F-13-9

Madison River/Ennis Reservoir Fisheries

1997 Annual Report
to
Montana Power Company
Environmental Division
Butte

from
Pat Clancey
Ennis
June 1998

EXECUTIVE SUMMARY

One young-of-the-year Arctic grayling was captured in Ennis Reservoir in 1997, compared to 0 in 1996 and 35 in 1995. Populations of two year old & older rainbow trout in monitoring sections of the Madison River remain at levels seen in recent years. Two year old & older brown trout in the Pine Butte section exhibited a marked increase over populations in 1995 and 1996, but either decreased or remained unchanged in other sections. Numbers of young-of-the-year rainbow trout in sections of the Madison River were intermediate to numbers sampled in the same sections in 1995 and 1996. Nineteen of 146 young-of-the-year trout sampled in December, 1997, were determined to be positive for whirling disease. Water temperature was monitored at 15 sites in the Madison River, and air temperature monitored at 7 sites. Densities of New Zealand Mud Snails in the Madison River in Yellowstone National Park were 7345/m^2, and comprised 62% of all invertebrates sampled. In the initial year of the Madison River Drainage Westslope Cutthroat Trout Conservation and Restoration Program, 11 tributaries of the Madison River were surveyed for habitat quality and fish species composition.

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INTRODUCTION

Since 1990, Montana Fish, Wildlife, & Parks (MFWP) has conducted fisheries studies in the Madison River to assess and improve the status of the Arctic grayling (*Thymallus arcticus*) population of Ennis Reservoir and to address effects on fisheries of hydropower operations at Hebgen and Ennis dams (Byorth and Shepard 1990, MFWP 1995, MFWP 1996, MFWP 1997a). This work has been funded through a cooperative agreement with the Montana Power Company (MPC), owner and operator of the dams. The agreement between MFWP and MPC was designed to anticipate relicensing requirements for MPC's hydropower system, which includes Hebgen and Ennis dams on the Madison River, as well as seven dams on the Missouri River (Figure 1). Collectively, the nine dams are called the 2188 Project, which refers to the Federal Energy Regulatory Commission (FERC) license number that authorizes their operation.

Late in 1996, MFWP initiated a ten year program to conserve and restore the native westslope cutthroat trout (*Oncorhynchus clarki lewisi*) in the Madison River drainage. Fieldwork for this effort began in 1997 in tributaries of the Madison River. The agreement between MFWP and MPC includes a provision to address issues related to species of special concern. In June, 1997, the U.S. Fish & Wildlife Service (USFWS) received a petition to list the westslope cutthroat trout as a Threatened species throughout its entire range, which includes parts of Montana, Idaho, Oregon, Washington, and Wyoming. The petition was filed by six conservation/environmental organizations and one individual.

The Westslope Cutthroat Trout Steering Committee (WCTSC) convened its first meeting in July, 1996, to develop goals and guidelines to address concerns related to the decline of the westslope cutthroat trout in Montana. The goals of the WCTSC are in draft form and expected to be released for public review and comment in the summer of 1998. The WCTSC is comprised of representatives from the Governors Office, Montana Fish, Wildlife, & Parks, Montana Department of Natural Resources and Conservation, Blackfeet Tribes, Confederated Salish & Kootenai Tribes, Montana Association of Conservation Districts, Montana Water Users Association, Montana Stockgrowers Association, Montana Sheepgrowers Association, Intermountain Forest Industry Association, Montana Farm Bureau, Montana State University, U.S. Forest Service, U.S. Fish & Wildlife Service, Natural Resources Conservation Service, Bureau of Land Management, Trout Unlimited, American Wildlands, and private natural resources consultants.

Montana Governor Marc Racicot convened the Governors Westslope Cutthroat Trout Workshop in September, 1996, to develop strategies to address the perils faced by westslope cutthroat. A second workshop was held in October, 1997.

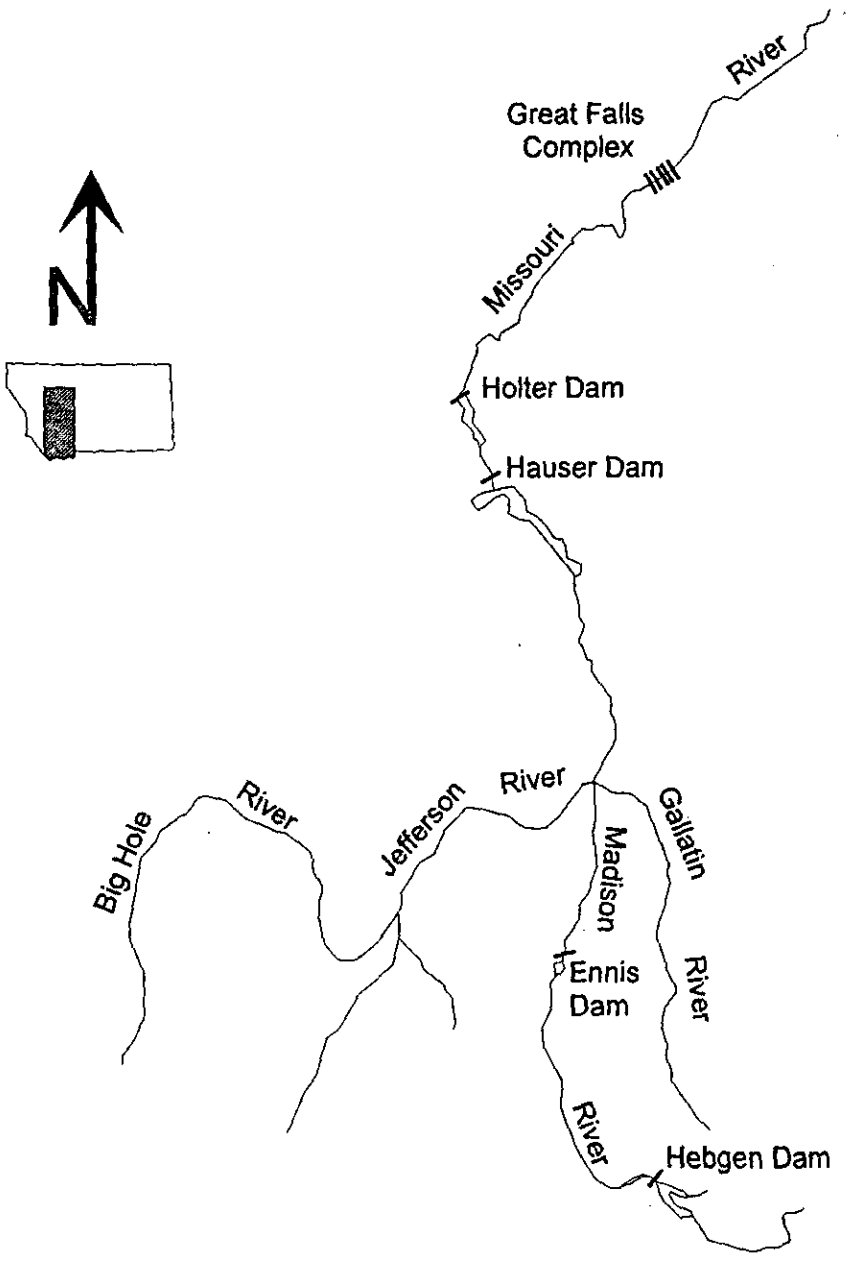

Figure 1. Locations of Montana Power Company dams on the Madison and Missouri Rivers.

METHODS

Madison Grayling

From 1990-96, electrofishing of adult grayling was the primary method used to monitor the Ennis Reservoir population. In conjunction with a Master of Science project at Montana State University, beach seining young-of-the-year (YOY) grayling in the reservoir was initiated in 1994. Due to the continually diminishing probability of capturing adult grayling by electrofishing, beach seining was adopted as the primary method to monitor the status of the Ennis Reservoir population.

To conduct the beach seining, two workers were let off a boat in water up to five feet deep. They stretched a 125-foot beach seine between them, and walked directly into the shoreline, pulling the seine into a large arch behind them. The seine was pulled onto the shoreline and captured fish were enumerated by species.

Population Estimates

Electrofishing from a driftboat mounted mobile anode system remained the principle method used to capture Madison River trout for population estimates and sampling. Fish captured for population estimates were weighed and measured, marked with a fin clip, and released. A log-likelihood statistical analysis (Montana Fish, Wildlife, & Parks 1997b) was used to estimate trout populations throughout the Madison River (Figure 2). One year old fish are distinguished from two year old & older fish because of the greater natural fluctuations that occur within yearling numbers from year to year. Generally, the number of two year old & older fish is a better indicator of population trends. Aging of fish has not been completed for samples collected in 1997, so for the two year old & older age class, 8 inch and larger fish are used in spring estimates and 10 inch and larger fish are used in fall estimates. The actual number of yearlings and two year old & older fish will most likely change once aging is completed.

Gillnetting

Gillnets were used to sample adult fish in Ennis Reservoir. In 1997, netting was conducted in June and August. Experimental nets, composed of five 25 foot panels of progressively larger mesh (3/4",1", 1-1/4", 1-3/4", 2") were set at four locations in Ennis Reservoir and left to fish overnight (Figure 3). For shoreline sets, the smallest mesh panel was set in the shallowest water, the largest mesh in the deepest water. Floating nets were used at the shallow south end of the reservoir, and one floating net and one sinking net were used near the county bridge at the north end of the reservoir. Because the south end of the reservoir is so

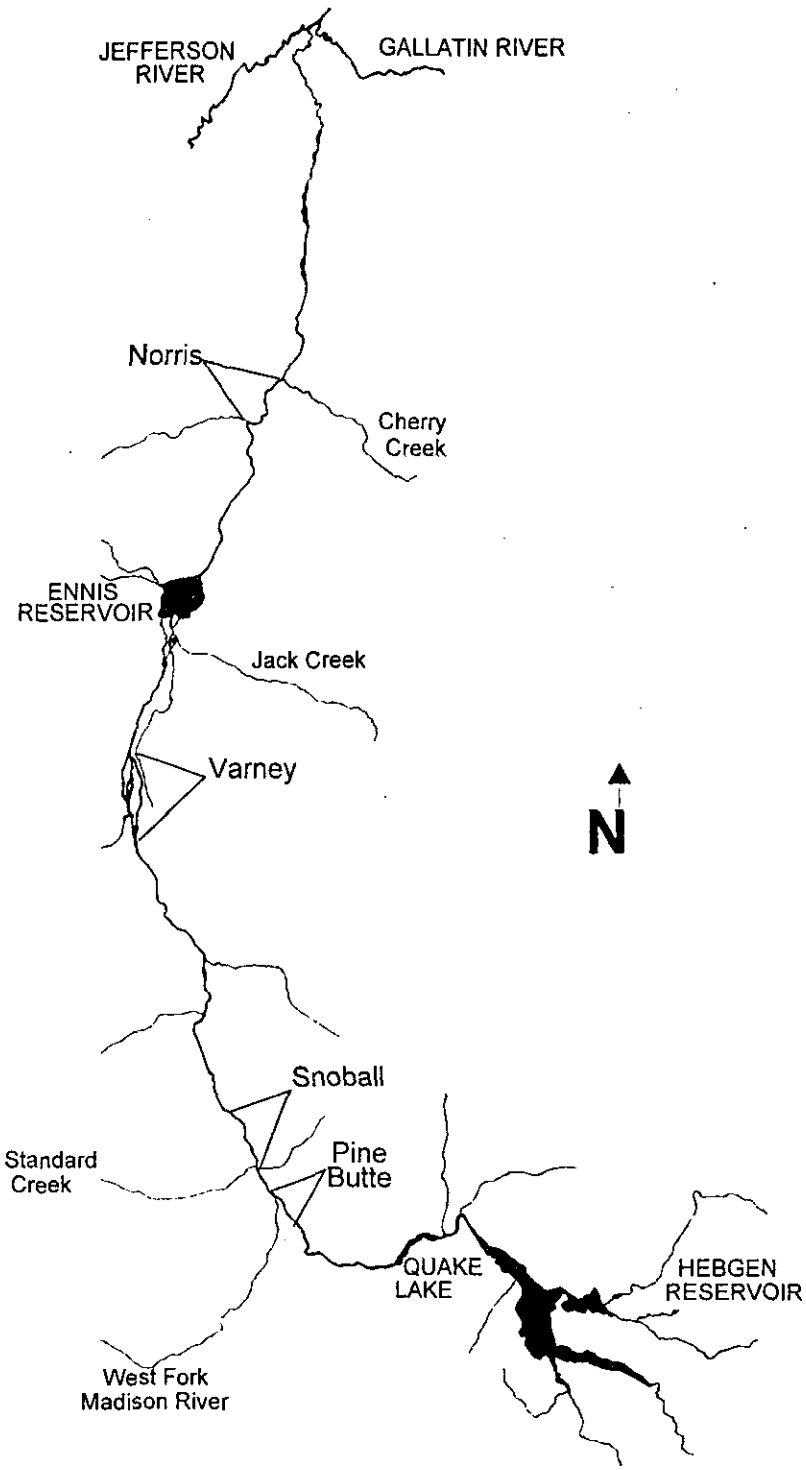

Figure 2. Locations of Montana Fish, Wildlife, & Parks Madison River trout population estimate sections.

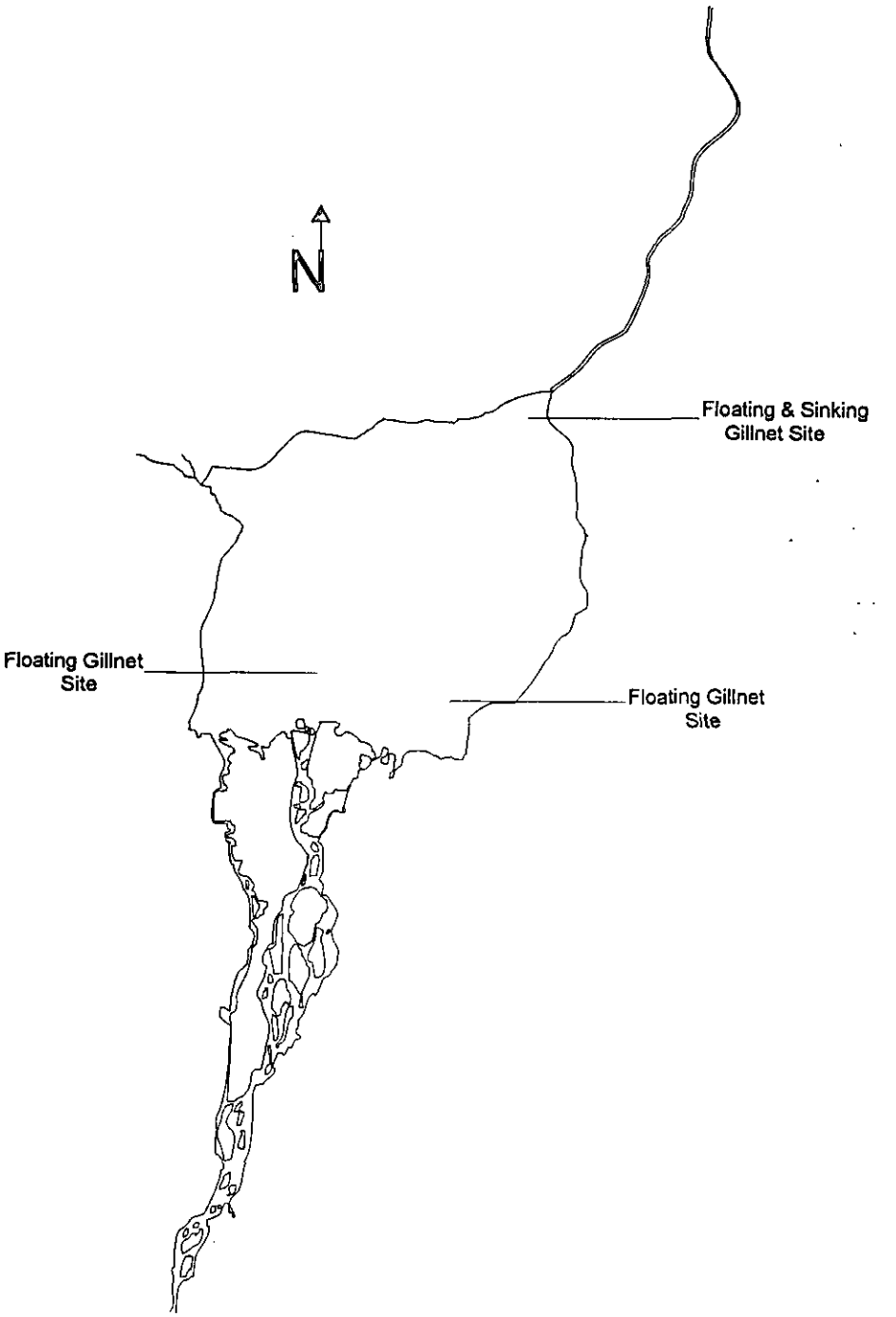

Figure 3. Locations of Montana Fish, Wildlife, & Parks seasonal gillnet sites in Ennis Reservoir.

shallow, floating nets were capable of sampling the entire water column. At the deeper north end of the reservoir, a sinking net and a floating net were required to sample benthic and pelagic areas, respectively. Captured fish were removed from the nets, separated by species, weighed, measured, and released. If a large number of one species was captured in a given net, 25 were weighed and measured and the remainder simply enumerated.

Whirling Disease

Young-of-the-year rainbow trout (*Oncorhynchus mykiss*) and brown trout (*Salmo trutta*) were sampled from areas within and between the Pine Butte and Snoball sections of the Madison River to determine the timing of infection by whirling disease (*Myxobolus cerebralis*), and to determine the infection rate of the disease. To accomplish these tasks, two methods were used to enumerate and collect YOY trout. The drift boat system used to conduct population estimates was modified by adding a 75 foot electrical cord to the anode. The system was then used to sample selected 150 foot sections. The boat was anchored within a few feet of the river bank, the 75-foot anode carried downstream, the system was powered up, and electrofishing proceeded in an upstream direction past the boat. Three passes were conducted at each location, with captured fish enumerated by species after each run. The Zippin Removal Method (Zippin 1958) was used to derive a numeric estimate of YOY brown and rainbow trout in that 150 feet of river bank. Generally, areas that look most likely to hold YOY were selected for sampling, so the numbers generated should not be extrapolated to arrive at YOY estimates for larger sections of the river. Abnormalities potentially caused by whirling disease were noted. Fish were held in water-filled buckets until the sampling was completed, then released. During each sampling period, up to ten individuals of each species are collected for later histological examination.

Additionally, a backpack mounted shocker was used to collect YOY trout from a series of locations throughout the Madison River drainage in early winter (Figure 4). These fish were collected solely for determining the presence or absence of whirling disease in a given area and its rate of infection in surviving YOY trout after their first growing season.

In an effort to re-assess spawning movements in the era of whirling disease, trout were captured in a side channel of the Slide area of the Madison River below Quake Lake using a backpack shocker. The trout were measured and their gender determined before seven rainbow and one brown trout were selected for radio transmitter implants. Those selected for implants were anesthetized with tricaine methanesulfonate prior to and during the implant procedure, and allowed to fully recover in fresh river water prior to release. A ventrolateral incision was made slightly

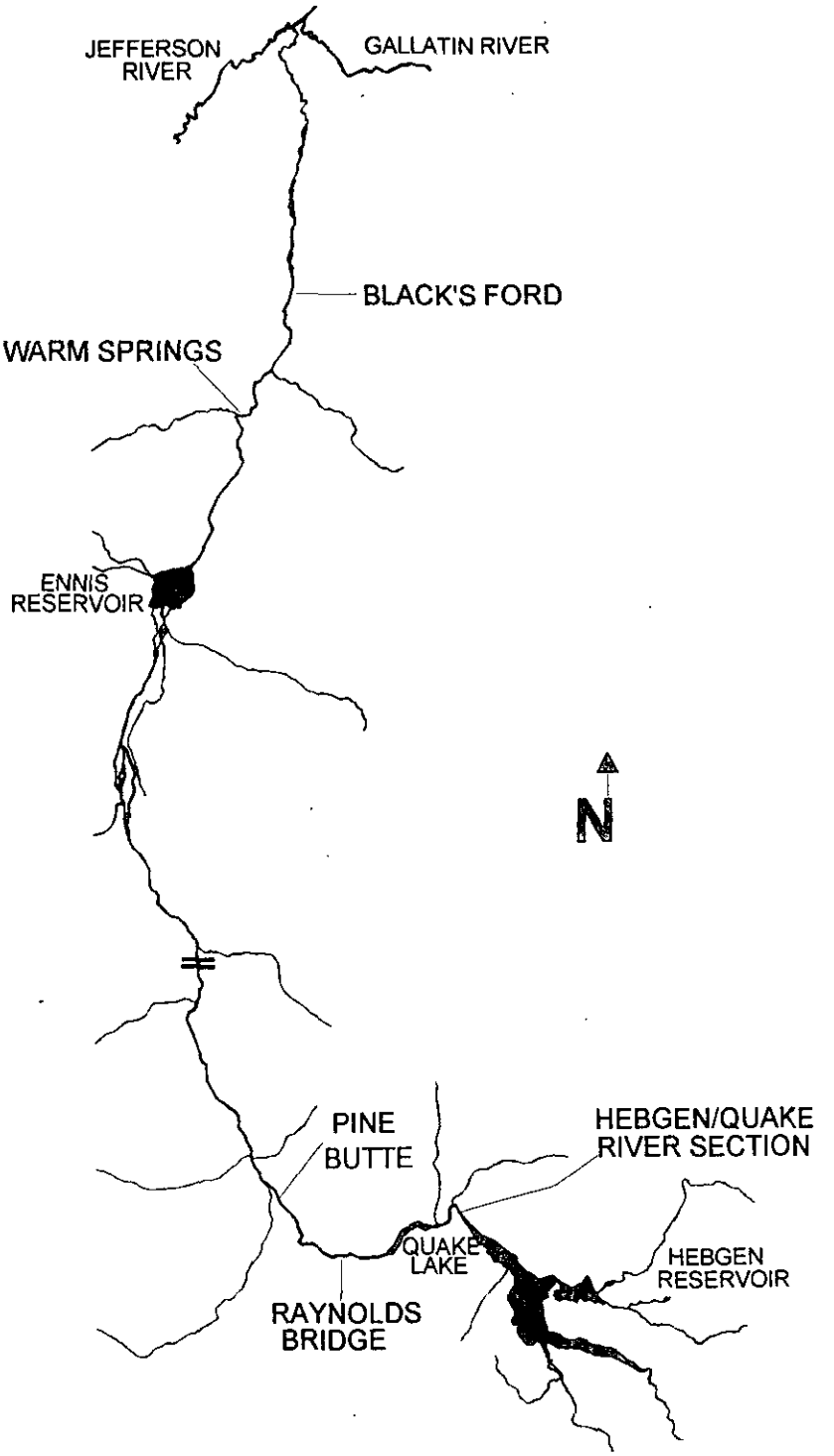

Figure 4. Collection sites of 1997 Madison River young-of-the-year trout for whirling disease testing.

anterior to the pelvic girdle, the transmitter inserted, and the incision closed with Ethilon suture swaged into a cutting needle. A mattress knot was used to suture the incision. The antenna of the transmitter was left protruding from the ventral side of the fish. Transmitter life was rated at 60 days. Relocations of radio tagged fish were attempted 2-3 times per week from mid-April through early August, or until the transmitter ceased functioning.

Temperature monitoring

Water and air temperature were recorded throughout the course of the Madison River from the Hebgen Reservoir inlet to the mouth of the river at Headwaters State Park (Figure 5). Optic StowAway loggers were programmed to record every 30 minutes, in Fahrenheit.

Biological monitoring

As part of the relicensing effort, MPC initiated a water quality monitoring program. In this program, personnel of MPC and several agencies, including MFWP, have conducted biological and biocontaminant monitoring collections at locations within the Madison/Missouri System since 1994. Aquatic invertebrate and periphyton samples were collected for biological trend monitoring at eight sites from the Madison River within Yellowstone National Park (YNP) to the Missouri River below Morony Dam at Great Falls. Seven of the sites have been sampled in previous years (MFWP 1997a), and a site at Ennis was added in 1997. In previous years, suckers, trout, and whitefish were collected from sites near or below MPC dams for biocontaminant analyses. Samples were analyzed by a variety of consultants, and results reported to the MPC Environmental Division.

Westslope Cutthroat Trout Conservation and Restoration

Fish and habitat surveys of tributary streams in the Madison River drainage were initiated in June. Gas and battery powered backpack shockers were used to sample fish each half mile, and methods described by Overton et al. (1997) were modified for qualitative and quantitative characterization of habitat.

RESULTS AND DISCUSSION

Madison Grayling

Electrofishing was used to monitor Ennis Reservoir grayling from 1990-96. It has not been conducted since 1996 because of the low probability of capturing spawning grayling. Table 1 shows the number of adult grayling captured during electrofishing in the Channels section of the Madison River from 1990-96.

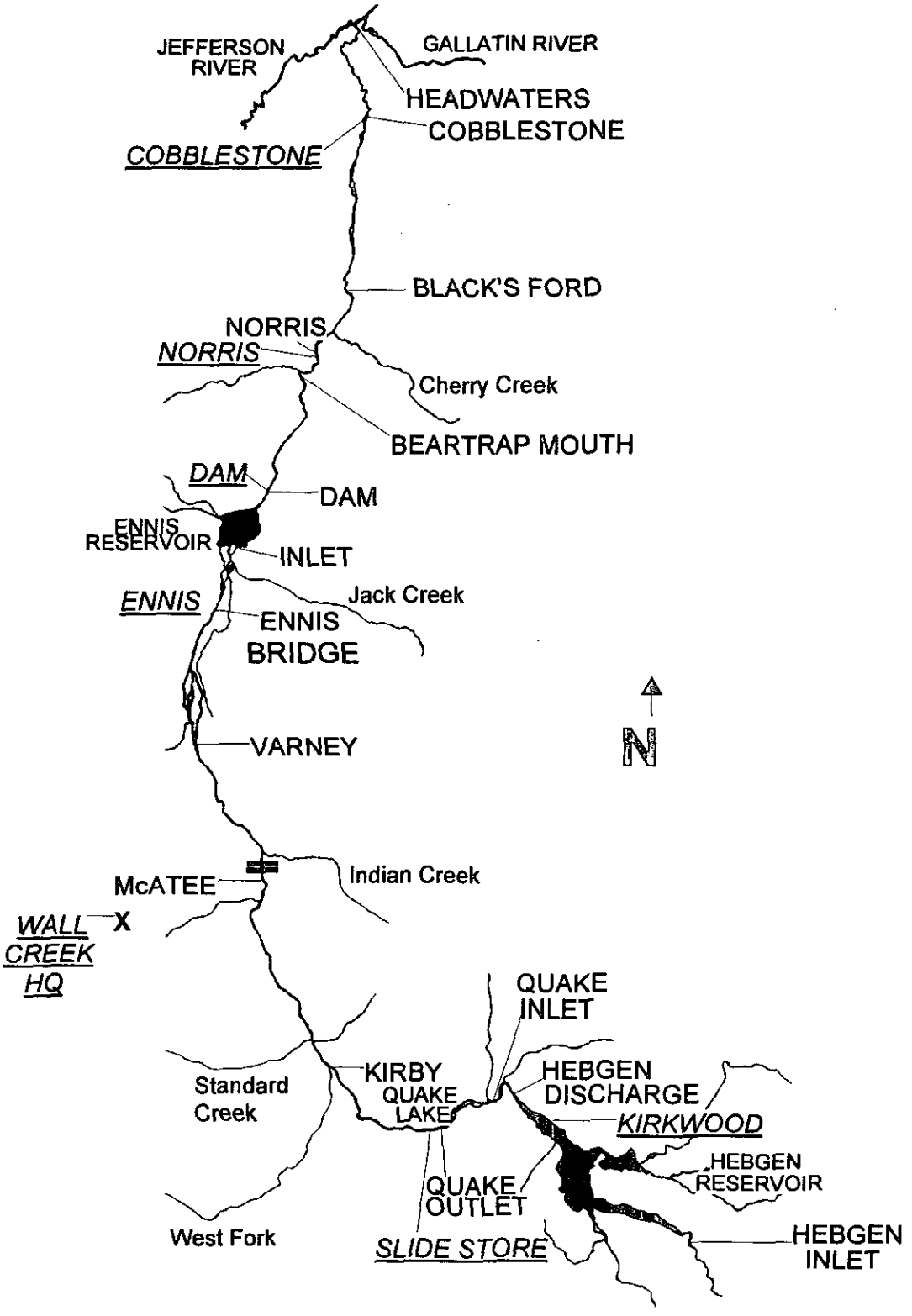

Figure 5. Locations of Montana Fish, Wildlife, & Parks 1997 Madison River temperature monitoring sites. Air temperature sites are underlined.

Table 1. Number of grayling captured by electrofishing in the Channels section of the Madison River, March/April 1990-95.

Year	No. captured	No. electrofishing runs
1990	24	7
1991	35	7
1992	107	8
1993	129	6
1994	29	4
1995	11	4
1996	19	7

Beach seining in Ennis Reservoir was conducted in August and October. One YOY grayling was captured in August near the mouth of Fletchers Channel (Table 2). Only five YOY mountain whitefish (*Prosopium williamsoni*) were captured, all in October. Other fish captured were Utah chub (*Gila atraria*), longnose sucker (*Catostomus catostomus*), white sucker (*Catostomus commersoni*), longnosed dace (*Rhinichthys cataractae*), and YOY brown trout. Site descriptions, dates, and 1997 catches are listed in Appendix A.

Table 2. Number of young-of-the-year grayling captured by beach seining in Ennis Reservoir, 1994-97.

Year	No. captured
1994	71
1995	35
1996	0
1997	1

Population Estimates

Seasonal population estimates were conducted in March/April and September, 1997.

Figures 6-9 illustrate historic population levels of rainbow trout in sections of the Madison River (Figure 2). In 1997, rainbow trout numbers remained suppressed in the three sections upstream of Ennis Reservoir. Snoball was closed to all angling in 1995 and 1996, but re-opened for the standard fishing season in 1997. As with the 1996 estimate, the estimate in 1997 is questionable due to poor recapture efficiency. Too few marked rainbow trout were captured in Snoball during the recapture runs to derive a statistically sound estimate. In the Norris section, the rainbow trout population remained at levels seen in recent years. As in 1996, several adult rainbow trout captured in the Norris

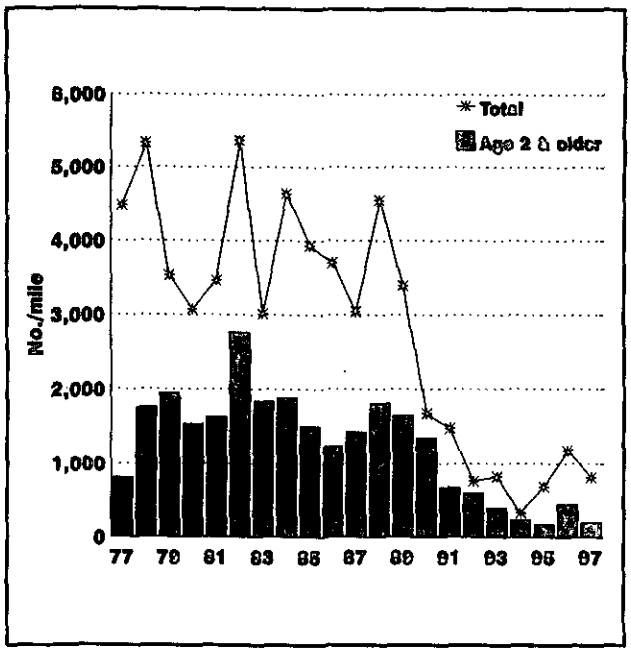

Figure 6. Rainbow trout populations in the Pine Butte section of the Madison River, 1977-1997, fall estimates.

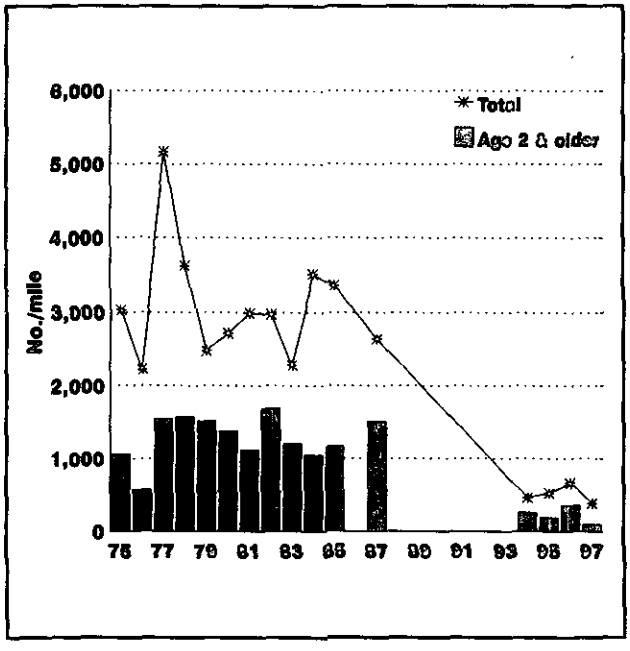

Figure 7. Rainbow trout populations in the Snoball section of the Madison River, 1975-1997, fall estimates.

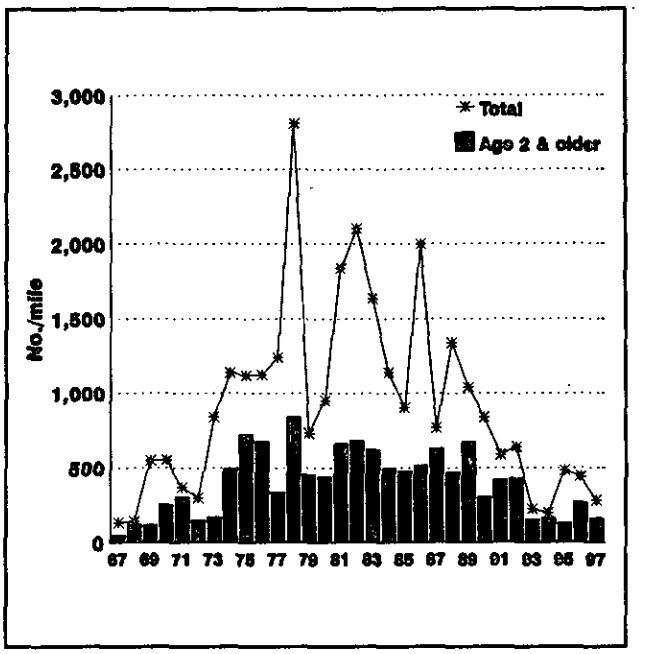

Figure 8. Rainbow trout populations in the Varney section of the Madison River, 1967-1997, fall estimates.

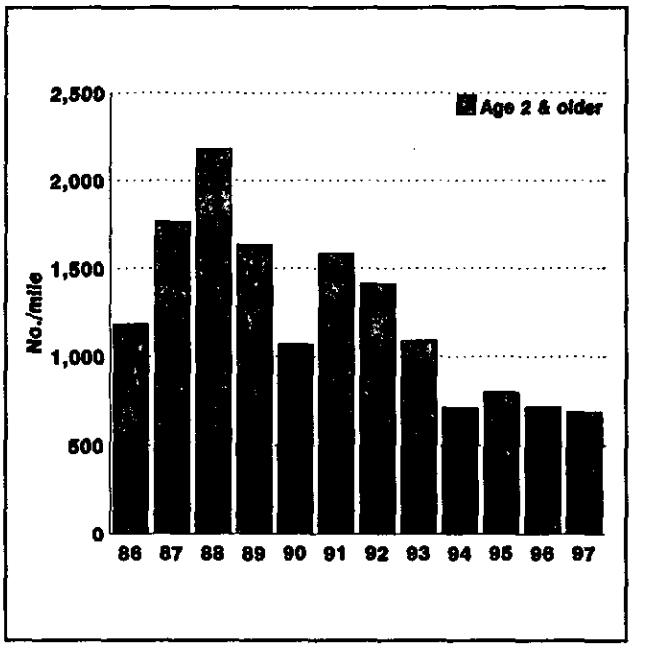

Figure 9. Rainbow trout populations in the Norris section of the Madison River, 1986-1997, spring estimates.

section during spring electrofishing exhibited cranial deformities consistent with whirling disease infection.

Figures 10-13 illustrate historic population levels of brown trout in sections of the Madison River (Figure 2). Total brown trout numbers in Pine Butte are at their highest level since 1989. In the Snoball section, the number of two year old & older fish decreased substantially from 1996, but was similar to 1994 and 1995. Brown trout numbers in the Varney section in 1997 remain similar to those in recent years. In the Norris section, the number of two year old & older brown trout is low compared to recent years. The reason for the apparent decline is unknown. A similar phenomenon occurred in the Pine Butte section during 1990-91.

Appendix B contains historic population levels of two year old & older rainbow and brown trout (± 80% Confidence Intervals). Aging of fish from 1995 and 1996 was completed in 1997, resulting in changes to the preliminary age structure of Pine Butte rainbow trout previously reported for 1996 (MFWP 1997a). The total estimated number of rainbows did not change, but a greater proportion of the population was determined to belong in the two year old & older class. Changes in population numbers between years may not be statistically significant, especially if those changes are minor.

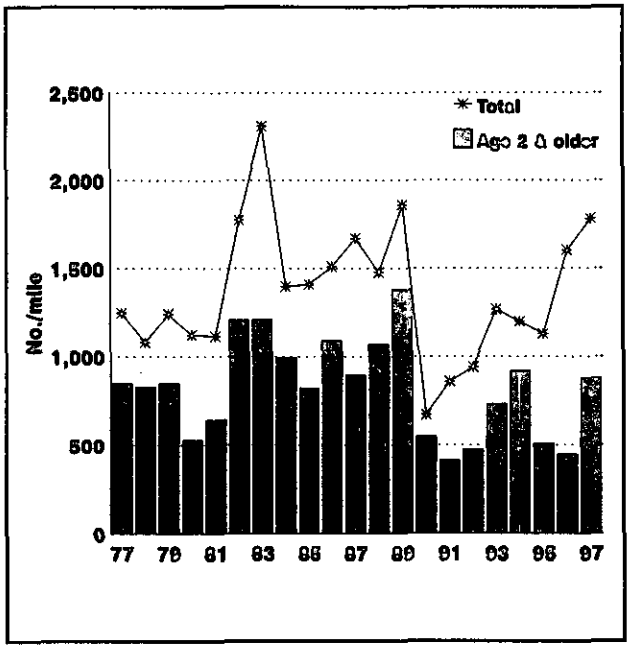

Figure 10. Brown trout populations in the Pine Butte section of the Madison River, 1977-1997, fall estimates.

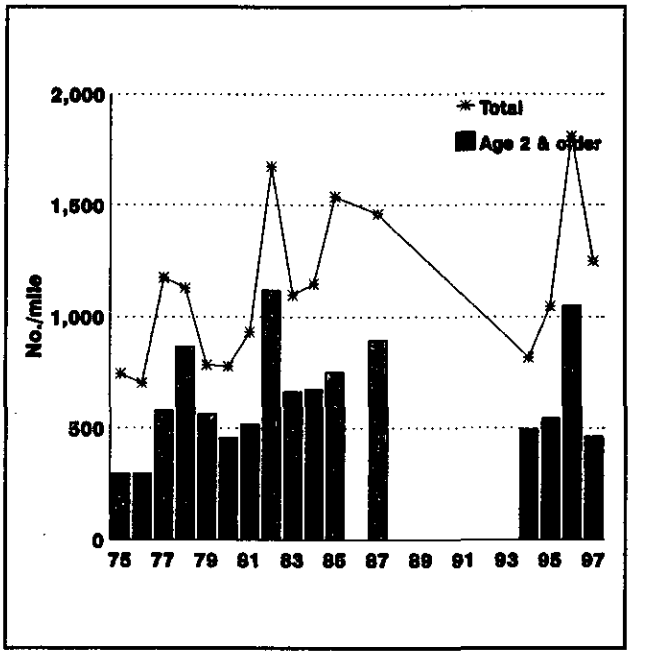

Figure 11. Brown trout populations in the Snoball section of the Madison River, 1975-1997, fall estimates.

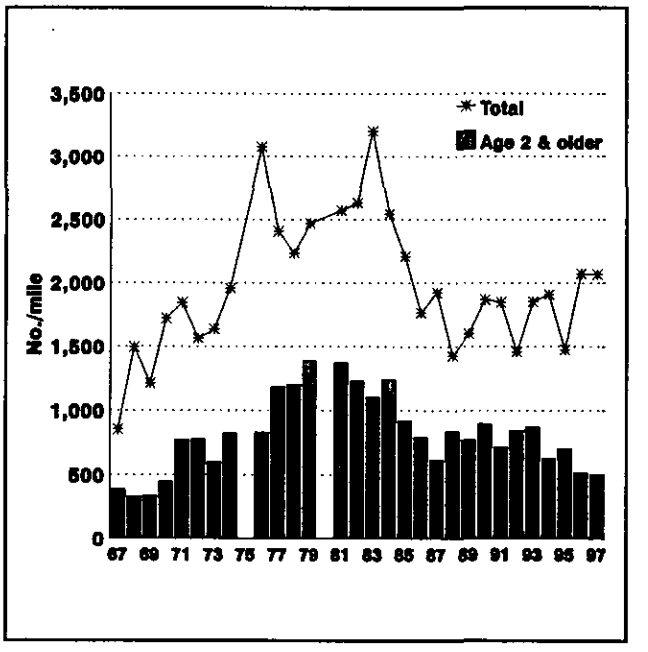

Figure 12. Brown trout populations in the Varney section of the Madison River, 1967-1997, fall estimates.

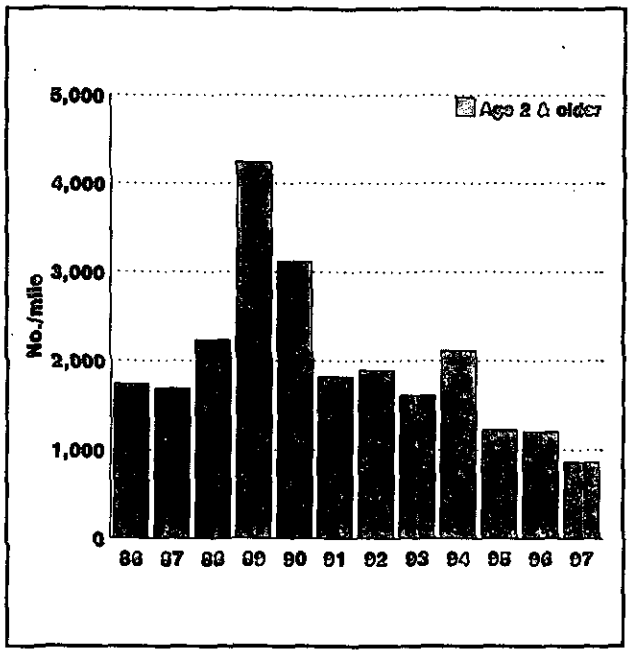

Figure 13. Brown trout populations in the Norris section of the Madison River, 1986-1997, spring estimates.

Gillnetting

Gillnetting statistics for Ennis Reservoir in 1997 are presented in Table 3. Gillnetting was not conducted in October due to time and personnel constraints. Few trout and no grayling were captured in 1997. Examination of statistics of the August netting, which was the only period commonly netted in 1995-97, indicates that the number and average size and weight of Utah chub and white sucker are similar each year. Too few of the other species were captured to draw meaningful conclusions.

Whirling disease

Young-of-the-year estimates were conducted in the Pine Butte and Snoball sections on July 16 & 17 and August 25 & 27, 1997. Table 4 compares the results of the 1997 sampling to similar dates in previous years.

In early December, a backpack shocker was used to collect YOY trout from five sites along the Madison River to determine the range and infection rate of whirling disease (Figure 4). Up to 20 rainbow trout and brown trout were collected from each location and sent to the Washington Animal Disease Diagnostic Laboratory at Washington State University for analyses of the presence (Table 5) and severity (Table 6) of infection of whirling disease.

Table 3.Summary of gillnet catch in Ennis Reservoir, 1997. Length is in inches, weight in pounds.

	UC[1]	WSu	LnSu	MWF	Rb	LL
June						
Av.length	9.7	13.8	7.8	10.1	10.3	13.0
Av.weight	0.40	1.20	0.18	0.43	0.37	0.85
# measured	63	57	3	4	3	14
total catch	235	67	3	4	3	14
August						
Av.length	10.0	13.5	8.4	---	14.7	12.6
Av.weight	0.46	1.19	0.23	---	1.20	0.33
# measured	92	63	4	0	3	5
total catch	118	73	4	0	3	5

[1] UC= Utah Chub, WSu= white sucker, LnSu= Longnose sucker, MWF= Mountain whitefish, Rb= Rainbow trout, LL= Brown trout

Table 4. Average number of young-of-the-year rainbow and brown trout estimated per 150 feet of riverbank in the upper Madison River, July-August, 1995-97. The number of sections sampled were 24 in 1995, 12 in 1996, and 19 in 1997.

	1995	1996	1997
Rainbow			
July	116	18	45
August	64	12	23
Brown			
July	36	22	54
August	19	12	15

Table 5. Results of analyses of fish collected during annual series sampling for whirling disease in the Madison River, December, 1997.

Sample site[1/]	Rainbow trout # WD+/# sampled	Brown trout # WD+/# sampled
Black's Ford	0/6	0/18
Warm Springs	0/20	0/16
Pine Butte	10/20	4/20
Raynolds Pass	4/20	1/3
Hebgen/Quake river section	0/20	0/3

Table 6. Grade of severity of samples determined to be whirling disease positive. Grade 4 are the most severely infected.

	Grade			
	1	2	3	4
Pine Butte rainbow	3	1	1	5
Pine Butte brown	3	1	0	0
Raynolds rainbow	1	1	2	0
Raynolds brown	1	0	0	0

To assess the feasibility of studying trout spawning movements in the whirling disease era, radio transmitters were implanted in seven rainbow and one brown trout captured in a side channel of the Madison River below Quake Lake on April 16, 1997. All fish survived the implant procedure and exhibited movement during radio tracking. One of the rainbow trout was caught twice in seven days by the same angler from behind the same rock. He stated that the incision had healed well. The brown trout was relocated eight times between April 16 and May 30. The signal from the transmitter grew increasingly weak until it could no longer be detected. This fish stayed within 0.5 mile of the surgery site. Transmitters in all seven of the rainbow trout continued to operate for at least 2 months. Four of the rainbow trout stayed within 0.6 mile of the surgery site and exhibited upstream and downstream movements. Three of the rainbow trout moved downstream- one moved 9.7 miles, one moved 31.3 miles, and one moved 44.8 miles (Appendix C).

Temperature monitoring

StowAway and Optic StowAway temperature recorders were deployed throughout the Madison River to document air and water temperatures (Figure 5). Table 7 summarizes the data collected at each location in 1997, and Appendix D contains thermographs for each location. Recorders deployed to monitor air temperatures were located in areas that were shaded 24 hours per day.

Table 7. Maximum and minimum temperatures (°F), the dates of each, the period monitored, and the number of recordings at selected locations in the Madison River drainage, 1997. Charts for each location are in Appendix D.

Site	Maximum	Minimum	Period	# readings
Water temperatures				
Hebgen inlet	73.56 (7/21)	47.54 (5/1)	4/26-10/8	7944
Hebgen discharge	65.25 (8/8, 24,29)	37.97 (4/26-29)	4/26-10/8	7944
Quake Lake inlet	64.44 (8/8, 9/8)	37.75 (4/26-30)	4/26-10/8	7944
Quake Lake outlet	62.95 (8/26)	38.19 (4/26)	4/26-10/8	7944
Kirby Bridge	67.54 (8/3)	37.35 (4/29)	4/26-10/8	7944
McAtee Bridge[1/]	69.64 (7/21)	36.82 (5/1)	4/26-8/29	6030
Varney Bridge	69.92 (7/24)	37.13 (5/1)	4/26-10/8	7944
Ennis Bridge	70.92 (7/24)	38.12 (5/1)	4/26-10/8	7944
Ennis Reservoir[2/] Inlet	74.66 (7/12)	39.84 (5/1)	4/26-10/13	8139
Ennis Dam	72.10 (7/24,25)	46.08 (4/26)	4/26-10/8	7944

Table 7, continued.

Beartrap Mouth	75.10 (7/24)	45.03 (4/26)	4/26-10/8	7944
Norris	75.86 (7/24)	44.76 (4/26)	4/26-10/8	7944
Black's Ford	76.58 (7/24)	42.43 (4/26,5/2)	4/26-10/8	7944
Cobblestone	77.66 (7/24)	40.63 (4/26)	4/26-10/8	7944
Headwaters S.P. (Madison mouth)	79.04 (7/24)	43.81 (4/26)	4/26-10/8	7944
Air temperatures				
Kirkwood Store	91.98 (7/15)	23.43 (5/3,9)	4/26-10/8	7944
Slide Store[3/]	96.33 (8/28)	23.45 (5/8)	4/26-9/7	6480
Wall Creek HQ	90.93 (7/15)	27.26 (5/8)	4/26-10/8	7944
Ennis Fisheries office	99.65 (6/26)	24.32 (10/6)	4/26-10/8	7944
Ennis Dam	86.85 (7/15)	31.52 (10/6)	4/26-10/8	7944
Norris	100.46 ( )[4/]	29.63 (5/8)	4/26-10/8	7944
Cobblestone	86.90 (8/27)	26.12 (10/6)	4/26-10/8	7944

[1/] This logger was removed from the river on 8/29/97 and set on the riverbank, but not recovered by FWP personnel until 9/26. Temperatures recorded after 8/29 are not reported.

[2/] The first logger set at this site indicated a malfunction and was replaced on July 16. The second logger ran beyond the original cessation date.

Table 7, continued.

3/ This logger was on private property attached to a shaded area on a fence that was removed approximately 9/8/97 and stored in an area of full sunlight. Temperatures recorded after 9/7 are not reported.

4/ 7/14-16,22-24, 8/2,3,6,7,21-23,26-29, 9/5,7,9,24. This recorder was inside a brown steel equipment tower along the riverbank. Temperatures inside the tower were probably artificially high and not a true reflection of ambient air temperature.

Biological monitoring

Monitoring was conducted in mid August at eight sites. Density of the New Zealand Mud Snail (*Potomopyrgus antipodarum*) at the Yellowstone National Park site was higher in 1997 than in previous years (Table 8).

Montana State University researchers sampled eight sites in the Madison River in Yellowstone Park during September, 1997, using a 100 micron (1 micron = 1/1000th millimeter) mesh Surber Sampler. They calculated NZMS densities from their samples to range from 46,000-299,000/m^2 (B. Kerans Wild Trout Lab, pers.comm).

Table 8. Density (#/m^2) and relative abundance (percent of all organisms collected) of New Zealand Mud Snails, and mesh size of sampling screen used during biological monitoring to collect samples in Yellowstone National Park, September 1994, August 1995-97.

	Density	relative abundance	mesh size
1994	19	7	1700
1995	156	8	800
1996	2187	52	800
1997	7345	62	560

Westslope Cutthroat Trout Conservation and Restoration

In December 1996, MFWP announced an effort to conserve and restore westslope cutthroat trout in tributaries of the Madison River. Westslope cutthroat trout, along with Arctic grayling and mountain whitefish, are the only salmonid species native to the upper Missouri River drainage in Montana. The mottled sculpin (*Cottus bairdi*), longnose sucker, white sucker, mountain sucker

(*Catostomus platyrhynchus*), longnose dace (*Rhinichthys cataractae*), and stonecat (*Noturus flavus*) are other species which are native to many waters in central Montana east of the continental divide (Holton and Johnson 1996). Rainbow trout, brown trout, brook trout (*Salvelinus fontinalis*), Yellowstone cutthroat trout (*Oncorhynchus clarki bouvieri*) and other fish species have all been introduced from sources outside the upper Missouri River drainage (upstream of the present day location of Fort Peck Reservoir).

Personnel of MFWP initiated the conservation and restoration work in the Madison drainage by surveying all or part of eleven selected tributary drainages of the upper Madison River during 1997. Information collected included fish species, habitat quality, and barrier sites. Sections of four streams were inhabited by what appear to be genetically pure westslope cutthroat trout. Samples were collected for electrophoresis testing at the University of Montana Genetics Lab. Barriers to upstream fish movement were located on three of these streams. The only fish species found in stream sections above these barriers were cutthroat trout and mottled sculpin. Barriers on two of the streams were decadent beaver dam complexes, while the barrier on the third stream was a natural rock formation. Surveys on the fourth stream will be completed in 1998. Man-made barriers are expected to be installed in 1999 in the two streams with insecure barriers to prevent invasion of non-native fish when the beaver complexes eventually fail.

In June, representatives of Turner Enterprises, Inc. (TEI), owners of the Flying D Ranch, approached MFWP to offer access to the Cherry Creek drainage, tributary of the lower Madison River, for assessment of westslope cutthroat trout introduction potential. In August, personnel of MFWP and TEI, with assistance from USFWS and U.S. Forest Service (USFS), conducted fish species distribution surveys, water chemistry and quantity measurements, qualitative habitat assessments, and barrier searches throughout most of the Cherry Creek drainage above a 25-30 foot waterfall in Cherry Creek Canyon. Fish species sampled in the upper portion of the drainage were Yellowstone cutthroat trout, rainbow trout, and brook trout, none of which are native to the Madison River drainage. Only the Yellowstone cutthroat is native to Montana, in the Yellowstone River drainage. Over 80 miles of stream are available in Cherry Creek and its tributaries above the waterfall. Fish presently occupy about 60-65 miles.

After the field surveys were conducted in August, an employee of the USFWS, who has extensive experience applying antimycin to reclaim streams for native fish species, visited Cherry Creek to review the project area. Based on information gathered during the field surveys, his on-site inspection of the area, and his previous experiences conducting similar projects, he determined the project to be feasible. Public scoping was conducted from December 16, 1997 through January 30, 1998.

CONCLUSIONS AND FUTURE PLANS

The Madison grayling population experienced another poor year. Only one young-of-the-year grayling was captured during seining in Ennis Reservoir in 1997. Anglers who frequently fish the inlet of the Madison River into Ennis Reservoir reported catching few grayling. Preliminary findings for two separate studies suggest that grayling are not affected by whirling disease (Kaya pers.comm., Vincent pers.comm.). The reason for the decline of Madison grayling is unknown. However, if grayling are conclusively found to be resistant to whirling disease, opportunities may become available for establishing fluvial grayling, a Species of Special Concern, into waters infected with whirling disease.

A Master of Science level graduate study will be implemented in the upper Madison River in 1998 to study the relationship between rainbow trout fry development and timing of whirling disease spore density. Personnel of the Madison River/Ennis Reservoir project will be closely involved in this two year study.

The primary focus of the Madison/Ennis project in 1998 will again be the Upper Missouri Westslope Cutthroat Trout (UMWCT) Conservation and Restoration Program. Due to the immediate opportunity presented at Cherry Creek, much effort is expected to be directed toward that project.

If any streams or sections of stream in the Madison River Drainage are determined to be suitable for expansion or restoration of westslope cutthroat trout, one or more of several methods may be used to remove non-native fish occupying that area. Depending on the size and complexity of the stream or stream section involved, physical removal may be possible using electrofishing, trapping, or netting. Streams over 4-5 cubic feet/second (cfs) discharge will probably require chemical eradication. A compound called antimycin would be preferred in those situations. Antimycin is toxic to trout in extremely low concentrations (8-12 parts per billion) if applied for 8-12 hours, depending on water chemistry and temperature. Rotenone would also be an alternative for chemical eradication, but would probably be used sparingly in conjunction with antimycin. Fertilized westslope cutthroat eggs would then be placed in streamside incubators, allowed to develop and hatch in a bath of creek water, and the fry would emerge from the incubator into the stream when they chose. Potential sources of eggs for seeding westslope cutthroat trout into a stream would be the MFWP Washoe Park Trout Hatchery in Anaconda, wild populations of genetically pure westslope cutthroat, or a combination of both.

Antimycin ($C_{28}H_{40}N_2O_9$) is registered by the Environmental Protection Agency (EPA) as a fish toxicant, and is obtained by fermenting Streptomycin. Streptomycin is a product of the metabolism of the bacteria Streptomyces, and in the past was commonly used as an antibiotic for human consumption. Schnick

(1974a) reviewed the toxicity of antimycin to a host of organisms ranging from bacteria to mammals. In the concentrations applied to eradicate fish, she found that some species of cladocerans and copepods (zooplankton), and Gammarus (an amphipod), exhibited temporary declines in their density, but were back to pre-treatment levels within seven months. Other organisms tested showed lesser or no effects. Rotenone ($C_{23}H_{22}O_6$) also is registered by the EPA as a fish toxicant, and is derived from the roots of certain plant species native to South America. It has been more commonly and widely used than antimycin. Schnick (1974b) reviewed the toxicity of rotenone to a variety of organisms and found little or no toxic effect to non-target organisms at the concentrations expected to be employed if rotenone is used in westslope cutthroat trout conservation and restoration efforts.

The Federal Energy Regulatory Commission released the Draft Environmental Impact Statement for the relicensing of MPC's Madison/Missouri Hydropower Project. Subsequently, MPC determined that it would be in their best interest, due at least in part to the deregulation of the electrical generating market, to divest themselves of their electrical generating facilities. MPC expects to select a buyer for the 2188 Project in 1998. The purchaser(s) of the facilities will be responsible for meeting the conditions of the FERC license. Thus, MPC will reduce their funding of the Madison/Ennis fisheries work to 50 percent of past budget levels for 1998 and 1999, then eliminate it completely. It is unknown if the purchaser(s) of the 2188 Project will continue the agreement with MFWP to conduct fisheries mitigation and enhancement work in the Madison River.

To insure the continuation of the Cherry Creek westslope cutthroat project, Turner Enterprises, Inc., owners of the Flying D Ranch, will enter into a cooperative agreement with MFWP to fund the remaining 50 percent of the annual budget during 1998 and 1999.

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Appendix A

Description of young-of-the-year grayling beach seining locations in Ennis Reservoir, and catch at each site.

Species abbreviations:

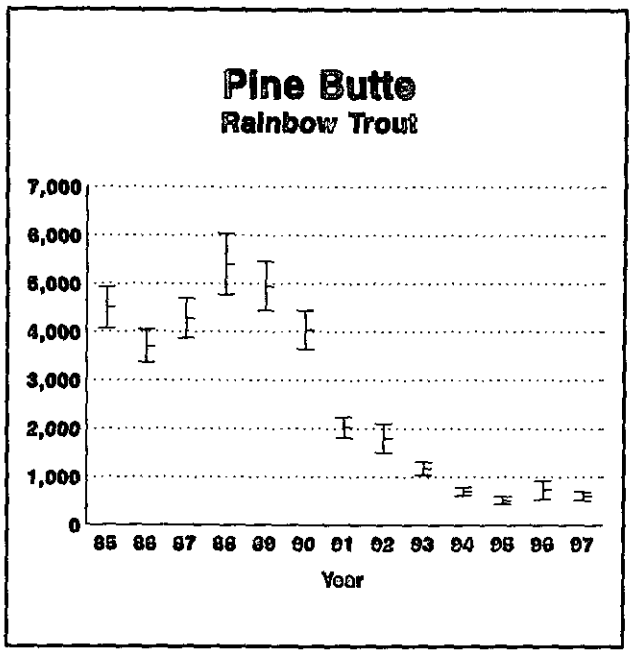
AG	Arctic grayling
MWF	mountain whitefish
WSu	white sucker
LND	longnosed dace
UC	utah chub
Sc	mottled sculpin
LL	brown trout

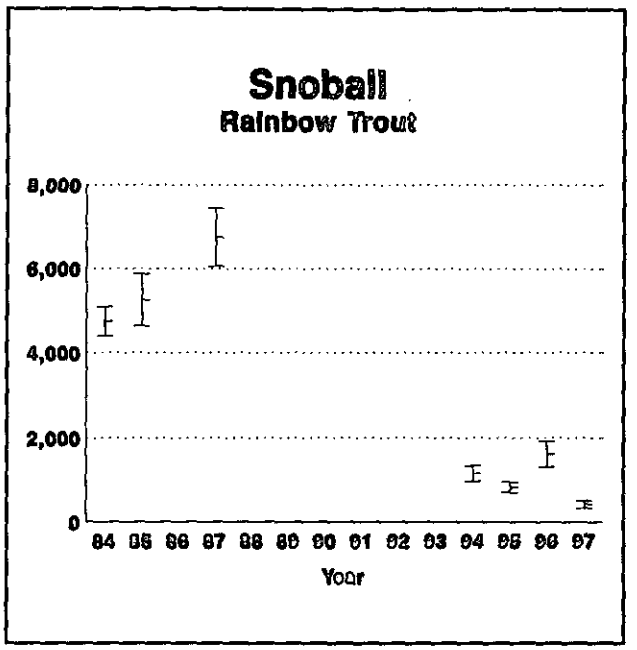
August 20 1997

Site seined/time	AG	MWF	Note
east side of willow patch between Meadow Creek FAS and Peterson property ($1000 house) 1354 hrs	0	0	macrophytes abundant throughout Meadow Cr. Bay
west side of willows at $1000 house 1409 hrs	0	0	abundant YOY and yearling suckers and chubs
midway between willow patch west of $1000 house and patch at Meadow Cr FAS 1425 hrs	0	0	numerous YOY suckers and chubs; 2 YOY LL
east end of 2nd willow patch west of $1000 house 1446 hrs	0	0	suckers and chubs
200 ft north of Meadow Cr mouth, 1516 hrs	0	0	macrophytes sparse
small bay west of Fletchers mouth 1550 hrs	1	0	several suckers and chubs, 1 YOY LL, macrophytes patchy
small bay immediately east of Fletchers mouth 1620 hrs	0	0	few suckers and chubs, macrophytes patchy

October 27 1997

Site seined/time	AG	MWF	Note
diagonally across 2nd willow patch west of $1000 house 1100 hrs	0	1	also caught YOY WSu, UC, LND, no macrophytes
600 ft north of Meadow Cr mouth, 1130 hrs	0	1	WSu, Sc, UC, no macrophytes
300 ft north of Meadow Cr mouth, 1150 hrs	0	2	WSu, UC, no macrophytes
bay south of Meadow Cr mouth, 1215 hrs	0	1	no macrophytes
small bay imm. west of Fletchers mouth 1310 hrs	0	0	WSu, UC, no macrophytes
point east od Moore's Cr mouth, 1330 hrs	0	0	WSu, Sc, no macrophytes, lots of algae


Pine Butte
Rainbow Trout
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
85 86 87 88 89 90 91 92 93 94 95 96 97
Year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Rainbow Trout
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6,000
4,000
2,000
0
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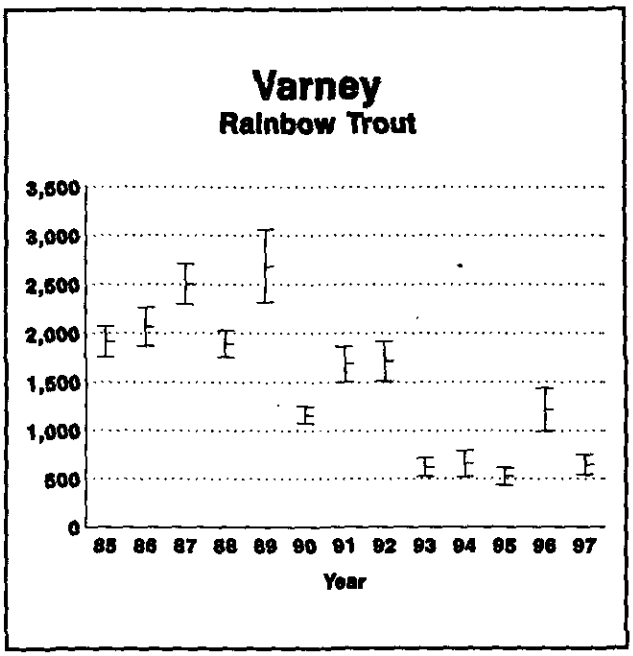
Year


Varney
Rainbow Trout
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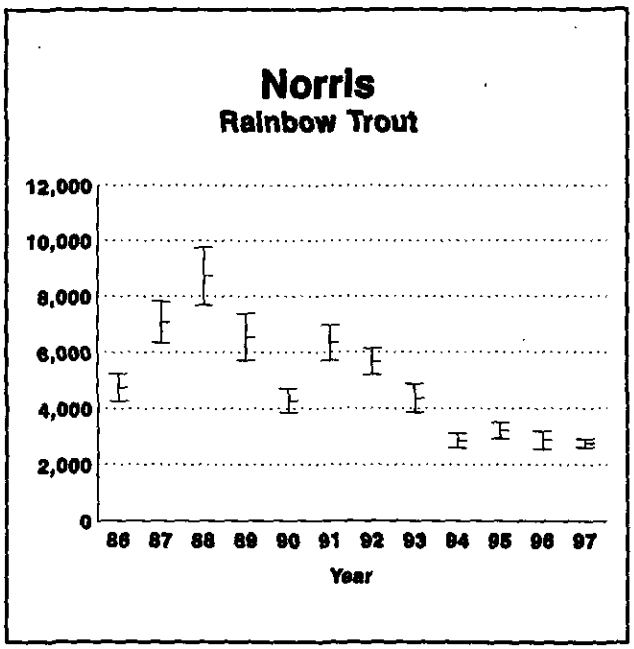
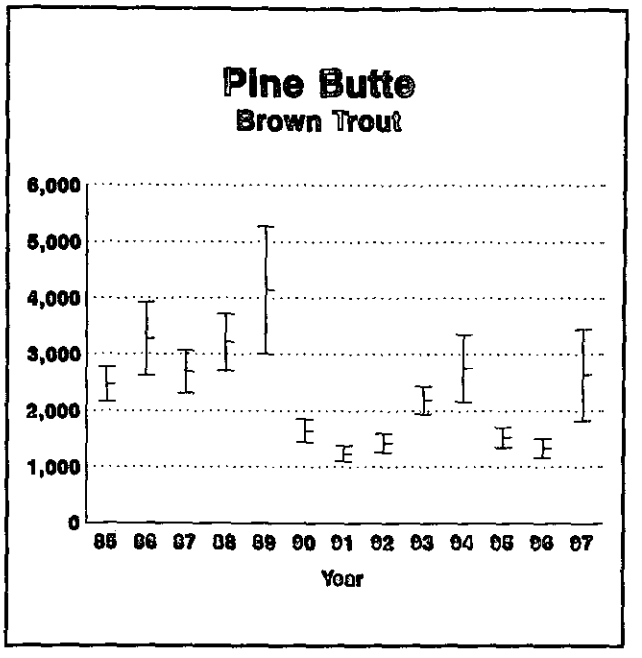
3,000
2,500
2,000
1,500
1,000
500
0
85 86 87 88 89 90 91 92 93 94 95 96 97
Year


Norris
Rainbow Trout
12,000
10,000
8,000
6,000
4,000
2,000
0
86 87 88 89 90 91 92 93 94 95 96 97
Year


Pine Butte
Brown Trout
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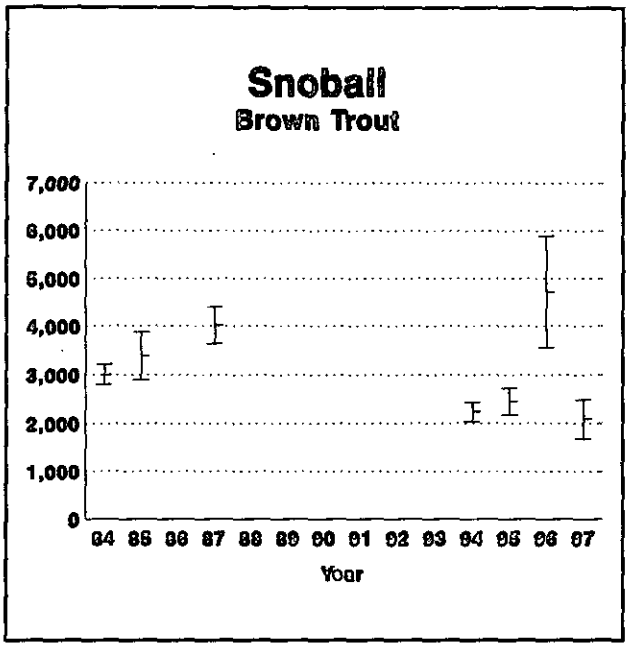
5,000
4,000
3,000
2,000
1,000
0
85 86 87 88 89 90 91 92 93 94 95 96 97
Year


Snoball
Brown Trout
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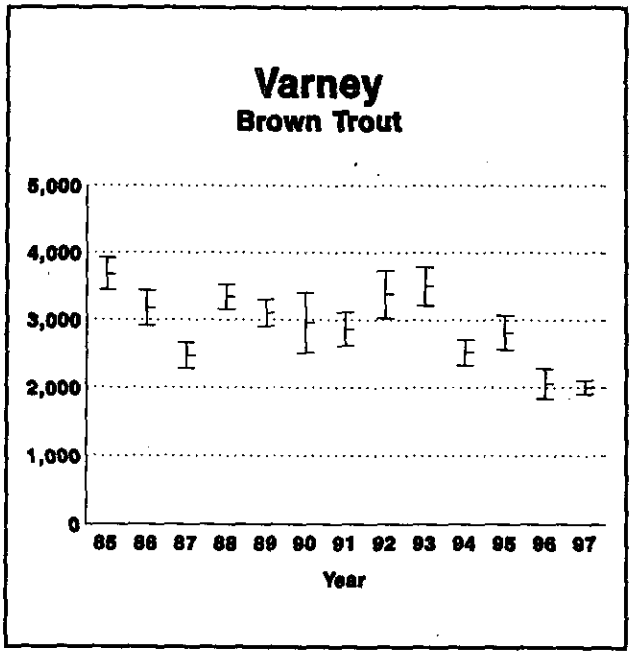
6,000
5,000
4,000
3,000
2,000
1,000
0
84 85 86 87 88 89 90 91 92 93 94 95 96 97
Year


Varney
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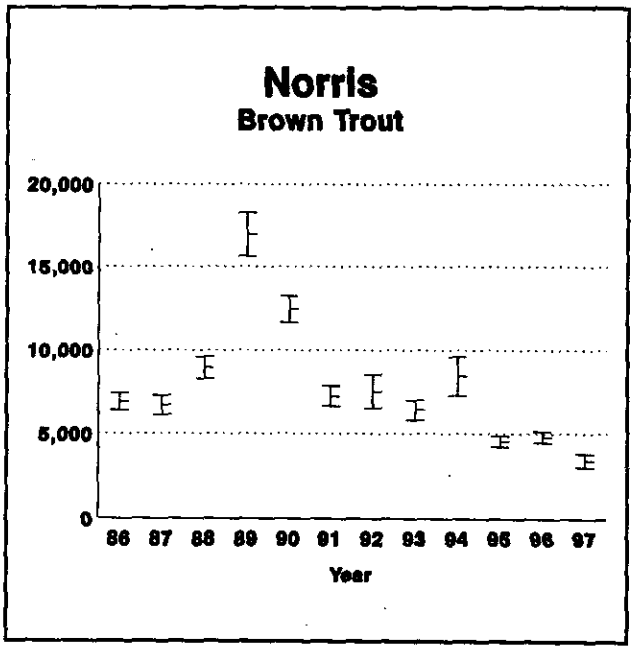
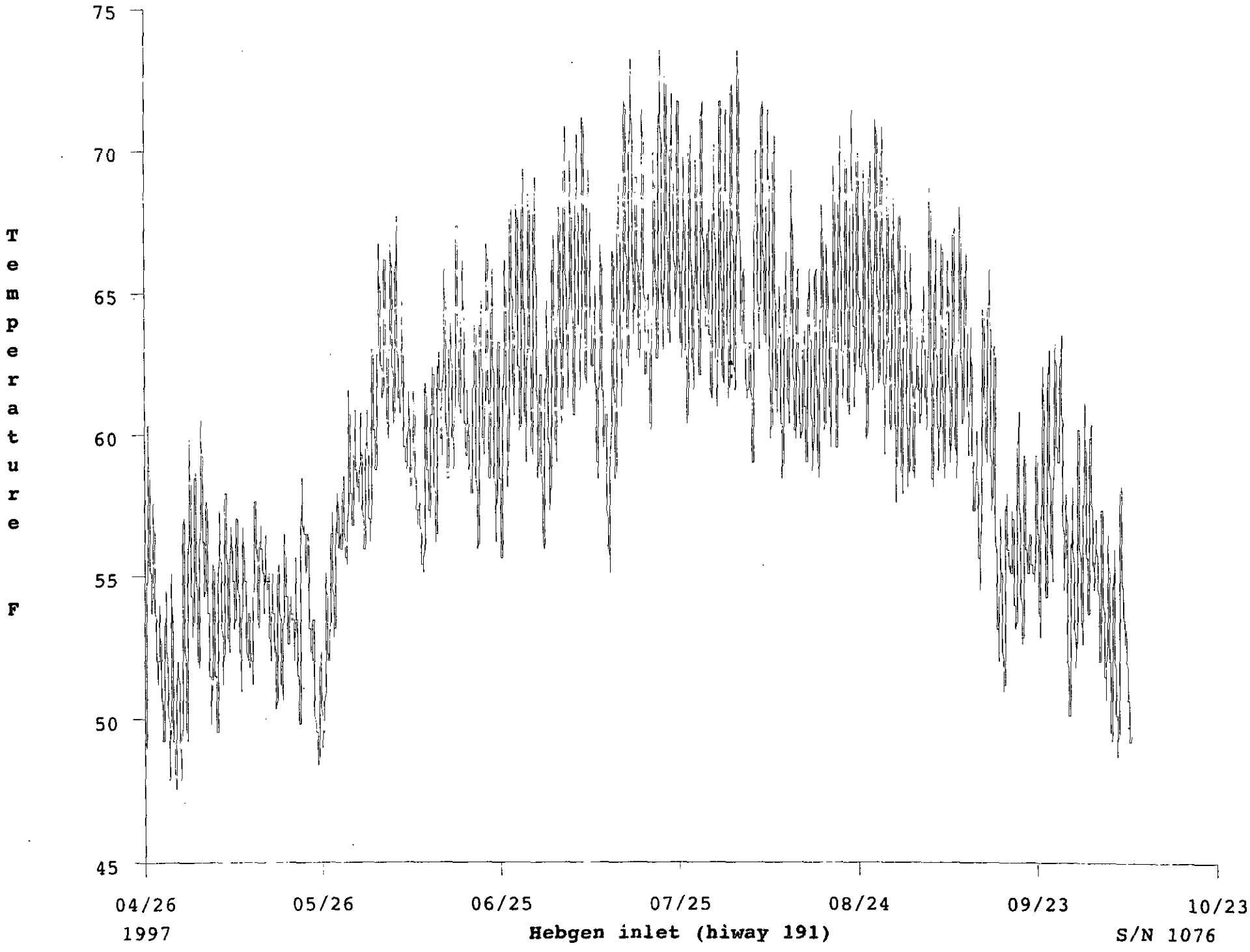
2,000
1,000
0
85 86 87 88 89 90 91 92 93 94 95 96 97
Year

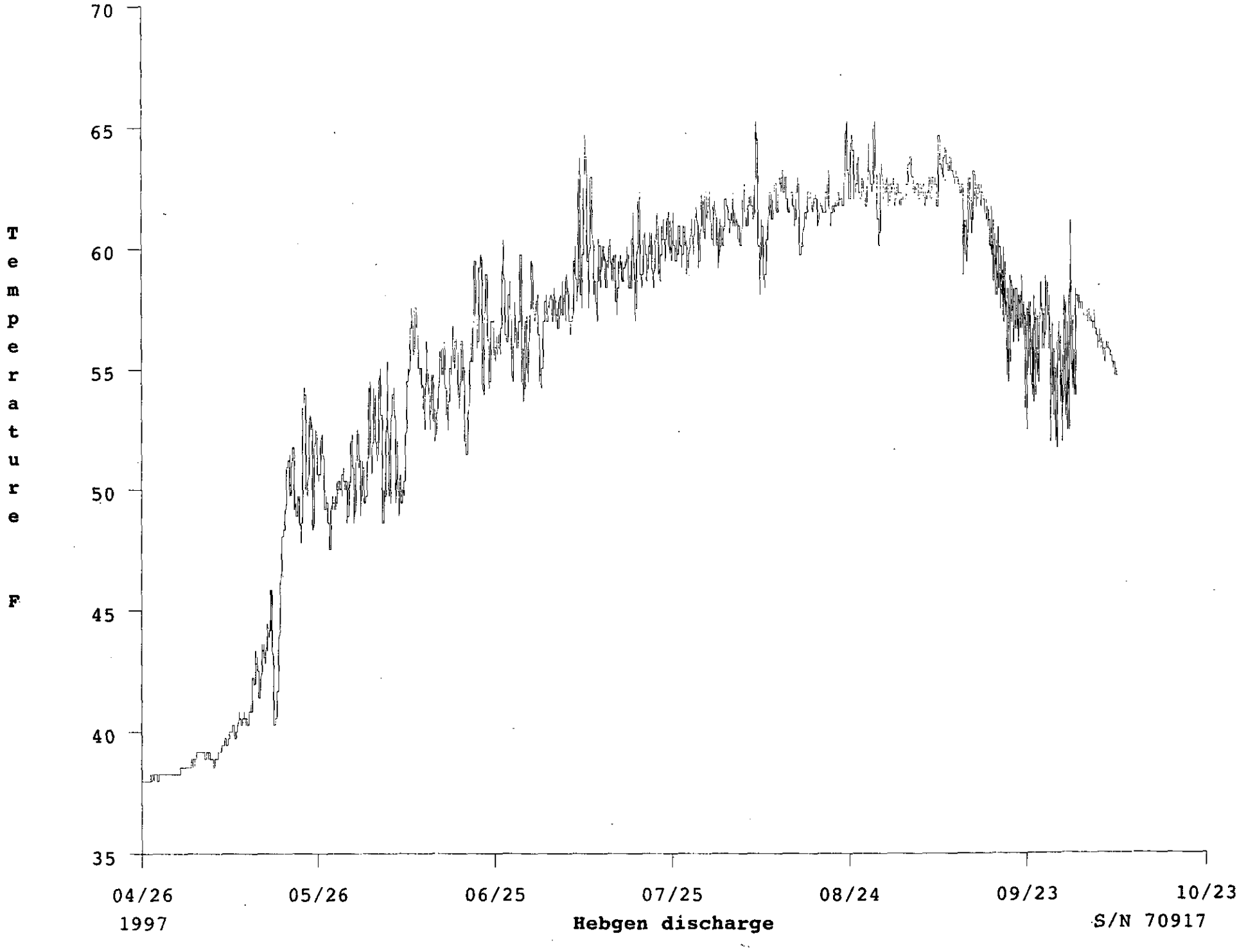

Norris
Brown Trout
20,000
15,000
10,000
5,000
0
86 87 88 89 90 91 92 93 94 95 96 97
Year

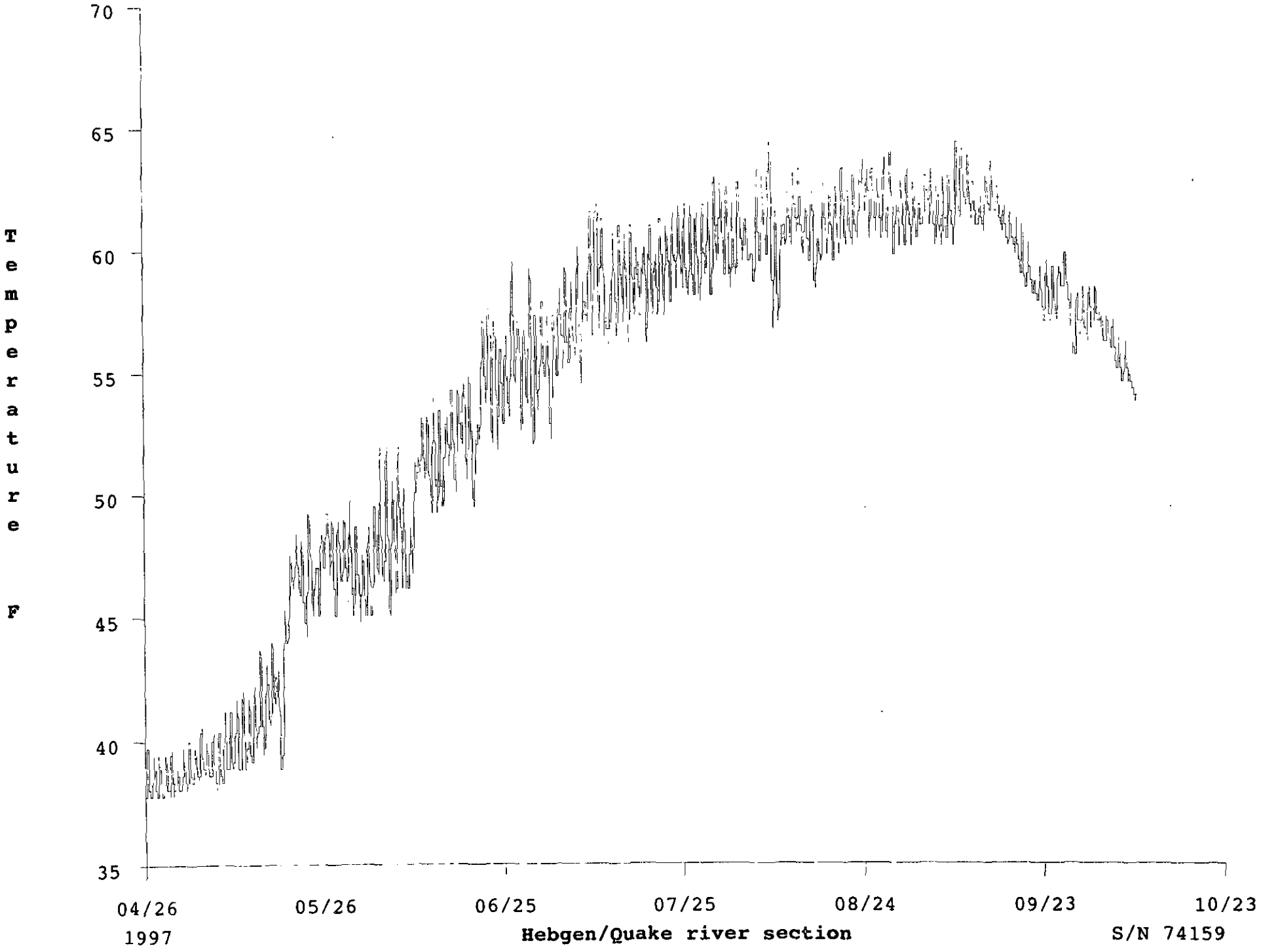
Appendix Table C1. Statistics of trout implanted with radio transmitters, Madison River, 1997.

Species	length (inches)	gender	spawning condition	max distance moved (miles)	monitoring period
rainbow	16.4	F	partially spent	0.2	4/18-8/4
rainbow	17.5	F	spent	9.7 downstream	4/18-8/4
brown	15.7	Unk	---	0.3	4/18-5/30
rainbow	19.0	M	ripe	0.4	4/18-6/23
rainbow	17.4	F	gravid	31.3 downstream	4/18-6/25
rainbow	17.9	M	ripe	0.3	4/18-7/14
rainbow[1/]	16.7	F	ripe	0.6	4/18-7/14
rainbow	16.9	M	ripe	44.8 downstream	4/18-7/14

1/ caught and released on 7/4 & 7/11 by the same angler, who reported the fish to be in good condition


75
70
65
60
55
50
45
Temperature F
04/26
1997
05/26
06/25
07/25
08/24
09/23
10/23
Hebgen inlet (hiway 191)
S/N 1076


70
65
60
55
50
45
40
35
Temperature F
04/26
1997
05/26
06/25
07/25
08/24
09/23
10/23
Hebgen discharge
S/N 70917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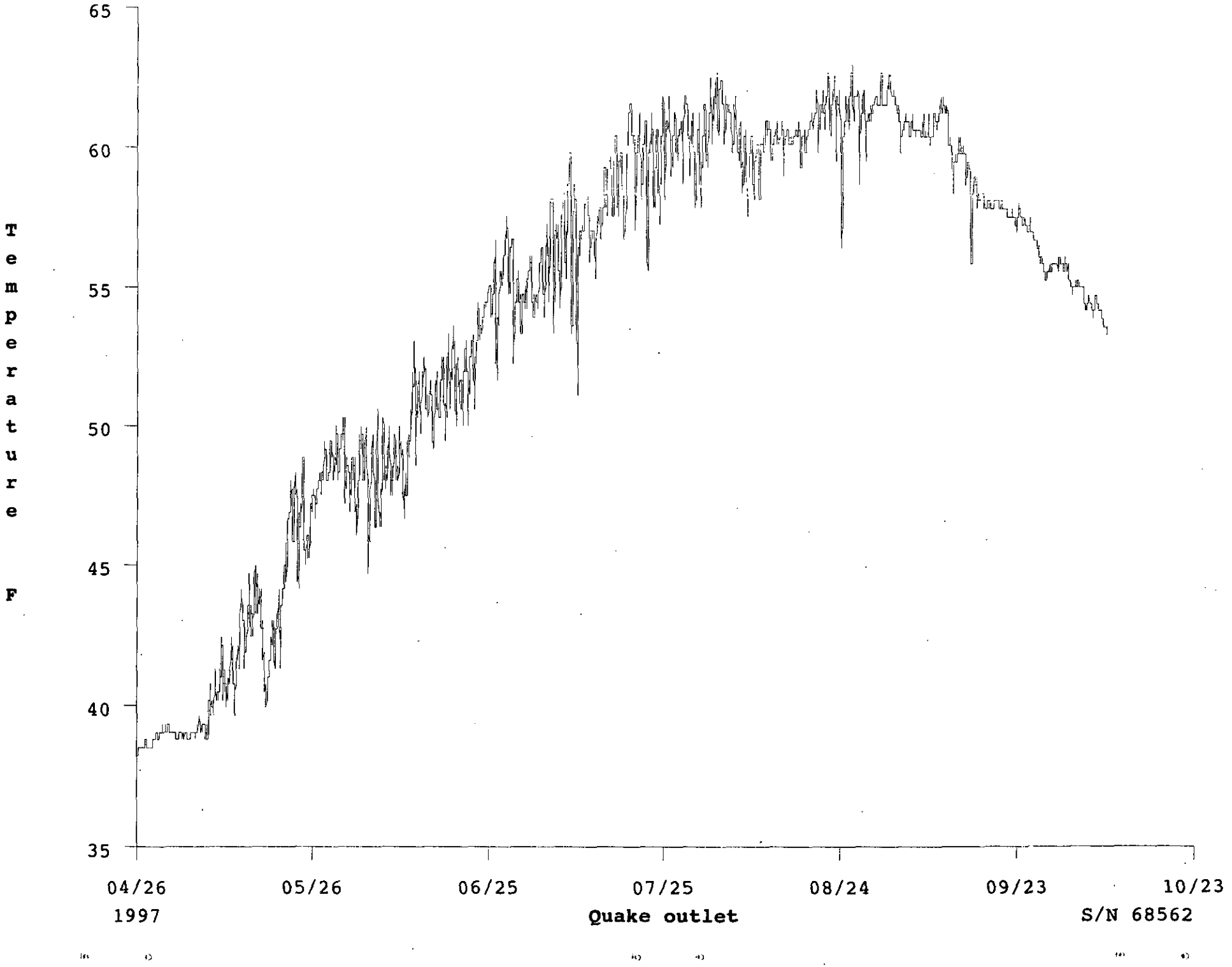
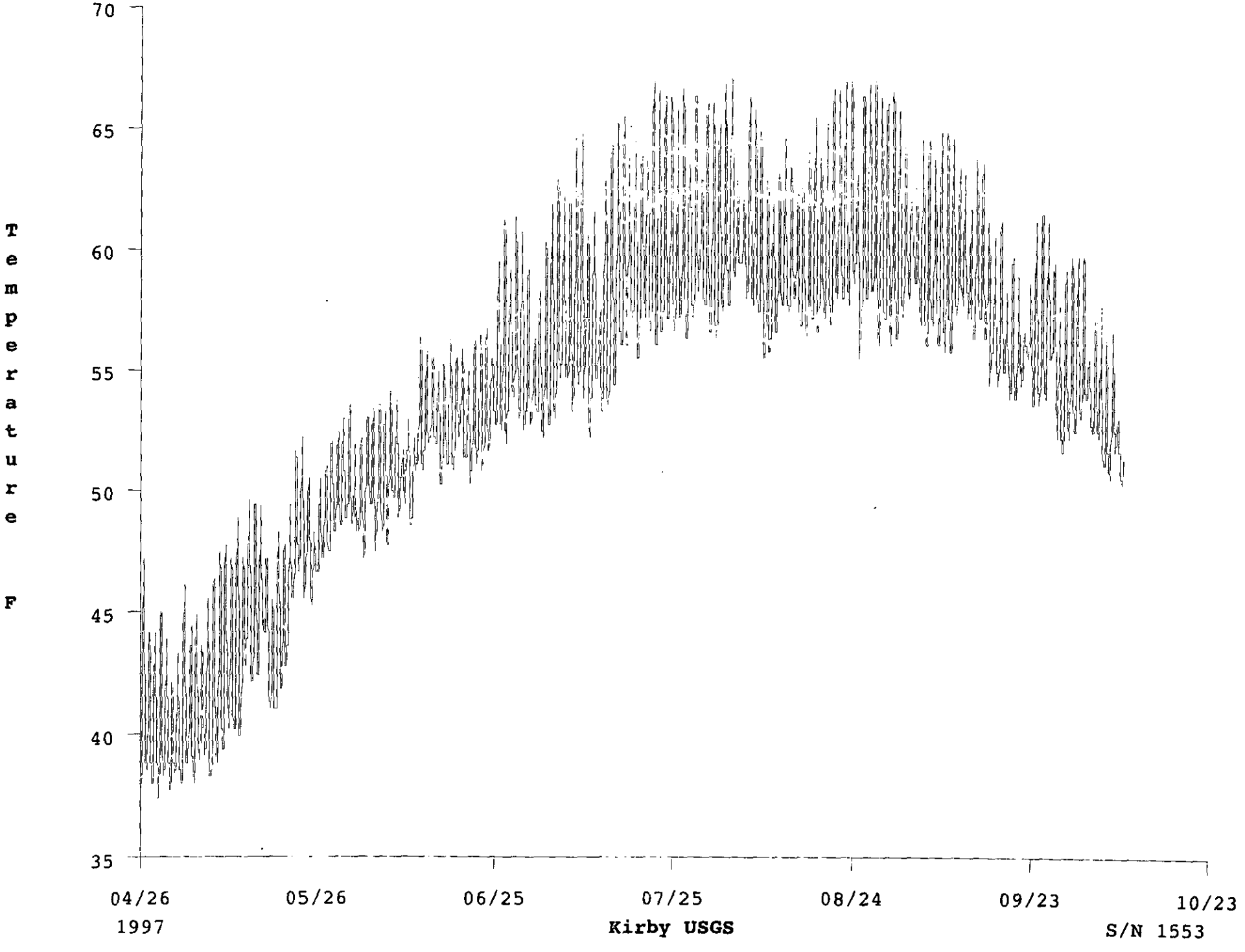
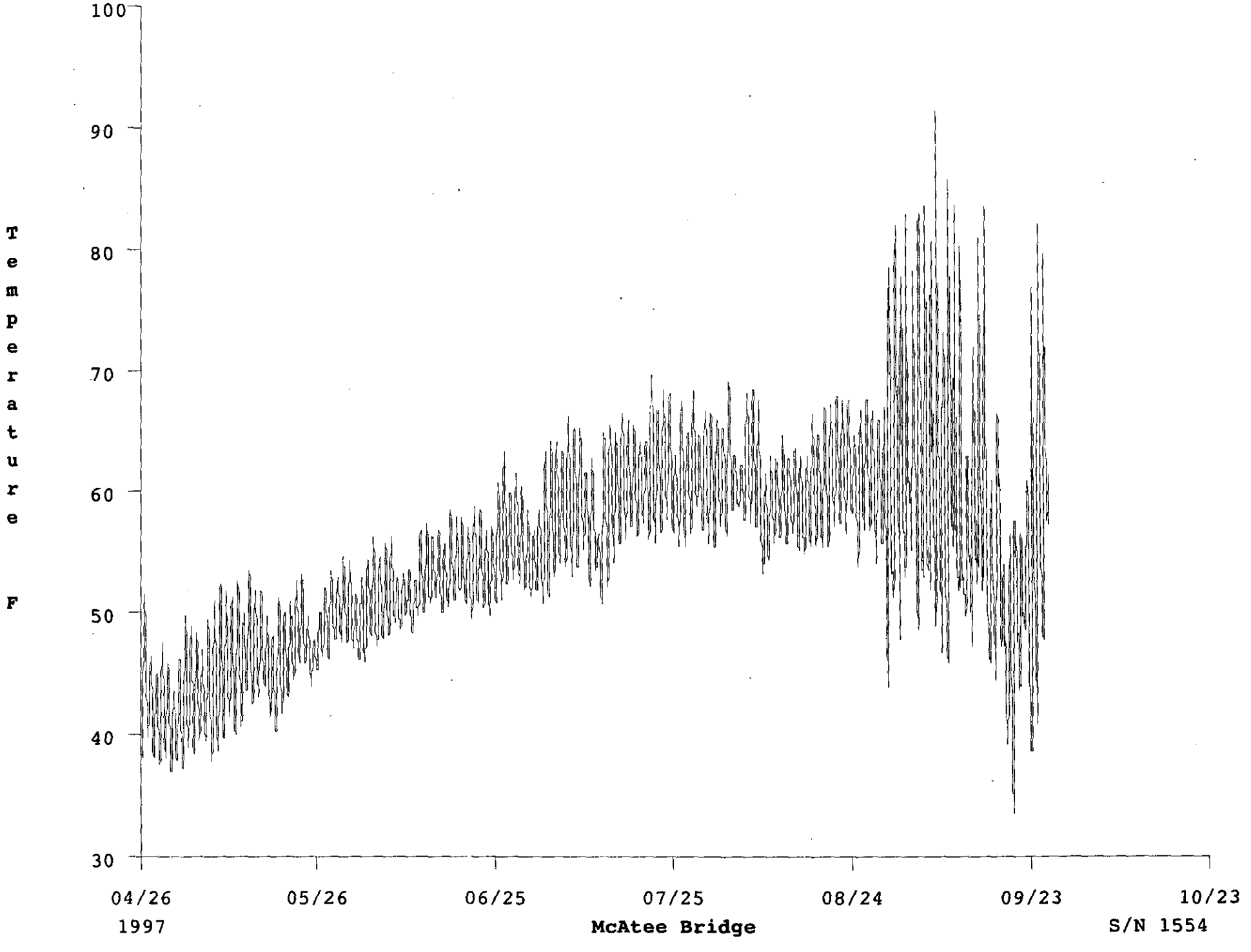
70
65
60
55
50
45
40
35
04/26
1997
05/26
06/25
07/25
08/24
09/23
10/23
Hebgen/Quake river section
S/N 74159


Temperature F
65
60
55
50
45
40
35
04/26
1997
05/26
06/25
07/25
08/24
09/23
10/23
Quake outlet
S/N 68562


70
65
60
55
50
45
40
35
Temperature F
04/26
1997
05/26
06/25
07/25
08/24
09/23
10/23
Kirby USGS
S/N 1553


100
90
80
70
60
50
40
30
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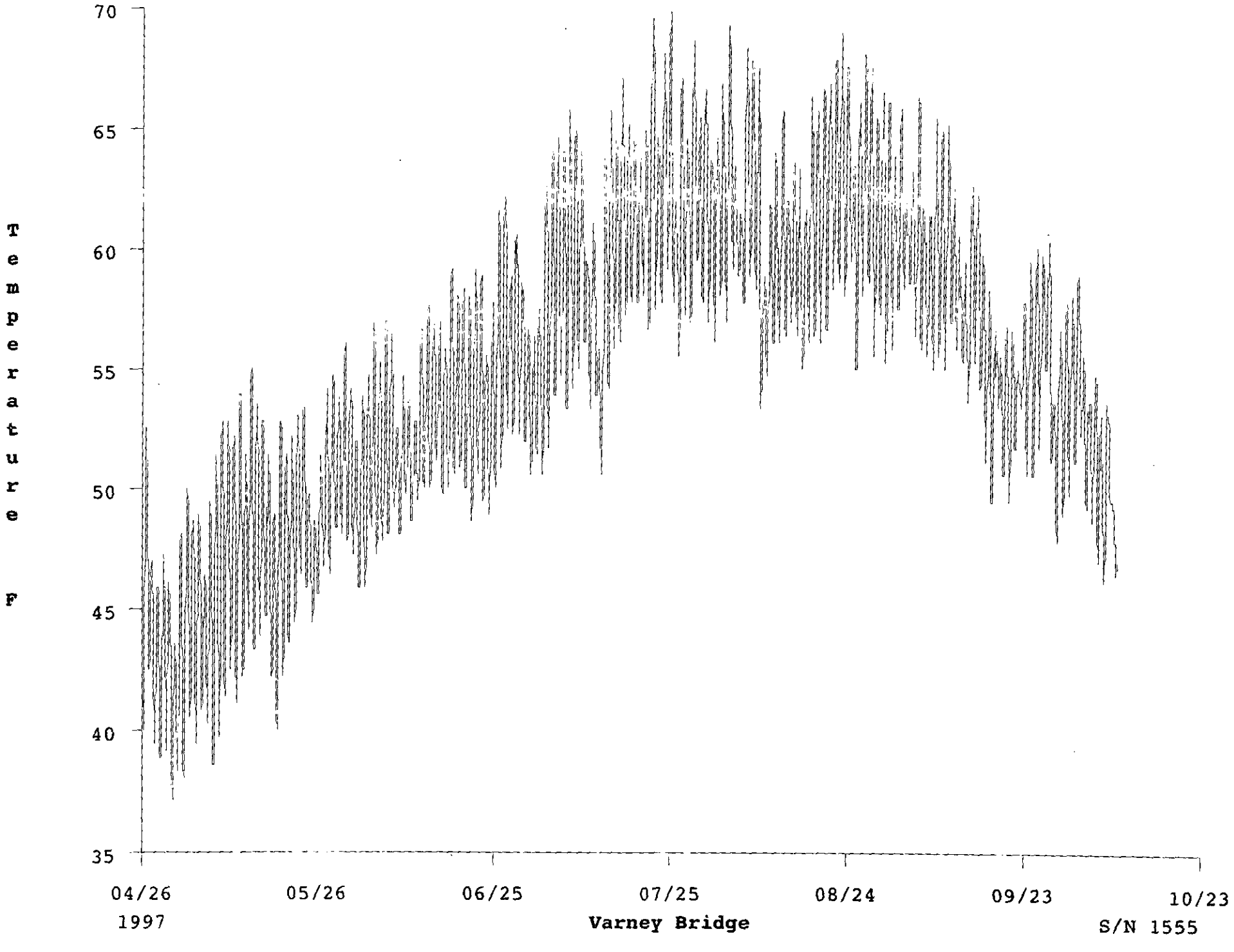
04/26
1997
05/26
06/25
07/25
08/24
09/23
10/23
McAtee Bridge
S/N 1554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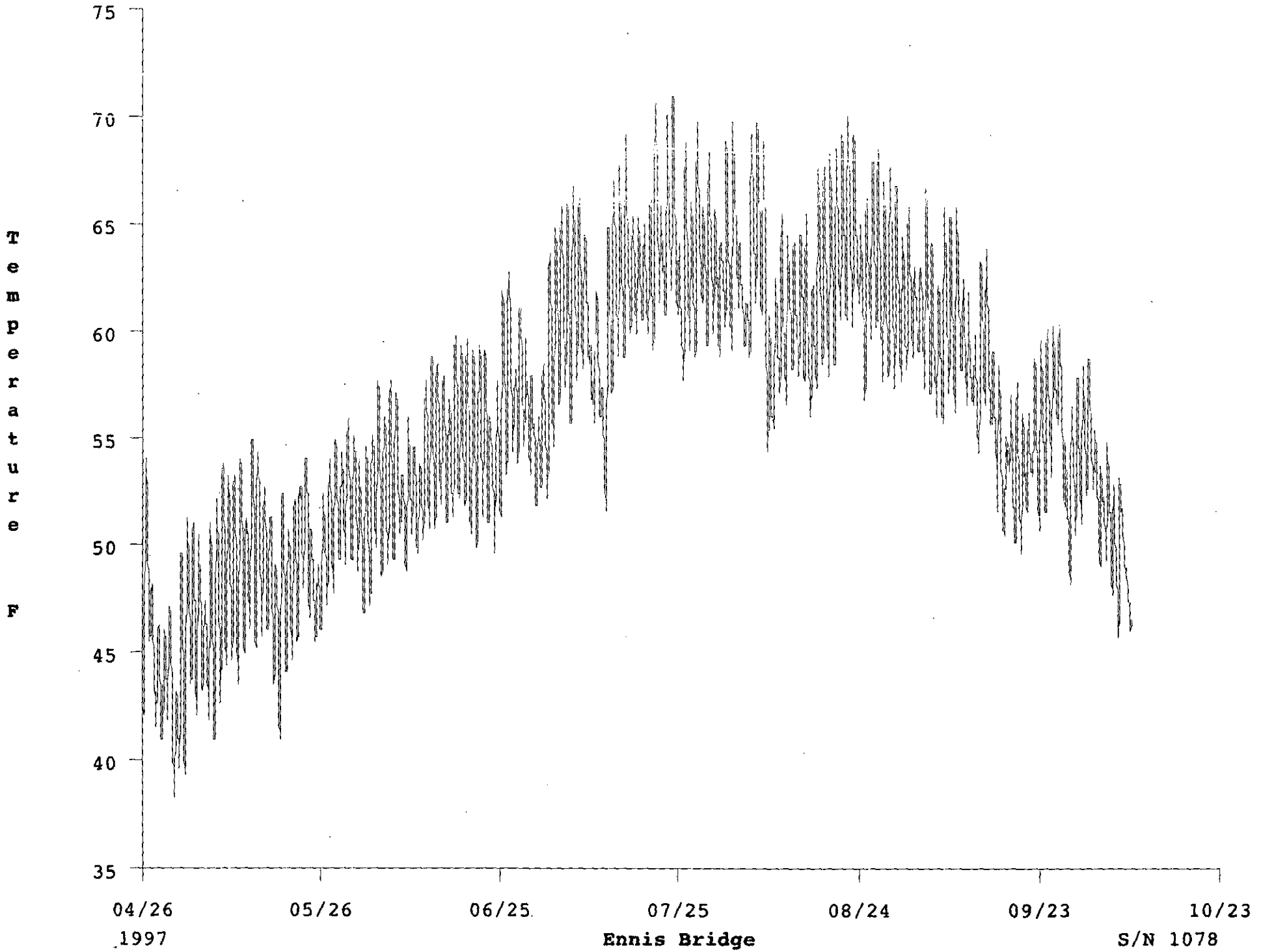
60
55
50
45
40
35
04/26
1997
05/26
06/25
07/25
08/24
09/23
10/23
Varney Bridge
S/N 1555


75
70
65
60
55
50
45
40
35
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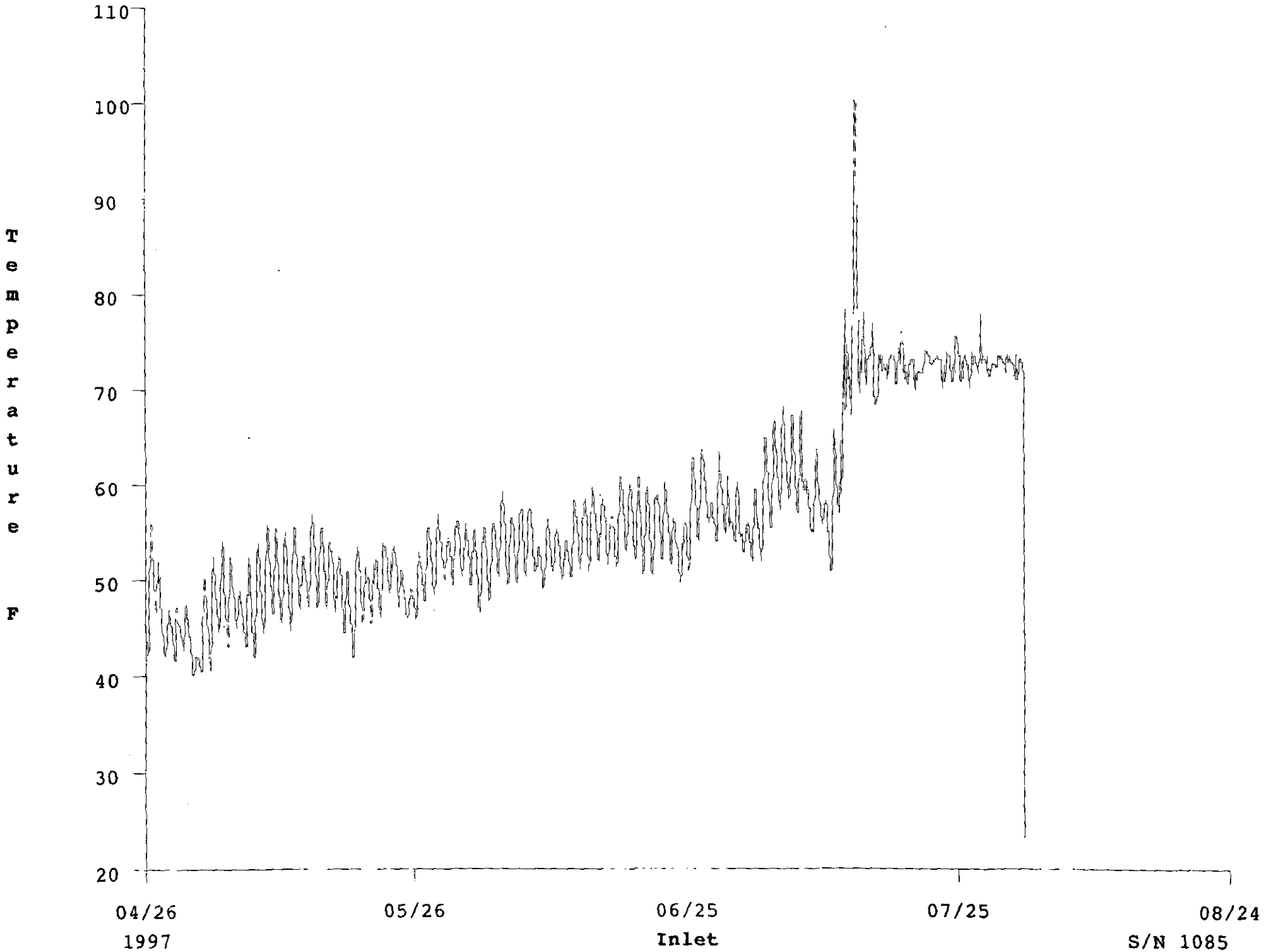
04/26
1997
05/26
06/25
07/25
08/24
09/23
10/23
Ennis Bridge
S/N 1078


110
100
90
80
70
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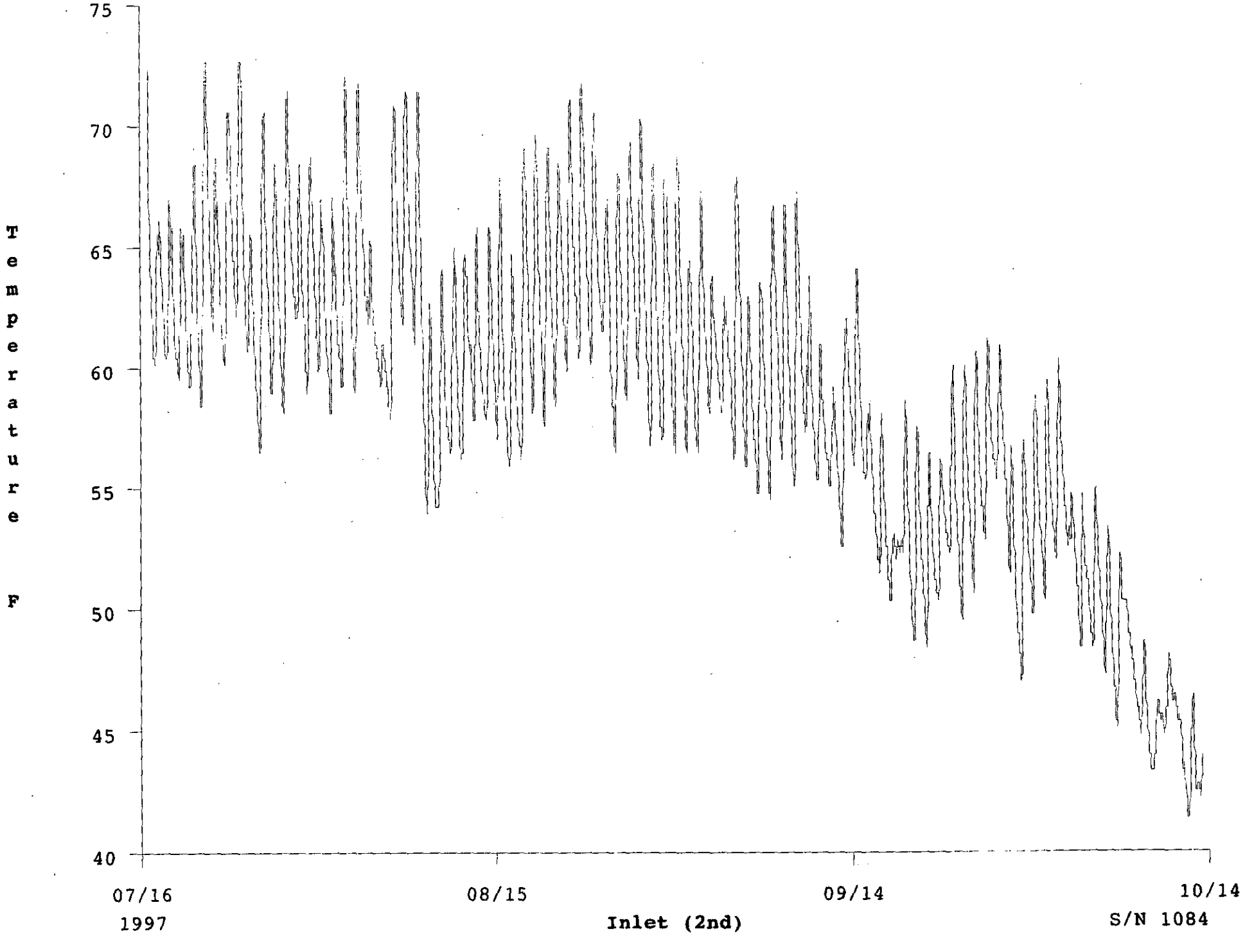
40
30
20
Temperature F
04/26
1997
05/26
06/25
07/25
08/24
Inlet
S/N 1085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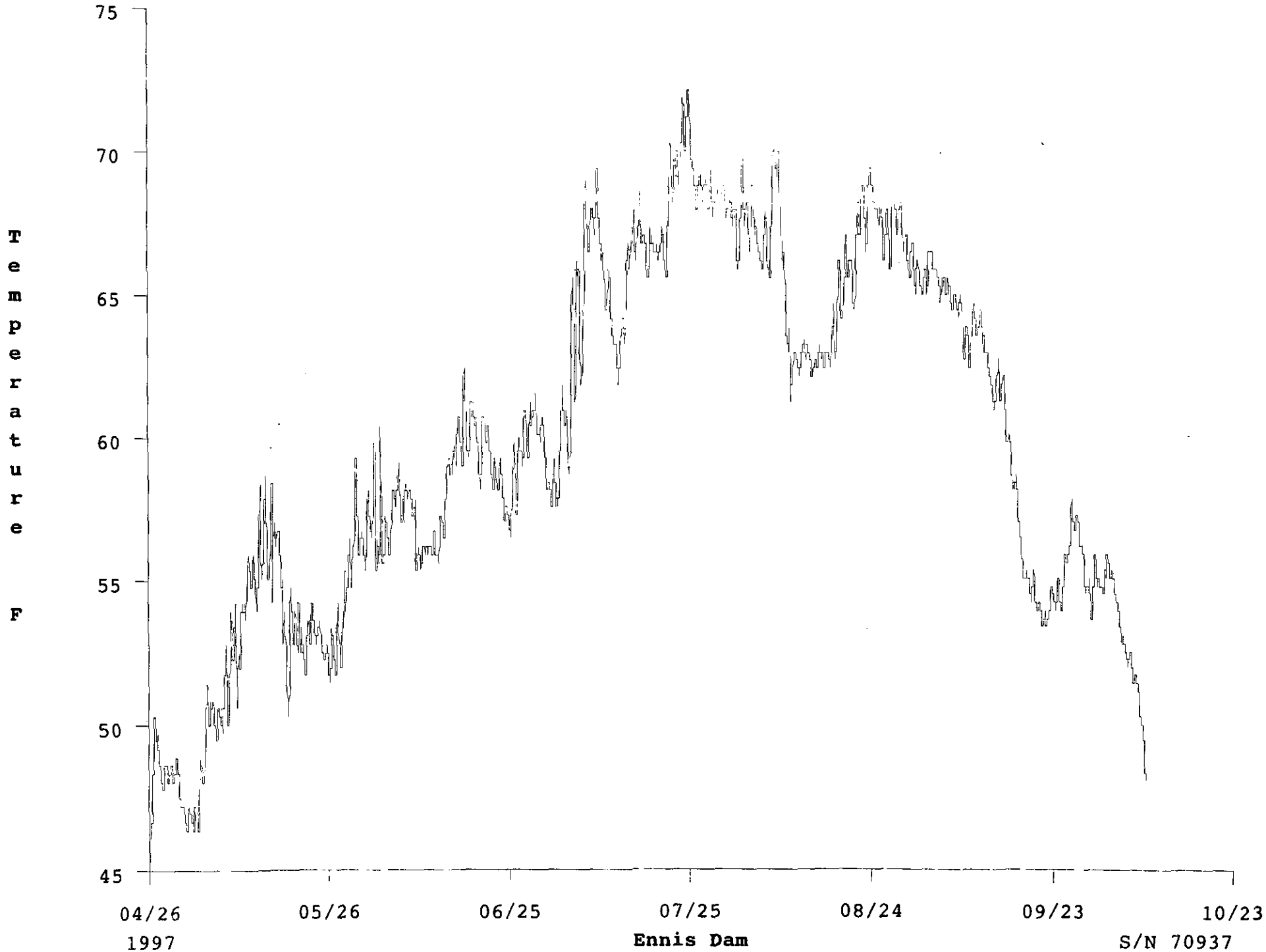
1997
08/15
09/14
10/14
Inlet (2nd)
S/N 1084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70
65
60
55
50
45
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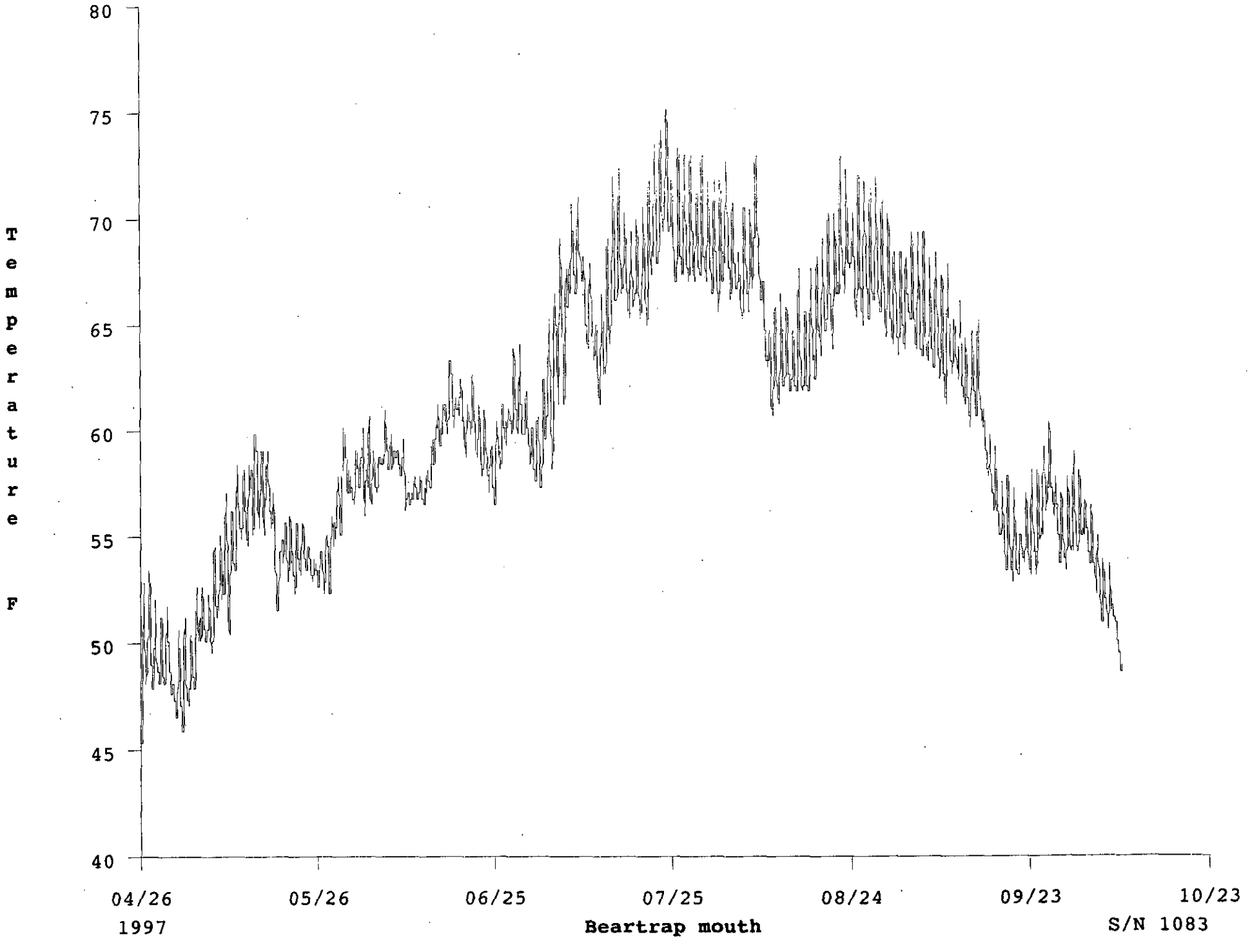
1997
05/26
06/25
07/25
08/24
09/23
10/23
Ennis Dam
S/N 70937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75
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65
60
55
50
45
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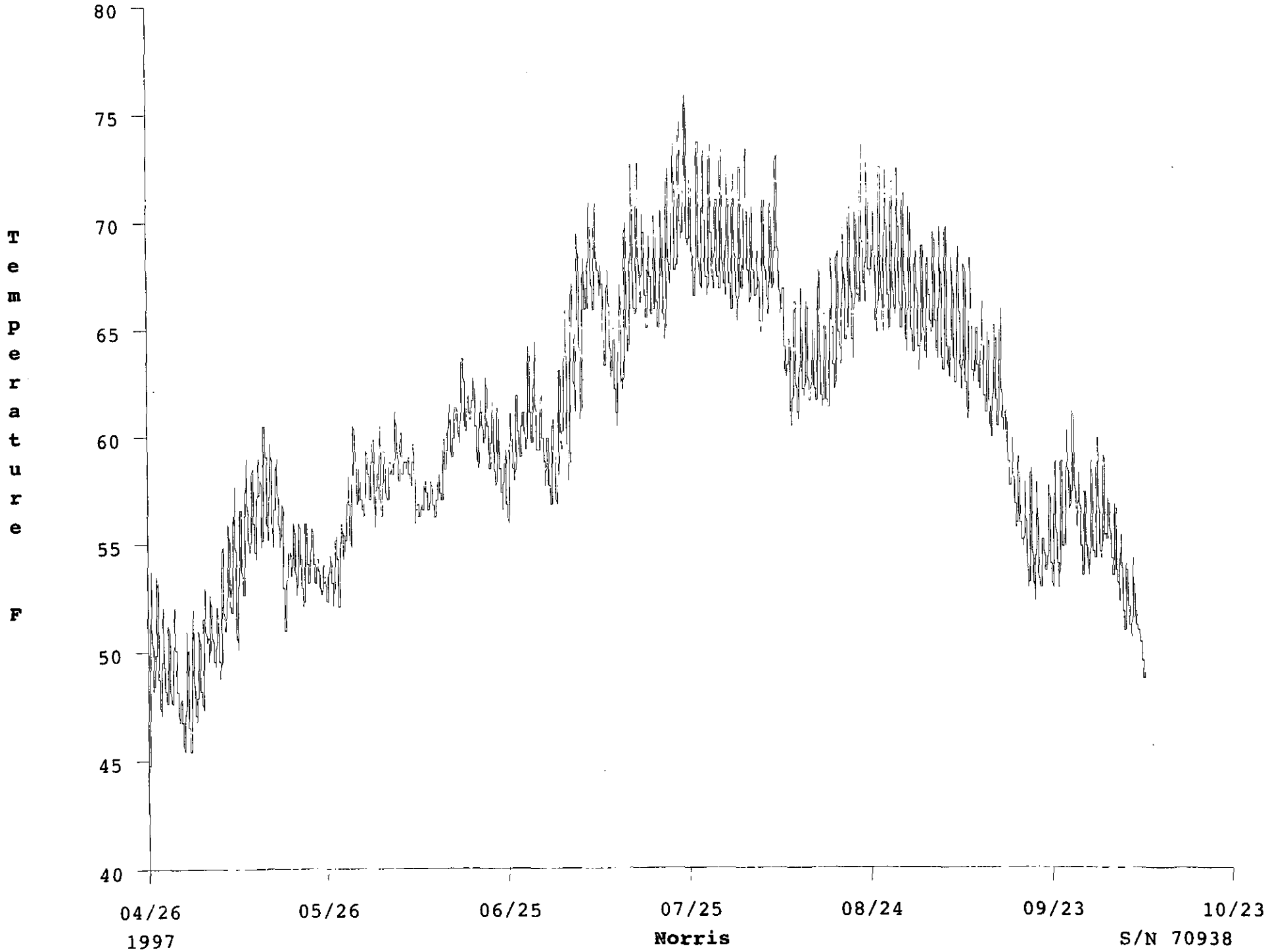
04/26
1997
05/26
06/25
07/25
08/24
09/23
10/23
Beartrap mouth
S/N 1083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60
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50
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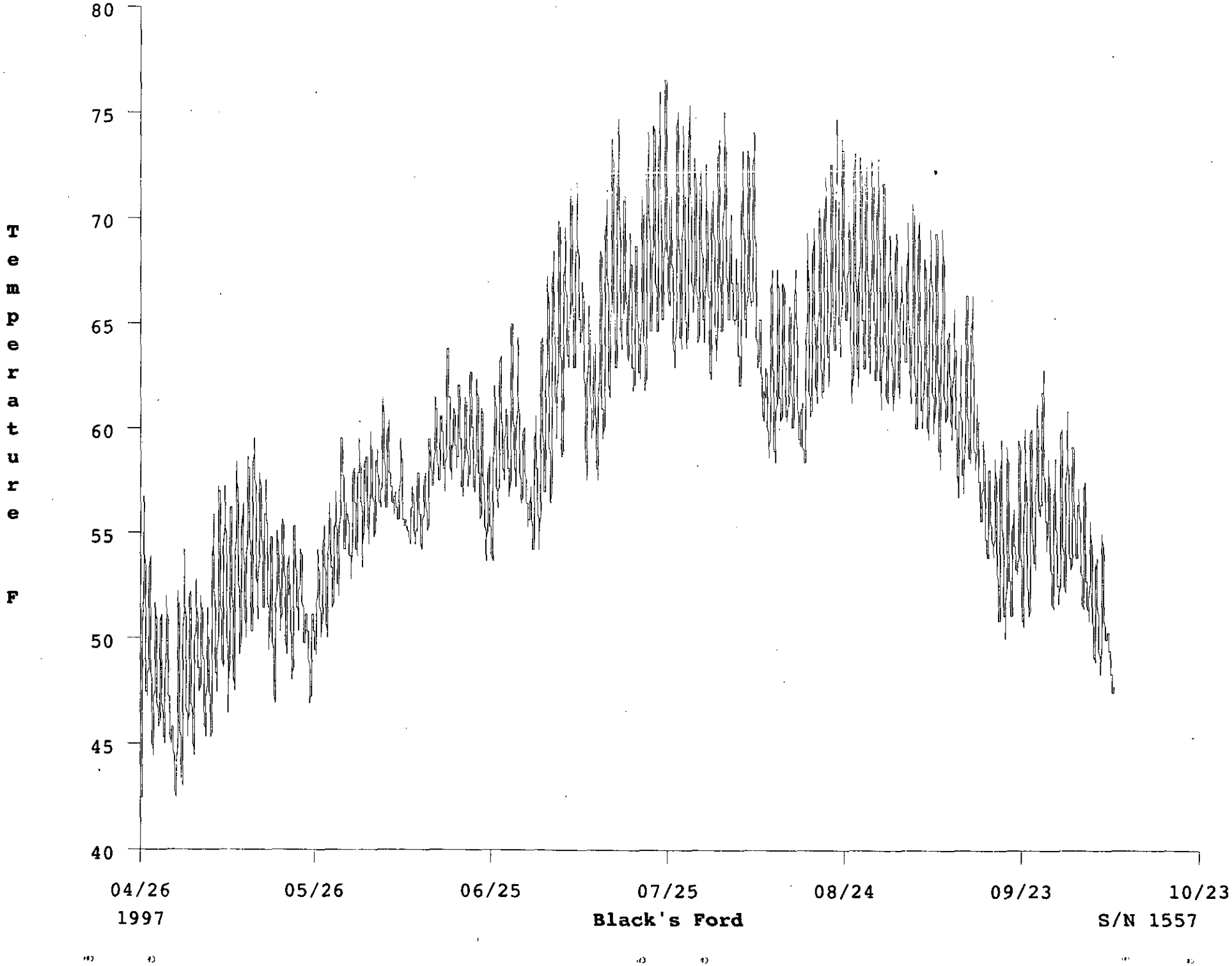
Temperature F
04/26
1997
05/26
06/25
07/25
08/24
09/23
10/23
Norris
S/N 70938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75
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60
55
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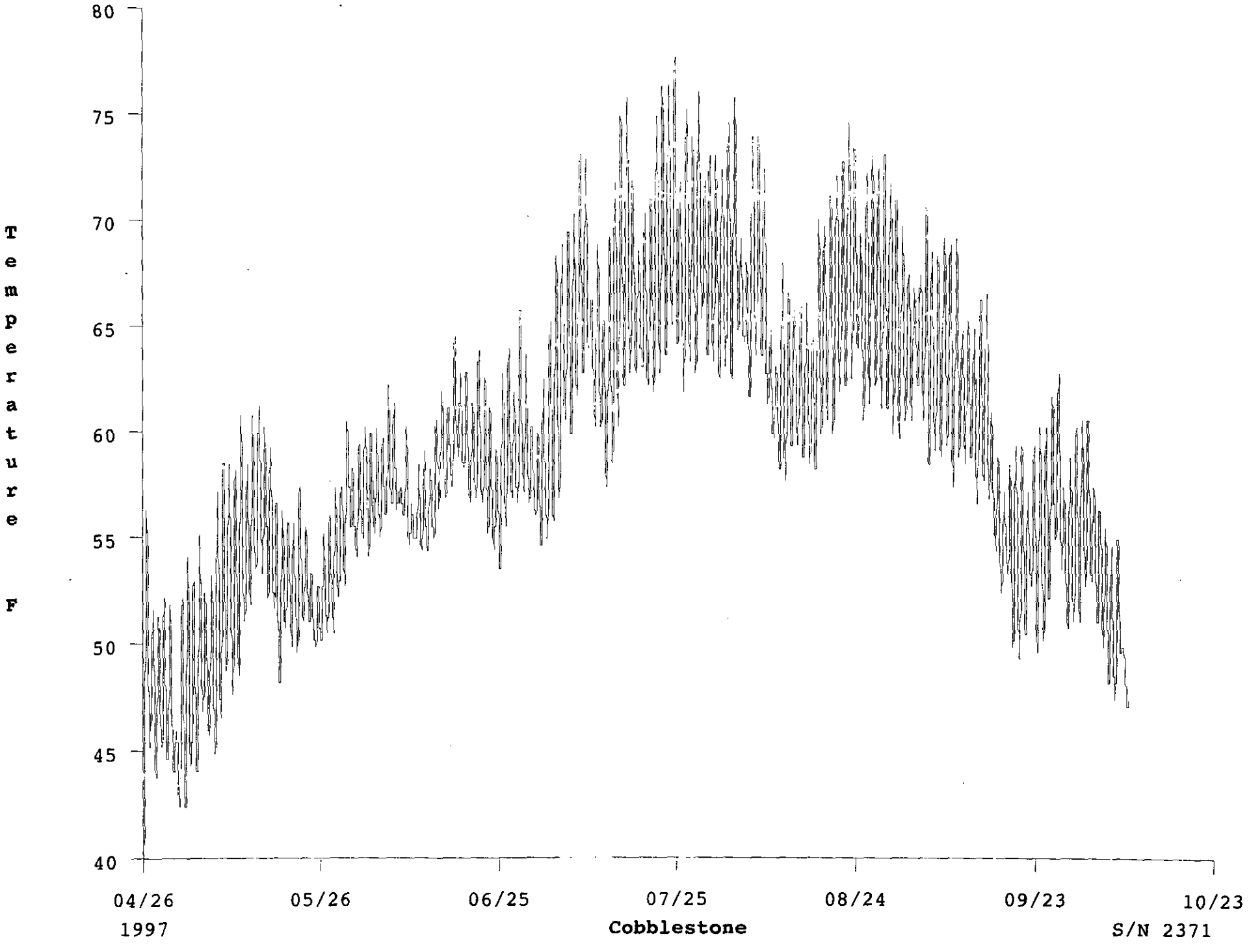
04/26
1997
05/26
06/25
07/25
08/24
09/23
10/23
Black's Ford
S/N 1557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60
55
50
45
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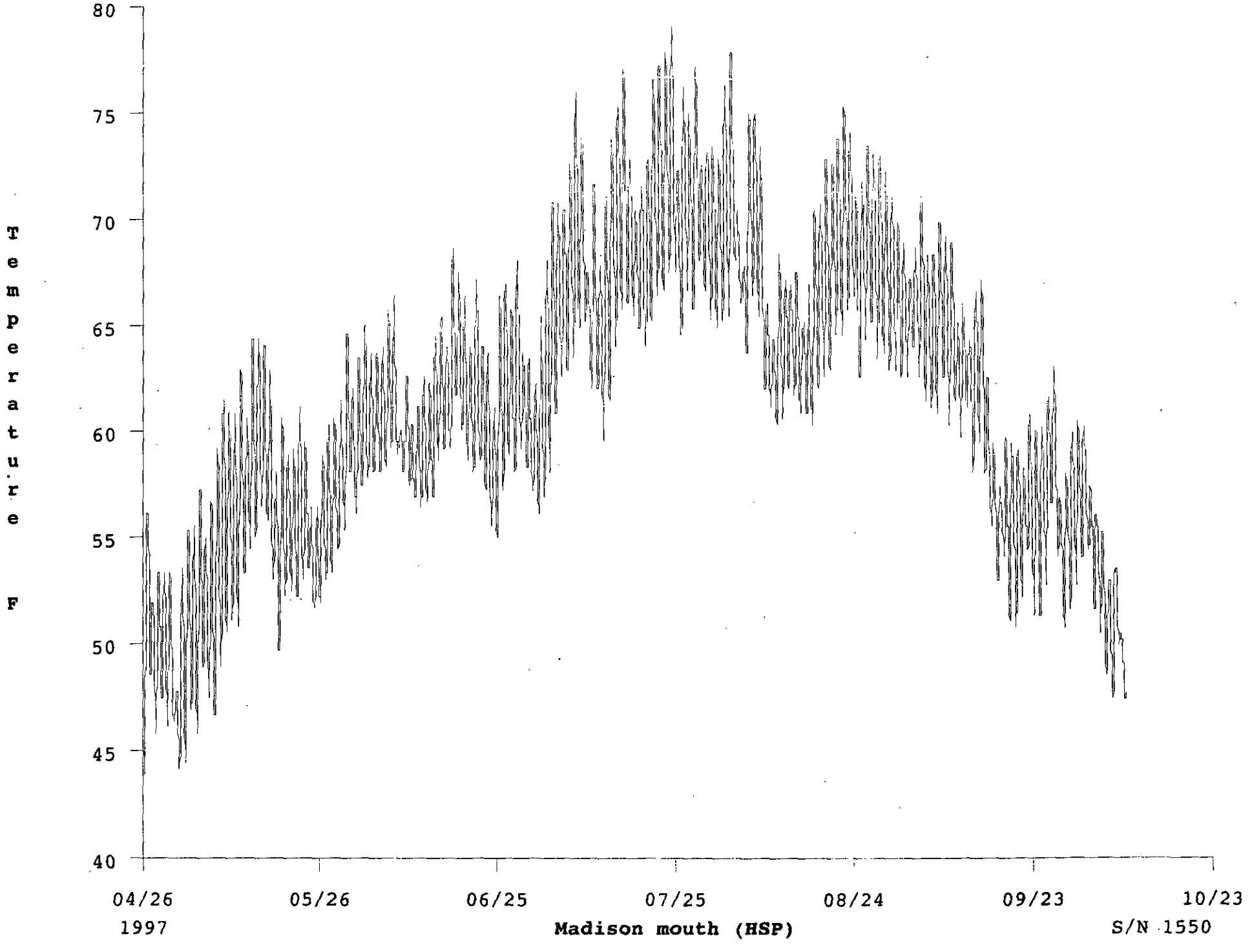
1997
05/26
06/25
07/25
08/24
09/23
10/23
Cobblestone
S/N 2371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75
70
65
60
55
50
45
40
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1997
05/26
06/25
07/25
08/24
09/23
10/23
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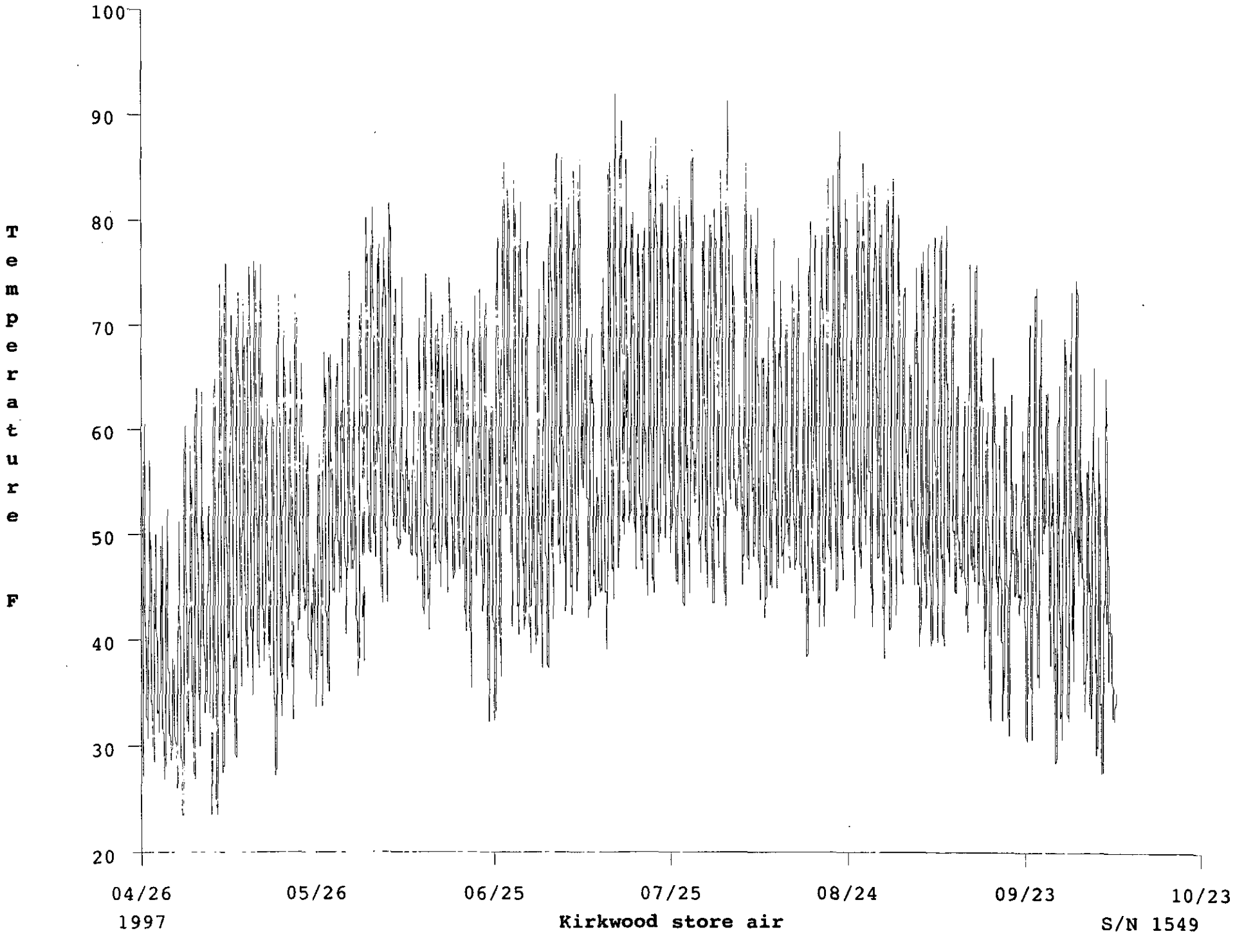
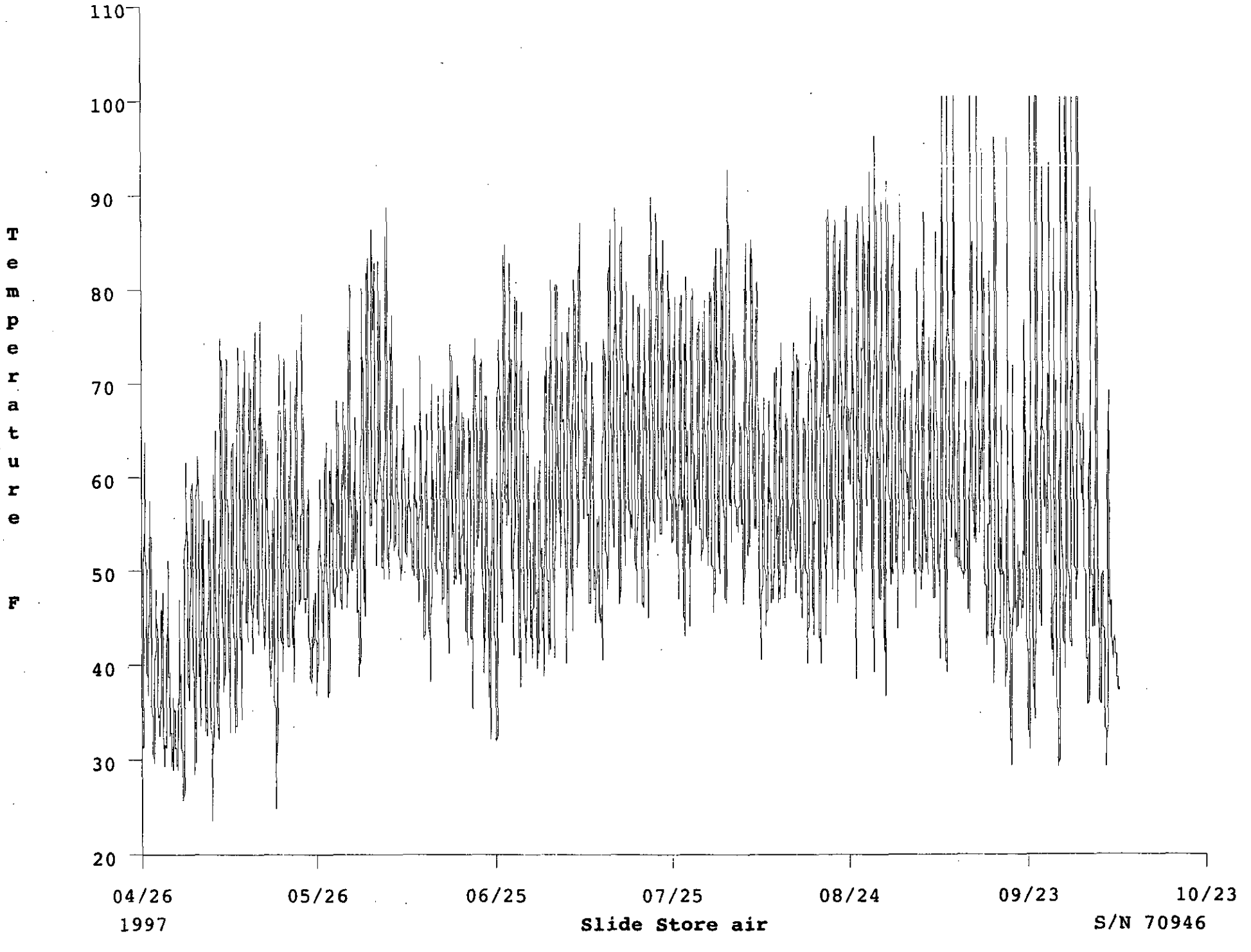
S/N 1550


Temperature F
100
90
80
70
60
50
40
30
20
04/26
1997
05/26
06/25
07/25
08/24
09/23
10/23
Kirkwood store air
S/N 1549


Temperature F
110
100
90
80
70
60
50
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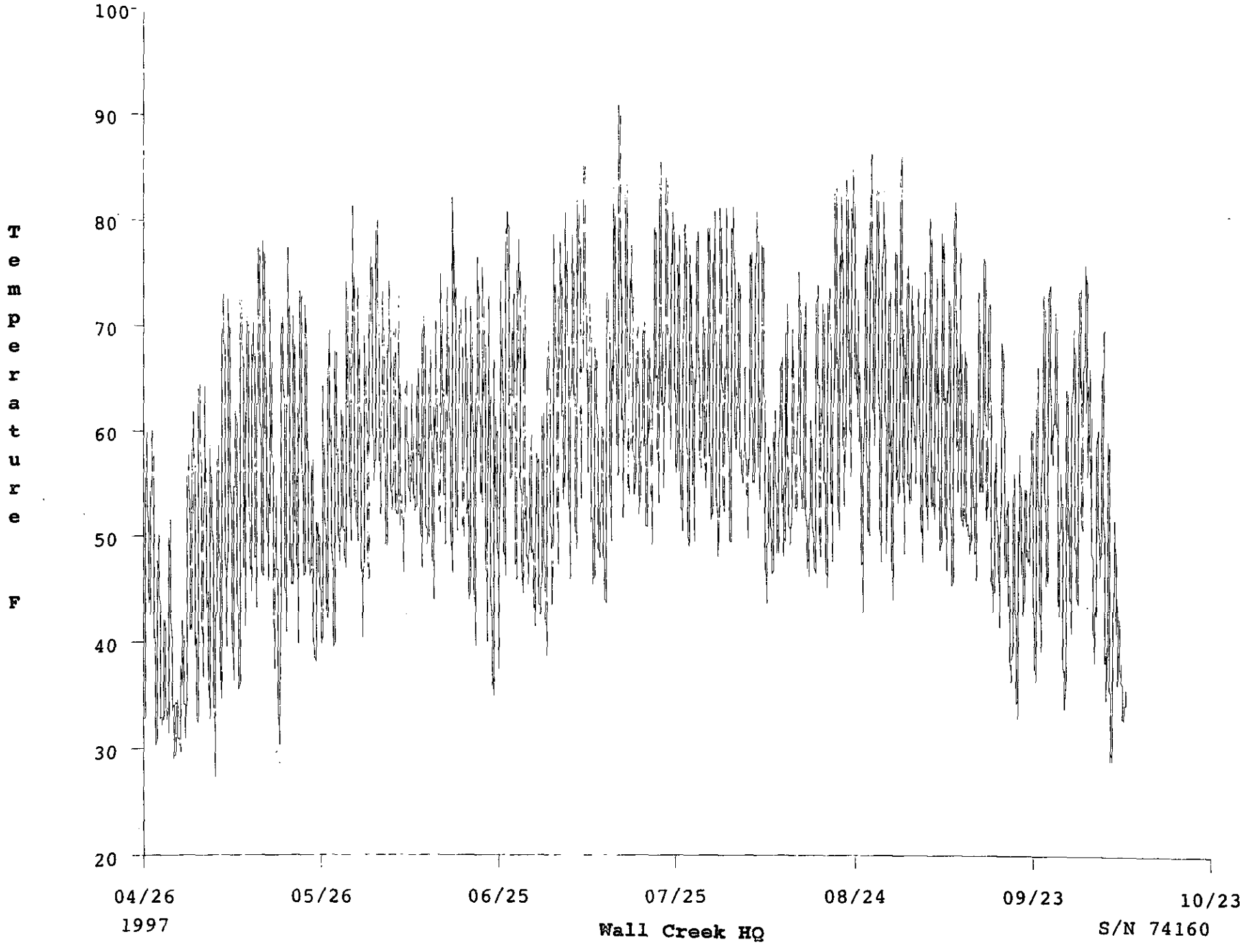
04/26
1997
05/26
06/25
07/25
08/24
09/23
10/23
Slide Store air
S/N 70946


Temperature F
100
90
80
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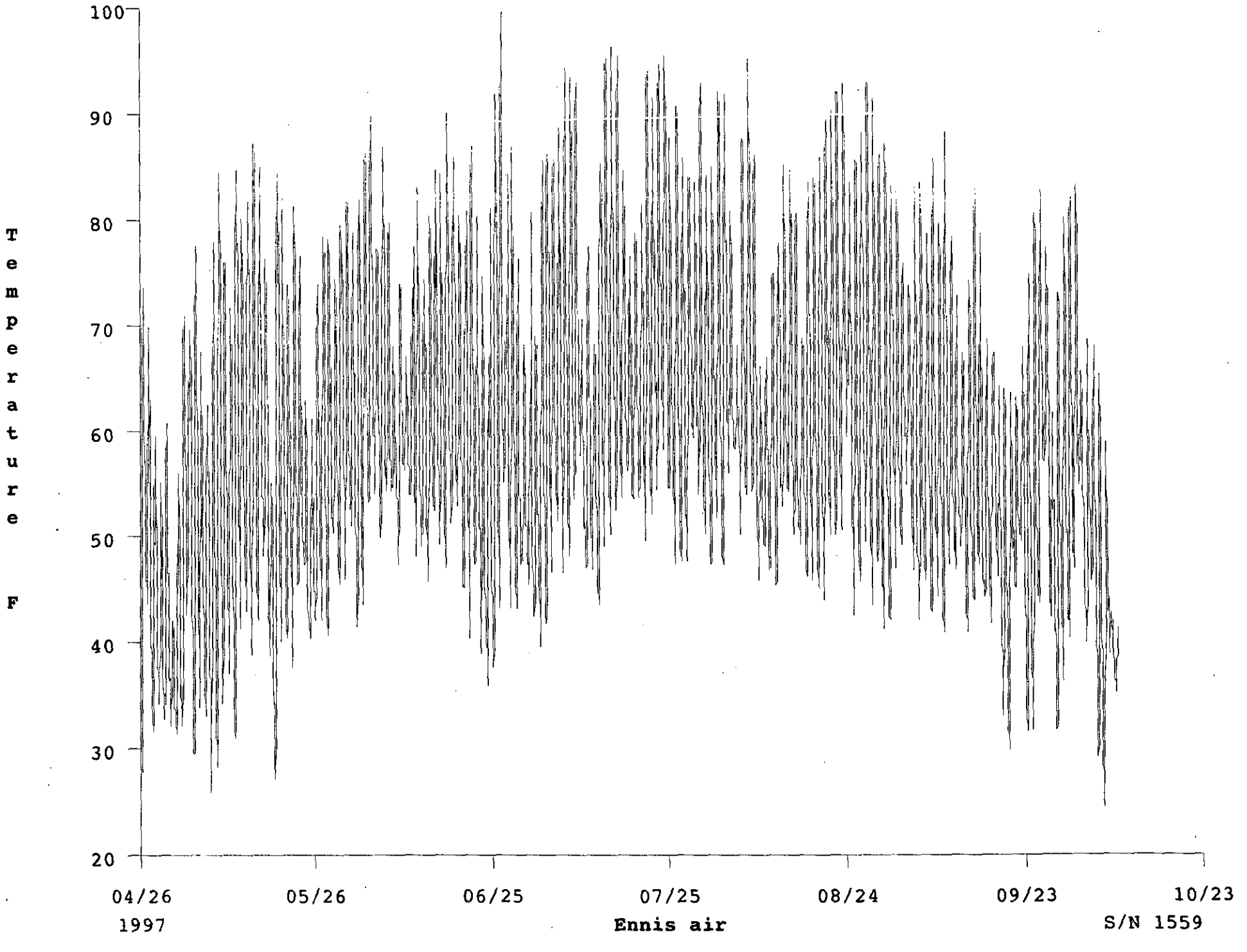
04/26
1997
05/26
06/25
07/25
08/24
09/23
10/23
Wall Creek HQ
S/N 74160


100
90
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60
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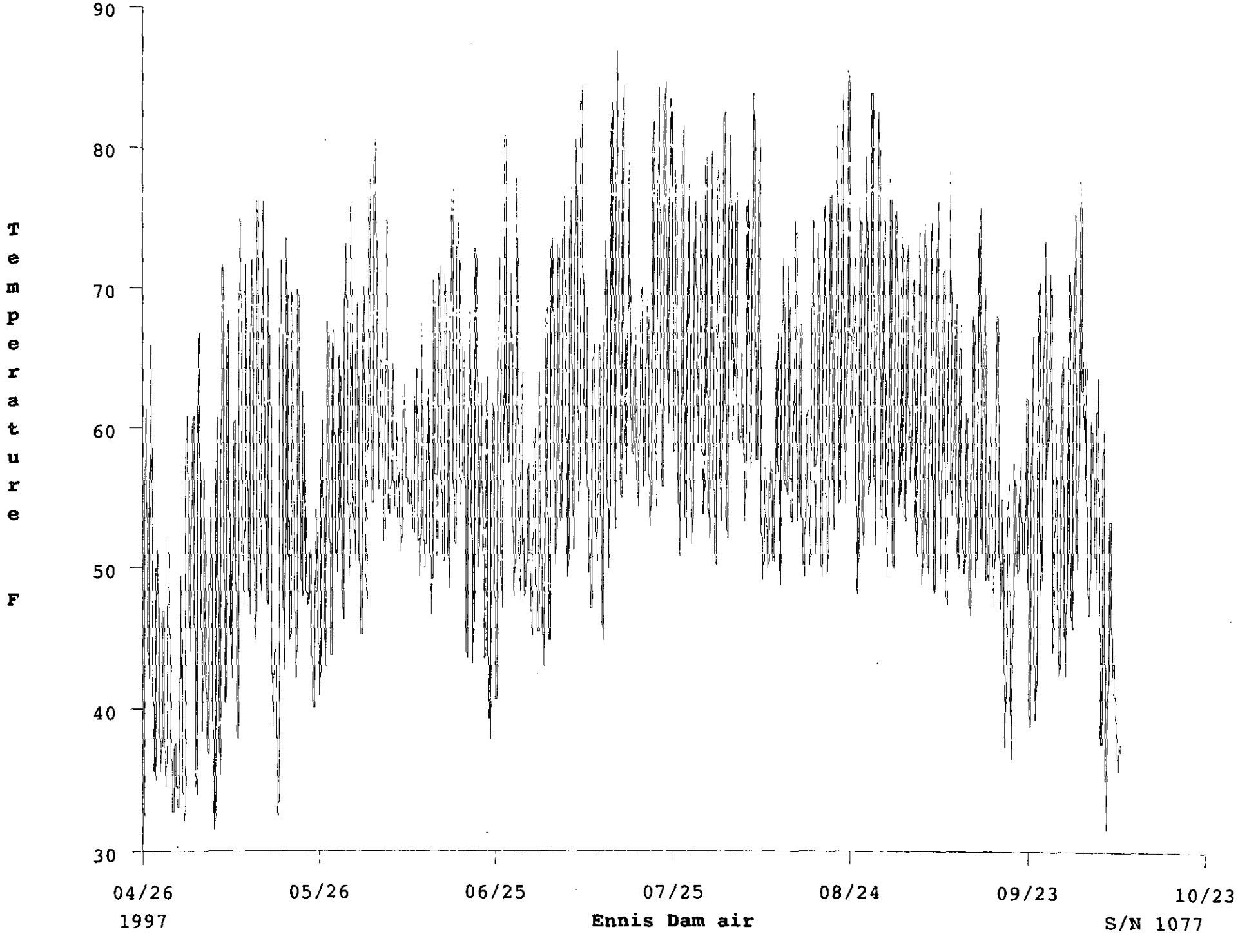
Temperature F
04/26
1997
05/26
06/25
07/25
08/24
09/23
10/23
Ennis air
S/N 1559


90
80
70
60
50
40
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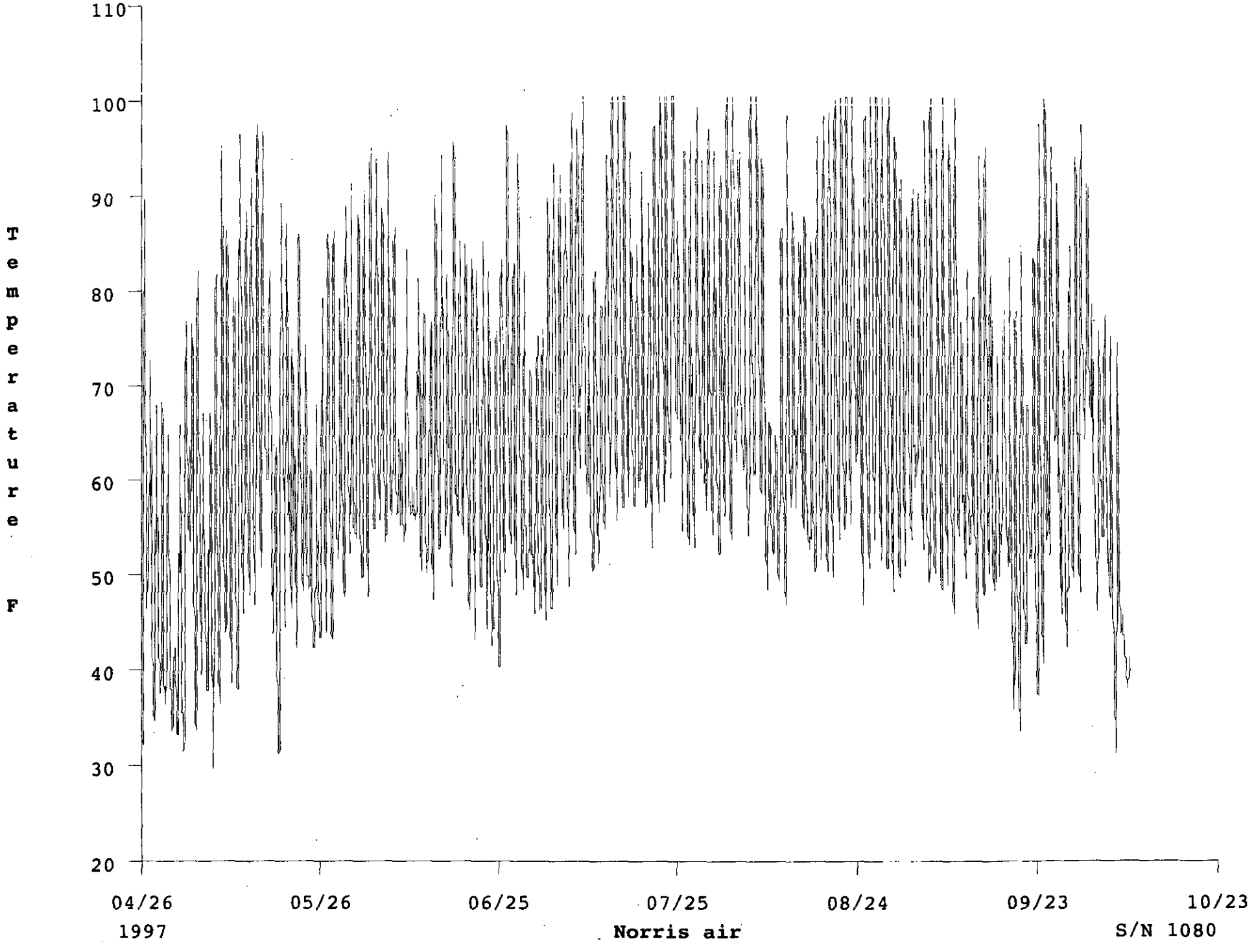
Temperature F
04/26
1997
05/26
06/25
07/25
08/24
09/23
10/23
Ennis Dam air
S/N 1077


110
100
90
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70
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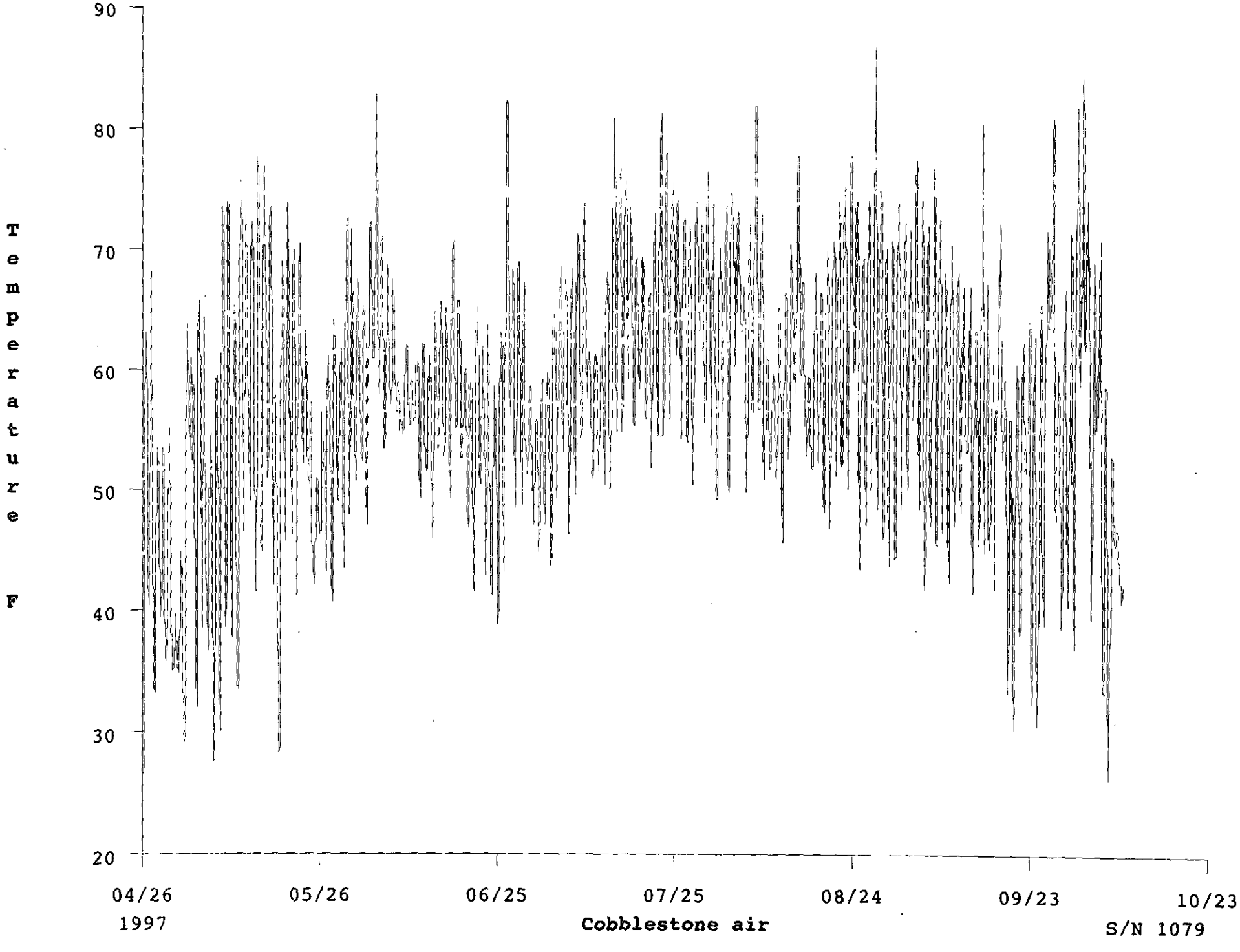
Temperature F
04/26
1997
05/26
06/25
07/25
08/24
09/23
10/23
Norris air
S/N 1080


Temperature F
90
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04/26
1997
05/26
06/25
07/25
08/24
09/23
10/23
Cobblestone air
S/N 1079