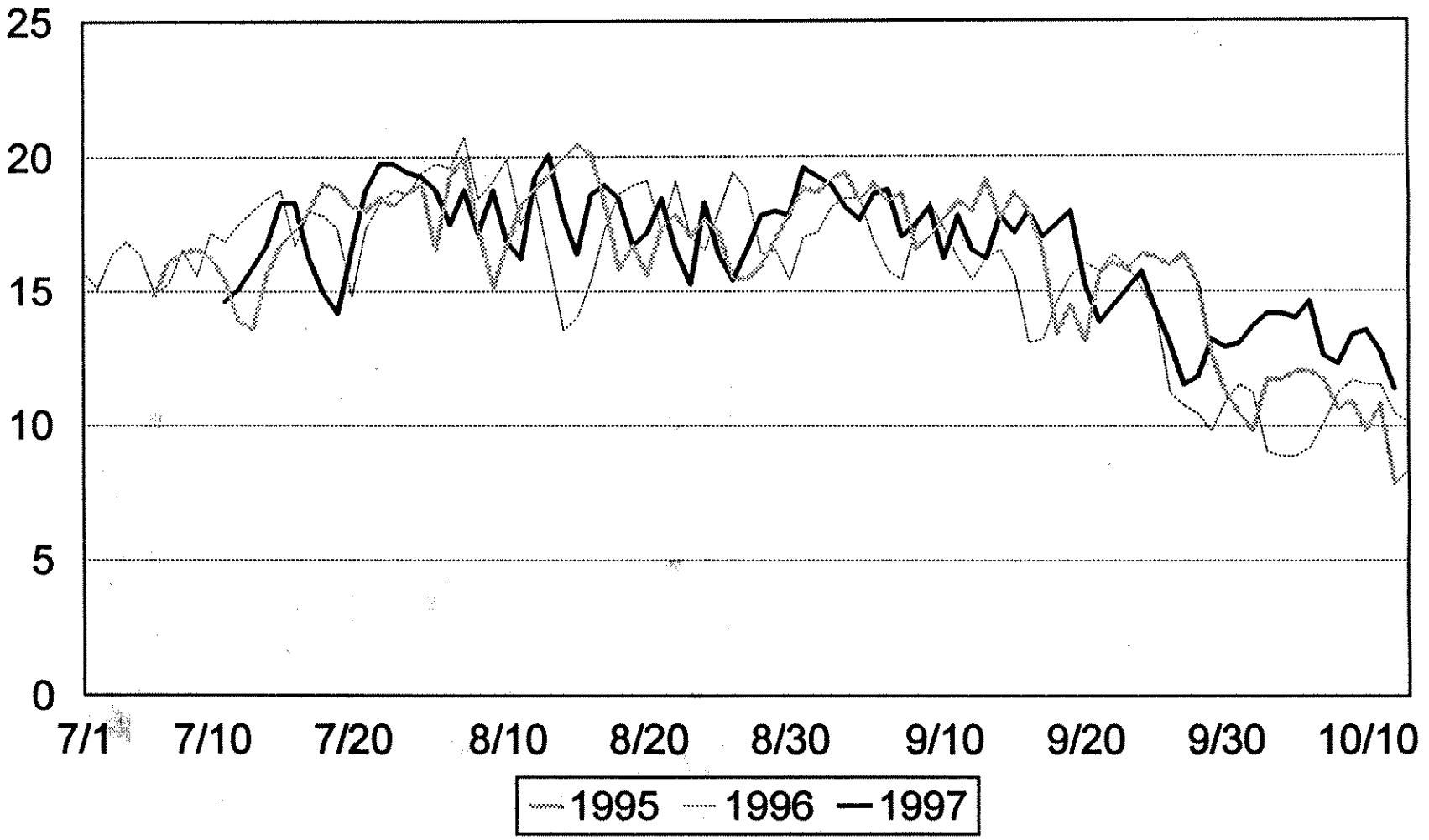


Figure 22. Daily maximum water temperature at Conner on the East Fork Bitterroot during 1995, 1996 and 1997.

temperatures than the Bitterroot River during midsummer. The other sites (Rock, Rye, Sleeping Child, Skalkaho, Blodgett, Mill and Sweathouse Creeks) did not appear to have significantly different temperatures than the river. During September, about 50 cfs is released into the river from Lake Como through Rock Creek. During this time period, the water temperature is slightly warmer in Rock Creek than the River.

Water temperature was measured in the Bitterroot River during 1984-86 (Spoon 1987). The 1997 water temperature maximums at Bell Crossing and Missoula were similar to the readings in the mid 1980's (Figures 24 and 25).

Bitterroot River Length

Over the years, there have been many projects that have physically altered the Bitterroot River. Some of these projects likely have changed the physical dynamic of the river. One method of seeing any changes in the Bitterroot River is to compare the length of the river over the recent past. Two methods were used to do this.

The first was to measure the length of the Bitterroot River between the confluence of the East and West Forks and Florence from aerial photographs in 1937, 1955, 1979,and 1990. There is no significant change in the length of the river over this time period (Figure 26).

An analysis of electronic files of the length of the thalweg from Tincup to Davis Creek in 1937, 1955 and 1987 also indicates that no significant change has occurred.

ROCK CREEK 0.1

Temperature Summaries

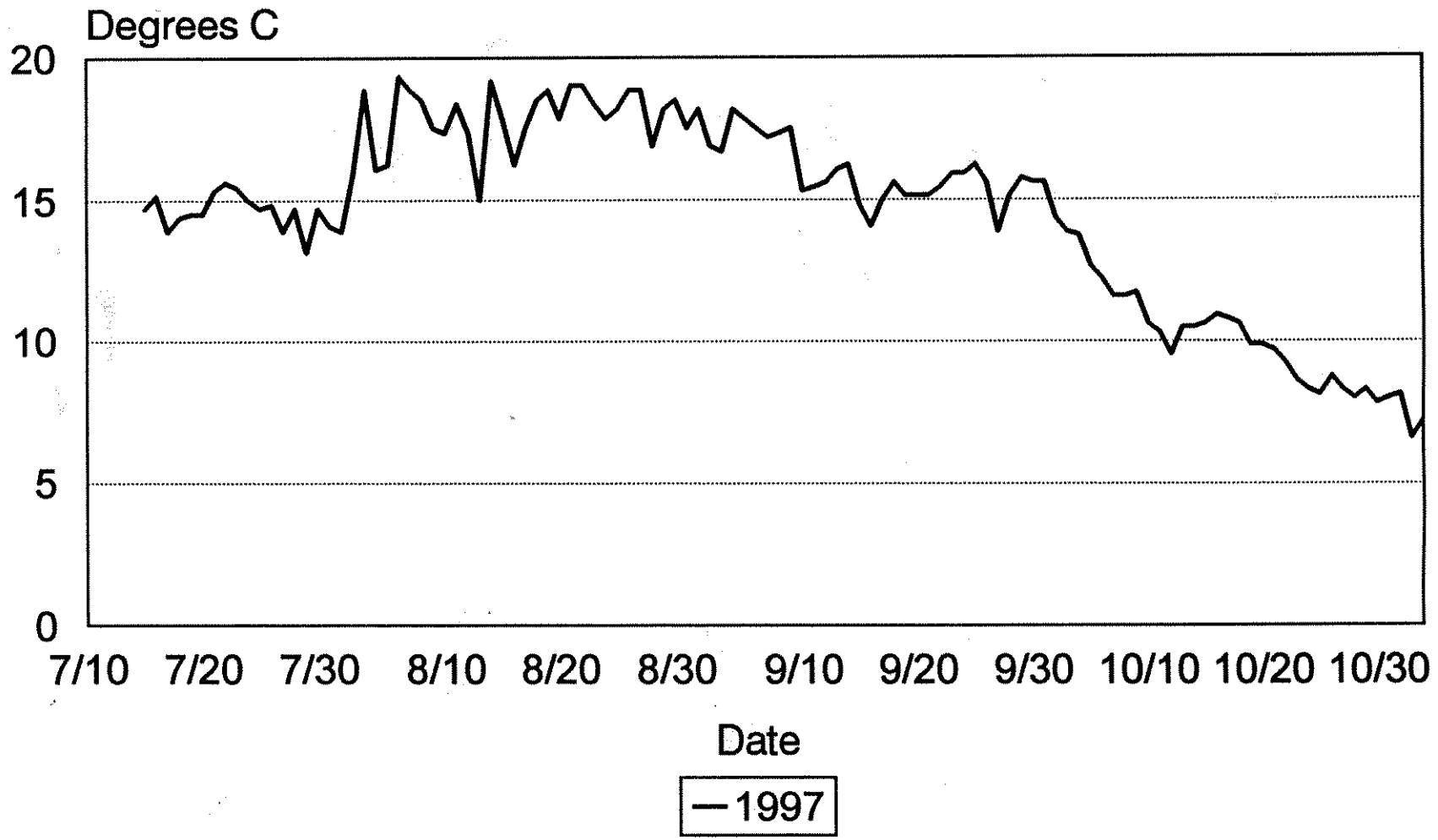


Figure 23. Daily maximum water temperature near the mouth of Rock Creek during 1997.

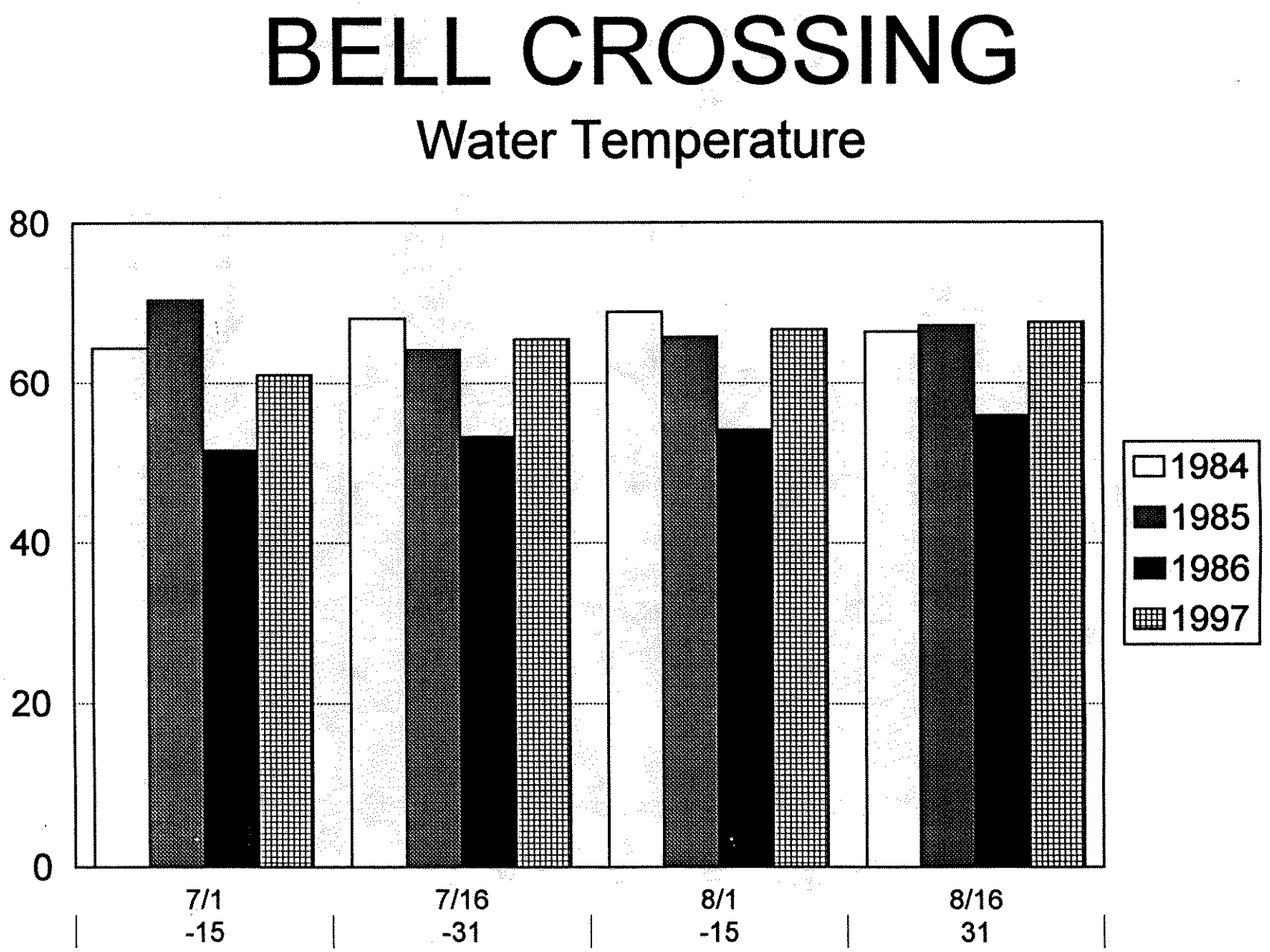


Figure 24. Mean maximum water temperature at Bell Crossing during the indicated time periods in 1984, 1985, 1986 and 1997.

BITTERROOT R. - MISSOULA

Water Temperature

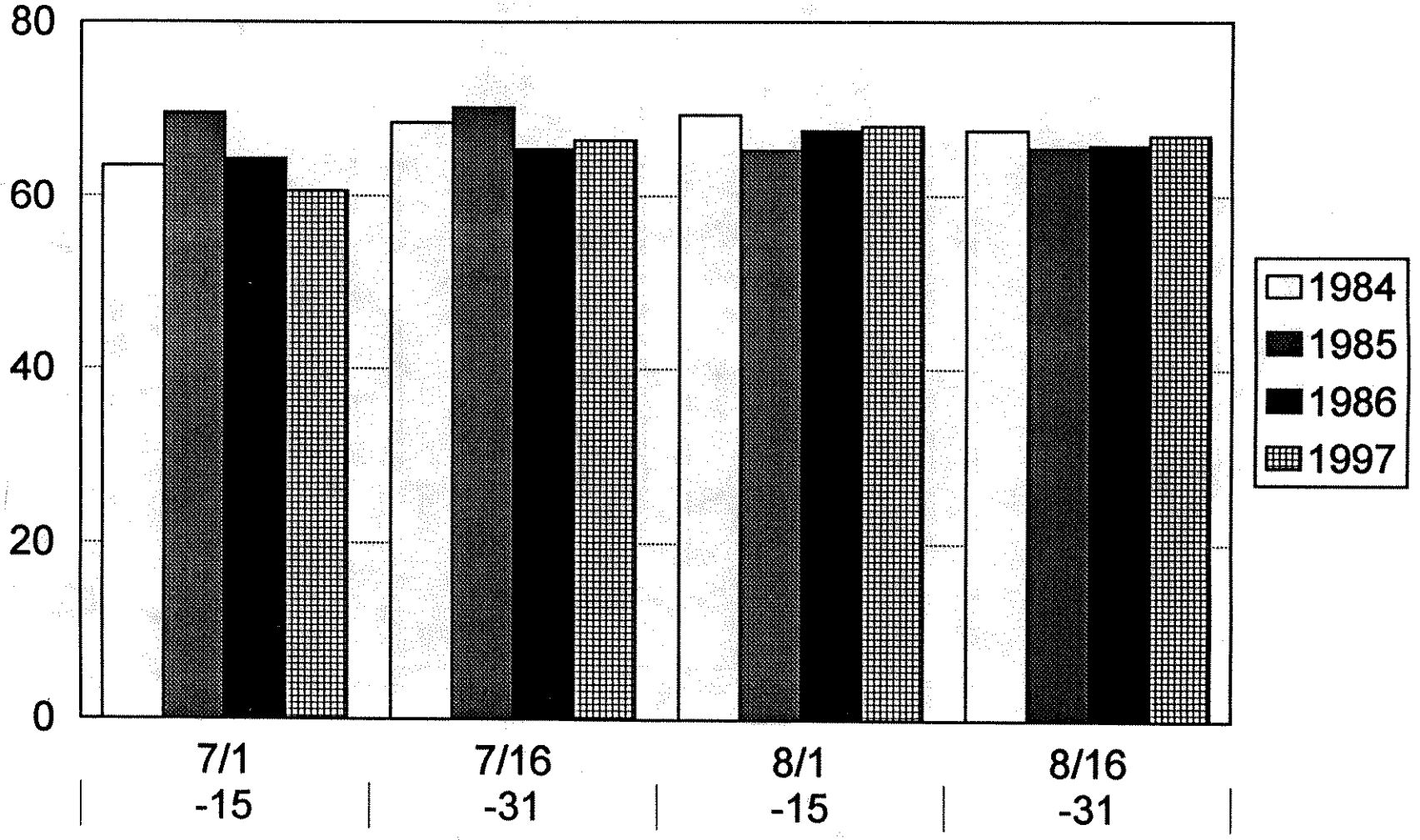


Figure 25. Mean maximum water temperature at Missoula during the indicated time periods in 1984, 1985, 1986 and 1997.

BITTERROOT RIVER

LENGTH IN MILES*

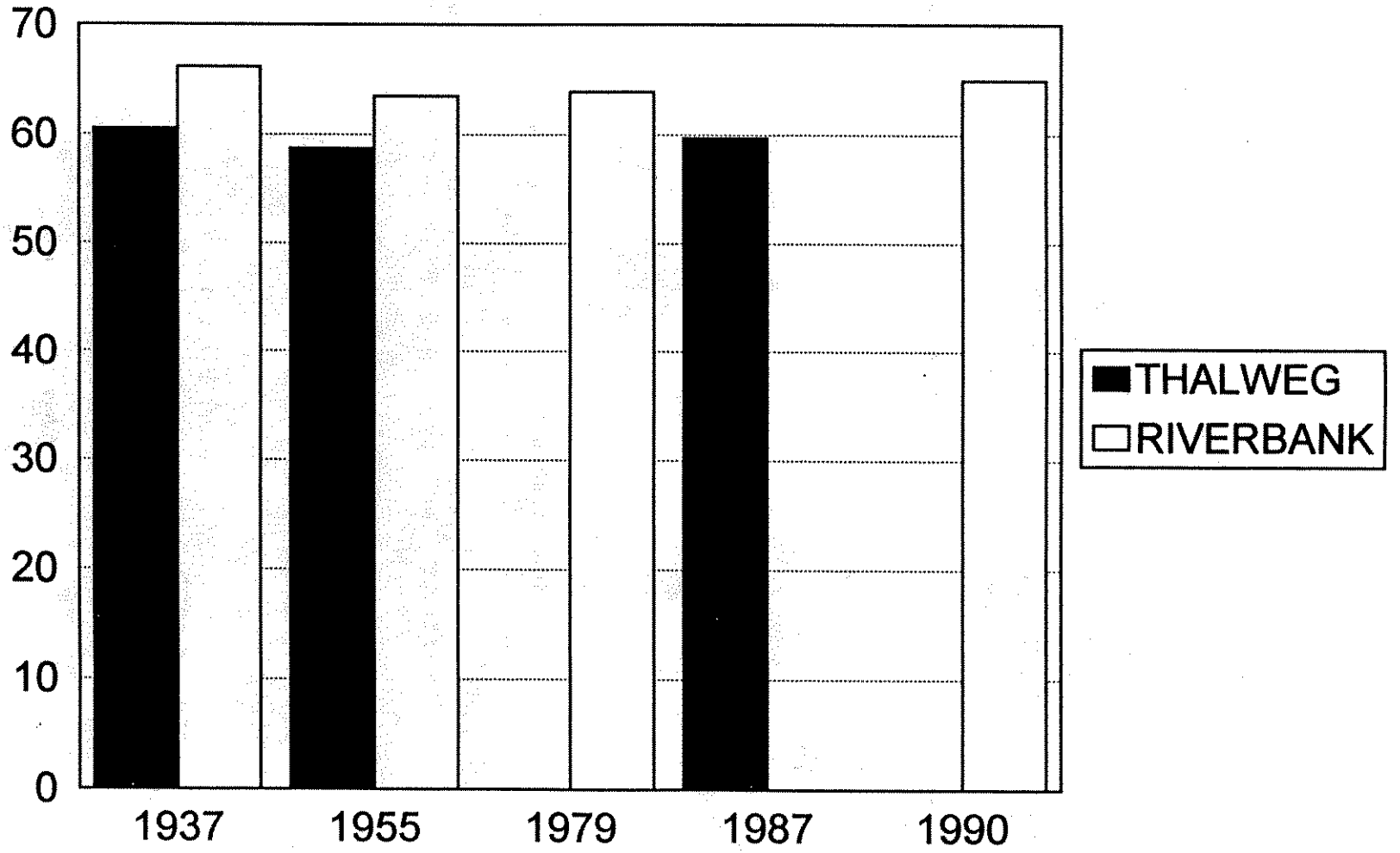


Figure 26. Bitterroot River length as measured by riverbank length between Florence Bridge and the confluence of the East and West Fork, and by measurement of the length of the thalweg from Tincup to Davis Creek from electronic files.

LITERATURE CITED

Bryant, 1995. Pulsed monitoring for watershed and stream restoration. Fisheries 20(11):6-13.

Clancy, C.G. 1991. Statewide Fisheries Investigations. Bitterroot Forest Inventory. Project F-46-R-4. Job Ij.

Clancy, C.G. 1993. Statewide Fisheries Investigations. Bitterroot Forest Inventory. Project F-46-R-4. Job Ij.

Clancy, C.G. 1996. Statewide Fisheries Investigations. Bitterroot Forest Inventory. Project F-46-R-4. Job Ij.

Garn, H.S. and R.C. Malmgren. 1973. Soil and water resources of the Bitterroot National Forest, Montana. Part I. USDA Forest Service. Bitterroot National Forest.

Good, W., C. Kronberg, and D. O'dell. 1984. Bitterroot tributary study, phases 1, 2 and 3. Trout Unlimited, Hamilton, MT.

Good, W.R. 1985. Bitterroot tributary study, phase 4. Trout Unlimited, Hamilton, MT.

Hoth, D. 1979. Summary: Magruder corridor intragravel environment. USDA Forest Service, Bitterroot National Forest, final report. Hamilton.

Jakober, M.J. 1995. Autumn and winter movement and habitat use of resident bull trout and westslope cutthroat in Montana. M.S. thesis. Montana State University, Bozeman.

Javorsky, L. 1994. The Bitterroot River Floodplain: An Historical Analysis. Montana Department of Fish, Wildlife and Parks.

McFarland, R.C. 1996. Montana Statewide Angling Pressure Mail Survey. Montana Department of Fish, Wildlife and Parks. Helena.

Montana Bull Trout Scientific Group. 1995. Bitterroot River drainage bull trout status review. Prepared for the Montana Bull Trout Restoration Team.

Montana Department of Fish, Wildlife and Parks. 1991. Bitterroot River Fisheries Management Plan for the period September 1991 to September 1996. Written by Joel Shouse Consulting Services, Bozeman, MT.

Munther, G. 1986. Aquatic environment and fisheries habitat 1986 monitoring report. Bitterroot, Deerlodge and Lolo National Forests. Missoula

Odell, D. 1985. A fishery study of potential hydropower sites on Bitterroot River tributary streams. National Trout Unlimited, Trout and Salmon Foundation, Montana Dept. of Fish, Wildlife and Parks, Anglers Afloat Guide Service, Al Engle, Bitterroot Chapter of Trout Unlimited.

Peters, D. 1987. Second year evaluation of sediment and fish populations in selected tributaries in Rock Creek and the Bitterroot River drainage. Montana Dept. of Fish, Wildlife and Parks, Missoula.

Peters, D. 1988. Third year evaluation of sediment and fish populations in selected tributaries in Rock Creek and the Bitterroot River drainage. Montana Dept. of Fish, Wildlife and Parks, Missoula.

Peterson, N.P. and C.J. Cederholm. 1984. A comparison of the removal and mark-recapture methods of population estimation for juvenile coho salmon in a small stream. North American Journal of Fisheries Management 4(1):99-102.

Ricker, W.E. 1975. Computation and Interpretation of Biological Statistics of Fish Populations. Fisheries Research of Canada Bulletin 191.

Riley, S.C. and K.D. Fausch. 1992. Underestimation of Trout Population Size by Maximum-Likelihood Removal Estimates in Small Streams. North American Journal of Fisheries Management 12:768-776.

Rodgers, J.D., M.F. Solazzi, S.L. Johnson and M.A. Buckman. 1992. Comparison of three techniques to estimate juvenile coho salmon populations in small streams. North American Journal of Fisheries Management 12:79-86.

Spoon, R.L. 1987. Evaluation of management of water releases for Painted Rocks Reservoir, Bitterroot River, Montana. Final Report. Montana Department of Fish, Wildlife and Parks. Bonneville Power Administration, contract report. Project 83-463, contract number DE-A179-83BP13076.

USDA Forest Service. 1987. Forest Plan. Bitterroot National Forest. Northern Region.

Vadeboncouer, Y., S. Luchessa, and R.P. Kramer. 1989. Fisheries habitat and aquatic environment monitoring report, Bitterroot, Deerlodge and Lolo National Forests. Missoula.

Prepared by Christopher G. Clancy
Date: August 1998

Stream	Code Number	Key Words
Bitterroot River drainage	2-03-8865	Trout populations Trout habitat Sediment Dewatering Fishing regulations Westslope Cutthroat Rainbow Trout Brown Trout Bull Trout Brook Trout Water Temperature