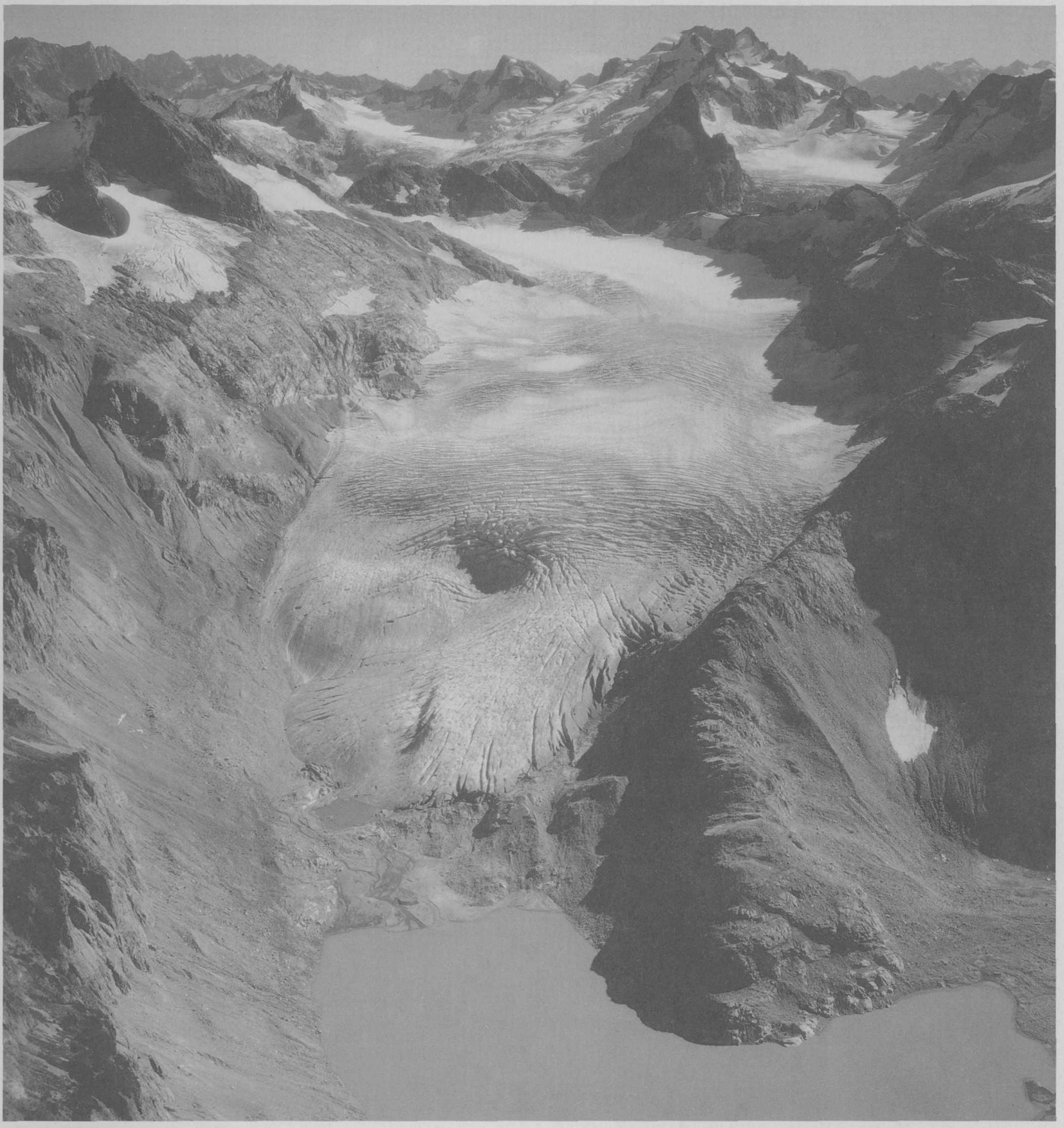
WATER, ICE, AND METEOROLOGICAL MEASUREMENTS AT SOUTH CASCADE GLACIER, WASHINGTON, 1986-1991 BALANCE YEARS

U.S. GEOLOGICAL SURVEY

Water-Resources Investigations Report 00-4006



USGS

science for a changing world

Cover - South Cascade Glacier, October 5, 1987, photograph 87R4-116

Water, Ice, and Meteorological Measurements at South Cascade Glacier, Washington, 1986–1991 Balance Years

By Robert M. Krimmel

U.S. GEOLOGICAL SURVEY

Water-Resources Investigations Report 00-4006

Tacoma, Washington
2000

U.S. DEPARTMENT OF THE INTERIOR
BRUCE BABBITT, Secretary

U.S. GEOLOGICAL SURVEY
Charles G. Groat, Director

For additional information write to:

District Chief
U.S. Geological Survey
1201 Pacific Avenue – Suite 600
Tacoma, Washington 98402

Copies of this report can be purchased from:

U.S. Geological Survey
Information Services
Building 810
Box 25286, Federal Center
Denver, CO 80225-0286

CONTENTS

Abstract 1
Introduction 1
  Description and climate of the area 2
  Measurement systems 2
Data collection 3
  Recorded variables 3
  Aerial photography 4
  Field measurements 4
Data reduction and analysis 5
  Runoff 5
  Winter balance 5
  Net balance 6
  Balance year transitions 6
  Balance measurement errors 7
  Concluding remarks 8
References cited 8

FIGURES

1. Map showing South Cascade Glacier and vicinity 10
2. Graph showing air temperature at the Gaging Station, 1,615 meters elevation, near South Cascade Glacier, for the 1986-91 water years 11
3. Graph showing daily average air temperature at the Hut, 1,842 meters elevation, near South Cascade Glacier, for the 1986-91 water years 12
4. Graph showing barometric pressure, 1,617 meters elevation, at the Gaging Station near South Cascade Glacier, for the 1986-91 water years 13
5. Graph showing South Fork Cascade River stage, near South Cascade Glacier, for thel 986-91 water years 14
6. Graph showing Salix Creek stage, near South Cascade Glacier, for the 1986-91 water years 15
7a. Oblique photograph of South Cascade Glacier, September 5, 1986 16
7b. Vertical photograph of South Cascade Glacier, September 9, 1987 17
7c. Oblique photograph of South Cascade Glacier, October 10, 1988 18
7d. Vertical photograph of South Cascade Glacier, September 12, 1989 19
7e. Oblique photograph of South Cascade Glacier, September 5, 1990 20
7f. Oblique photograph of South Cascade Glacier, September 9, 1991 21
8. Graph showing South Cascade Glacier terminus positions 22
9a-f. Altitude grids for South Cascade Glacier, measured from stereo vertical photographs taken on:
  a. September 5, 1986 23
  b. September 9, 1987 24
  c. August 21, 1988 25
  d. September 12, 1989 26
  e. September 5, 1990 27
  f. September 9, 1991 28
10. Map showing South Cascade Glacier surface speed, measured from vertical photographs taken on September 5, 1986, September 9, 1987, and September 12, 1989 29
11a-f. Maps showing snow depths, pit, and stake locations on South Cascade Glacier:
  a. 1986 30
  b. 1987 31
  c. 1988 32
  d. 1989 33

FIGURES--Continued

11a-f. Maps showing snow depths, pit, and stake locations on South Cascade Glacier—Continued:
e. 1990 34
f. 1991 35
12. Box plots showing snow depth and firn or ice loss at South Cascade Glacier at each stake for years 1986-91 36
13. Graphs showing average daily temperature, daily runoff at South Fork Basin and Salix Basin, and daily precipitation, near South Cascade Glacier, water years 1986-91 37
14. Box plots showing measured winter snow depth at South Cascade Glacier for years 1986-91 38
15. Box plots showing net balance at South Cascade Glacier for years 1986-91 39

TABLES

1a-f. Air temperature at 1,615 meters altitude, South Cascade Glacier Basin:
a. 1986 water year 40
b. 1987 water year 41
c. 1988 water year 42
d. 1989 water year 43
e. 1990 water year 44
f. 1991 water year 45
2a-f. Air temperature at 1,842 meters altitude, South Cascade Glacier Basin:
a. 1986 water year 46
b. 1987 water year 47
c. 1988 water year 48
d. 1989 water year 49
e. 1990 water year 50
f. 1991 water year 51
3. Daily precipitation near South Fork Cascade River gaging station 52
4. Large format aerial photography of South Cascade Glacier, 1986-91 55
5a-f. South Cascade Glacier altitude grid:
a. September 5, 1986 56
b. September 9, 1987 57
c. August 21, 1988 58
d. September 12, 1989 59
e. September 5, 1990 60
f. September 9, 1991 61
6. Positions of velocity features on South Cascade Glacier 62
7. Snow density at South Cascade Glacier near P1 63
8. Snow density near the South Fork Cascade gaging station, at 1,618 meters altitude 65
9. Snow depths at South Cascade Glacier 66
10. Stake measurements at South Cascade Glacier in the 1986-91 balance year 67
11. Runoff from South Fork Basin 69
12. Runoff from Salix Basin 72
13. Values used to interpolate snow depth (in meters) at any altitude (in meters) 75
14. Linear interpolations used to determine the bulk snowpack density at any altitude near the spring snowpack maximum depth 75
15. Values used to interpolate net balance (in meters) at any altitude (in meters) 76
16. Dates of South Cascade Glacier measured snow balance, $\bar{b}_m(s)$, and net balance, $\bar{b}_1$, number of measurement sites, and errors 77

CONVERSION FACTORS, VERTICAL DATUM, SYMBOLS, AND MACHINE-READABLE FILES

Multiply	By	To obtain
degree Celsius (°C)	1.8, then add 32	degree Fahrenheit
kilogram	2.205	pound
kilogram per cubic meter (kg/m^3)	0.06243	pound per cubic foot
kilometer (km)	0.6214	mile
meter (m)	3.281	foot
millimeter (mm)	0.03937	inch
square kilometer (km^2)	0.3861	square mile

Vertical datum:

In this report "sea level" refers to the National Geodetic Vertical Datum of 1929 (NGVD of 1929)--a geodetic datum derived from a general adjustment of the first-order level nets of both the United States and Canada, formerly called Sea Level Datum of 1929.

Symbols used in this report:

$\bar{b}_0$ The change in balance between the minimum balance near the beginning of the water year and October 1.

$\bar{b}_1$ The change in balance between the minimum balance near the end of the water year and September 30.

$\bar{b}_a$ The change in snow, firn, and ice storage between the beginning and end of some fixed period, which here is the water year.

$\bar{b}_m(s)$ The snow above the previously formed summer surface as measured directly by field work in late spring as near as possible to the time of greatest glacier mass.

$\bar{b}_n$ The change in snow, firn, and ice storage between times of minimum mass.

X Approximate east/west position in the local survey net.

Y Approximate north/south position in the local survey net.

Z Altitude above NGVD of 1929.

Machine-readable files:

Most of the data contained in this report have been recorded on easily copied computer media. This machine-readable material is available from the World Data Center, Campus Box 449, University of Colorado, Boulder, CO 80309 <URL: http://www-nsidc.colorado.edu/NOAA/>.

Water, Ice, and Meterological Measurements at South Cascade Glacier, Washington, 1986–1991 Balance Years

By Robert M. Krimmel

ABSTRACT

Mass balance and climate variables are reported for South Cascade Glacier, Washington, for the years 1986–91. These variables include air temperature, precipitation, water runoff, snow accumulation, snow and ice melt, terminus position, surface level, and ice speed. Data are reduced to daily and monthly values where appropriate. The glacier-averaged values of spring snow accumulation and fall net balance given in this report differ from previous results because a more complete analysis is made. Snow accumulation values for the 1986–91 period ranged from 3.54 (water equivalent) meters in 1991 to 2.04 meters in 1987. Net balance values ranged from 0.07 meters in 1991 to -2.06 meters in 1987. The glacier became much smaller during the 1986–91 period and retreated a cumulative 50 meters.

INTRODUCTION

The mass balance program at South Cascade Glacier is part of a larger U.S. Geological Survey (USGS) effort to monitor glacier mass balance throughout the western states. Mass balance at two other glaciers, Gulkana Glacier and Wolverine Glacier, both in Alaska, is also monitored by the USGS (Kennedy, 1995; March, 1998). The broad USGS glacier monitoring program is discussed in a separate document (Fountain and others, 1997), and South Cascade Glacier is considered to be a "benchmark glacier" as described in that document. The collective records from these glaciers have formed the basis for the analysis of glacier-climate relations on a synoptic scale (Hodge and others, 1998).

South Cascade Glacier is a small valley glacier near the crest of the North Cascade Range, Washington State (fig. 1). Numerous variables relating to the glacier regime have been measured on and near South Cascade Glacier since the late 1950's. The long-term goal of this project is to understand the climate-glacier relation. A short-term goal is to document the measurements with sufficient detail so that an internally consistent record of conditions on and around the glacier can be assembled despite personnel changes, discontinuous records, and changing methods of data collection and analysis. Some periods of record at South Cascade Glacier have been documented. Work from 1957–64 is described by Meier and Tangborn (1965), work from 1965–67 is described by Meier and others (1971) and by Tangborn and others (1977). Hydrologic and meteorological data for 1957–67 are presented by Sullivan (1994). Mass balance results for 1958–85 are summarized by Krimmel (1989), and are presented in detail for 1992–97 (Krimmel, 1993, 1994, 1995, 1996a, 1997, 1998). The purpose of this report is to document the measurements for the 1986–91 balance years that are relevant to the relation between South Cascade Glacier and climate. These measurements include basin runoff, precipitation, air temperature, barometric pressure, snow thickness and density, ice ablation, surface speed, and surface altitude.

Description and Climate of the Area

South Cascade Glacier is located at the head of the South Fork of the Cascade River, a tributary to the Skagit River, which flows into Puget Sound about 100 kilometers (km) to the west. The region is dominated by steep terrain, with local relief of more than 1,000 meters (m). Areas within the basin not covered by glacier ice or water are thinly veneered bedrock. The bedrock either is mantled by a thin layer of soil and, in places, by scrub conifer, heather, or other vegetation typical of the high North Cascade Range, or is covered by glacial moraine or outwash material.

South Cascade Lake Basin has an area[1] of 6.14 km^2 and spans from 1,615 to 2,518 m altitude. Salix Creek Basin (fig. 1) is an unglacierized basin adjacent to the South Cascade Lake Basin. It has an area[2] of 0.22 km^2, spans from 1,587 to 2,140 m altitude, and is predominantly south facing.

The climate of the region is maritime. Near the glacier, typical winter low temperatures are about -10°C, and typical summer high temperatures are about 20°C. Most of the precipitation, which commonly amounts to 4.5 m annually (Meier and others, 1971), falls as snow in the period October to May.

Measurement Systems

Glacier mass balance definitions (Mayo and others, 1972) are adhered to in this report, and the stratigraphic system, which is more field compatible than the fixed date system, is usually used. The specific terms are defined where first used. Other mass balance nomenclatures are in use, notably those described by Østrem and Brugman (1991), which could as well be used to report these results. The definitions by Mayo and others (1972) are used to maintain consistency with earlier reports on South Cascade Glacier work.

The balance year, defined by Mayo and others (1972) as the interval between the minimum glacier mass in one year and the minimum glacier mass the following year, is used in this report because most of the field measurements reference the surface formed at the end of the previous balance year. This report contains recorded data for the 1986–91 water years (WY), October 1, 1985, through September 30, 1991. The WY is identical to the hydrologic year that was used in earlier mass balance reports (Mayo and others, 1972; Meier and others, 1971). When information concerning these variables is required, but is outside of the WY, the required data are discussed.

All local geodetic coordinates are in meters, in which the local +Y axis is approximately true north. Vertical locations are in meters above the National Geodetic Vertical Datum of 1929. Horizontal locations are defined by a local system that can be converted to Universal Transverse Mercator (UTM) zone 10 coordinates by:

UTM easting = local X (0.99985) + 642,000

UTM northing = local Y (0.99985) + 5,355,000.

Densities are given as a decimal fraction of the density of water, the density of which is considered to be 1,000 kilograms per cubic meter (kg/m^3). All balance measurements are given as water equivalents unless otherwise stated.

---

[1]The area of this basin has been previously reported at 6.02 and 6.11 km^2. These differences are due to different interpretations of the drainage divide.

[2]Salix Creek Basin drainage divides are poorly defined.

DATA COLLECTION

Recorded Variables

Several variables were measured continuously during the 1986–91 period in so far as environmental and instrumentation complications could be overcome.

At the South Fork Cascade River Gaging Station (1,615 m) air temperature was measured above the peak of a building about 6 m above the ground elevation. Usually the temperature was measured hourly, the value of which was stored digitally. In addition the air temperature was recorded on an analogue strip chart. The hourly data are shown graphically on figure 2. During periods when the digital system was not functional, the analogue record was used and those data are shown as dots on figure 2, each dot representing the daily average, which is the average position of the trace during the day. These daily averages or the average of the 24 daily hourly values are given in tables 1a–f. The hourly values and averages are estimated to be accurate to ±1°C, and the analogue averages to ±2°C.

Air temperature was measured continuously, but with many gaps in the record, at the Hut about 1 m above the roof of a building about 4 m above the ground elevation of 1,842 m. Temperature was recorded on a circular chart with an ink pen. The recorder ran for about 50 days unattended but began over-writing the trace after 31 days. Subsequently, the trace sometimes became ambiguous and could not be used. The daily average temperature at 1,842 m, taken as the average position of the trace, is given on figure 3 and tables 2 a–f. Accuracy is estimated at ± 2°C.

All temperature sensors were in enclosures designed to perpetually shade the sensors from direct sun, prevent direct contact with precipitation, and to allow passive air circulation. Air circulation was not forced. A systematic error in temperature readings may occur because of possible radiation loading.

Hourly barometric pressure was measured at the South Fork Cascade River Gaging Station, at an elevation of 1,617 m. These data are shown graphically on figure 4.

Water stage was measured continuously near the outlet of South Cascade Lake. Three recording systems were used, and usually provided redundant data. The primary system utilized a float-activated shaft encoder, and the hourly data stored digitally. This float was in a well adjacent to the lake outlet, and was usually covered by snow during the winter, and thus normally did not freeze during the winter. Two other recorders were in a well about 6 m from the other well, about 3 m upstream from a covered weir. Stage was recorded at 0.5-hour intervals on a paper punch recorder, and continuously on an analogue strip chart recorder. Both sensors were activated by floats in a well that sometimes froze during winter. The stage from the primary recorder, supplemented with equivalent stage from the other recorders when necessary, is shown graphically on figure 5. Stage is accurate to ±3 millimeters(mm).

Water stage was continuously measured in a well about 2 m upstream of a covered weir controlling Salix Creek. Redundant recorders, each with an independent float, but in the same well, were used. Stage was recorded every 0.25 hour on a paper punch recorder, and continually on an analogue strip chart. The punch recorder was the primary record, supplemented with data from the analogue chart when necessary. These data are accurate to ±3 mm, and are shown on figure 6.

Precipitation was measured near the South Fork Cascade River Gaging Station at about 1,615 m elevation. Two different gages were used during the 1986–91 period, sometimes redundantly, but neither of which were dependable. The water level in a tank that stored precipitation as it fell through a 150-mm diameter orifice about

5 m above the ground was sensed with a float and recorded on an analogue strip chart. This gage operated about 10 percent of the time, and was not carefully maintained. A tipping bucket precipitation gage, with a 150-mm orifice about 1 m above the ground was used for some of the 1986-91 period. Hourly data from this gage were stored digitally. This tipping bucket gage was destroyed by an avalanche in early 1990. Neither gage had a wind shield. The available precipitation data, a composite from both gages, is given as daily totals in table 3. Because of uncertainties in the orifice catch efficiency during windy periods and problems with snow, the precipitation measurements should only be considered as an indication of timing and intensity of precipitation. Errors are thought to be more than 50 percent of the recorded values.

Aerial Photography

Aerial photography provides an accurate record of a glacier at a specific time. Ideally the glacier is photographed shortly before the end of the balance year and without any fresh snow cover. Under that circumstance, the transient summer snow line is at its highest elevation, and the terminus is near its most annually retracted position. Stereo vertical photography allows digital elevation models (DEM) to be made, and other features to be mapped. Oblique photography offers a view from a "human" perspective. In practice, the photography is usually acquired several days or weeks prior to the date of maximum elevation of the transient snow line. Large format aerial photography acquired during the 1986–91 period is described in table 4, the negatives for which are archived at the GeoData Center, Geophysical Institute, University of Alaska, Fairbanks, Alaska. Examples of this photography are shown on figures 7 a–f. No attempt has been made to list 35 mm or other small format ground or aerial photographs; aerial photography that may have included South Cascade Glacier, but was acquired for purposes other than the South Cascade Glacier work; or satellite imagery that may be relevant to this mass balance work.

The stereo vertical photography, which was available for each year 1986–91, is used to derive the extent of ice cover, the surface elevation of the glacier, and for some periods the ice displacement. The terminus of the glacier is defined by recording points at about 5 m spacing along the ice edge as seen on stereo models. The terminus outline is shown for each year on figure 8. No attempt was made to define the edge of the glacier where the edge was snow or firn. A DEM was formed from the stereo models for each year and these are shown on figures 9 a–f and tables 5 a–f. Ice displacement can be measured between certain dates of photography when the same natural feature can be identified on each date. Suitable features could be found on date pairs of 1986–87 and 1987–89. The displacements are shown on figure 10 and table 6.

Field Measurements

Site visits were made periodically for facility maintenance, instrument repair and installation, and direct measurement of variables. In most years about six visits were made: instruments were serviced in mid-winter, the balance measured near the time of maximum accumulation in mid-spring; snow and ice ablation were measured several times in the summer, and final ablation measurements made after snow had fallen in mid-fall.

Each year the glacier was visited near the time of maximum accumulation, for measurement of $\bar{b}_m(s)$ the measured snow balance. A vertical profile of snow density through the entire snow pack was usually measured near P-1 (fig. 1) in a hand-dug snow pit or by using a coring auger, from which the total snow pack water equivalent (WE) was determined (tables 7 a–f). For some years bulk snow pack density and WE were also measured near the South Fork Cascade River Gaging Station, elevation 1,618 m, at 7 to 9 points along a predetermined 100-m long line using a snow tube (table 8). Snow depth was probed, using a slender sectional metal rod at anywhere from 5 to 35 points (figs. 11 a–f, table 9). Extra care was used to determine snow depths at locations where 30-mm diameter sectional aluminum stakes were set through the snow pack into ice or firn (figs. 11 a–f). A wood plug was inserted into the base of the lower stake section to reduce possible melt into the ice.

During the summer the level of snow, firn, or ice was measured on these stakes anywhere from 2 to 12 times (table 10, fig. 12). If there had been enough ablation to make it probable that a stake would melt from the glacier before the next visit, the stake was usually reinstalled. If there was freshly fallen snow, as was often the case by fall, the level of underlying snow, firn, or ice, and the new snow depth, were measured. If the new snow did not melt completely away prior to the winter season, that underlying level was the seasonal minimum balance at that stake.

DATA REDUCTION AND ANALYSIS

Runoff

Stage measurements are converted to instantaneous discharge using a unique stage-discharge relation for each measurement site. The stage measurements are initially recorded in units of 0.01 foot, and discharge measurements are made in English units, resulting in a stage-discharge relation in similar units. For convenience, the English units are preserved in the calculations until an average daily cubic feet per second (ft^3/s) is determined, which is then converted to a one-dimensional value of runoff averaged over the basin, in mm (tables 11, 12; fig. 13).

Winter Balance

The measurements of snow depth and density near the time of the end of the accumulation season are the basic data used to determine the maximum balance. The location of the snow depth probes was determined at the time of the measurement by visual reference to known points near the glacier perimeter, and by pacing regular intervals along specific headings. These locations are accurate to ±100 m. The altitude of the probe locations was taken from the DEM for the previous fall and is accurate to ±30 m. The snow depth measurements for each year were plotted with their respective altitudes (fig. 14) and a curved line was hand drawn to approximate the trend of the altitude - depth function. In years 1989–91 there were many measured snow depths and these spanned most of the altitude range of the glacier, and the curve probably represents the true altitude - depth function well. In 1986 and 87 measurements were sparse, but they covered a fairly good altitude representation. In 1988 there were no measurements above 1,900 m altitude and the curve above that altitude was formed using the lower altitude points and the shape of other years as a guide. The hand-drawn curves were segmented, which allowed tables of altitude - depth to be formed (table 13). The tables allowed an interpolation to be made to determine the snow depth at every point in the respective DEMs. The snow density at each measurement location was determined on the basis of density measurements at one or two altitudes. If density was measured at both the snow course and P-1 (tables 7 a–f, 8) then that altitude - density gradient was applied linearly to every DEM point. If density was measured at only P-1, then the snow density gradient was assumed to be -0.0002/m, based on the typical spring snow pack density gradient (table 14). The calculated density is used to determine the WE at each DEM point, and an average of all the WE values is the measured winter balance, $\bar{b}_m(s)$. This grid-index method of balance calculation is described by the author in an earlier paper (Krimmel, 1996b). No correction was made to adjust for the time offset between the date on which measurements were made and the actual date of maximum balance.

Net Balance

Glacier net balances were also calculated for each year using a grid-index method. Each altitude grid was measured photogrammetrically from late season vertical photographs (table 4). The minimum net value at each stake was plotted with its respective altitude (fig. 15). For years 1986–91 a curve was drawn that approximated the balance change as altitude changed and balance at any grid point altitude was determined by interpolation of values (table 15) between points on the curve.

Net balance was only measured at one spot in 1988. The shape of the 1988 balance curve is based on the shapes of curves for 1986, 87, 89, and 91, when there was a fairly good balance measurement representation over the entire altitude span of the glacier. Similarly, the curve for 1990, when minimum balance was measured at only two places, was based on the curve shapes of years when balance was measured over more of the glacier.

Balance Year Transitions

The balance year begins when the total mass of the glacier begins to increase from the minimum mass that occurred as the glacier ablated in the summer and fall season. Ablation may continue in the lower glacier area after the beginning of the balance year even when accumulation is occurring on the upper glacier. A precipitation event, during which rain fell on the lower glacier and snow fell on the upper glacier, would cause such a condition. Ablation may even occur on the upper glacier after the beginning of the balance year, but by definition can not reduce the mass of the glacier to less than that of the previous total minimum mass. Usually the beginning of the balance year is not witnessed by personnel because it normally occurs during a fall storm—a situation avoided by most people. Instead, proxy methods can be used to determine the time of transition between balance years. At South Cascade Glacier the runoff records from Salix Creek and South Fork Cascade River, and local air temperature and precipitation (if available) records are used to estimate the date of the balance year transition, and may be used to estimate the magnitude of the balance year to annual system conversions ($\bar{b}_0$ and $\bar{b}_1$). By the end of the summer nearly all the snow has melted from the Salix Creek Basin and a rapid rise in runoff indicates that precipitation fell. If a precipitation record exists, Salix runoff and the precipitation total are compared—if they are nearly the same, it is assumed that rain occurred over the basin, and hence also South Cascade Glacier, and the accumulation season was not beginning. If however the precipitation is much greater than the runoff, snow probably fell over much of the glacier, and the accumulation season has begun. The air temperature record can also be used to estimate the rain-to-snow ratio—during near-freezing temperature, it is probable that the upper glacier was receiving snow and offsetting any ablation still occurring on the lower glacier. The relative stage records at South Fork and Salix are also useful to determine the late season conditions. During periods when the South Fork runoff record indicates a greater runoff than that from Salix Creek Basin, it is assumed that the glacier is melting, and that is usually accompanied by mild temperatures, and the balance year has not changed.

The best measurement of the magnitude of the $\bar{b}_0$ and $\bar{b}_1$ is a stake measurement after the ablation has ended at the stake. This is possible after snow falls, at which time the level of buried ice (or firn) is measured at the stake.

The final determination of the balance year transition date and magnitude of the conversion factors is subjective.

At South Cascade Glacier the balance year usually ends in October or early November. At the altitude of South Cascade Glacier it is usual to have snow accumulate in mid-summer, but this snow always melts away within a few days. Snow falls almost every September, but usually this snow melts completely off the lower glacier allowing additional ice to melt. September snow may or may not entirely melt from the upper glacier, and if it does not it becomes part of the following balance year's accumulation. Usually September snow melts entirely from the lower glacier, allowing October ablation. A heavy snow in early October may remain over the entire glacier, or if clear weather prevails ablation may continue for most of the month, but ablation is minor. By November snow usually covers the entire glacier, but if not, ablation has nearly stopped. Intense storms sometimes occur in the fall, and if associated with a warm front, rain may fall over the entire glacier. The warm conditions may ablate all earlier snow and some additional ice from the lower glacier, but rain on the upper glacier usually is absorbed by the snow, resulting in an increase of mass.

The 1986 balance year began on November 3, 1985, as indicated by a rise in Salix Creek stage accompanied with near freezing temperatures. Ablation between October 1, and November 3, 1995, was minor as several storms occurred, most of which probably deposited snow on the upper glacier, and perhaps also temporarily covered the lower glacier.

The 1987 balance year began on November 5, 1986, when snow fell on all of the glacier (as indicated by the below freezing air temperature near that time). A major storm around November 20 may have been mixed snow and rain, but certainly added sufficient snow to the upper glacier to offset lower glacier ablation.

A mild October and early November of 1987 resulted in ablation until November 12, 1987, when snow fell, marking the beginning of the 1988 balance year.

October and early November of 1988 were mild and wet. The 1989 balance year began on November 5, 1988, when the temperature went below freezing and snow began to fall. The extreme storm in mid-October resulted in rain on the lower glacier, and possible snow on the upper glacier. The extreme storm in mid-December probably caused melting on the lower glacier, but resulted in a thick snow cover on the upper glacier.

Two extreme storms occurred in the fall of 1989, both of which came with above-freezing air temperature at the lower glacier, but below-freezing temperature high on the glacier. The 1990 balance year probably began in early November.

An extreme storm in early October 1990, combined with near-freezing air temperature, probably began the 1991 balance year. A second extreme storm in mid-November added thick snow to the upper glacier. The 1991 balance year ended October 16, 1991, after which the glacier was snow covered continuously (Krimmel, 1993).

In each of the balance years 1986-91, the balance year began after the respective hydrologic year, thus the terms to relate the balance year to the hydrologic year, $\bar{b}_0$ and $\bar{b}_1$, are all negative. Because ablation is reduced by the cooler temperatures and low sun angle in early fall, and is partially offset by snow that often begins to accumulate on the upper glacier, the magnitude of $\bar{b}_0$ and $\bar{b}_1$ is small compared to the values of $\bar{b}_m(s)$ and $\bar{b}_n$. Furthermore, these terms tend to become cumulatively less important as the length of record increases, and are used only to relate the balance year to hydrologic year measurements. For these reasons, the temperature, precipitation, runoff, and stake measurements were not analyzed in the detail required to determine the absolute values for $\bar{b}_0$ and $\bar{b}_1$ but rather the generalization was made that they were typical of the values normally seen at South Cascade Glacier, somewhere between -0.05 and -0.20 meters. Because these values were not reported, neither are annual balance values, $\bar{b}_a$: instead, only the net balance values, $\bar{b}_n$, are reported.

Balance Measurement Errors

Errors in glacier balance measurements are difficult to quantify. In prior years of balance measurements at South Cascade Glacier, error values ranging around 0.10 m were placed on the balance values (Meier and others, 1971). In 1965 and 1966, more information was used to derive the balances than in 1986–91. The availability of less information in these years would suggest that greater errors should be assigned to the 1986–91 balance values.

The relative paucity of data for 1986–91 is offset somewhat, however, by the experience gained since the mid-1960's, when 20 to 30 ablation stakes were used and it was found that spatial variations in balance were similar from year to year (Meier and Tangborn, 1965). Estimated errors for the 1986–91 balance values are given in table 16. Although other factors that affect the balance, such as internal accumulation of ice, superimposed ice, internal melt, and basal melt, are possible, they are not considered in this report. These unknowns are thought to be small and do not change the error estimates.

Concluding Remarks

The $\bar{b}_m(s)$ and $\bar{b}_n$ values given in this report (table 16) differ considerably from the estimates given in the 1992–98 South Cascade Glacier annual reports. This is because no thorough analysis of the entire data sets for years 1986–91 had been made prior to this report. Instead, the P-1 index station measurements were considered to be representative of the entire glacier (Krimmel, 1996b). Values for $\bar{b}_m(s)$ and $\bar{b}_n$ are the best currently obtainable by the methods used in this report. If different methods are used to expand discreet measurements into area averages, or other reference is used, these values will likely be modified. Data in this report may be the basis for new interpretations as other methods evolve.

Data presented in this report are all derived from the most fundamental source: field notes, analogue strip charts, digital files, and photographs. The original field notes and strip charts have been archived, but due to the volume will probably not be stored beyond one more generation of scientists. Because of the difficulty in working with the analogue material, it is unlikely that any attempt will be made to derive more information from those data sources. The original digital files, as they were downloaded from data loggers, have not been preserved. The derived digital files, cleaned of spurious values, tagged with time, and prefaced with descriptions (meta data), will hopefully be available for many decades into the future. The stereo vertical photographic negatives, which are the most fundamental and detailed descriptive record of the former condition of the glacier, will hopefully be preserved indefinitely, and will likely be used in the future as improvements are made in the methods of photogrammetry.

REFERENCES CITED

Fountain, A.G., Krimmel, R.M., and Trabant, D.C., 1997, A strategy for monitoring glaciers: U.S. Geological Survey Circular 1132, 20 p.

Hodge, Steven M., Trabant, Dennis C., Krimmel, Robert M., Heinrichs, Thomas A., March, Rod S., and Josberger, Edward G., 1998, Climate variations and changes in mass of three glaciers in western North America: Journal of Climate, v. 11, no. 9, p. 2,161-2,179.

Kennedy, Ben W., 1995, Air temperature and precipitation data, Wolverine Glacier Basin, Alaska, 1967-94: U.S. Geological Survey Open-File Report 95-444, 79 p.

Krimmel, R.M., 1989, Mass balance and volume of South Cascade Glacier, Washington, 1958-1985, *in* Oerlemans, J., ed., Glacier fluctuations and climatic change: Dordrecht, Netherlands, Kluwer Academic Publishers, p. 193-206.

_____1993, Mass balance, meteorological, and runoff measurements at South Cascade Glacier, Washington, 1992 balance year: U.S. Geological Survey Open-File Report 93-640, 38 p.

_____1994, Runoff, precipitation, mass balance, and ice velocity measurements at South Cascade Glacier, Washington, 1993 balance year: U.S. Geological Survey Water-Resources Investigations Report 94-4139, 35 p.

_____1995, Water, ice, and meteorological measurements at South Cascade Glacier, Washington, 1994 balance year: U.S. Geological Survey Water-Resources Investigations Report 95-4162, 41 p.

_____1996a, Water, ice, and meteorological measurements at South Cascade Glacier, Washington, 1995 balance year: U.S. Geological Survey Water-Resources Investigations Report 96-4174, 37 p.

_____1996b, Glacier mass balance using the grid-index method, *in* Colbeck, S.C., ed., Glaciers, ice sheets and volcanoes—a tribute to Mark F. Meier: U.S. Army Corps of Engineers Cold Regions Research and Engineering Laboratory Special Report 96-27, p. 62-68.

_____1997, Water, ice, and meteorological measurements at South Cascade Glacier, Washington, 1996 balance year: U.S. Geological Survey Water-Resources Investigations Report 97-4143, 34 p.

_____1998, Water, ice and meteorological measurements at South Cascade Glacier, Washington, 1997 balance year: U.S. Geological Survey Water-Resources Investigations Report 98-4090, 30 p.

Mayo, L.R., Meier, M.F., and Tangborn, W.V., 1972, A system to combine stratigraphic and annual mass-balance systems—a contribution to the International Hydrological Decade: Journal of Glaciology, v. 11, no. 61, p. 3-14.

March, Rod S., 1998, Mass balance , meteorological, ice motion, surface altitude, and runoff data at Gulkana Glacier, Alaska, 1994 balance year: U.S. Geological Survey Water-Resources Investigations Report 97-4251, 31 p.

Meier, M.F., and Tangborn, W.V., 1965, Net budget and flow of South Cascade Glacier, Washington: Journal of Glaciology, v. 5, no. 41, p. 547-566.

Meier, M.F., Tangborn, W.V., Mayo, L.R., and Post, Austin, 1971, Combined ice and water balances of Gulkana and Wolverine Glaciers, Alaska, and South Cascade Glacier, Washington, 1965 and 1966 water years: U.S. Geological Survey Professional Paper 715-A, 23 p.

Østrem, G., and Brugman, M., 1991, Glacier mass-balance measurements—a manual for field and office work: Environment Canada, National Hydrology Research Institute Science Report no. 4, 224 p.

Sullivan, M.E., 1994, South Cascade Glacier, Washington—hydrologic and meteorological data, 1957-67: U.S. Geological Survey Open-File Report 94-77, 105 p.

Tangborn, W.V., Mayo, L.R., Scully, D.R., and Krimmel, R.M., 1977, Combined ice and water balances of Maclure Glacier, California, South Cascade Glacier, Washington, and Wolverine and Gulkana Glaciers, Alaska, 1967 water year: U.S. Geological Survey Professional Paper 715-B, 20 p.

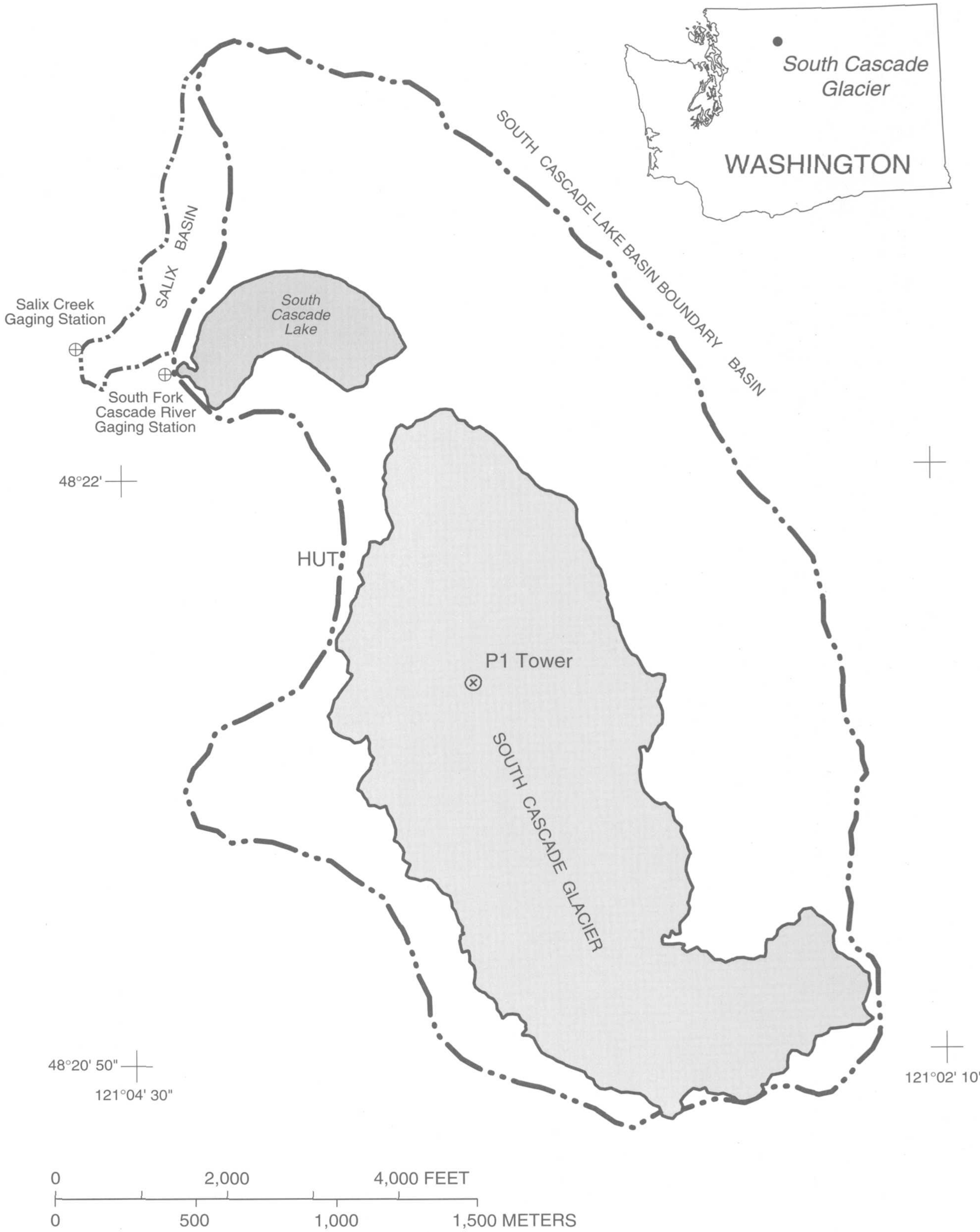


Figure 1. South Cascade Glacier and vicinity.

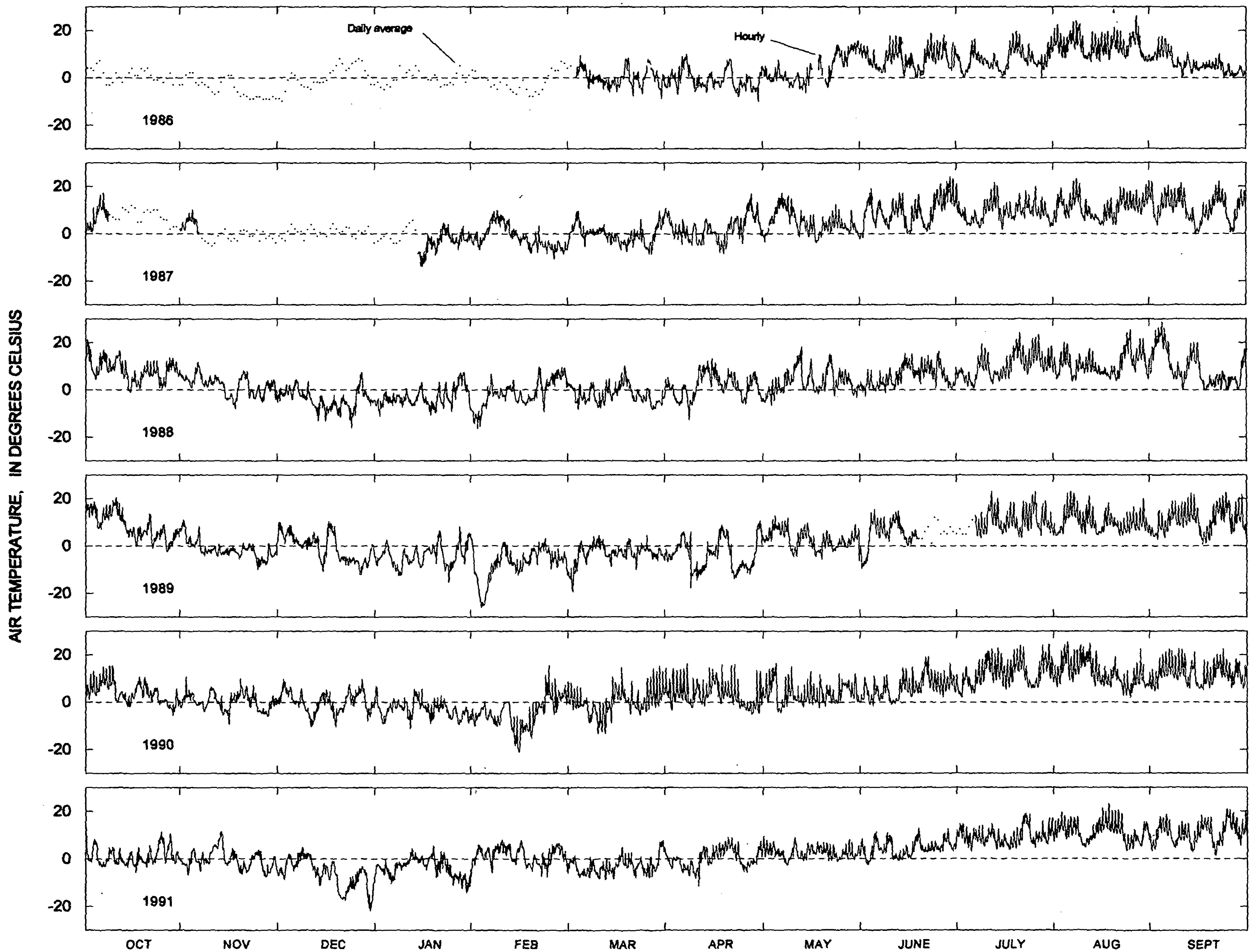


FIGURE 2. Air temperature at the Gaging Station, 1,615 meters elevation, near South Cascade Glacier, for the 1986-91 water years.

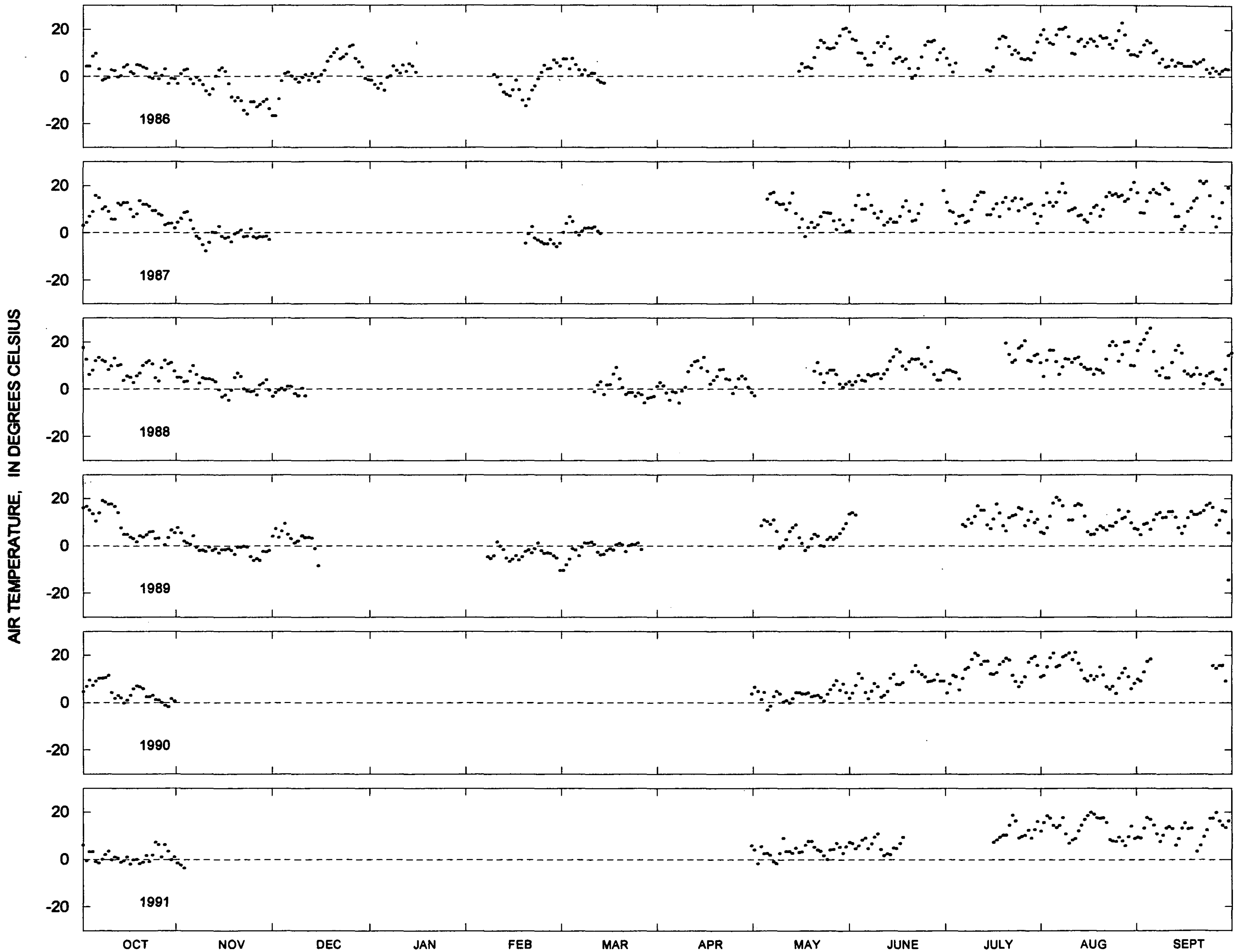


FIGURE 3. Daily average air temperature at the Hut, 1,842 meters elevation, near South Cascade Glacier, for the 1986-91 water years.

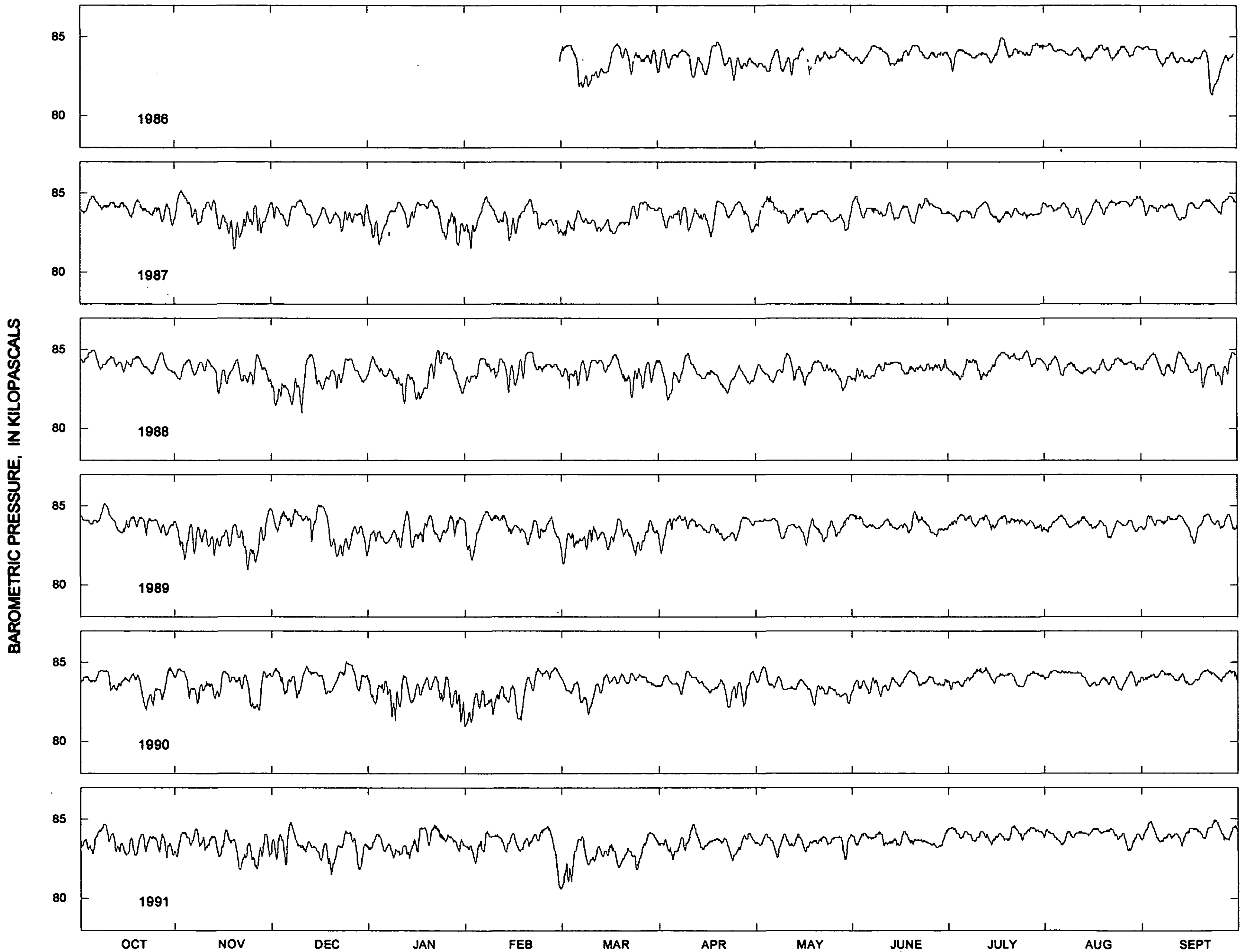


FIGURE 4. Barometric pressure, 1,617 meters elevation, at the Gaging Station near South Cascade Glacier, for the 1986-91 water years.

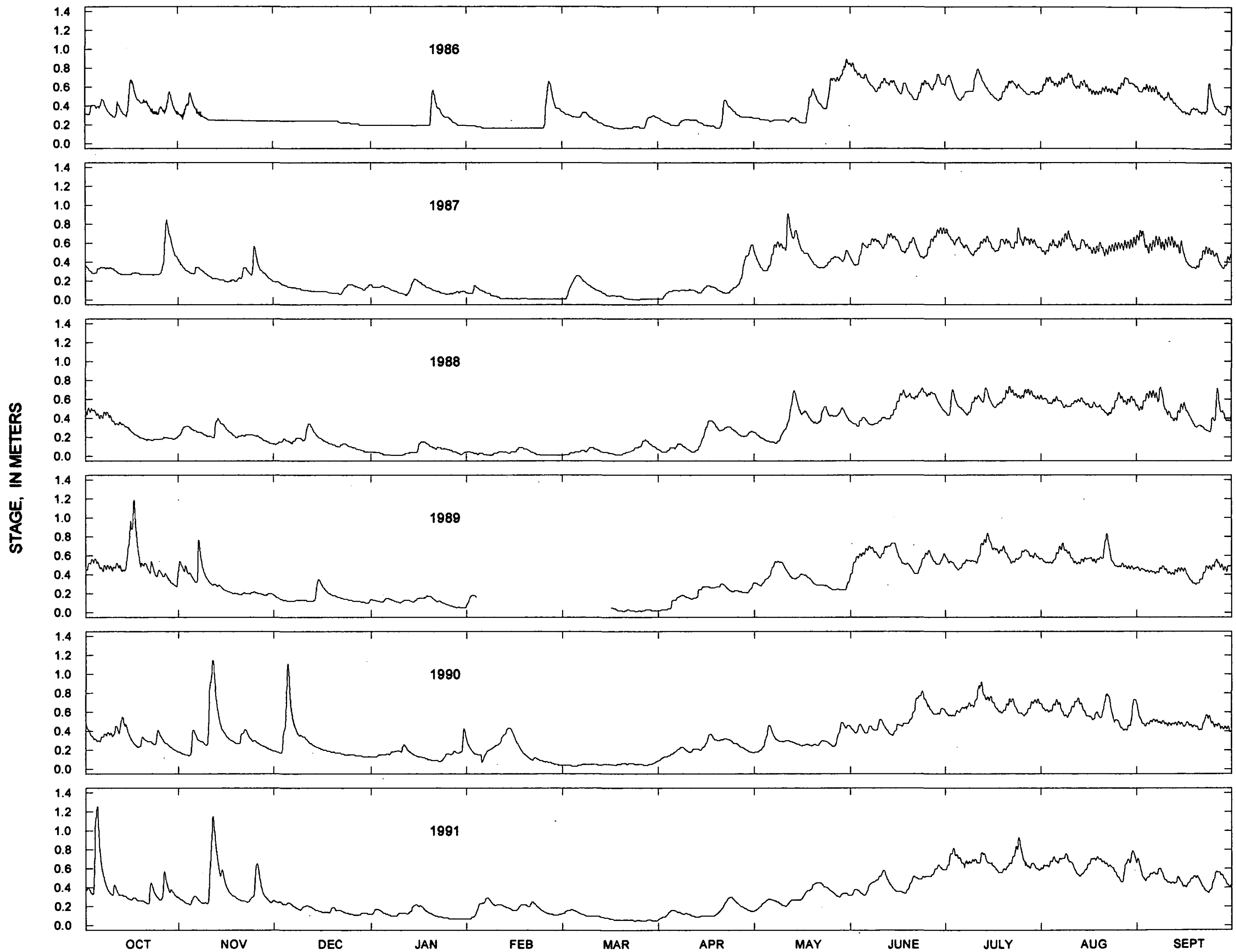


FIGURE 5. South Fork Cascade River stage, near South Cascade Glacier, for the 1986-91 water years.

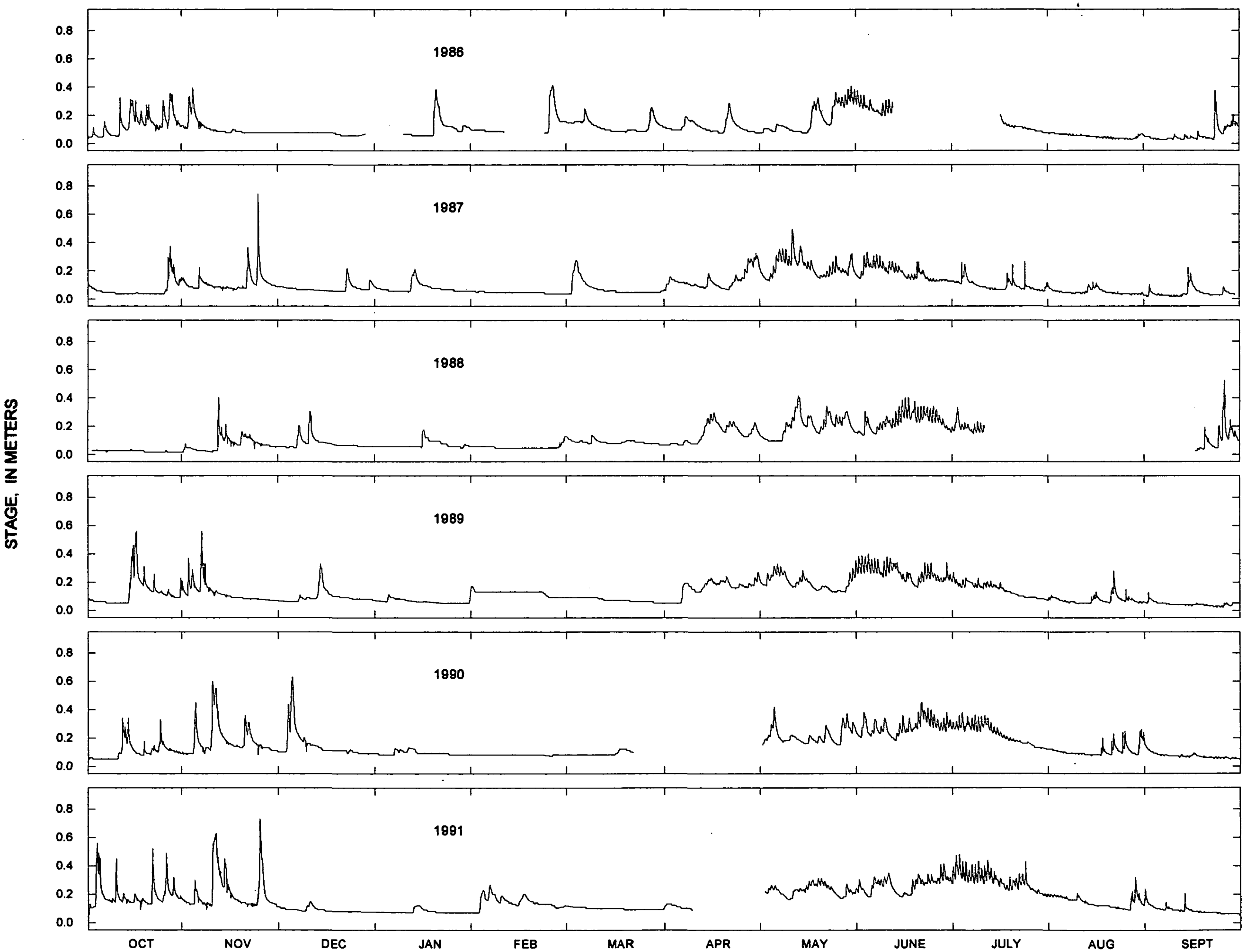


FIGURE 6. Salix Creek stage, near South Cascade Glacier, for the 1986-91 water years.

FIGURE 7a. Oblique photograph of South Cascade Glacier, September 5, 1986. The maximum width of the glacier is about 1 kilometer, photograph 86R1-025.

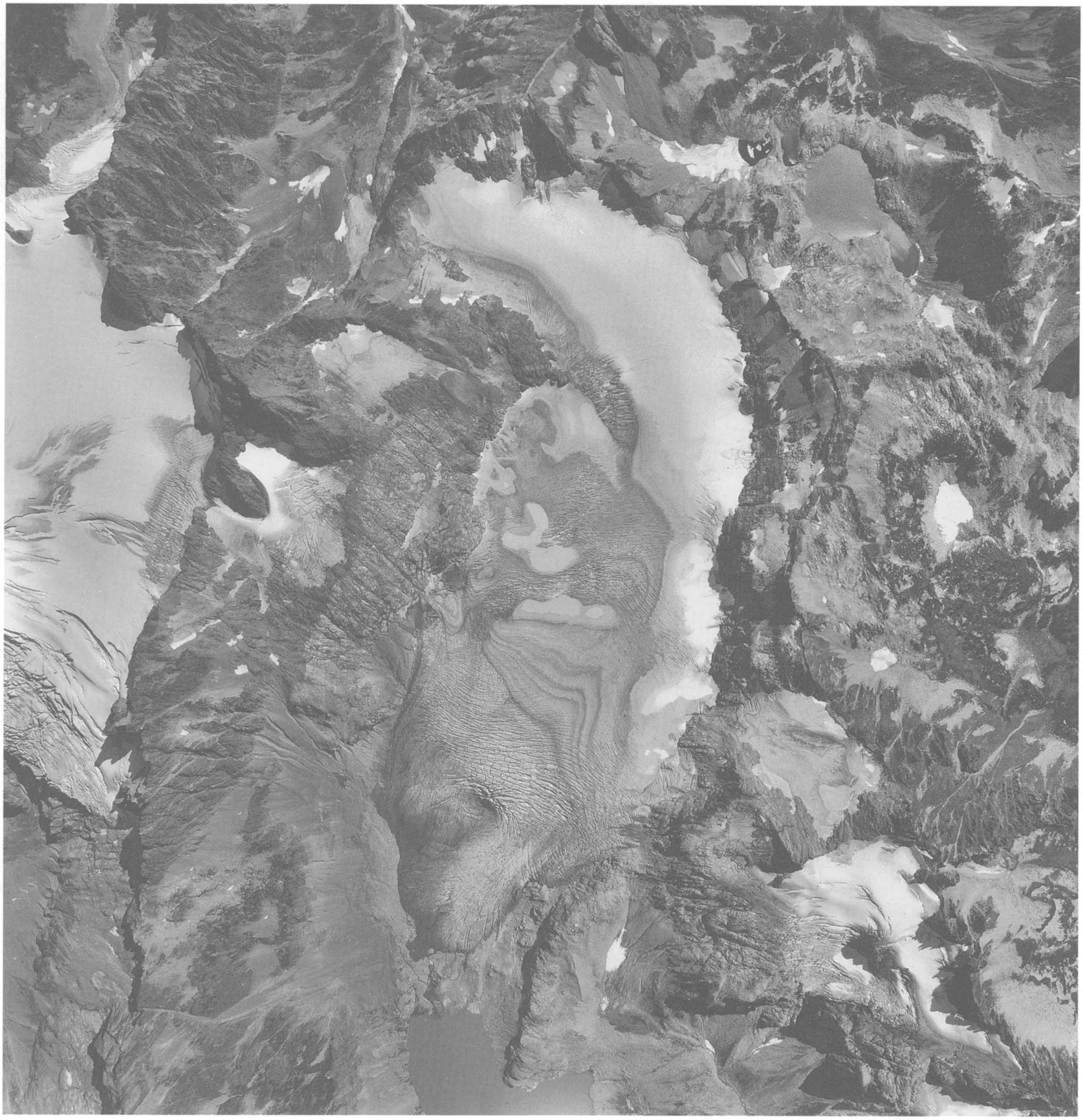


FIGURE 7b. Vertical photograph of South Cascade Glacier, September 9, 1987. The maximum width of the glacier is about 1 kilometer, north is approximately up, photograph A19-008.

FIGURE 7c. Oblique photograph of South Cascade Glacier, October 10, 1988. The maximum width of the glacier is about 1 kilometer, photograph 88R2-124.

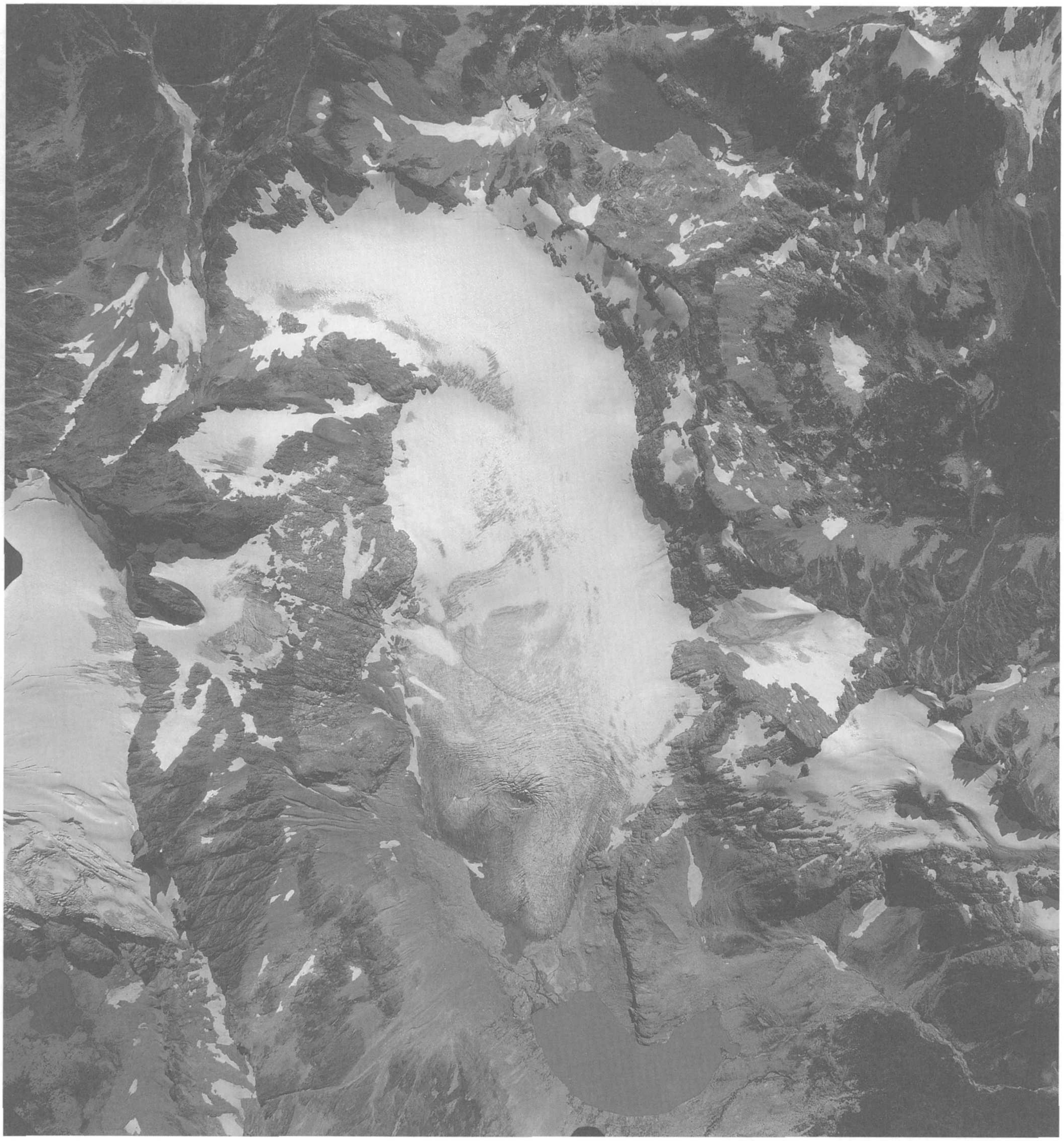


FIGURE 7d. Vertical photograph of South Cascade Glacier, September 12, 1989. The maximum width of the glacier is about 1 kilometer, north is approximately up, photograph A19-002.

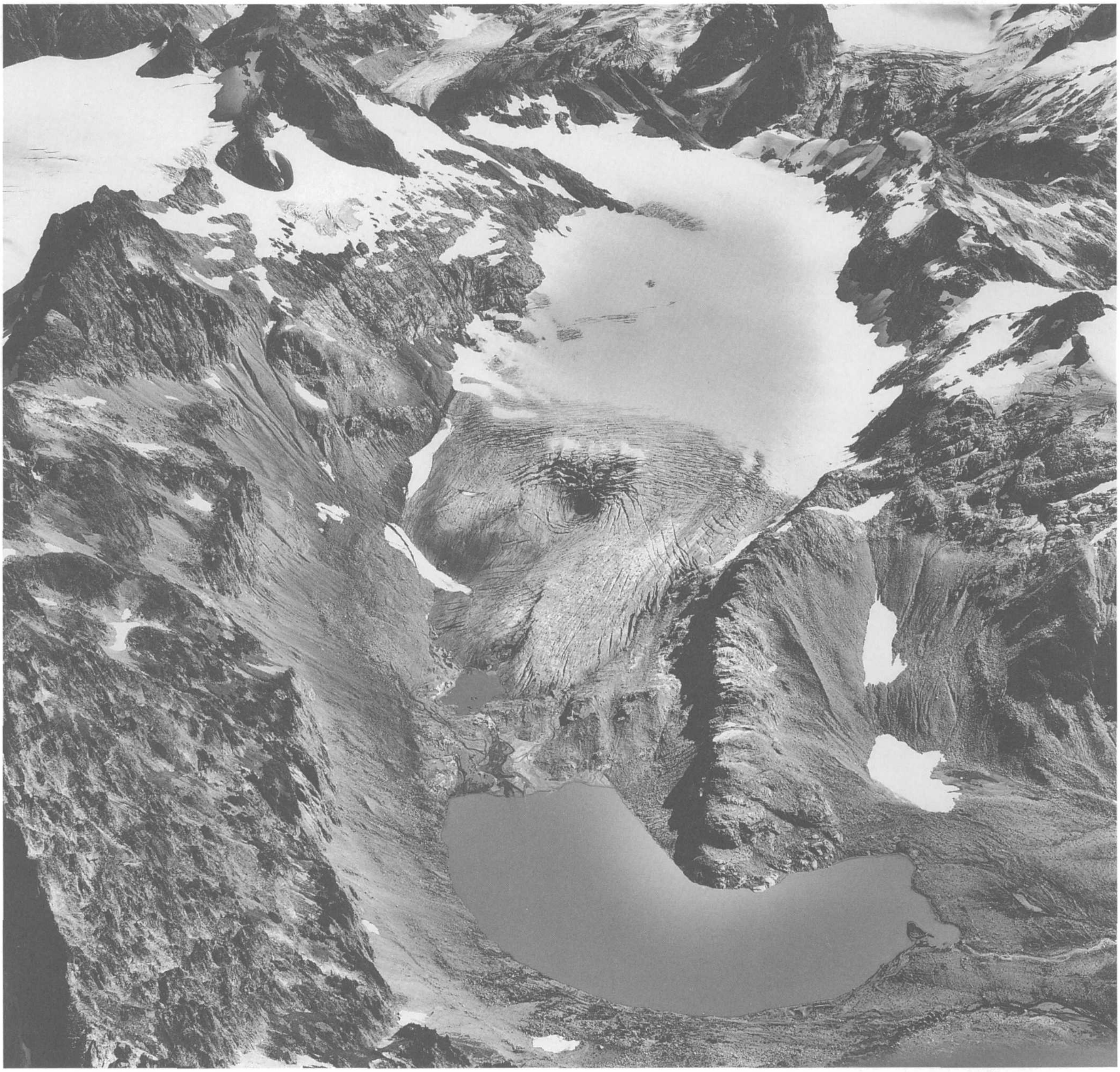


FIGURE 7e. Oblique photograph of South Cascade Glacier, September 5, 1990. The maximum width of the glacier is about 1 kilometer, photograph 90R2-072.

FIGURE 7f. Oblique photograph of South Cascade Glacier, September 9, 1991. The maximum width of the glacier is about 1 kilometer, photograph 91R2-098.

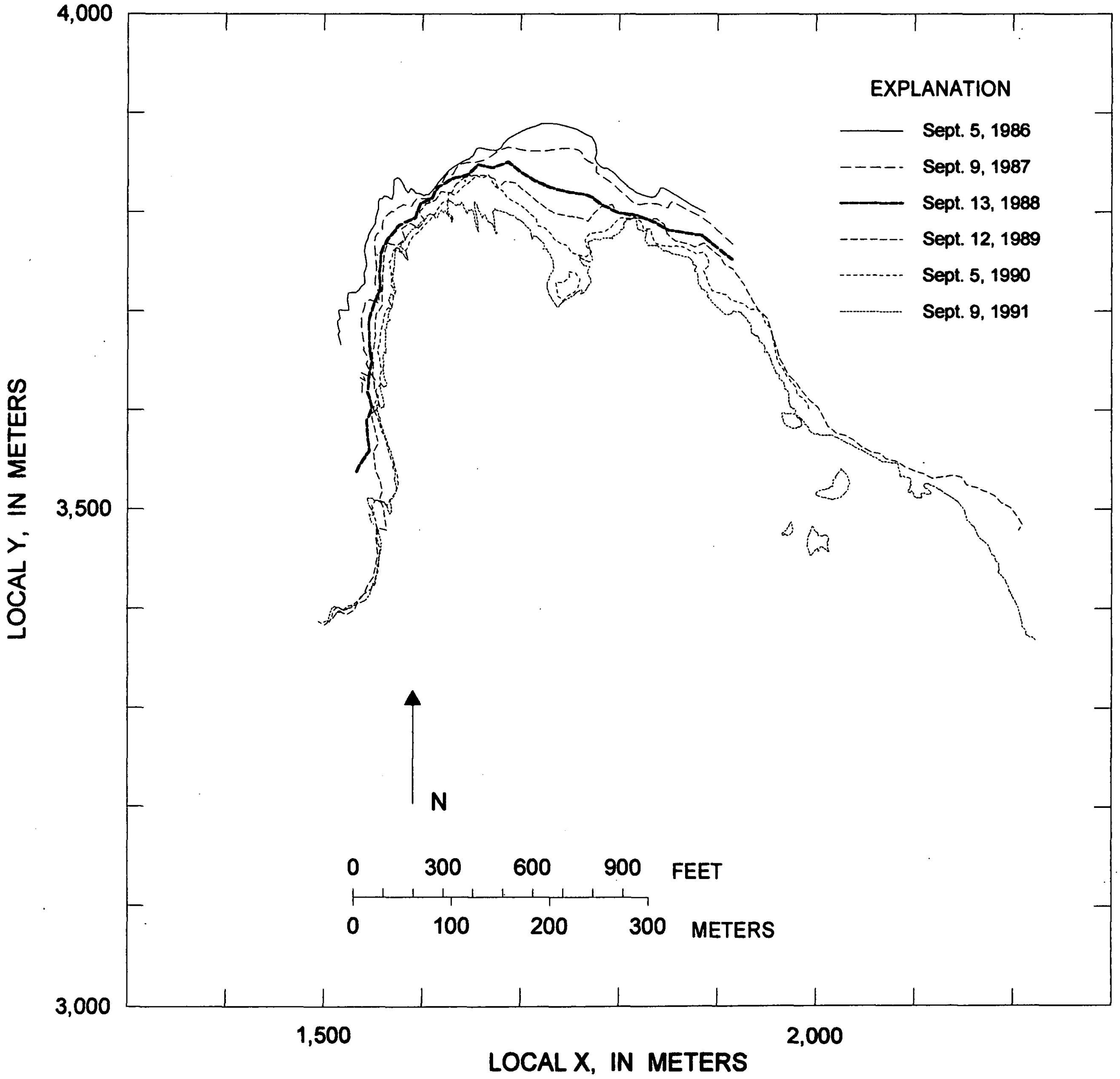


FIGURE 8. South Cascade Glacier terminus positions.

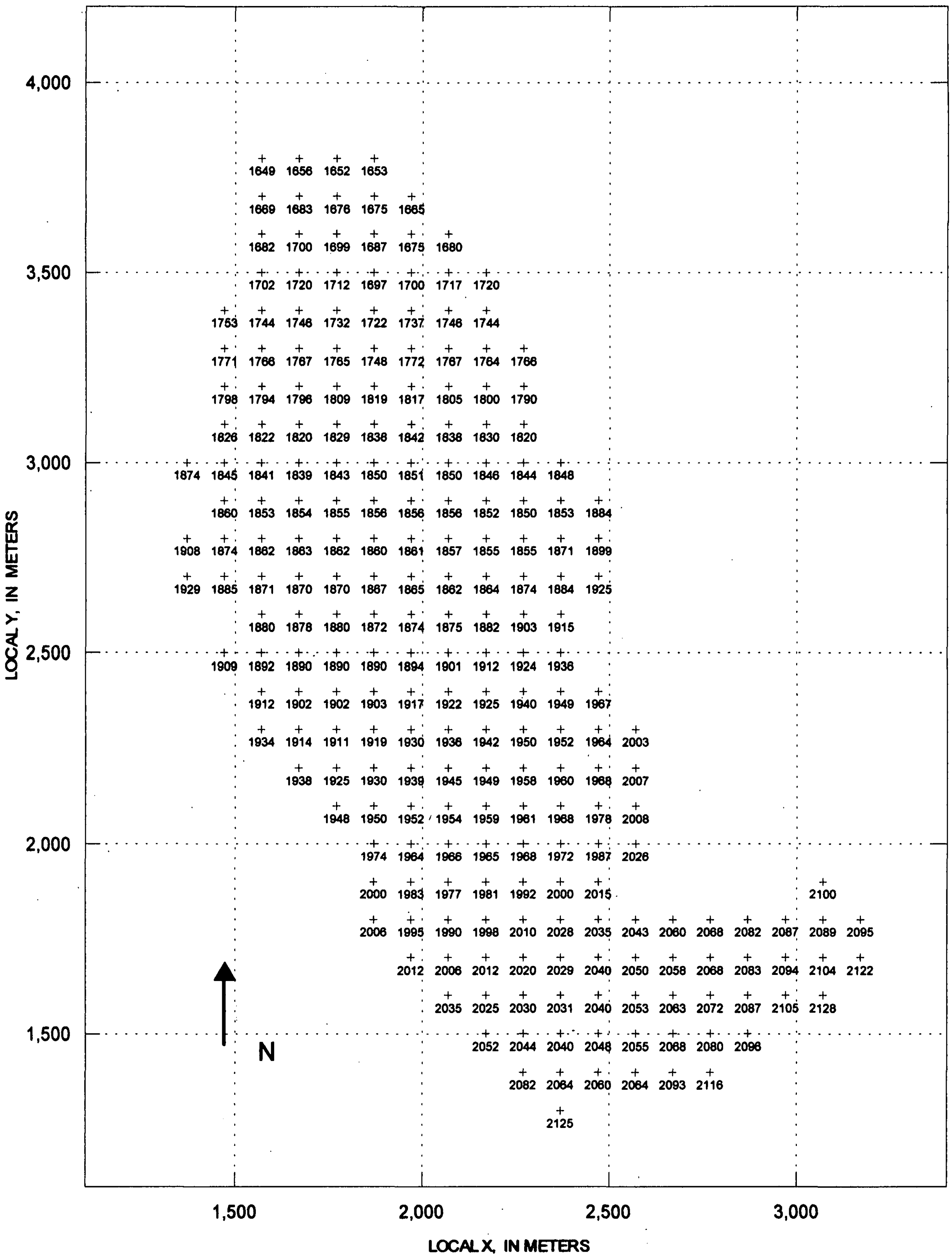


Figure 9a. Altitude grid for South Cascade Glacier, measured from stereo vertical photographs taken on September 5, 1986. Tabular data are in Table 5a.

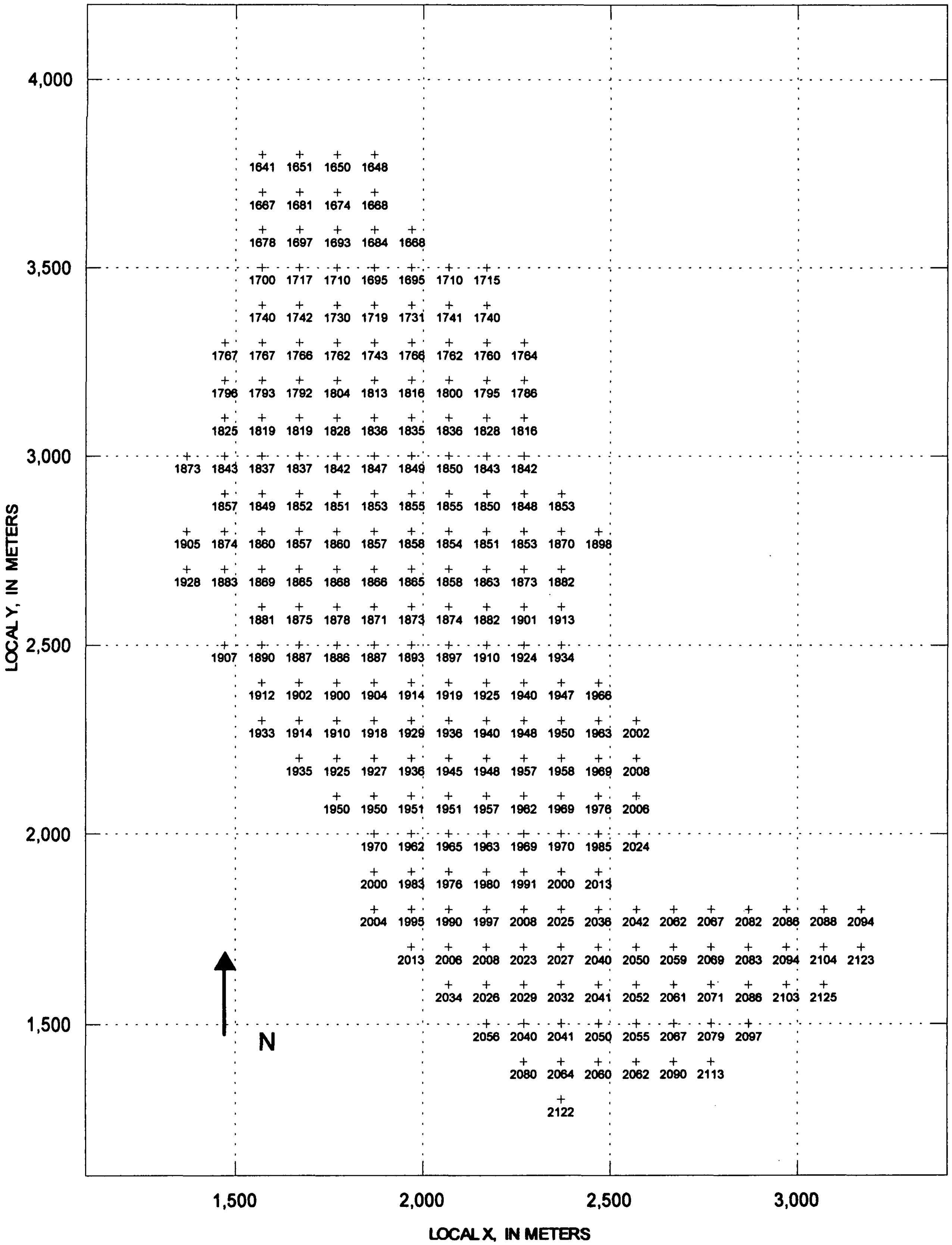


Figure 9b. Altitude grid for South Cascade Glacier, measured from stereo vertical photographs taken on September 9, 1987. Tabular data are in Table 5b.

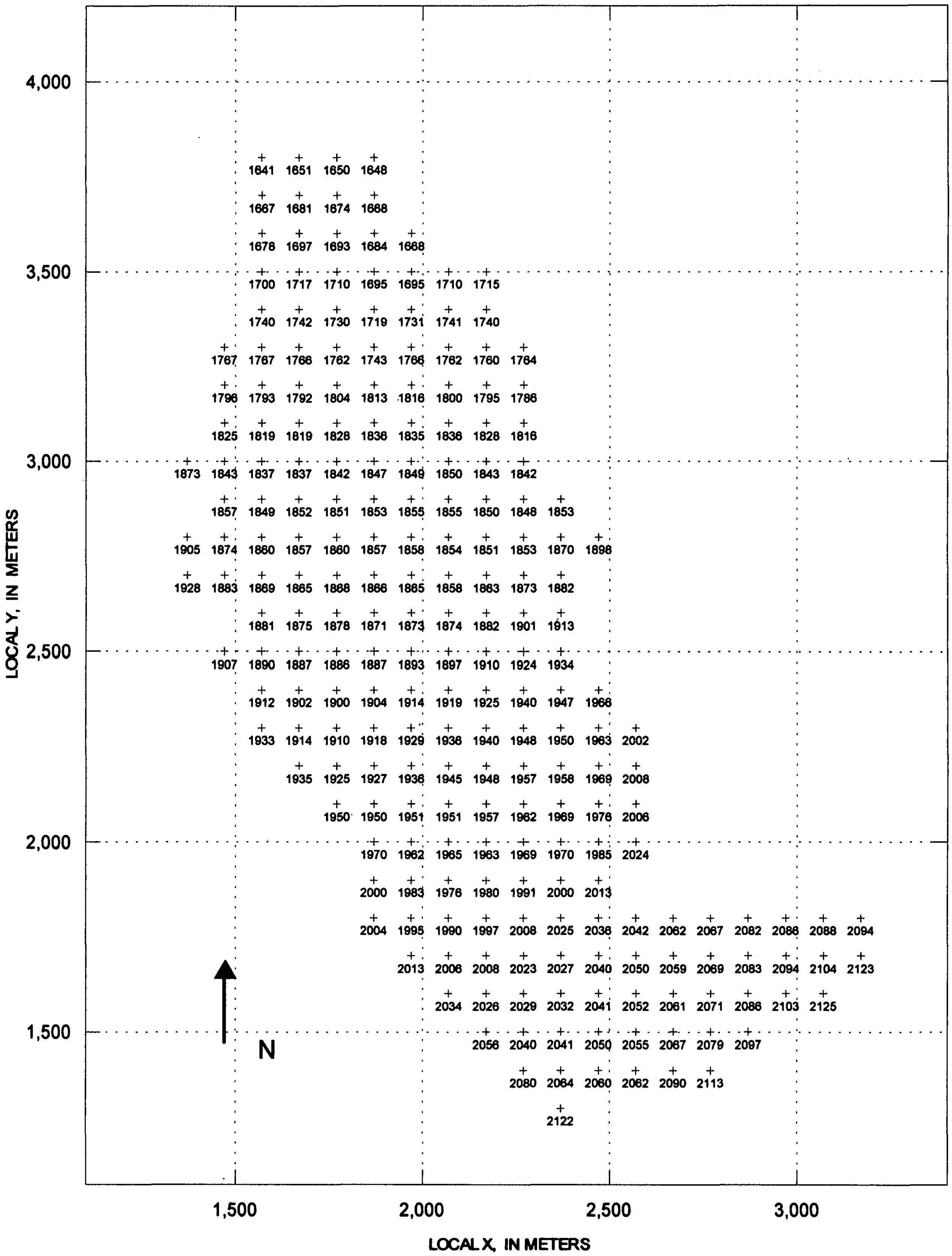


Figure 9c. Altitude grid for South Cascade Glacier, measured from stereo vertical photographs taken on August 21, 1988. Tabular data are in Table 5c.

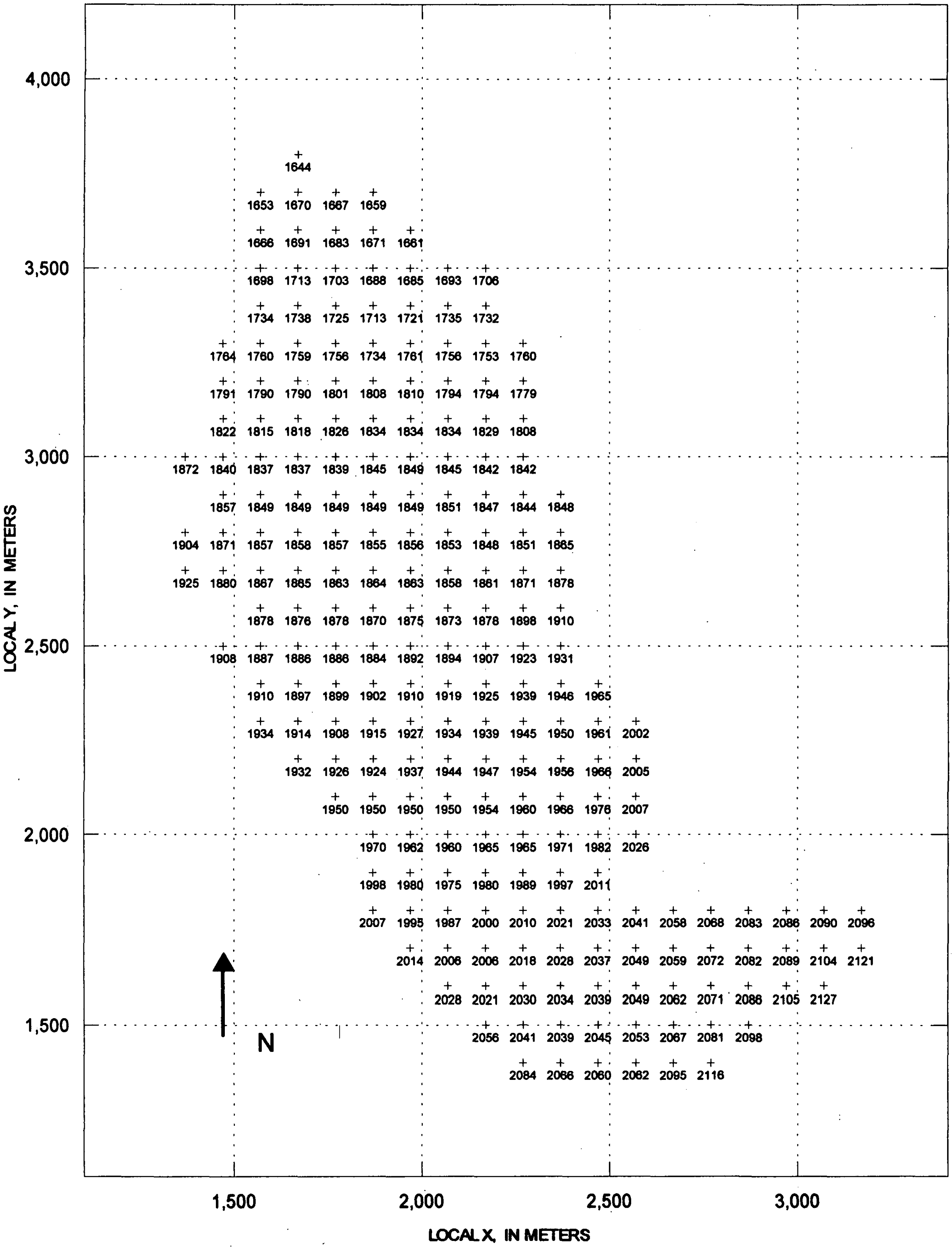


Figure 9d. Altitude grid for South Cascade Glacier, measured from stereo vertical photographs taken on September 12, 1989. Tabular data are in Table 5d.

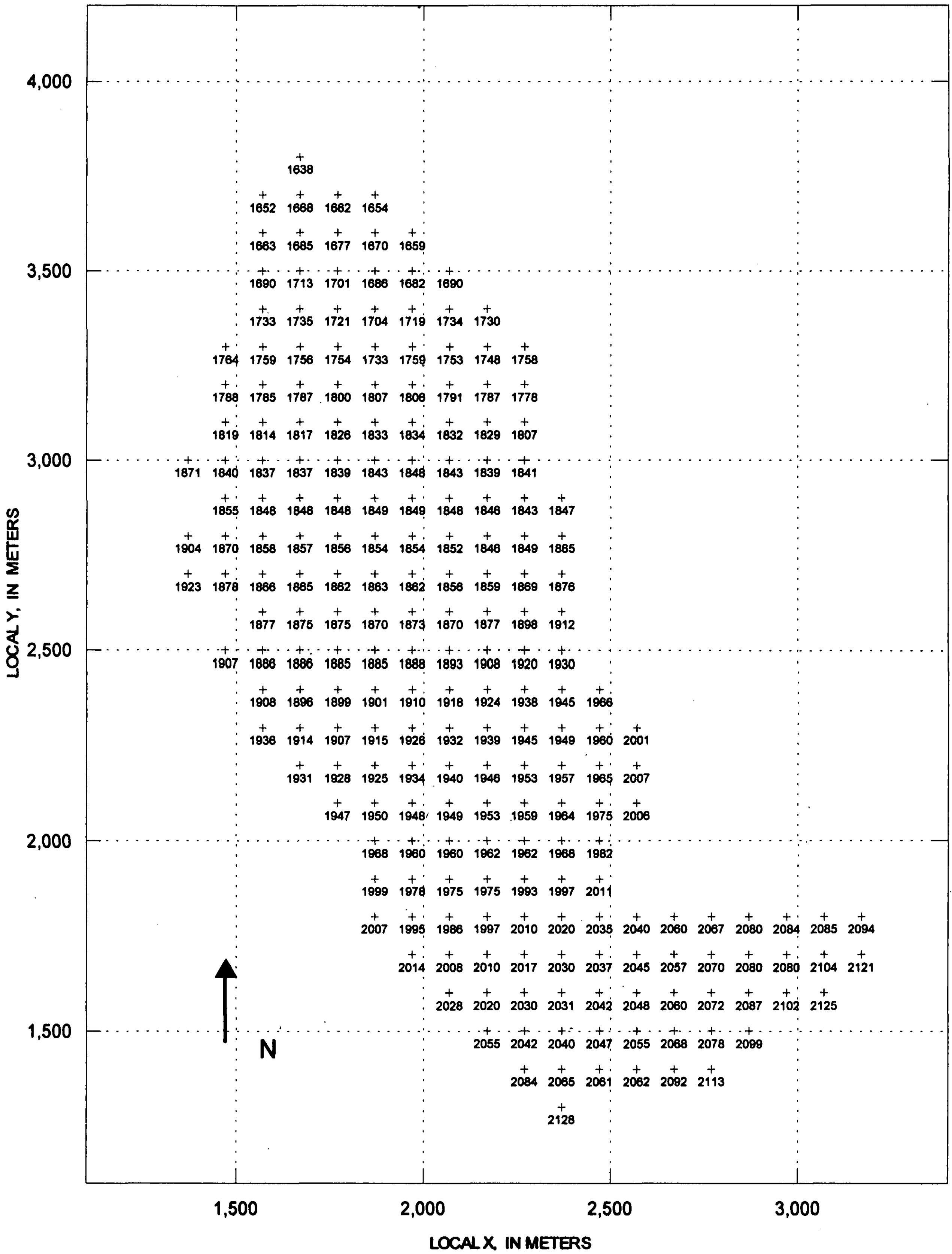


Figure 9e. Altitude grid for South Cascade Glacier, measured from stereo vertical photographs taken on September 5, 1990. Tabular data are in Table 5e.

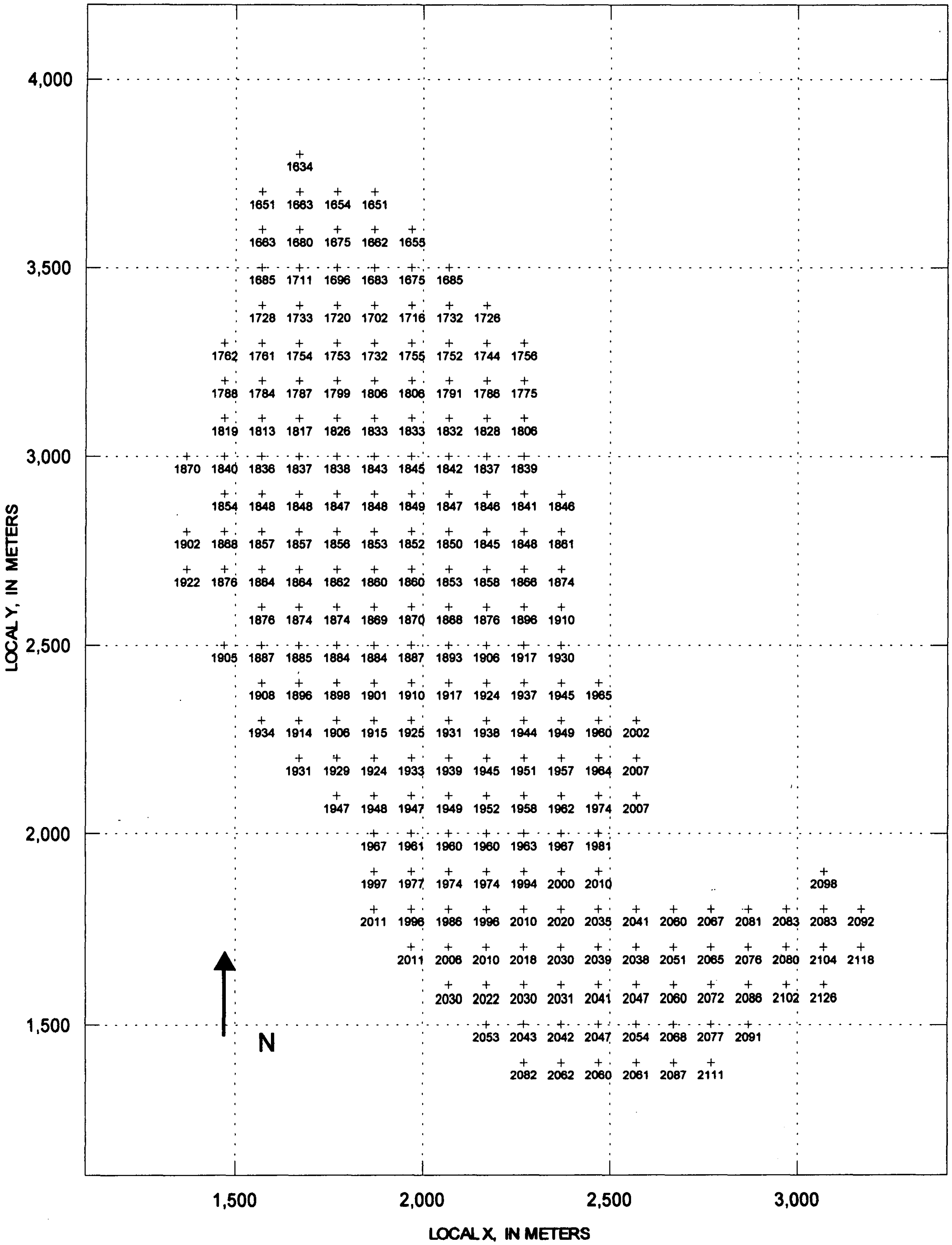


Figure 9f. Altitude grid for South Cascade Glacier, measured from stereo vertical photographs taken on September 9, 1991. Tabular data are in Table 5f.

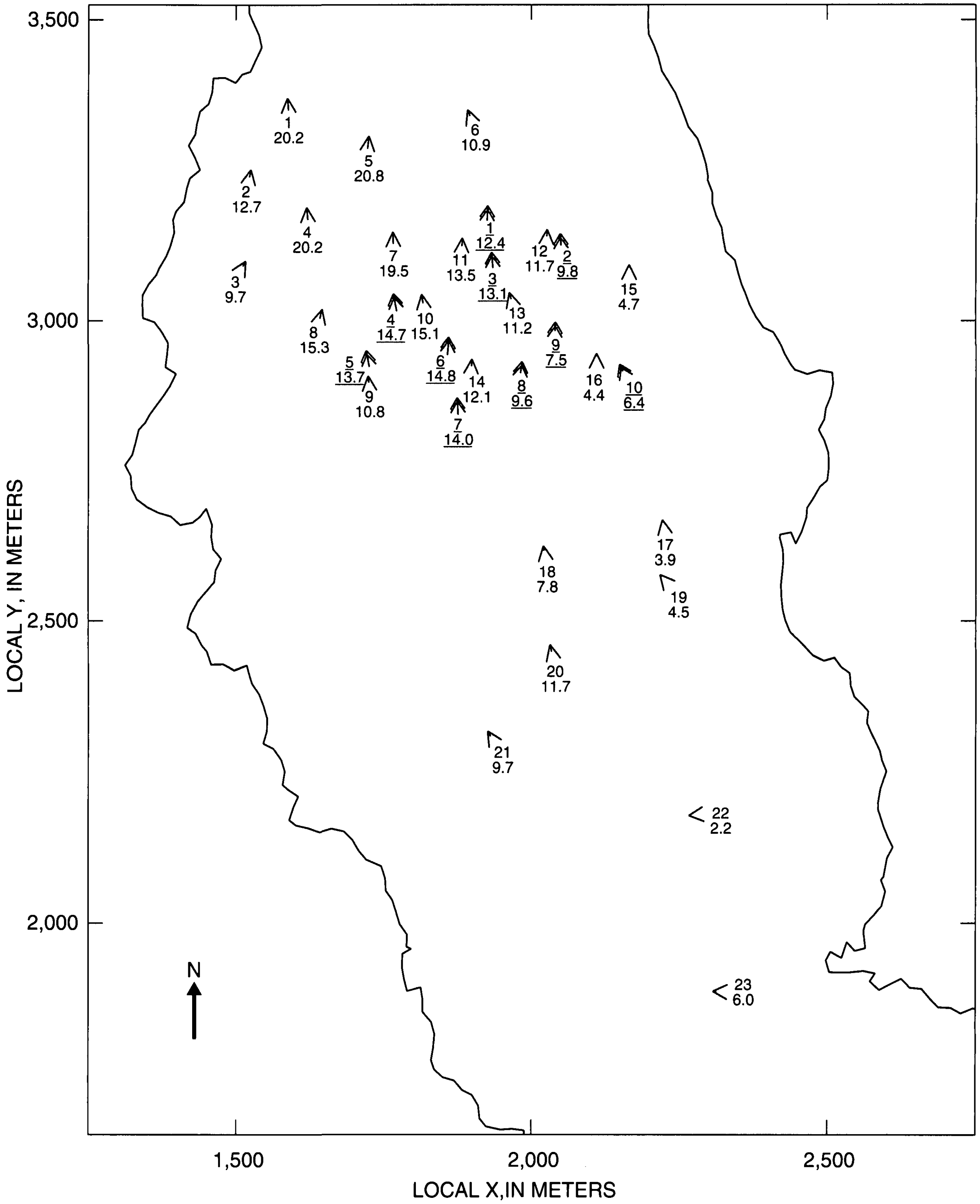


FIGURE 10. South Cascade Glacier surface speed, measured from vertical photographs taken on September 5, 1986, September 9, 1987, and September 12, 1989. Vectors with single line head are for the 1986-87 interval and vectors with double head are for the 1987-89 interval. Point identification (refer to Table 6) and speed in meters per year (both underlined for the 1987-89 interval) are shown below the vectors. Vector endpoints are accurate to 1 meter.

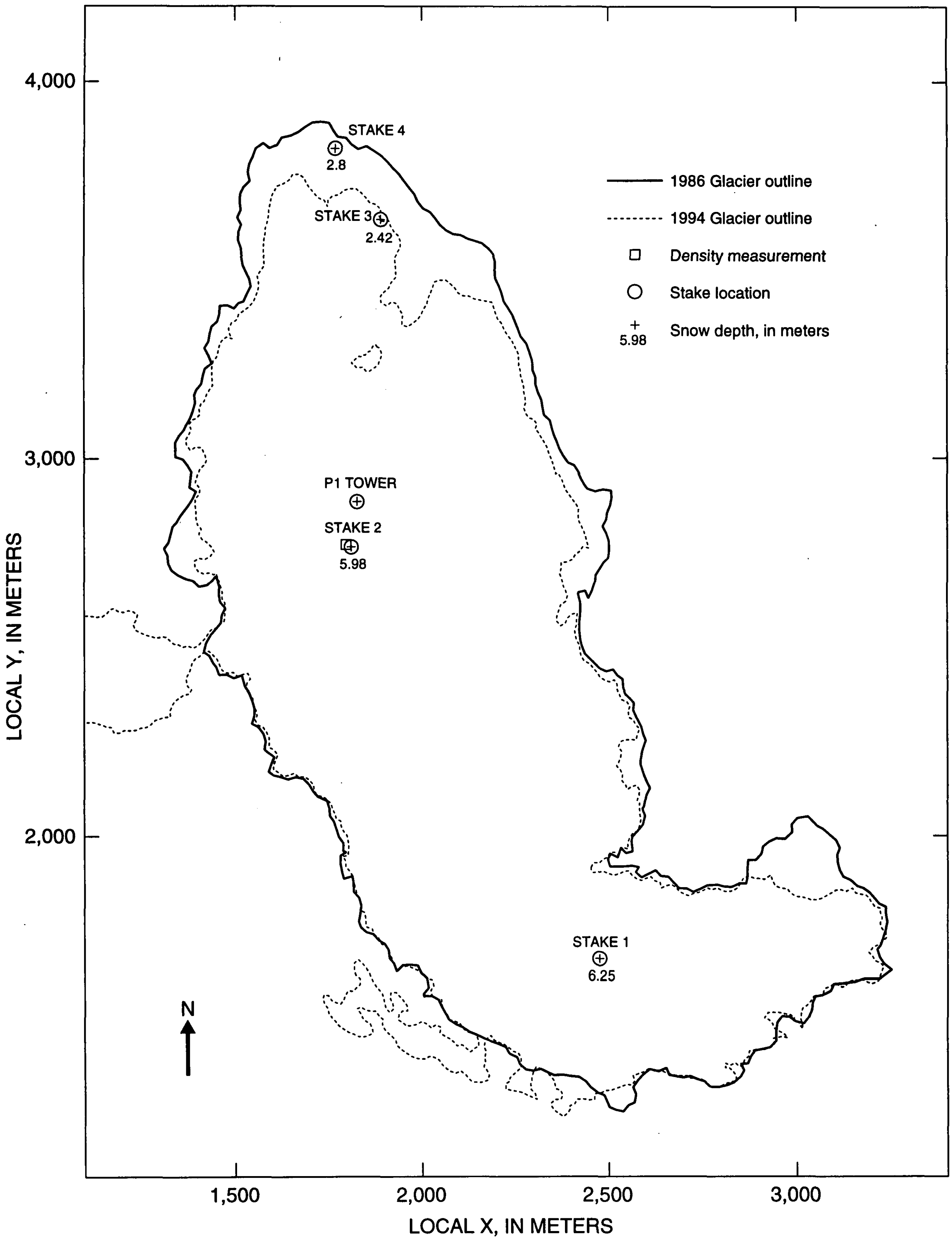


FIGURE 11a. Snow depths, pit, and stake locations on South Cascade Glacier, 1986.

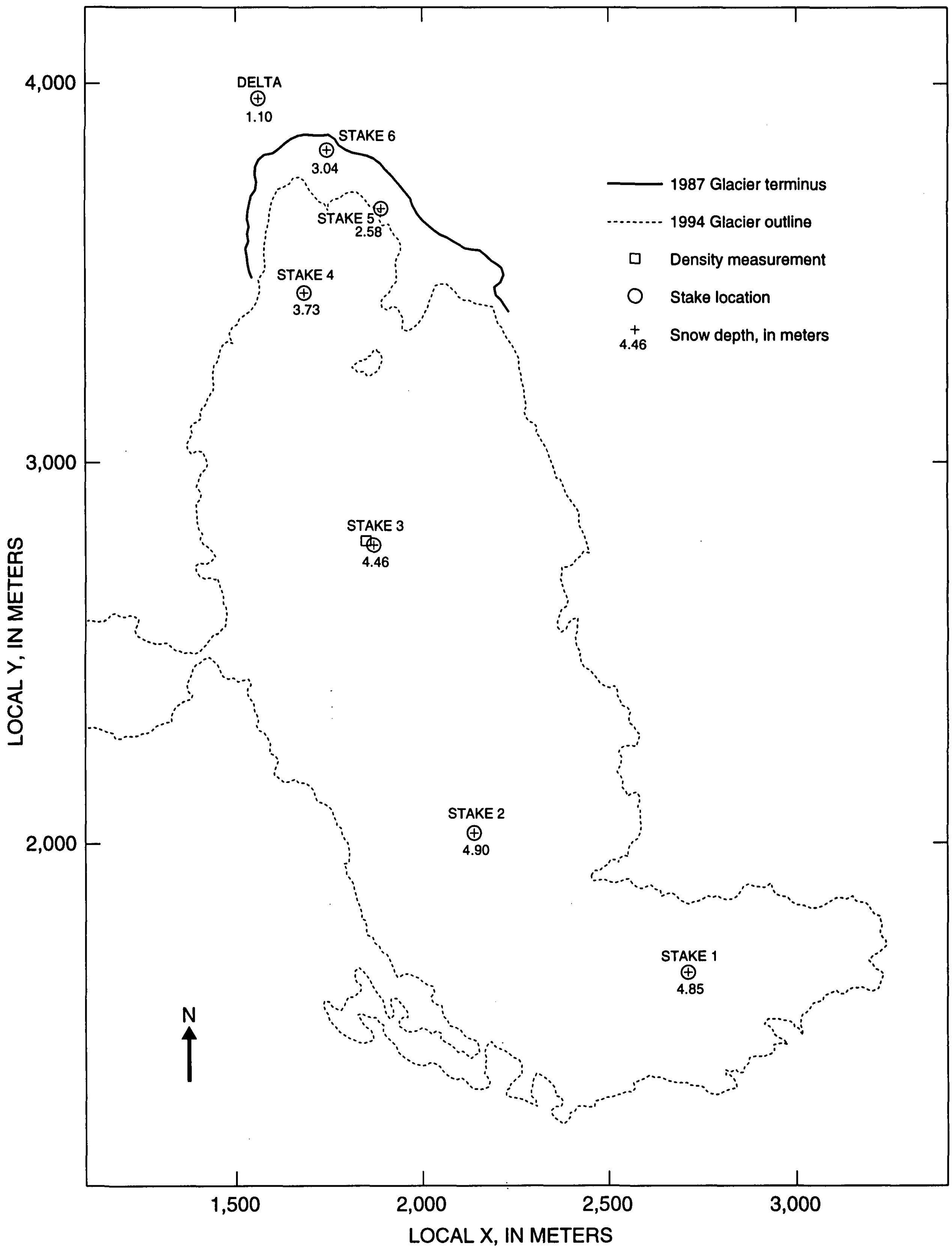


FIGURE 11b. Snow depths, pit, and stake locations on South Cascade Glacier, 1987.

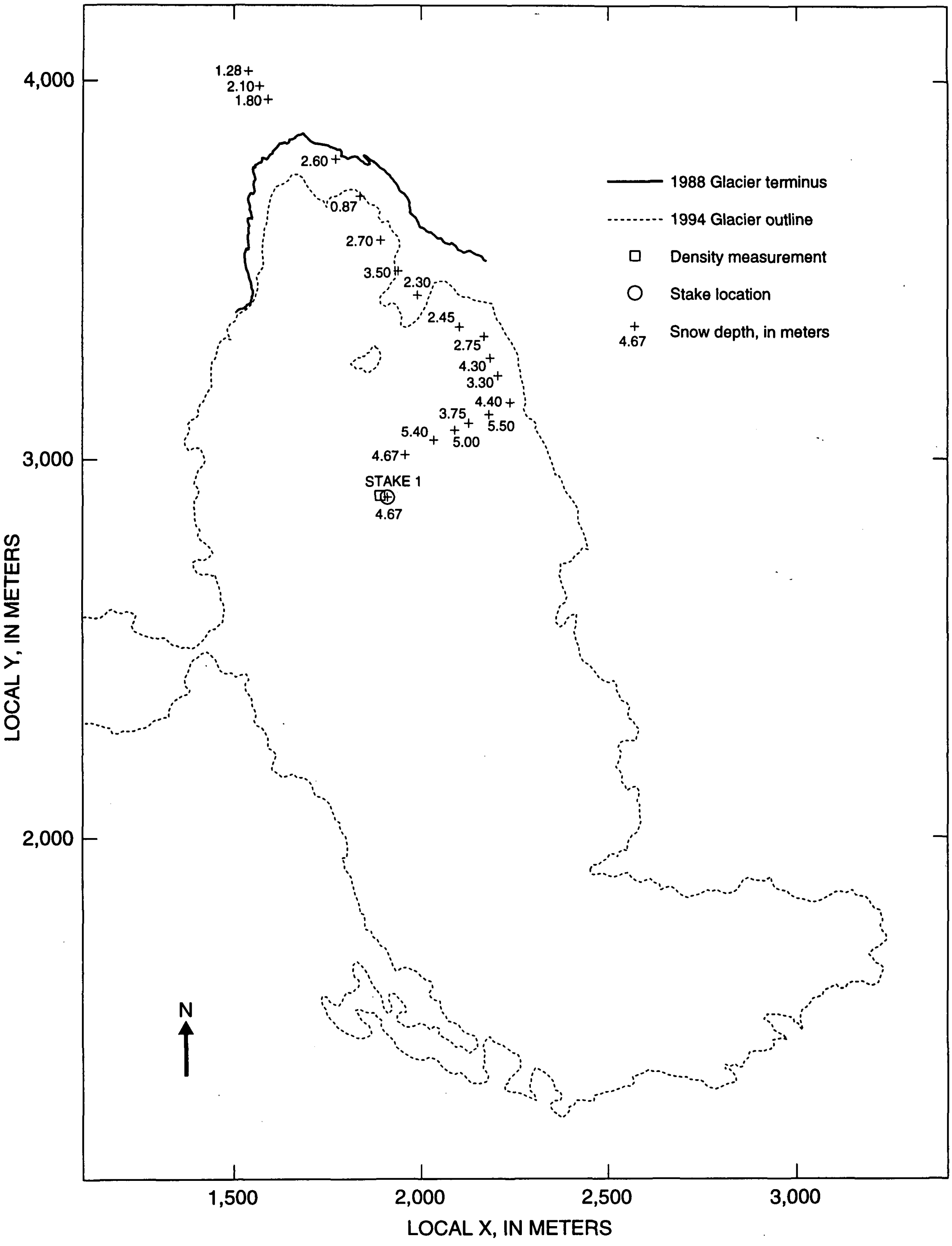


FIGURE 11c. Snow depths, pit, and stake locations on South Cascade Glacier, 1988.

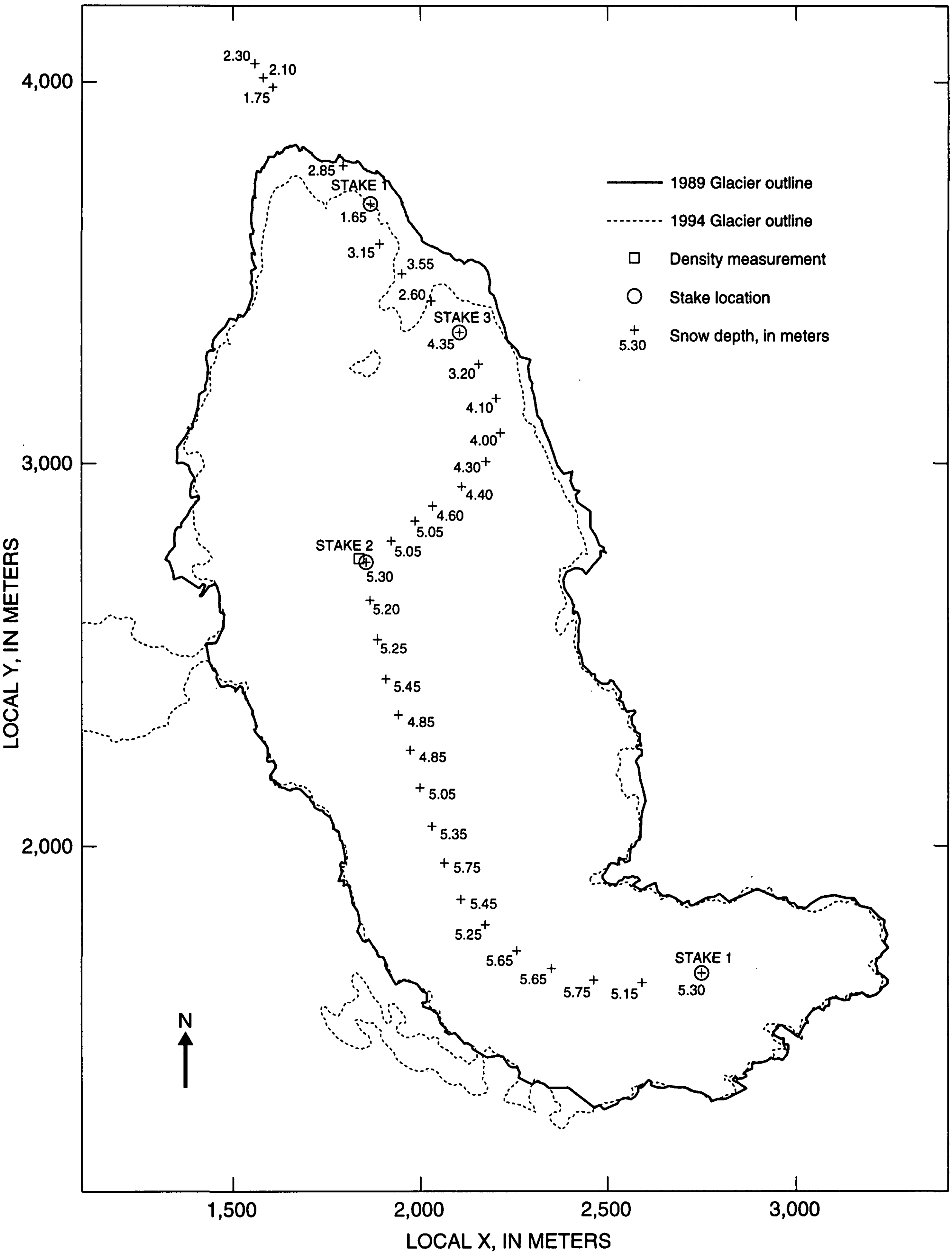


FIGURE 11d. Snow depths, pit, and stake locations on South Cascade Glacier, 1989.

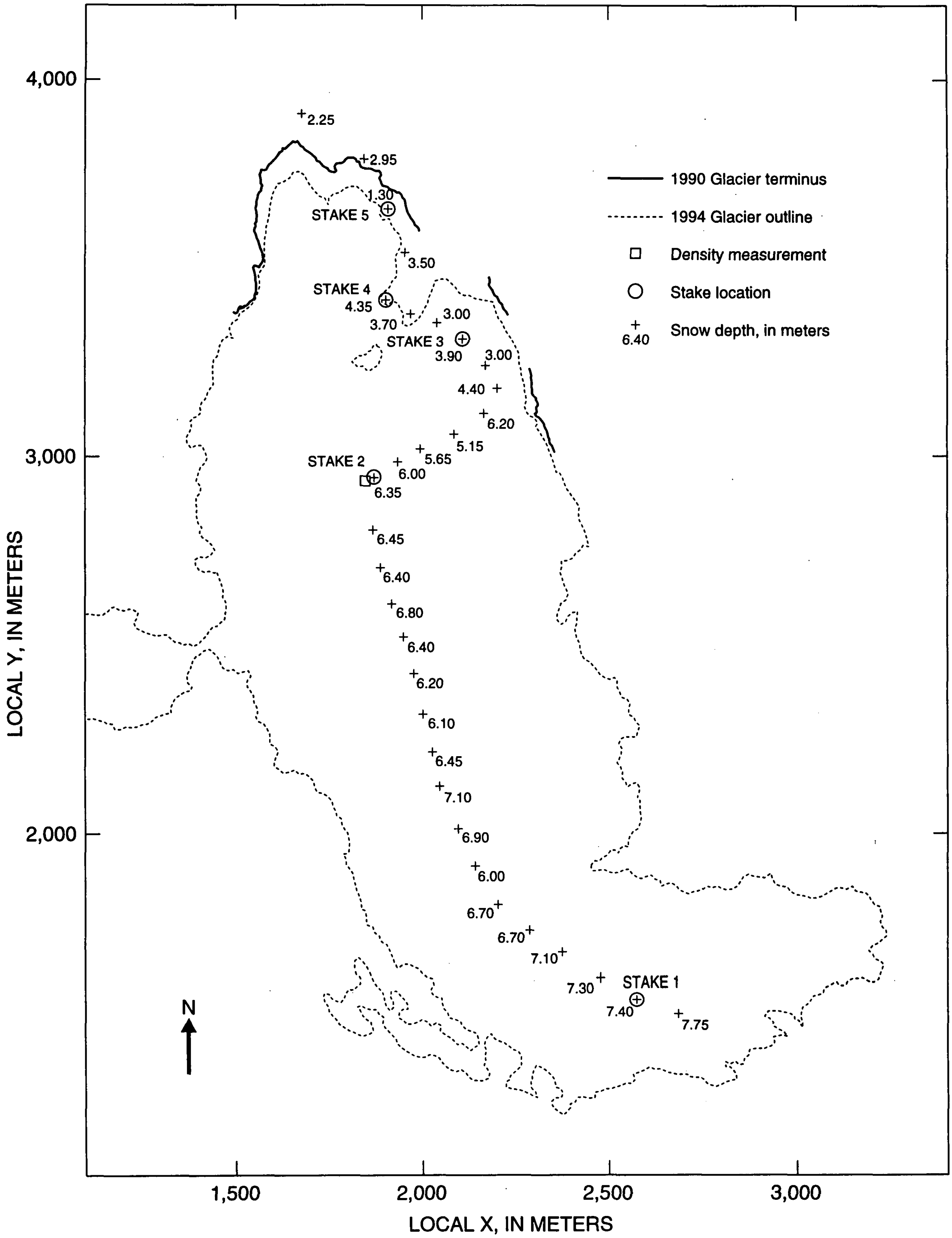


FIGURE 11e. Snow depths, pit, and stake locations on South Cascade Glacier, 1990.

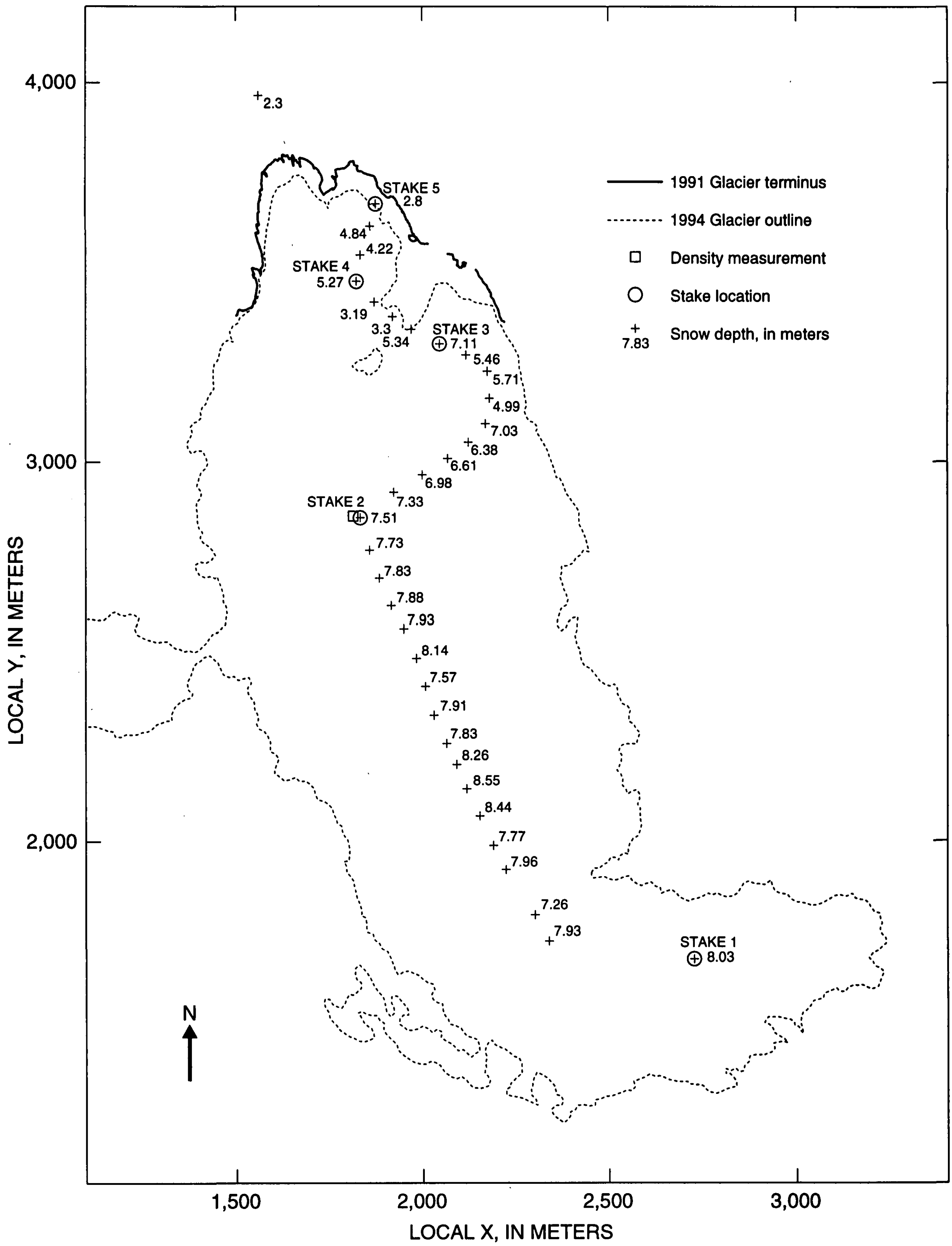


FIGURE 11f. Snow depths, pit, and stake locations on South Cascade Glacier, 1991.

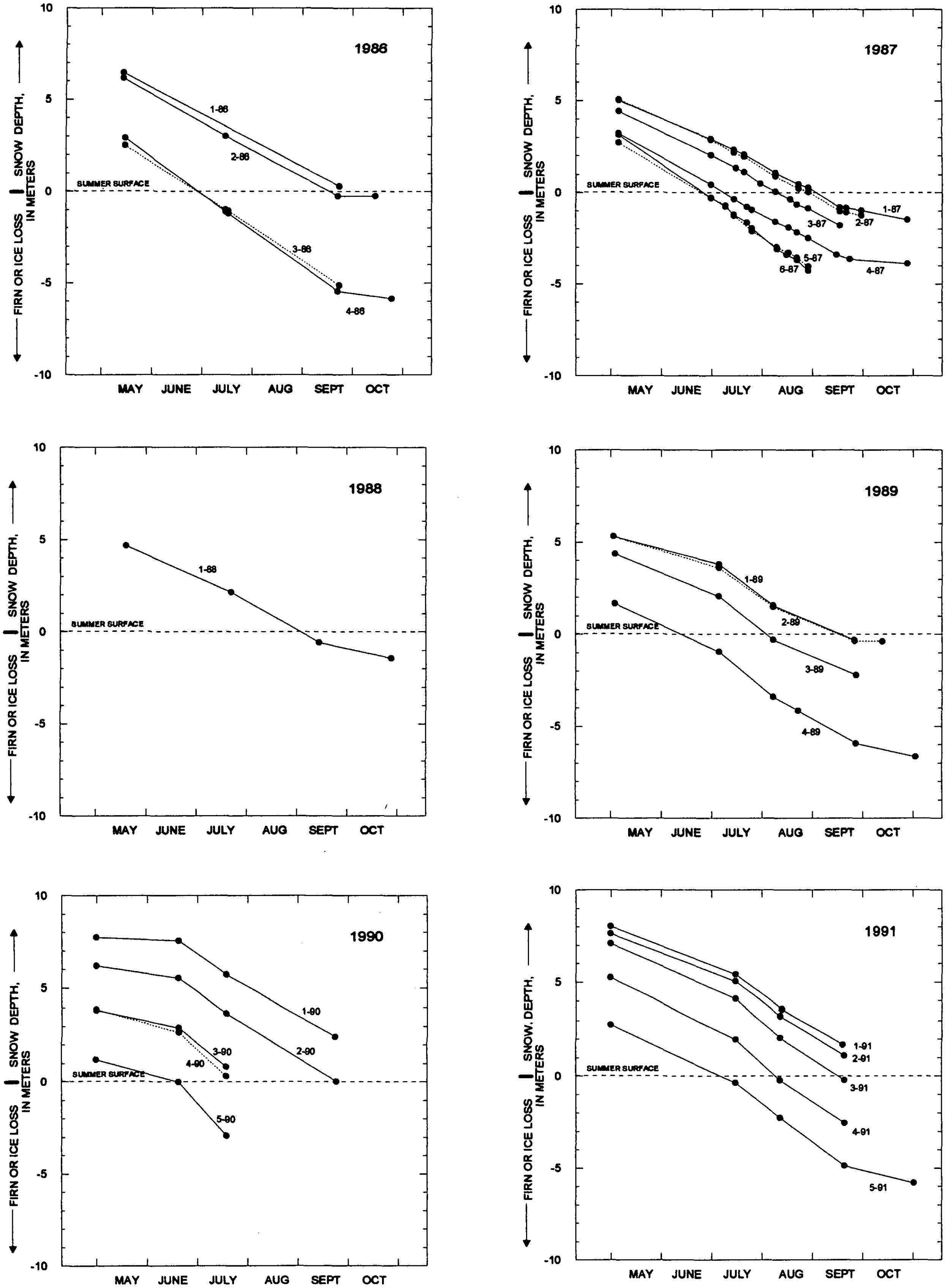


FIGURE 12. Snow depth and firn or ice loss at South Cascade Glacier at each stake for years 1986-91. Stake locations are shown in figures 11a-f and tables 10a-f.

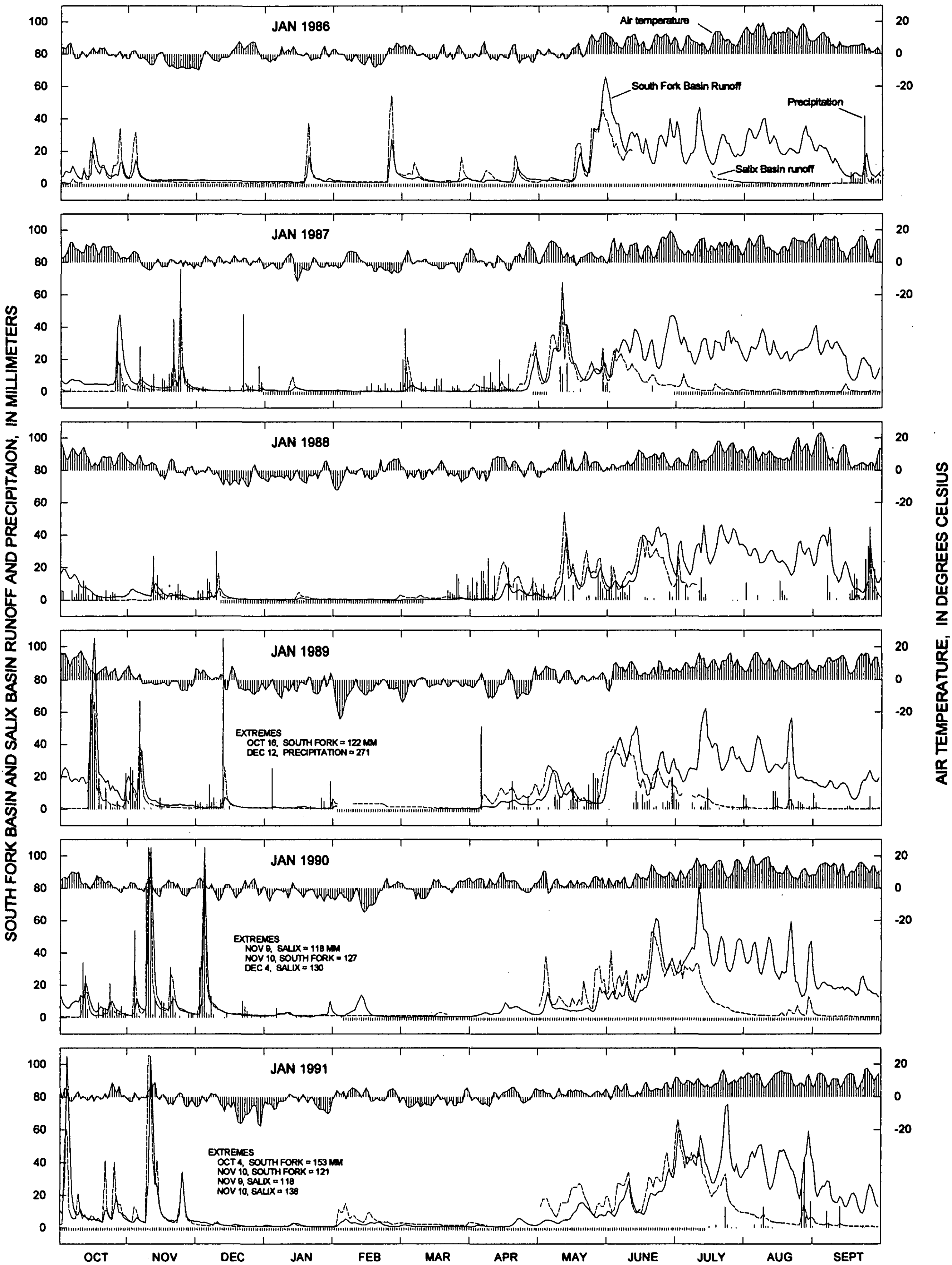


FIGURE 13. Average daily temperature, daily runoff at South Fork Basin and Salix Basin, and daily precipitation, near South Cascade Glacier, water years 1986-91. A negative precipitation indicates there were no data on that day.

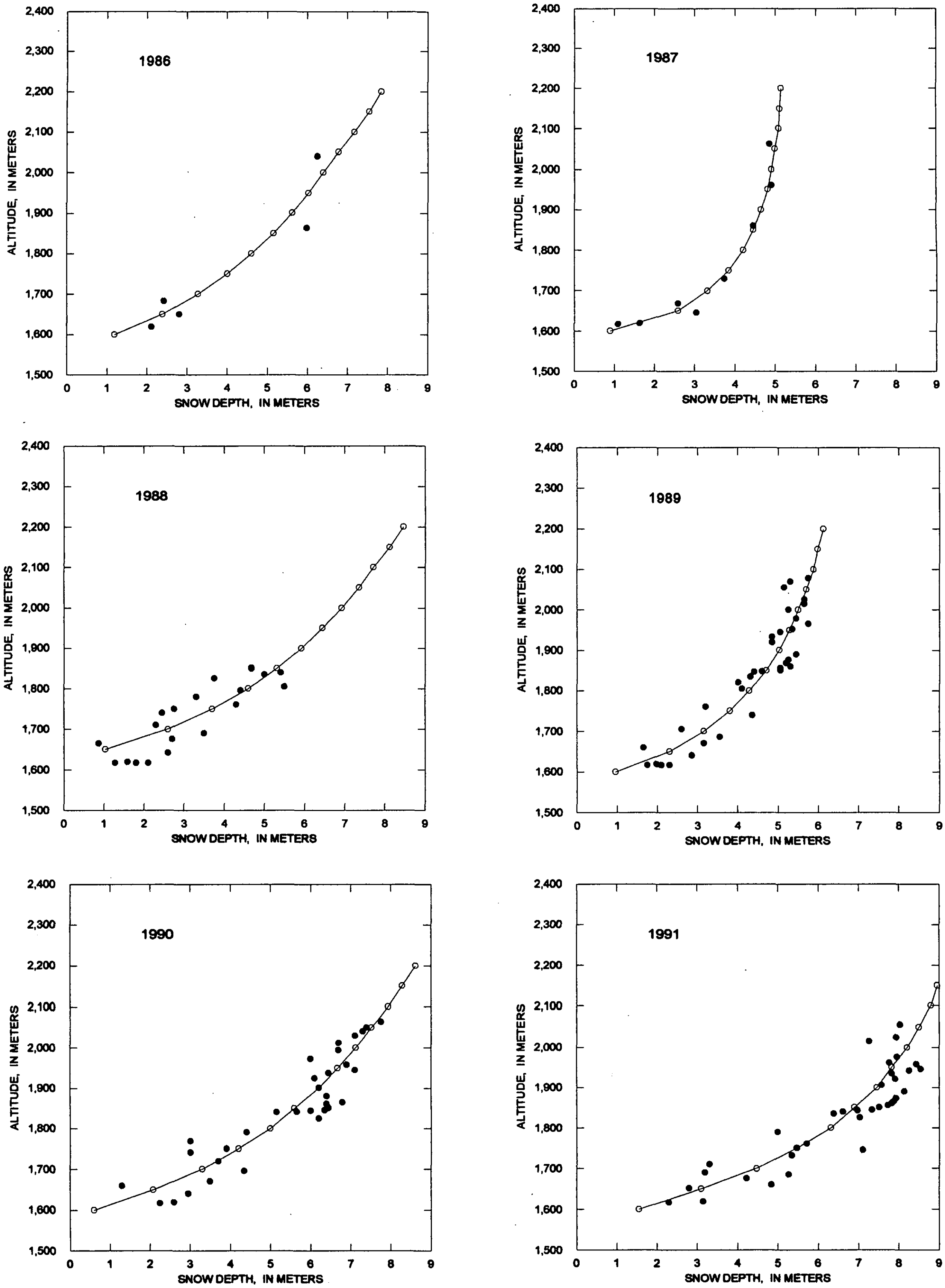


FIGURE 14. Measured winter snow depth at South Cascade Glacier for years 1986-91. Solid circles are measured, open circles are along a hand-drawn curve used for interpolation.

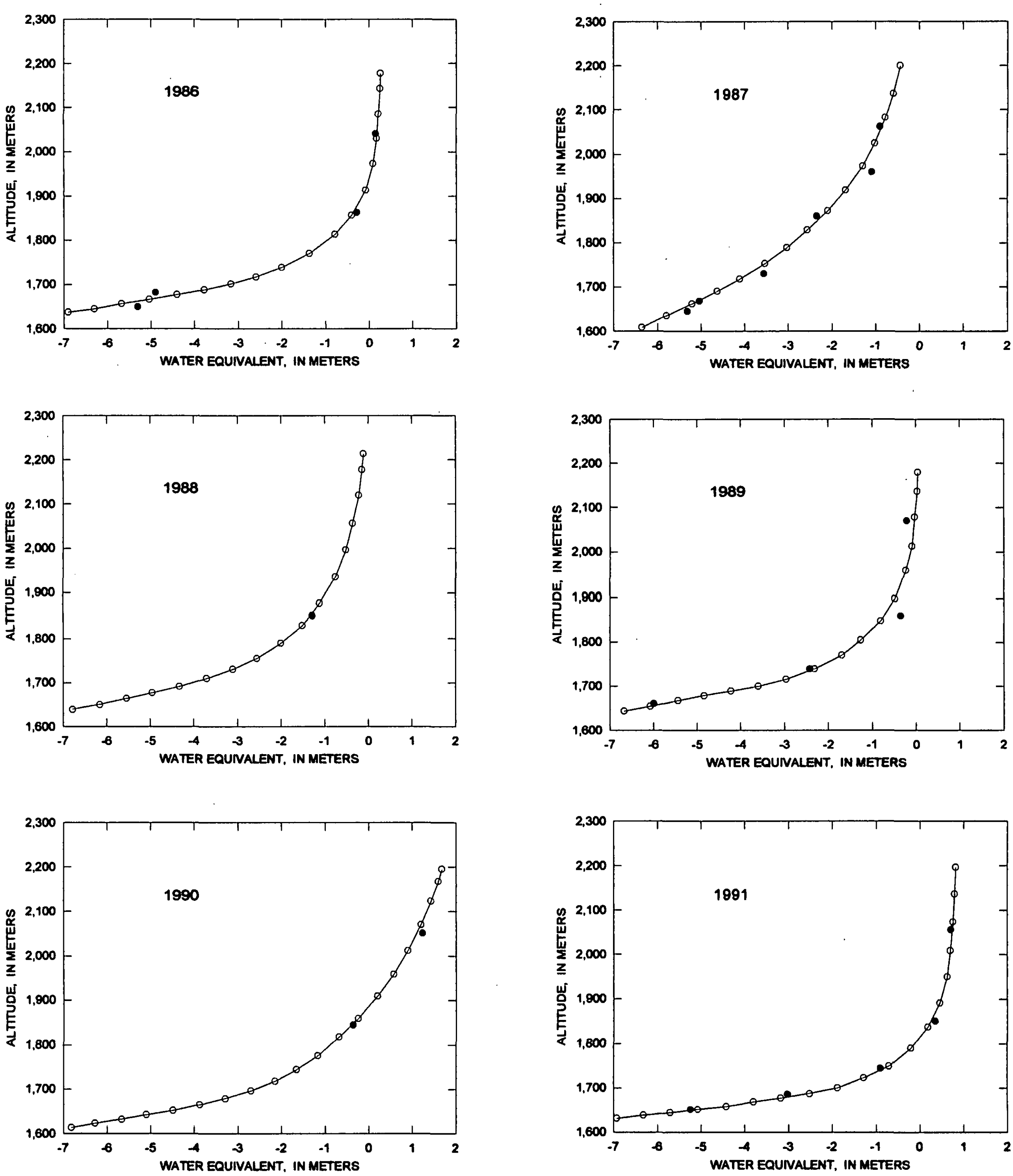


FIGURE 15. Net balance at South Cascade Glacier for years 1986-91. Solid circles are measured, open circles are along a hand-drawn curve used for interpolation.

Table 1a. Air temperature at 1,615 meters altitude, South Cascade Glacier Basin, 1986 water year
[Daily average air temperature, in degrees Celsius. The temperature was recorded continuously on an analog strip chart at the South Fork Cascade River gaging station (fig. 1) and averaged graphically]

Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept
1	4	1	-10	-4	0	4	-2.4	3.2	11.7	10.5	15.2	7.9
2	4	2	-6	-5	0	5	-2.3	1.9	11.2	8.1	16.8	9.6
3	3	2	-1	-3	0	5	0.7	0.0	10.1	2.5	14.0	11.2
4	6	-2	2	-4	-1	2.6	-0.9	-1.0	6.5	1.6	12.3	12.7
5	7	-3	1	-1	-4	5.7	-1.3	0.9	7.1	3.9	12.6	13.5
6	2	-2	-1	-1	-3	4.7	4.4	3.3	4.5	10.9	16.6	10.1
7	-3	-3	-3	5	-5	2.1	7.8	0.3	3.7	11.8	18.8	10.5
8	-3	-4	-4	0	-2	-0.8	2.8	0.7	3.5	9.1	16.7	4.9
9	-2	-6	-4	2	0	-0.9	-0.6	-0.8	8.5	7.9	19.5	5.9
10	2	-7	-5	3	-3	-0.2	-3.4	-2.6	11.0	7.4	13.5	4.2
11	0	-6	-2	1	-5	0.1	-2.0	-2.1	10.3	6.5	8.8	3.6
12	-2	-2	-2	5	-6	-1.5	-3.0	0.8	11.7	4.9	9.1	7.6
13	0	0	-2	3	-7	-1.7	-3.9	-3.2	12.6	7.0	12.4	4.8
14	2	1	-2	0	-4	-3.8	-0.2	-2.8	8.2	5.7	13.6	4.9
15	4	1	-1	0	-1	-2.7	-0.1	-1.1	4.8	2.7	11.7	4.6
16	1	-4	2	-1	-5	-2.0	-1.9	2.6	6.4	1.5	13.6	4.1
17	1	-6	3	-1	-8	-3.6	-2.0	3.9	7.8	4.2	13.1	5.1
18	4	-8	5	1	-8	-0.6	-2.5	4	3.1	11.0	13.9	5.1
19	3	-7	8	-1	-6	3.4	2.0	7.2	2.6	14.1	12.6	5.4
20	4	-8	6	-4	-7	6.4	5.8	2.0	2.3	13.9	16.6	5.1
21	1	-9	3	-3	-5	-1.8	6.0	-1.9	6.5	14.0	15.1	5.5
22	-1	-9	4	-3	-2	-2.1	-3.3	-0.7	11.0	10.9	14.0	6.5
23	-1	-8	6	-2	1	0.9	-5.7	4.4	12.5	7.8	12.5	5.3
24	0	-8	7	-3	4	-3.5	-3.3	9.7	10.2	9.1	9.5	1.3
25	-2	-9	8	2	3	-2.3	-3.0	12.3	10.2	8.7	14.7	3.8
26	0	-9	7	5	3	3.8	-1.9	9.0	11.3	6.3	17.6	1.4
27	2	-9	3	1	7	5.7	-1.1	7.7	12.5	6.0	18.8	1.1
28	-3	-8	1	-2	6	2.4	-4.6	8.6	10.4	4.7	15.3	2.2
29	0	-9	-3	1		0.6	-5.1	12.6	4.8	6.4	9.9	3.8
30	-3	-9	-3	3		-3.3	-1.6	13.0	8.3	9.3	7.9	1.6
31	-3		-2	3		-2.2		13.5		12.5	8.1	
Average	0.9	-4.9	0.5	-0.1	-2.1	0.6	-0.9	3.4	8.2	7.8	13.7	5.8

Table 1b. Air temperature at 1,615 meters altitude, South Cascade Glacier Basin, 1987 water year
[Daily average air temperature, in degrees Celsius. The temperature was recorded continuously on an analog strip chart at the South Fork Cascade River gaging station (fig. 1) and averaged graphically]

Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept
1	2.4	4.5	-2	-2	-3.5	-5.0	8.8	-0.2	-0.7	15.2	6.6	17.6
2	2.7	6.7	-3	-1	-3.1	0.6	7.6	-0.7	4.0	10.5	11.1	7.8
3	4.7	6.6	1.3	0	-1.2	3.3	3.0	2.8	12.0	8.1	15.4	7.8
4	7.9	5.2	4.1	-2	1.7	7.7	0.2	5.9	15.0	7.5	12.7	12.0
5	12.2	0.6	2.0	-4	5.6	3.1	1.1	8.6	7.0	4.2	9.5	14.3
6	12.2	-2	0.8	-4	6.9	-1.1	1.2	11.9	7.1	5.5	11.7	15.9
7	8.4	-3	0.9	-3	6.9	-0.6	0.3	13.4	12.4	7.3	15.3	14.2
8	8.2	-4	-3	0.9	6.5	0.8	-2.6	12.7	7.7	4.5	17.0	13.6
9	7	-5	1.9	2.8	5.9	0.7	0.2	11.8	5.0	4.7	16.5	14.3
10	6	-4	3.8	4.7	3.8	0.6	0.3	9.3	4.7	9.5	8.2	16.3
11	6	-1	1.8	5.7	1.3	1.4	-3.5	9.2	10.5	11.3	9.5	14.6
12	11	0	-1	1.6	0.6	2.0	-2.7	2.9	10.4	13.9	9.5	8.4
13	10	2.2	0.7	-7.8	-0.1	-0.2	4.4	3.8	11.7	14.7	7.3	6.5
14	9	-2	0	-11.6	-2.4	-0.9	2.9	6.1	11.9	15.2	7.2	6.6
15	12	-3	-1	-9.3	-1.7	-1.9	1.0	2.6	4.9	8.1	6.0	1.3
16	11	-2	2.1	-3.5	-1.6	-1.7	0.2	3.0	1.0	6.4	4.5	2.8
17	5	-3	4.2	-3.9	-5.9	-2.1	-3.6	4.4	5.9	10.5	8.1	8.0
18	5	1.3	2.0	-5.0	-5.6	-4.3	-5.3	-2.2	9.2	9.6	9.8	9.1
19	9	1.6	0.4	-4.8	-2.9	-3.9	-4.3	-0.7	10.6	6.9	10.1	9.5
20	10	1.0	1.1	-1.2	-2.7	-3.7	0.6	3.0	8.5	10.2	6.2	12.4
21	9	-1	2.7	3.0	-4.1	-1.6	3.9	3.2	3.2	12.8	9.5	15.8
22	10	-1	2.5	1.6	-5.2	-1.4	3.5	3.9	2.6	9.1	14.4	16.4
23	10	1.5	-1	-1.5	-4.6	-0.7	5.7	5.0	6.4	12.2	15.5	15.5
24	7	-3	-2	-3.0	-5.8	-0.4	1.9	5.8	10.8	12.2	13.6	12.5
25	6	1.0	1.2	-3.0	-7.2	-1.4	2.3	6.1	15.1	9.2	13.4	5.9
26	6	-2	0.4	-2.8	-4.5	-5.9	9.5	3.6	15.6	14.2	13.2	1.9
27	2	-1	1.2	0.1	-6.2	-6.2	12.9	2.8	13.9	9.0	13.5	5.9
28	3	-2	3.1	-2.6	-6.6	-3.3	9.3	1.9	16.8	10.6	11.7	11.1
29	3	-4	0	-1.3		2.1	8.5	4.1	19.6	10.2	12.6	14.0
30	1.8	-1	-4	-2.5		5.8	4.6	3.3	17.3	7.2	15.0	14.1
31	3.1		-3	-1.3		4.6		0.2		4.0	17.1	
Average	7.1	-0.4	0.6	-2.0	-1.3	-0.4	2.4	4.8	9.3	9.5	11.3	10.9

Table 1c. Air temperature at 1,615 meters altitude, South Cascade Glacier Basin, 1988 water year
[Daily average air temperature, in degrees Celsius. The temperature was recorded continuously on an analog strip chart at the South Fork Cascade River gaging station (fig. 1) and averaged graphically]

Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept
1	17.2	4.9	-1.6	-7.2	-12.2	1.6	2.2	-4.0	0.4	7.1	5.7	19.9
2	13.3	3.4	-1.0	-3.5	-8.8	0.0	0.6	-0.7	3.6	7.6	11.4	22.7
3	7.4	2.8	-0.1	-3.3	-6.4	-5.3	-4.1	-1.5	3.6	4.4	14.2	23.3
4	6.8	7.1	-1.7	-4.4	-2.1	-1.2	-5.5	0.2	1.1	4.5	14.9	20.9
5	10.4	9.8	2.2	-3.8	2.4	-3.2	-0.2	1.7	1.4	2.4	11.1	16.3
6	13.8	4.4	1.6	-3.5	-1.5	-4.7	-1.6	0.0	2.9	3.6	5.0	9.0
7	12.4	2.7	-1.9	-3.7	-1.8	-1.1	-6.9	3.7	2.7	10.0	8.1	5.8
8	9.6	3.2	-2.7	-4.9	-1.3	0.8	-3.6	5.3	3.1	13.5	11.3	7.8
9	9.5	3.3	-1.0	-2.5	-2.5	-5.1	0.7	3.7	6.0	11.6	10.0	5.5
10	12.2	4.8	-3.7	-4.3	-0.3	-5.8	7.2	8.0	2.5	11.2	10.0	4.0
11	14.5	4.2	-6.7	-6.2	0.7	-3.9	7.0	12.2	4.1	5.0	12.3	9.3
12	9.3	3.0	-9.1	-4.7	1.0	-0.6	8.9	12.7	5.3	6.0	11.2	14.0
13	7.8	-0.5	-4.9	-1.3	-4.5	0.8	7.8	1.0	8.7	6.5	8.9	15.9
14	2.4	-3.7	-6.3	0.1	-2.1	-2.9	7.8	2.2	12.7	5.6	8.3	15.2
15	2.4	-2.5	-9.5	-4.5	-4.8	-0.3	8.3	8.4	11.0	7.5	7.0	7.6
16	4.9	-5.6	-7.7	-6.1	-5.8	0.8	4.4	2.4	10.6	9.0	7.7	2.4
17	2.4	-1.5	-5.6	-7.2	-3.7	3.2	1.2	-0.2	6.8	9.6	6.3	0.8
18	4.3	4.9	-7.1	-7.9	-3.7	6.1	1.3	0.4	7.3	14.5	6.9	3.2
19	7.8	7.0	-8.8	-2.4	-1.1	3.5	5.3	3.4	8.4	17.9	7.8	2.7
20	8.7	5.7	-3.8	-3.5	6.7	0.1	6.0	5.5	8.4	18.4	5.4	4.1
21	7.7	-1.2	-5.6	-3.1	-0.5	-3.8	4.0	11.9	10.2	14.0	10.0	4.7
22	8.2	-1.6	-8.2	-1.3	-0.8	-1.6	1.1	8.7	9.4	10.8	15.5	4.6
23	8.3	-1.4	-10.4	-5.5	2.7	-3.0	-1.4	0.9	6.3	11.7	19.1	3.5
24	2.9	-1.1	-6.0	-0.9	5.1	-3.8	-4.4	4.4	10.3	14.8	20.5	2.5
25	3.0	-3.6	1.3	-0.3	5.5	-1.7	-0.8	5.5	11.1	16.6	11.8	4.9
26	7.6	2.0	3.7	5.3	7.2	-3.8	3.2	5.4	6.7	17.2	12.5	4.4
27	10.5	1.4	-1.4	5.9	6.6	-7.5	5.8	4.6	4.2	12.6	15.8	1.1
28	11.0	2.8	-3.4	1.6	7.4	-5.7	4.2	1.9	2.2	10.4	16.5	8.0
29	9.1	-1.2	-4.8	-3.3	2.4	-4.8	-1.5	-1.0	1.8	12.3	10.8	13.7
30	6.7	-2.8	-5.0	-9.2		-4.0	-4.2	0.2	5.5	13.2	8.5	12.4
31	5.3		-6.0	-12.0		0.8		1.8		10.0	13.1	
Average	8.3	1.7	-4.0	-3.5	-0.6	-1.8	1.8	3.5	5.9	10.3	10.9	9.0

Table 1d. Air temperature at 1,615 meters altitude, South Cascade Glacier Basin, 1989 water year
[Daily average air temperature, in degrees Celsius. The temperature was recorded continuously on an analog strip chart at the South Fork Cascade River gaging station (fig. 1) and averaged graphically]

Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept
1	16.2	4.4	6.2	-4.4	-18.8	-11.4	-3.8	2.9	-4.8	5	5.6	5.7
2	15.8	2.4	3.5	-2.4	-24.8	-14.3	-5.0	2.8	-7.2	7	5.2	4.6
3	16.1	0.5	6.5	0.9	-22.5	-11.1	-4.3	4.7	-2.8	5	7.1	9.0
4	13.2	1.1	5.2	-4.8	-15.2	-6.9	-1.6	6.3	9.1	5	11.5	8.9
5	8.3	4.0	2.6	-7.8	-11.0	-0.1	0.9	8.8	11.2	8	14.7	7.2
6	12.4	-2.4	1.5	-9.7	-8.5	-3.0	4.7	7.7	8.5	11	16.5	10.2
7	13.8	-2.4	-0.1	-11.7	-6.5	-4.7	-0.1	6.9	7.4	10.1	17.2	13.7
8	14.0	-2.1	1.1	-4.6	-4.9	-1.0	-5.1	6.9	8.0	6.7	14.1	14.1
9	16.0	-1.9	1.3	-4.3	0.8	0.5	-11.4	6.3	4.6	8.3	11.1	11.3
10	17.8	-1.3	0.9	-7.1	-3.8	1.0	-10.0	-1.5	6.8	6.9	9.4	11.9
11	14.0	-2.5	3.3	-5.8	-6.2	1.4	-11.6	-2.4	10.9	12.9	10.8	12.7
12	12.1	-2.8	2.0	-1.5	-7.5	0.6	-9.8	0.7	11.6	16.9	13.8	13.3
13	8.5	-2.5	-6.0	-6.3	-9.6	-3.7	-6.7	4.2	9.2	12.6	11.1	14.7
14	5.7	-2.7	-6.3	-7.6	-9.6	-4.8	-2.2	5.6	6.2	13.9	7.5	15.0
15	5.7	-1.7	2.3	-2.3	-6.6	-3.5	-3.2	6.3	2.7	7.9	5.1	12.6
16	4.0	-1.6	8.7	-1.2	-7.1	-3.4	-2.1	2.6	2.2	7.3	6.6	5.6
17	3.8	-3.3	6.0	-2.4	-6.1	-2.6	1.6	0.2	3.8	10.0	10.7	3.6
18	5.0	-3.7	0.2	-2.8	-1.5	-2.6	7.0	-2.9	4.6	12.5	12.6	4.7
19	6.1	-0.5	-5.5	2.0	-3.6	-3.4	4.3	-2.2	3	12.7	10.9	6.2
20	7.4	-1.0	-5.2	1.4	-1.9	0.8	2.8	1.2	3	8.6	9.4	11.9
21	8.4	-0.5	-6.1	-7.3	0.1	-1.8	-5.5	2.8	6	5.8	8.4	14.4
22	1.4	-1.2	-6.5	-8.8	-0.1	-4.5	-12.2	1.9	8	11.5	6.7	16.3
23	5.0	-6.1	-5.8	-9.0	-2.4	-3.8	-10.6	-0.8	1	12.6	7.4	14.7
24	5.2	-6.8	-6.6	-7.2	-5.9	-1.6	-8.2	-1.0	12	12.0	7.6	16.6
25	7.3	-6.3	-8.8	-2.5	-5.3	-0.9	-8.1	1.0	11	15.5	9.6	15.9
26	-0.3	-6.8	-9.0	2.8	-6.0	-0.9	-9.4	2.5	5	16.9	10.7	7.7
27	0.4	-1.4	-6.8	-4.5	-5.5	-1.9	-9.4	0.5	6	8.0	9.3	11.3
28	3.0	-4.3	-7.1	-1.1	-4.9	-3.9	-6.4	1.1	5	10.5	10.7	14.3
29	5.8	-2.2	-1.3	4.4		-4.4	2.5	3.1	8	13.2	12.7	14.1
30	6.4	7.1	-3.6	0.0		-1.9	8.6	4.5	6	8.9	8.4	6.6
31	9.2		-6.4	-11.7		-4.2		2.2		8.2	6.6	
Average	8.6	-1.6	-1.3	-4.1	-7.3	-3.3	-3.8	2.7	5.5	10.0	10.0	11.0

Table 1e. Air temperature at 1,615 meters altitude, South Cascade Glacier Basin, 1990 water year
[Daily average air temperature, in degrees Celsius. The temperature was recorded continuously on an analog strip chart at the South Fork Cascade River gaging station (fig. 1) and averaged graphically]

Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept
1	4.3	3.6	5.2	-5.4	-5.4	2.7	6.5	2.8	1.0	7.1	10.4	8.2
2	6.2	3.1	6.5	-8.0	-2.8	2.9	3.5	4.8	6.2	3.5	11.0	8.0
3	7.0	2.9	4.2	-3.8	-3.2	0.6	3.7	6.6	4.0	7.6	13.8	12.5
4	5.5	-0.3	3.1	-2.1	-6.0	-0.6	5.7	10.8	0.6	11.4	18.7	14.6
5	8.0	-0.8	0.1	-0.3	-5.4	-0.7	6.0	10.4	4.2	8.2	20.1	14.9
6	10.1	-0.6	-0.3	-1.3	-8.2	-0.7	6.1	-3.3	5.0	5.4	14.1	16.0
7	9.8	-2.5	2.7	-1.2	-8.0	-1.3	5.3	-1.9	2.2	8.4	14.5	14.9
8	8.9	1.9	-1.7	-2.4	-5.6	-7.3	-0.4	2.4	5.0	11.7	15.4	13.4
9	10.2	5.6	-4.5	-1.1	-1.3	-2.2	2.1	5.1	6.9	11.6	17.2	13.8
10	3.5	2.9	-8.1	-6.5	0.2	-6.5	6.1	5.8	1.0	14.4	18.6	15.6
11	2.1	-0.2	-6.6	-3.0	-6.4	-6.3	3.5	1.7	0.0	18.8	19.1	13.8
12	3.2	-2.9	-2.6	3.5	-12.5	-6.8	2.3	1.7	0.7	15.9	19.5	7.5
13	1.6	-3.7	1.6	0.8	-14.9	-5.2	2.6	0.5	4.9	13.0	13.4	13.4
14	-0.6	-5.7	2.0	-0.7	-13.9	-2.2	6.6	1.0	9.0	15.0	13.5	15.3
15	1.8	0.4	2.2	-2.3	-10.8	0.2	9.3	2.7	8.6	14.9	11.1	7.2
16	3.6	1.5	-0.4	-3.5	-10.7	5.5	9.8	5.0	5.3	11.6	8.9	6.4
17	7.8	2.5	-3.9	-5.8	-10.4	3.4	4.2	2.4	6.7	11.3	9.9	9.5
18	6.3	5.3	-6.3	-2.3	-8.8	5.4	4.7	1.3	6.0	11.8	8.8	10.7
19	6.7	3.0	-3.2	-1.7	-4.3	2.1	4.4	5.1	5.4	14.4	10.3	9.6
20	4.5	3.8	-2.8	-0.9	-1.6	0.4	4.5	1.7	8.3	16.5	14.1	12.4
21	2.7	0.2	1.2	-0.6	-1.3	1.2	4.6	3.3	14.7	17.7	11.0	15.3
22	4.3	3.0	5.2	-3.6	3.1	-0.7	3.9	3.5	13.1	16.8	8.1	16.2
23	3.8	-0.9	0.6	-6.6	6.4	-1.0	1.8	1.9	9.4	11.2	6.1	14.8
24	0.3	-4.0	2.3	-3.9	1.4	-3.2	-1.2	0.1	8.6	7.7	6.5	13.4
25	0.5	-4.3	4.6	-4.7	0.8	-0.6	-1.3	3.1	7.9	6.5	5.0	11.7
26	-0.1	-4.9	6.2	-8.4	1.8	1.7	-2.4	6.6	6.8	7.8	9.0	9.1
27	-2.2	-2.6	0.8	-5.2	2.2	3.9	-2.6	7.4	7.1	9.7	11.0	13.6
28	-3.0	0.2	-4.5	-3.5	4.1	4.4	-2.3	6.9	7.5	16.7	12.6	13.6
29	1.2	0.2	-2.7	-6.8		3.9	0.6	4.0	10.2	17.9	9.8	8.8
30	-0.4	0.5	1.0	-5.9		4.4	3.0	6.8	8.6	17.3	7.1	10.6
31	0.3		0.6	-7.7		5.5		1.0		13.9	8.2	
Average	3.8	0.2	0.1	-3.4	-4.3	0.1	3.4	3.6	6.2	12.1	12.2	12.2

Table 1f. Air temperature at 1,615 meters altitude, South Cascade Glacier Basin, 1991 water year
[Daily average air temperature, in degrees Celsius. The temperature was recorded continuously on an analog strip chart at the South Fork Cascade River gaging station (fig. 1) and averaged graphically]

Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept
1	4.7	-3.1	-6.0	-4.4	4.1	-3.7	2.2	4.9	5.0	8.1	11.0	5.3
2	-0.9	-2.7	-4.7	-4.2	2.1	-0.8	-2.0	4.0	2.3	12.1	13.0	8.0
3	5.2	2.8	0.8	-4.8	1.4	-0.6	-1.0	3.7	-1.8	11.6	14.8	14.1
4	4.3	0.4	-1.5	-7.8	3.5	-5.2	-0.2	4.4	1.2	9.0	14.0	14.5
5	-2.0	-2.0	-3.2	-7.0	-1.7	-6.7	-2.0	2.4	6.6	7.5	11.1	13.9
6	-2.6	-0.2	-0.3	-2.8	3.3	-6.1	-3.9	2.2	7.1	7.6	13.5	12.4
7	-1.3	-0.4	2.3	-2.8	4.5	-5.5	-4.6	2.3	3.8	10.2	14.0	7.6
8	1.7	-0.7	1.4	-2.7	5.5	-4.0	-3.7	-1.1	3.5	9.3	13.7	5.9
9	3.2	3.4	1.5	-2.2	4.6	-2.8	-4.6	-1.2	7.0	8.8	9.4	9.8
10	-1.4	5.3	-0.3	-0.1	4.0	-6.2	-5.8	1.8	8.1	7.1	5.6	11.0
11	0.6	7.1	-4.5	1.9	2.4	-5.7	-2.4	5.7	1.6	9.5	6.6	10.7
12	-0.7	8.8	-5.9	0.8	-0.5	-3.8	3.1	1.4	0.5	11.3	8.0	11.0
13	-2.2	0.1	-9.0	-0.4	2.0	-4.9	2.3	1.4	0.4	8.4	9.9	4.9
14	-1.1	-1.9	-4.3	-0.1	5.6	-4.6	-1.6	0.6	1.1	7.4	11.6	7.3
15	1.3	1.1	-4.5	-3.2	3.0	-5.7	1.1	3.5	3.4	6.1	13.9	10.8
16	-3.0	1.3	-6.7	-0.9	-2.8	-3.0	2.8	4.3	1.1	7.6	14.5	12.9
17	0.6	-1.3	-2.3	1.6	-2.7	-1.1	3.1	2.8	3.2	6.0	15.3	14.2
18	0.2	-4.8	-8.6	-1.0	-1.6	1.6	3.6	4.1	7.7	5.9	16.1	14.1
19	-1.5	-3.2	-15.5	-3.9	-0.6	-1.9	4.6	4.1	8.9	7.6	14.6	13.0
20	-0.6	-5.0	-16.4	-1.1	-2.5	-1.4	6.0	3.4	4.3	8.2	14.4	5.0
21	2.3	-1.6	-15.0	0.2	-1.9	-1.3	5.8	3.9	3.3	8.5	14.4	4.9
22	-1.0	0.8	-11.1	-3.8	-2.8	-5.5	3.2	2.1	3.7	14.3	13.8	7.9
23	3.4	2.5	-10.8	-5.7	-0.8	-2.7	2.7	2.3	4.9	16.8	8.2	10.6
24	8.8	1.9	-9.6	-7.6	3.2	-1.6	-2.1	0.8	5.0	12.9	6.4	16.8
25	5.3	-4.5	-6.0	-7.7	4.5	-5.3	-3.8	-0.1	4.2	7.4	6.7	17.4
26	2.2	-6.0	-4.6	-7.9	5.0	-5.5	-3.3	1.6	4.4	8.5	8.5	14.9
27	6.8	-5.5	-5.9	-9.1	3.6	-3.2	-2.1	2.8	7.9	9.2	8.4	13.1
28	0.0	-2.0	-16.3	-10.3	0.9	-3.7	-1.5	3.5	9.0	10.5	6.0	9.2
29	1.0	-2.6	-17.9	-8.9		-3.4	0.7	2.6	5.6	8.5	11.1	11.9
30	0.1	-5.5	-7.8	-1.9		3.7	4.7	1.0	4.7	10.4	13.8	13.8
31	-1.9		-2.7	0.5		5.7		3.1		12.6	9.1	
Average	1.0	-0.6	-6.3	-3.5	1.6	-3.1	9.0	2.5	4.3	9.3	11.3	10.9

Table 2a. Air temperature at 1,842 meters altitude, South Cascade Glacier Basin, 1986 water year
[Daily average air temperature, in degrees Celsius. The temperature was recorded continuously on an analog circular chart at the Hut (fig. 1) and averaged graphically. A 999.9 indicates no data]

Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept
1	999.9	1.1	-16.7	-3.6	999.9	4.2	999.9	999.9	18.6	11.4	17.5	8.6
2	4.2	2.8	-9.4	-5.0	999.9	7.2	999.9	999.9	15.6	7.5	19.7	10.3
3	4.4	3.1	-1.9	-3.1	999.9	7.2	999.9	999.9	15.0	4.7	15.6	13.3
4	8.6	-1.1	1.1	-5.8	999.9	3.1	999.9	999.9	10.0	1.7	14.2	15.0
5	9.7	-3.1	1.7	-0.6	999.9	7.5	999.9	999.9	9.7	5.6	13.6	14.2
6	3.1	-0.6	0.0	0.0	999.9	5.0	999.9	999.9	7.5	999.9	17.5	10.0
7	-1.7	-1.7	-1.1	4.4	999.9	2.8	999.9	999.9	4.7	999.9	20.0	10.8
8	-1.1	-3.6	-2.5	2.5	0.6	0.8	999.9	999.9	4.7	999.9	20.0	5.8
9	-0.6	-6.1	-0.6	1.4	-0.3	2.8	999.9	999.9	10.0	999.9	20.8	7.2
10	2.8	-7.8	0.6	4.7	-3.6	0.3	999.9	999.9	14.2	999.9	16.7	3.9
11	2.5	-5.3	-1.7	2.2	-6.7	1.4	999.9	999.9	12.5	999.9	9.7	4.2
12	-0.3	0.0	1.1	5.3	-7.8	1.4	999.9	999.9	13.9	999.9	9.4	6.9
13	0.3	2.8	-0.6	4.4	-8.3	-1.4	999.9	999.9	16.7	999.9	14.7	4.2
14	3.9	3.6	-2.2	1.7	-5.6	-2.5	999.9	999.9	11.4	999.9	15.8	5.8
15	5.0	2.2	0.8	999.9	-1.7	-2.8	999.9	999.9	5.6	2.8	12.5	5.6
16	1.9	-3.1	2.5	999.9	-5.6	999.9	999.9	2.2	7.2	2.2	14.2	4.4
17	1.1	-8.6	6.4	999.9	-10.0	999.9	999.9	5.3	8.1	3.9	15.6	4.2
18	5.0	-10.3	8.3	999.9	-12.5	999.9	999.9	3.6	6.4	11.9	14.7	4.2
19	4.7	-8.9	10.0	999.9	-9.7	999.9	999.9	3.9	7.2	15.8	12.8	6.4
20	3.9	-10.3	11.4	999.9	-5.8	999.9	999.9	3.3	3.3	16.9	17.2	5.6
21	3.3	-14.2	7.2	999.9	-4.2	999.9	999.9	7.8	-0.8	16.4	16.1	6.4
22	-0.3	-15.8	8.1	999.9	-1.1	999.9	999.9	12.2	0.3	12.5	16.4	7.2
23	-0.8	-10.8	9.4	999.9	1.7	999.9	999.9	15.0	3.3	9.2	13.6	3.1
24	1.4	-10.8	12.5	999.9	4.7	999.9	999.9	14.2	8.1	10.8	11.9	1.7
25	-1.1	-12.8	13.1	999.9	3.1	999.9	999.9	11.9	13.1	9.7	15.0	3.9
26	0.3	-11.9	7.5	999.9	3.3	999.9	999.9	11.4	14.7	7.2	19.4	2.5
27	3.1	-10.6	6.1	999.9	6.9	999.9	999.9	11.9	14.4	6.9	22.5	1.4
28	-3.1	-9.7	3.9	999.9	5.8	999.9	999.9	13.9	15.0	7.5	17.5	2.5
29	-0.8	-13.6	-0.8	999.9		999.9	999.9	17.2	6.9	6.9	10.8	3.3
30	-1.1	-16.7	-1.4	999.9		999.9	999.9	20.0	10.0	10.0	9.2	3.1
31	-3.1		-1.7	999.9		999.9		20.3		14.4	9.2	
Average	1.8	-6.1	2.3	--	--	--	--	--	9.6	--	15.3	6.2

Table 2b. Air temperature at 1,842 meters altitude, South Cascade Glacier Basin, 1987 water year
[Daily average air temperature, in degrees Celsius. The temperature was recorded continuously on an analog circular chart at the Hut (fig. 1) and averaged graphically. A 999.9 indicates no data]

Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept
1	3.1	6.1	999.9	999.9	999.9	-4.4	999.9	999.9	0.8	17.8	6.9	16.7
2	4.2	8.6	999.9	999.9	999.9	0.0	999.9	999.9	5.3	12.8	11.4	8.3
3	6.9	8.9	999.9	999.9	999.9	3.9	999.9	999.9	11.4	9.2	16.7	8.1
4	8.9	5.3	999.9	999.9	999.9	6.7	999.9	999.9	15.8	8.6	12.8	13.1
5	15.6	1.7	999.9	999.9	999.9	4.7	999.9	999.9	10.0	3.6	11.1	16.7
6	14.7	-1.4	999.9	999.9	999.9	0.0	999.9	14.2	10.0	6.9	12.8	18.1
7	10.0	-2.5	999.9	999.9	999.9	-1.1	999.9	16.4	16.1	7.2	17.2	16.7
8	10.8	-5.0	999.9	999.9	999.9	0.8	999.9	16.9	11.4	4.4	20.8	16.1
9	8.9	-7.8	999.9	999.9	999.9	1.9	999.9	12.8	8.1	5.0	16.7	20.8
10	5.8	-4.2	999.9	999.9	999.9	2.2	999.9	11.9	6.1	9.7	9.2	18.9
11	5.8	0.0	999.9	999.9	999.9	1.9	999.9	12.2	8.9	13.1	9.7	18.1
12	12.5	0.0	999.9	999.9	999.9	2.5	999.9	9.7	3.1	15.6	10.3	12.2
13	11.7	2.8	999.9	999.9	999.9	0.8	999.9	12.5	4.2	17.2	6.9	6.7
14	12.8	-1.4	999.9	999.9	999.9	-0.3	999.9	16.7	5.8	16.9	7.2	6.7
15	12.8	-2.2	999.9	999.9	999.9	999.9	999.9	8.1	4.4	7.5	5.3	1.4
16	10.0	-1.9	999.9	999.9	999.9	999.9	999.9	2.2	4.2	7.5	4.4	2.8
17	6.7	-3.9	999.9	999.9	999.9	999.9	999.9	5.8	6.9	10.0	7.8	8.9
18	7.8	-0.6	999.9	999.9	-4.4	999.9	999.9	-1.7	10.8	12.2	10.6	10.3
19	13.6	0.0	999.9	999.9	-0.6	999.9	999.9	2.2	13.6	6.7	11.4	13.3
20	11.9	1.1	999.9	999.9	2.5	999.9	999.9	4.4	9.2	12.8	6.9	14.4
21	11.9	-1.7	999.9	999.9	-2.2	999.9	999.9	2.2	5.0	14.7	9.7	21.7
22	11.1	-1.4	999.9	999.9	-3.1	999.9	999.9	3.3	5.3	10.0	15.0	20.8
23	9.4	1.7	999.9	999.9	-3.9	999.9	999.9	6.7	8.1	13.3	16.9	21.7
24	9.4	-1.7	999.9	999.9	-4.7	999.9	999.9	8.6	11.9	14.4	15.6	15.6
25	7.8	-2.2	999.9	999.9	-4.7	999.9	999.9	8.3	999.9	9.2	16.4	6.9
26	7.2	-1.7	999.9	999.9	-2.8	999.9	999.9	8.1	999.9	14.2	15.0	2.5
27	3.3	-1.7	999.9	999.9	-4.7	999.9	999.9	5.0	999.9	10.6	15.6	6.1
28	3.9	-1.4	999.9	999.9	-5.8	999.9	999.9	1.4	999.9	11.7	13.1	12.8
29	3.9	-2.8	999.9	999.9		999.9	999.9	5.6	999.9	12.2	14.2	999.9
30	1.9	999.9	999.9	999.9		999.9	999.9	3.3	999.9	7.8	18.1	18.9
31	4.4		999.9	999.9		999.9		0.3		3.9	21.1	
Average	8.7	-0.3	--	--	--	--	--	--	--	10.5	12.5	12.9

Table 2c. Air temperature at 1,842 meters altitude, South Cascade Glacier Basin, 1988 water year
[Daily average air temperature, in degrees Celsius. The temperature was recorded continuously on an analog circular chart at the Hut (fig. 1) and averaged graphically. A 999.9 indicates no data]

Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept
1	17.5	5.0	-1.4	999.9	999.9	999.9	2.8	-2.8	1.7	7.8	5.3	18.9
2	12.5	3.1	-0.6	999.9	999.9	999.9	1.4	999.9	3.1	7.8	12.2	20.8
3	6.1	3.3	0.3	999.9	999.9	999.9	-1.7	999.9	5.8	7.2	16.4	23.6
4	7.8	7.5	-0.6	999.9	999.9	999.9	-4.7	999.9	3.6	6.9	16.4	25.6
5	11.9	10.0	1.1	999.9	999.9	999.9	-1.1	999.9	3.3	4.4	11.4	15.8
6	13.3	6.1	1.1	999.9	999.9	999.9	-1.4	999.9	6.1	999.9	6.1	7.5
7	12.2	2.5	-1.9	999.9	999.9	999.9	-5.8	999.9	5.6	999.9	9.4	5.8
8	11.4	4.7	-2.8	999.9	999.9	999.9	-0.8	999.9	6.1	999.9	12.8	8.9
9	8.1	4.2	0.3	999.9	999.9	999.9	0.6	999.9	6.4	999.9	12.5	4.7
10	9.7	4.4	-2.8	999.9	999.9	999.9	7.2	999.9	4.4	999.9	11.1	4.7
11	13.1	3.9	999.9	999.9	999.9	-1.1	10.0	999.9	6.4	999.9	12.8	11.1
12	10.0	3.1	999.9	999.9	999.9	1.7	11.4	999.9	8.1	999.9	13.3	16.4
13	10.3	-0.3	999.9	999.9	999.9	3.1	11.9	999.9	11.7	999.9	10.3	18.3
14	3.6	-3.3	999.9	999.9	999.9	-2.2	8.9	999.9	13.6	999.9	9.2	15.0
15	5.6	-2.5	999.9	999.9	999.9	1.7	13.3	999.9	16.7	999.9	8.1	7.5
16	5.0	-4.7	999.9	999.9	999.9	1.9	7.5	999.9	15.6	999.9	8.3	6.4
17	2.8	-0.6	999.9	999.9	999.9	6.4	2.2	999.9	9.7	999.9	6.1	5.3
18	5.6	5.0	999.9	999.9	999.9	9.2	3.6	999.9	8.3	999.9	8.3	6.1
19	6.7	6.7	999.9	999.9	999.9	4.2	5.3	999.9	11.4	999.9	7.8	8.9
20	10.0	5.3	999.9	999.9	999.9	0.6	8.1	7.5	12.8	19.2	6.7	6.1
21	11.1	0.0	999.9	999.9	999.9	-2.2	8.3	11.1	12.5	14.4	12.5	2.2
22	11.9	-0.8	999.9	999.9	999.9	-1.4	4.4	6.4	12.8	11.1	18.3	5.6
23	10.6	-1.1	999.9	999.9	999.9	-1.4	3.9	2.8	10.6	12.2	20.0	6.7
24	4.7	-0.8	999.9	999.9	999.9	-3.1	-1.9	6.7	9.4	17.2	18.3	7.2
25	3.3	-2.5	999.9	999.9	999.9	-1.7	0.8	7.8	17.5	18.1	11.7	4.4
26	8.9	1.7	999.9	999.9	999.9	-2.5	4.2	7.8	11.4	20.3	14.4	3.9
27	12.2	2.5	999.9	999.9	999.9	-5.8	5.6	6.1	6.1	12.2	19.7	1.9
28	10.6	3.9	999.9	999.9	999.9	-3.9	4.4	2.2	3.6	11.7	20.0	8.3
29	11.1	-0.6	999.9	999.9	999.9	-3.6	0.6	0.8	3.6	14.2	10.0	14.2
30	7.5	-3.1	999.9	999.9		-3.1	1.4	2.2	6.9	14.7	9.7	15.0
31	5.0		999.9	999.9		1.1		3.1		11.1	16.1	
Average	9.0	2.1	--	--	--	--	3.6	--	8.5	--	12.0	10.4

Table 2d. Air temperature at 1,842 meters altitude, South Cascade Glacier Basin, 1989 water year
[Daily average air temperature, in degrees Celsius. The temperature was recorded continuously on an analog circular chart at the Hut (fig. 1) and averaged graphically. A 999.9 indicates no data]

Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept
1	15.8	5.3	7.2	999.9	999.9	-10.6	999.9	999.9	13.3	999.9	5.6	6.7
2	16.4	1.9	3.6	999.9	999.9	-10.6	999.9	999.9	13.9	999.9	5.0	4.4
3	15.0	1.1	6.1	999.9	999.9	-8.1	999.9	999.9	12.8	999.9	7.5	8.9
4	13.3	0.6	9.2	999.9	999.9	-5.8	999.9	8.3	999.9	999.9	12.2	9.2
5	10.3	4.2	4.7	999.9	999.9	-1.4	999.9	10.8	999.9	999.9	17.8	6.7
6	13.6	-0.6	2.8	999.9	-4.7	-1.9	999.9	10.0	999.9	999.9	20.3	10.8
7	18.9	-2.2	1.1	999.9	-5.6	-4.2	999.9	8.9	999.9	8.9	19.2	13.1
8	18.3	-1.9	1.9	999.9	-4.4	-0.6	999.9	10.6	999.9	8.1	16.7	13.9
9	17.2	-2.5	4.2	999.9	1.4	1.1	999.9	5.8	999.9	11.1	999.9	11.7
10	17.5	-0.6	3.3	999.9	-0.3	1.1	999.9	-1.1	999.9	9.4	10.6	11.9
11	16.4	-2.2	3.6	999.9	-1.7	1.4	999.9	0.0	999.9	12.2	10.8	14.2
12	13.9	-1.4	3.1	999.9	-5.3	0.6	999.9	2.5	999.9	16.7	16.7	14.2
13	7.5	-3.1	-1.4	999.9	-6.7	-2.8	999.9	5.8	999.9	15.0	17.5	11.9
14	4.7	-1.7	-8.6	999.9	-5.8	-3.9	999.9	7.5	999.9	15.0	16.9	7.5
15	4.7	-1.7	999.9	999.9	-4.4	-3.6	999.9	8.6	999.9	8.6	12.2	5.0
16	3.6	-1.4	999.9	999.9	-6.1	-2.2	999.9	3.3	999.9	7.2	5.6	8.1
17	2.8	-2.2	999.9	999.9	-4.7	-1.4	999.9	0.8	999.9	11.1	4.4	11.7
18	1.4	-3.6	999.9	999.9	-2.5	-1.9	999.9	-2.2	999.9	17.5	4.7	14.4
19	4.2	-0.6	999.9	999.9	-1.9	0.3	999.9	-0.6	999.9	13.6	6.7	13.1
20	3.6	-0.8	999.9	999.9	-3.1	0.8	999.9	2.8	999.9	8.3	8.3	13.1
21	4.4	-0.3	999.9	999.9	-1.4	0.3	999.9	4.7	999.9	6.1	7.5	13.6
22	5.6	-0.6	999.9	999.9	1.1	-2.5	999.9	3.9	999.9	11.7	6.4	14.7
23	5.8	-4.7	999.9	999.9	-2.2	0.0	999.9	0.0	999.9	12.5	8.3	16.9
24	2.8	-6.4	999.9	999.9	-3.3	0.6	999.9	-0.3	999.9	12.8	8.1	17.8
25	3.1	-5.6	999.9	999.9	-3.1	0.3	999.9	2.5	999.9	15.8	9.7	16.1
26	999.9	-6.4	999.9	999.9	-3.3	1.1	999.9	3.6	999.9	15.3	15.0	8.6
27	0.3	-2.5	999.9	999.9	-4.4	-1.7	999.9	2.5	999.9	8.3	11.4	10.6
28	3.3	-2.8	999.9	999.9	-5.3	999.9	999.9	3.6	999.9	10.8	11.9	14.7
29	6.4	-2.2	999.9	999.9		999.9	999.9	5.0	999.9	14.4	14.4	14.2
30	5.3	3.9	999.9	999.9		999.9	999.9	7.2	999.9	9.7	9.4	5.3
31	7.5		999.9	999.9		999.9		9.2		11.1	7.2	
Average	8.8	-1.4	--	--	--	--	--	--	--	--	10.9	11.4

Table 2e. Air temperature at 1,842 meters altitude, South Cascade Glacier Basin, 1990 water year
[Daily average air temperature, in degrees Celsius. The temperature was recorded continuously on an analog circular chart at the Hut (fig. 1) and averaged graphically. A 999.9 indicates no data]

Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept
1	4.4	999.9	999.9	999.9	999.9	999.9	999.9	3.6	1.6	9.0	10.7	9.7
2	6.7	999.9	999.9	999.9	999.9	999.9	999.9	6.2	3.9	3.8	11.4	9.0
3	9.2	999.9	999.9	999.9	999.9	999.9	999.9	4.5	7.0	7.6	14.9	12.7
4	7.2	999.9	999.9	999.9	999.9	999.9	999.9	1.2	12.1	11.2	18.7	17.1
5	8.9	999.9	999.9	999.9	999.9	999.9	999.9	4.2	10.0	10.6	20.7	18.1
6	10.0	999.9	999.9	999.9	999.9	999.9	999.9	-3.3	4.1	5.4	14.8	999.9
7	10.0	999.9	999.9	999.9	999.9	999.9	999.9	-1.7	1.4	10.2	15.6	999.9
8	10.3	999.9	999.9	999.9	999.9	999.9	999.9	2.2	4.6	13.9	19.2	999.9
9	11.4	999.9	999.9	999.9	999.9	999.9	999.9	4.4	7.9	14.6	19.8	999.9
10	4.2	999.9	999.9	999.9	999.9	999.9	999.9	3.4	6.6	18.1	20.7	999.9
11	1.7	999.9	999.9	999.9	999.9	999.9	999.9	0.1	2.1	20.6	18.0	999.9
12	2.8	999.9	999.9	999.9	999.9	999.9	999.9	0.7	3.0	19.8	21.0	999.9
13	1.9	999.9	999.9	999.9	999.9	999.9	999.9	-0.3	4.4	15.9	16.3	999.9
14	-0.3	999.9	999.9	999.9	999.9	999.9	999.9	1.5	10.0	17.3	13.5	999.9
15	0.8	999.9	999.9	999.9	999.9	999.9	999.9	4.0	11.6	17.4	9.9	999.9
16	2.8	999.9	999.9	999.9	999.9	999.9	999.9	4.2	7.5	11.8	8.9	999.9
17	5.6	999.9	999.9	999.9	999.9	999.9	999.9	3.5	7.4	11.6	11.1	999.9
18	6.9	999.9	999.9	999.9	999.9	999.9	999.9	3.4	8.4	12.4	9.6	999.9
19	6.4	999.9	999.9	999.9	999.9	999.9	999.9	3.9	999.9	15.9	10.9	999.9
20	5.6	999.9	999.9	999.9	999.9	999.9	999.9	2.2	999.9	17.0	14.8	999.9
21	2.2	999.9	999.9	999.9	999.9	999.9	999.9	2.7	12.8	18.6	11.5	999.9
22	2.2	999.9	999.9	999.9	999.9	999.9	999.9	3.0	15.6	17.7	6.6	999.9
23	2.8	999.9	999.9	999.9	999.9	999.9	999.9	1.9	12.8	11.2	5.5	999.9
24	1.1	999.9	999.9	999.9	999.9	999.9	999.9	0.5	11.7	8.7	6.7	999.9
25	0.8	999.9	999.9	999.9	999.9	999.9	999.9	3.3	10.8	6.5	3.7	15.5
26	0.0	999.9	999.9	999.9	999.9	999.9	999.9	5.2	8.6	8.3	10.2	14.4
27	-1.4	999.9	999.9	999.9	999.9	999.9	999.9	7.1	8.8	10.7	12.2	15.5
28	-1.9	999.9	999.9	999.9	999.9	999.9	999.9	9.1	9.3	16.9	14.4	15.5
29	1.4	999.9	999.9	999.9		999.9	999.9	5.1	11.6	18.6	10.6	8.9
30	0.6	999.9	999.9	999.9		999.9	999.9	7.6	9.0	19.3	5.7	51.5
31	999.9		999.9	999.9		999.9		4.2		15.5	7.9	
Average	4.1	--	--	--	--	--	--	3.1	8.0	13.4	12.8	--

Table 2f. Air temperature at 1,842 meters altitude, South Cascade Glacier Basin, 1991 water year
[Daily average air temperature, in degrees Celsius. The temperature was recorded continuously on an analog circular chart at the Hut (fig. 1) and averaged graphically. A 999.9 indicates no data]

Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept
1	5.8	-2.5	999.9	999.9	999.9	999.9	999.9	5.6	7.2	999.9	11.9	9.2
2	-0.6	-3.6	999.9	999.9	999.9	999.9	999.9	3.9	6.7	999.9	15.6	8.9
3	3.1	999.9	999.9	999.9	999.9	999.9	999.9	-1.9	4.4	999.9	18.3	13.1
4	3.1	999.9	999.9	999.9	999.9	999.9	999.9	5.3	5.6	999.9	17.2	17.5
5	-1.1	999.9	999.9	999.9	999.9	999.9	999.9	2.2	8.1	999.9	14.4	16.7
6	-1.7	999.9	999.9	999.9	999.9	999.9	999.9	2.5	8.9	999.9	13.3	14.4
7	0.0	999.9	999.9	999.9	999.9	999.9	999.9	1.7	4.4	999.9	14.4	10.8
8	1.9	999.9	999.9	999.9	999.9	999.9	999.9	-1.1	6.4	999.9	17.5	7.5
9	3.3	999.9	999.9	999.9	999.9	999.9	999.9	-1.9	9.2	999.9	10.6	10.0
10	-0.3	999.9	999.9	999.9	999.9	999.9	999.9	2.5	10.8	999.9	6.7	13.1
11	0.8	999.9	999.9	999.9	999.9	999.9	999.9	8.9	4.2	999.9	8.1	13.6
12	0.6	999.9	999.9	999.9	999.9	999.9	999.9	3.3	1.4	999.9	8.6	12.8
13	-1.4	999.9	999.9	999.9	999.9	999.9	999.9	3.3	2.2	999.9	11.9	5.8
14	-0.6	999.9	999.9	999.9	999.9	999.9	999.9	2.5	1.9	999.9	14.2	8.6
15	0.8	999.9	999.9	999.9	999.9	999.9	999.9	4.7	4.7	999.9	16.7	13.1
16	-2.2	999.9	999.9	999.9	999.9	999.9	999.9	2.8	4.4	999.9	18.3	15.3
17	-0.3	999.9	999.9	999.9	999.9	999.9	999.9	3.1	6.7	7.2	19.7	12.8
18	0.0	999.9	999.9	999.9	999.9	999.9	999.9	5.8	9.2	8.1	18.9	13.1
19	-1.9	999.9	999.9	999.9	999.9	999.9	999.9	7.5	999.9	9.2	17.5	999.9
20	-1.4	999.9	999.9	999.9	999.9	999.9	999.9	7.5	999.9	10.0	17.2	3.3
21	1.4	999.9	999.9	999.9	999.9	999.9	999.9	5.0	999.9	10.0	17.5	5.8
22	-1.1	999.9	999.9	999.9	999.9	999.9	999.9	3.9	999.9	14.2	15.6	9.4
23	1.7	999.9	999.9	999.9	999.9	999.9	999.9	3.3	999.9	18.6	8.3	12.2
24	7.2	999.9	999.9	999.9	999.9	999.9	999.9	1.4	999.9	16.1	7.8	17.2
25	6.1	999.9	999.9	999.9	999.9	999.9	999.9	0.0	999.9	8.9	7.5	17.2
26	0.8	999.9	999.9	999.9	999.9	999.9	999.9	3.9	999.9	9.4	9.2	19.7
27	6.1	999.9	999.9	999.9	999.9	999.9	999.9	4.2	999.9	10.0	7.8	16.1
28	3.3	999.9	999.9	999.9	999.9	999.9	999.9	6.7	999.9	12.2	5.6	14.4
29	-0.3	999.9	999.9	999.9		999.9	999.9	5.0	999.9	8.9	9.4	13.3
30	0.8	999.9	999.9	999.9		999.9	999.9	2.5	999.9	12.5	13.9	16.1
31	-1.7		999.9	999.9		999.9		5.3		15.8	8.6	
Average	1.0	--	--	--	--	--	--	3.5	--	--	13.0	12.4

Table 3. Daily precipitation near South Fork Cascade River gaging station
[Precipitation is sampled once every hour and the daily sum is given in millimeters; -99.9 indicates no data]

	1986 water year											
DAY	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9
2	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9
3	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9
4	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9
5	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9
6	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9
7	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9
8	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	0.0
9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	0.0
10	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	0.0
11	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	0.0
12	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	0.0
13	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	3.0
14	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	0.0
15	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	0.0
16	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	0.0
17	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	7.0
18	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	6.0
19	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	3.0
20	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	3.0
21	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	3.0
22	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	3.0
23	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	42.0
24	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	0.0
25	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	0.0
26	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	4.0
27	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	3.0
28	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	2.0
29	-99.9	-99.9	-99.9	-99.9		-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	3.0
30	-99.9	-99.9	-99.9	-99.9		-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	2.0
31	-99.9		-99.9	-99.9		-99.9		-99.9		-99.9	-99.9	
SUM	--	--	--	--	--	--	--	--	--	--	--	--

	1987 water year											
DAY	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	0.0	0.0	2.0	-99.9	-99.9	6.0	0.0	-99.9	6.0	-99.9	-99.9	-99.9
2	0.0	0.0	0.0	-99.9	-99.9	20.0	0.0	-99.9	0.0	-99.9	-99.9	-99.9
3	0.0	0.0	3.0	-99.9	-99.9	39.0	0.0	-99.9	0.0	-99.9	-99.9	-99.9
4	0.0	4.0	2.0	-99.9	-99.9	12.0	0.0	-99.9	0.0	-99.9	-99.9	-99.9
5	2.0	28.0	0.0	-99.9	-99.9	7.0	3.0	-99.9	0.0	-99.9	-99.9	-99.9
6	0.0	9.0	0.0	-99.9	-99.9	4.0	2.0	0.0	0.0	-99.9	-99.9	-99.9
7	0.0	4.0	0.0	-99.9	-99.9	2.0	10.0	0.0	0.0	-99.9	-99.9	-99.9
8	0.0	0.0	0.0	-99.9	-99.9	0.0	2.0	0.0	0.0	-99.9	-99.9	-99.9
9	0.0	2.0	0.0	-99.9	-99.9	0.0	2.0	0.0	0.0	-99.9	-99.9	-99.9
10	0.0	4.0	0.0	-99.9	-99.9	6.0	12.0	0.0	0.0	-99.9	-99.9	-99.9
11	0.0	11.0	0.0	-99.9	-99.9	2.0	6.0	16.0	0.0	-99.9	-99.9	-99.9
12	0.0	0.0	0.0	-99.9	0.0	3.0	4.0	11.0	0.0	-99.9	-99.9	-99.9
13	0.0	0.0	0.0	-99.9	0.0	0.0	1.0	0.0	0.0	-99.9	-99.9	-99.9
14	0.0	0.0	0.0	-99.9	3.0	0.0	20.0	18.0	0.0	-99.9	-99.9	-99.9
15	0.0	8.0	3.0	-99.9	0.0	0.0	3.0	0.0	0.0	-99.9	-99.9	-99.9
16	0.0	7.0	0.0	-99.9	5.0	3.0	3.0	0.0	0.0	-99.9	-99.9	-99.9
17	0.0	4.0	0.0	-99.9	0.0	8.0	2.0	0.0	0.0	-99.9	-99.9	-99.9
18	0.0	11.0	0.0	-99.9	0.0	4.0	11.0	0.0	0.0	-99.9	-99.9	-99.9
19	0.0	12.0	0.0	-99.9	4.0	8.0	2.0	0.0	0.0	-99.9	-99.9	-99.9
20	0.0	45.0	0.0	-99.9	2.0	0.0	2.0	2.0	0.0	-99.9	-99.9	-99.9
21	0.0	5.0	48.0	-99.9	0.0	0.0	0.0	0.0	4.0	-99.9	-99.9	-99.9
22	0.0	10.0	0.0	-99.9	5.0	0.0	0.0	0.0	0.0	-99.9	-99.9	-99.9
23	0.0	76.0	4.0	-99.9	2.0	0.0	0.0	0.0	0.0	-99.9	-99.9	-99.9
24	0.0	0.0	3.0	-99.9	0.0	3.0	0.0	0.0	0.0	-99.9	-99.9	-99.9
25	0.0	0.0	4.0	-99.9	2.0	2.0	0.0	0.0	0.0	-99.9	-99.9	-99.9
26	38.0	8.0	0.0	-99.9	0.0	4.0	0.0	0.0	0.0	-99.9	-99.9	-99.9
27	18.0	4.0	0.0	-99.9	0.0	2.0	0.0	0.0	0.0	-99.9	-99.9	-99.9
28	4.0	3.0	16.0	-99.9	0.0	0.0	0.0	0.0	0.0	-99.9	-99.9	-99.9
29	3.0	0.0	6.0	-99.9		0.0	-99.9	0.0	0.0	-99.9	-99.9	-99.9
30	1.0	0.0	-99.9	-99.9		0.0	-99.9	24.0	0.0	-99.9	-99.9	-99.9
31	0.0		-99.9	-99.9		0.0		4.0		-99.9	-99.9	
SUM	66.0	255.0	--	--	--	135.0	--	--	10.0	--	--	--

Table 3. Daily precipitation near South Fork Cascade River gaging station--Continued

	1988 water year											
DAY	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	6.0	0.0	6.0	-99.9	-99.9	-99.9	14.0	3.0	7.0	10.0	11.0	0.0
2	6.0	0.0	4.0	-99.9	-99.9	-99.9	3.0	7.0	21.0	15.0	0.0	0.0
3	0.0	0.0	6.0	-99.9	-99.9	-99.9	12.0	10.0	1.0	0.0	0.0	0.0
4	0.0	0.0	0.0	-99.9	-99.9	-99.9	0.0	2.0	12.0	0.0	0.0	0.0
5	0.0	0.0	13.0	-99.9	-99.9	-99.9	18.0	4.0	2.0	9.0	0.0	0.0
6	6.0	0.0	11.0	-99.9	-99.9	-99.9	18.0	2.0	5.0	2.0	3.0	15.0
7	2.0	0.0	0.0	-99.9	-99.9	-99.9	10.0	0.0	11.0	0.0	0.0	5.0
8	4.0	0.0	0.0	-99.9	-99.9	-99.9	26.0	6.0	5.0	0.0	0.0	0.0
9	10.0	0.0	30.0	-99.9	-99.9	-99.9	0.0	0.0	3.0	0.0	0.0	0.0
10	4.0	0.0	0.0	-99.9	-99.9	-99.9	3.0	0.0	9.0	0.0	0.0	1.0
11	12.0	27.0	-99.9	-99.9	-99.9	0.0	15.0	0.0	0.0	6.0	0.0	0.0
12	9.0	3.0	-99.9	-99.9	-99.9	0.0	0.0	9.0	0.0	14.0	0.0	0.0
13	3.0	15.0	-99.9	-99.9	-99.9	0.0	0.0	0.0	0.0	2.0	0.0	0.0
14	0.0	4.0	-99.9	-99.9	-99.9	0.0	0.0	0.0	0.0	4.0	0.0	0.0
15	4.0	7.0	-99.9	-99.9	-99.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
16	0.0	3.0	-99.9	-99.9	-99.9	0.0	0.0	9.0	0.0	0.0	12.0	4.0
17	3.0	0.0	-99.9	-99.9	-99.9	0.0	20.0	0.0	2.0	0.0	6.0	6.0
18	2.0	0.0	-99.9	-99.9	-99.9	0.0	0.0	0.0	1.0	0.0	3.0	16.0
19	2.0	3.0	-99.9	-99.9	-99.9	0.0	0.0	0.0	0.0	0.0	1.0	13.0
20	0.0	0.0	-99.9	-99.9	-99.9	0.0	0.0	0.0	0.0	0.0	0.0	3.0
21	6.0	5.0	-99.9	-99.9	-99.9	6.0	10.0	0.0	1.0	0.0	0.0	0.0
22	0.0	10.0	-99.9	-99.9	-99.9	5.0	0.0	2.0	0.0	0.0	0.0	0.0
23	3.0	6.0	-99.9	-99.9	-99.9	4.0	3.0	3.0	0.0	0.0	0.0	25.0
24	5.0	4.0	-99.9	-99.9	-99.9	3.0	4.0	0.0	0.0	0.0	0.0	33.0
25	4.0	0.0	-99.9	-99.9	-99.9	16.0	4.0	0.0	0.0	0.0	0.0	45.0
26	0.0	0.0	-99.9	-99.9	-99.9	13.0	0.0	2.0	0.0	0.0	0.0	13.0
27	0.0	0.0	-99.9	-99.9	-99.9	0.0	0.0	17.0	0.0	0.0	0.0	19.0
28	0.0	0.0	-99.9	-99.9	-99.9	0.0	14.0	11.0	5.0	0.0	0.0	4.0
29	0.0	2.0	-99.9	-99.9	-99.9	0.0	5.0	7.0	2.0	0.0	0.0	0.0
30	0.0	0.0	-99.9	-99.9		9.0	4.0	1.0	0.0	0.0	0.0	0.0
31	0.0		-99.9	-99.9		5.0		6.0		0.0	0.0	
SUM	91.0	89.0	--	--	--	--	183.0	101.0	87.0	62.0	36.0	202.0

	1989 water year											
DAY	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	0.0	26.0	3.0	0.0	-99.9	-99.9	-99.9	1.0	0.0	10.0	9.0	10.0
2	0.0	24.0	4.0	0.0	-99.9	-99.9	-99.9	1.0	0.0	6.0	7.0	4.0
3	0.0	5.0	2.0	25.0	-99.9	-99.9	-99.9	0.0	0.0	4.0	1.0	0.0
4	0.0	6.0	0.0	0.0	-99.9	-99.9	-99.9	0.0	0.0	0.0	0.0	0.0
5	0.0	67.0	3.0	0.0	-99.9	-99.9	-99.9	0.0	0.0	0.0	0.0	0.0
6	0.0	0.0	15.0	0.0	-99.9	-99.9	51.0	1.0	0.0	0.0	0.0	0.0
7	0.0	1.0	4.0	0.0	-99.9	-99.9	0.0	0.0	0.0	0.0	0.0	0.0
8	0.0	0.0	7.0	0.0	-99.9	-99.9	0.0	0.0	0.0	0.0	0.0	0.0
9	0.0	0.0	1.0	0.0	-99.9	-99.9	0.0	9.0	0.0	4.0	0.0	0.0
10	0.0	1.0	1.0	0.0	-99.9	-99.9	0.0	6.0	0.0	1.0	0.0	0.0
11	0.0	0.0	6.0	0.0	-99.9	-99.9	0.0	7.0	0.0	0.0	1.0	0.0
12	0.0	0.0	271.0	0.0	-99.9	-99.9	0.0	0.0	0.0	0.0	0.0	0.0
13	15.0	0.0	0.0	0.0	-99.9	-99.9	0.0	0.0	4.0	2.0	0.0	0.0
14	71.0	7.0	0.0	0.0	-99.9	-99.9	0.0	0.0	11.0	1.0	11.0	0.0
15	92.0	2.0	2.0	0.0	-99.9	-99.9	0.0	0.0	4.0	5.0	11.0	0.0
16	58.0	0.0	0.0	0.0	-99.9	-99.9	0.0	6.0	0.0	13.0	7.0	2.0
17	0.0	0.0	0.0	0.0	-99.9	-99.9	0.0	13.0	9.0	1.0	0.0	2.0
18	19.0	0.0	0.0	0.0	-99.9	-99.9	1.0	4.0	4.0	0.0	0.0	0.0
19	3.0	0.0	0.0	0.0	-99.9	-99.9	4.0	7.0	5.0	0.0	0.0	0.0
20	0.0	0.0	0.0	2.0	-99.9	-99.9	17.0	0.0	6.0	0.0	0.0	0.0
21	13.0	0.0	0.0	0.0	-99.9	-99.9	2.0	0.0	0.0	1.0	29.0	0.0
22	0.0	0.0	0.0	0.0	-99.9	-99.9	1.0	2.0	1.0	0.0	6.0	0.0
23	3.0	0.0	0.0	0.0	-99.9	-99.9	0.0	5.0	2.0	0.0	1.0	0.0
24	1.0	0.0	0.0	0.0	-99.9	-99.9	0.0	15.0	0.0	0.0	0.0	0.0
25	1.0	0.0	0.0	7.0	-99.9	-99.9	1.0	5.0	0.0	0.0	5.0	1.0
26	5.0	0.0	0.0	5.0	-99.9	-99.9	0.0	22.0	4.0	0.0	4.0	8.0
27	1.0	0.0	0.0	1.0	-99.9	-99.9	8.0	19.0	1.0	2.0	3.0	1.0
28	0.0	0.0	0.0	1.0	-99.9	-99.9	1.0	19.0	5.0	0.0	0.0	0.0
29	3.0	0.0	0.0	17.0		-99.9	0.0	0.0	4.0	0.0	0.0	0.0
30	22.0	5.0	0.0	5.0		-99.9	0.0	0.0	20.0	1.0	2.0	1.0
31	0.0		0.0	0.0		-99.9		0.0		1.0	1.0	
SUM	307.0	144.0	319.0	63.0	--	--	--	142.0	80.0	52.0	98.0	29.0

Table 3. Daily precipitation near South Fork Cascade River gaging station--Continued

DAY	1990 water year Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	3.0	0.0	4.0	0.0	0.0	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9
2	0.0	2.0	31.0	0.0	0.0	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9
3	0.0	54.0	46.0	0.0	1.0	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9
4	0.0	3.0	102.0	0.0	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9
5	0.0	1.0	3.0	6.0	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9
6	0.0	0.0	2.0	0.0	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9
7	0.0	0.0	13.0	0.0	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9
8	0.0	83.0	2.0	0.0	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9
9	0.0	99.0	0.0	0.0	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9
10	12.0	66.0	0.0	0.0	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9
11	34.0	2.0	0.0	0.0	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9
12	26.0	12.0	0.0	0.0	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9
13	5.0	0.0	0.0	0.0	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9
14	0.0	1.0	2.0	1.0	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9
15	0.0	10.0	0.0	0.0	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9
16	0.0	9.0	0.0	1.0	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9
17	0.0	3.0	0.0	0.0	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9
18	9.0	1.0	0.0	0.0	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9
19	0.0	31.0	0.0	0.0	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9
20	6.0	13.0	0.0	1.0	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9
21	6.0	3.0	10.0	0.0	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9
22	1.0	0.0	7.0	0.0	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9
23	21.0	1.0	4.0	0.0	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9
24	5.0	0.0	0.0	0.0	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9
25	1.0	0.0	2.0	0.0	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9
26	5.0	0.0	0.0	0.0	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9
27	3.0	2.0	0.0	0.0	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9
28	7.0	2.0	0.0	0,0	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9
29	1.0	2.0	1.0	0.0		-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9
30	3.0	0.0	0.0	0.0		-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9
31	0.0		2.0	0.0		-99.9		-99.9		-99.9	-99.9	
SUM	148.0	400.0	231.0	9.0	--	--	--	--	--	--	--	--

DAY	1991 water year Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	0.0	1.0
2	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	0.0	0.0
3	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	0.0	0.0
4	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	0.0	0.0
5	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	0.0	0.0
6	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	2.0	0.0
7	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	0.0	10.0
8	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	0.0	3.0
9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	2.0	0.0
10	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	13.0	0.0
11	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	1.0	0.0
12	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	1.0	0.0
13	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	0.0	13.0
14	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	0.0	0.0
15	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	0.0	0.0
16	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	0.0	0.0	0.0
17	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	1.0	0.0	0.0
18	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	0.0	0.0	0.0
19	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	0.0	0.0	0.0
20	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	2.0	0.0	0.0
21	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	0.0	0.0	0.0
22	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	0.0	0.0	0.0
23	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	0.0	0.0	1.0
24	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	13.0	0.0	0.0
25	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	2.0	0.0	0.0
26	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	0.0	0.0	0.0
27	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	0.0	30.0	0.0
28	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	0.0	41.0	0.0
29	-99.9	-99.9	-99.9	-99.9		-99.9	-99.9	-99.9	-99.9	0.0	7.0	0.0
30	-99.9	-99.9	-99.9	-99.9		-99.9	-99.9	-99.9	-99.9	0.0	0.0	0.0
31	-99.9		-99.9	-99.9		-99.9		-99.9		0.0	16.0	
SUM	--	--	--	--	--	--	--	--	--	--	113.0	28.0

Table 4. Large format aerial photography of South Cascade Glacier, 1986-91
[O, indicates the photography was oblique; V, indicates the photography was vertical. Altitude is in meters above sea level]

Date		Altitude	Roll number	Frame number	Remarks
September 5, 1986	O	3,000	86R1	024-027	
September 5, 1986	V	4,600	86V1	020-023	Covers entire glacier
September 5, 1986	V	2,700	86V1	024-026	Terminus area only
August 21, 1987	O	3,000	87R1	102-103	
August 21, 1987	V	3,000	87V1	082-086	
September 9, 1987	V	4,700	A19	4-10	Covers entire glacier
October 5, 1987	O	3,000	87R4	107-116	
August 21, 1988	O	2,600	88R1	021-022	
August 21, 1988	V	2,600	88V1	008-011	Lower glacier only
October 10, 1988	O	2,700	88R2	120, 123-128	
September 12, 1989	V	4,700	A19	1-3	Covers entire glacier
September 5, 1990	O	3,700	90R2	071-073	
September 5, 1990	V	3,700	90V3	064-070	Covers entire glacier
September 9, 1991	O	2,700	91R1	092-093, 096-099, 101	
September 9, 1991	V	3,600	91V3	054-067	Covers entire glacier
September 9, 1991	V	2,500	91V3	068-074	Lower Glacier only

Table 5a. South Cascade Glacier altitude grid, September 5, 1986

[Surface altitude (Z), in meters above National Geodetic Vertical Datum of 1929, was measured near the central point for each grid cell. Coordinates X and Y are local, ± 1 meter; Z is accurate to ± 2 meters. Grid map is shown in figure 9a]

X	Y	Z	X	Y	Z	X	Y	Z	X	Y	Z
1570	3800	1649	1470	3000	1845	1870	2500	1890	2270	1900	1992
1670	3800	1656	1570	3000	1841	1970	2500	1894	2370	1900	2000
1770	3800	1652	1670	3000	1839	2070	2500	1901	2470	1900	2015
1870	3800	1653	1770	3000	1843	2170	2500	1912	3070	1900	2100
1570	3700	1669	1870	3000	1850	2270	2500	1924	1870	1800	2006
1670	3700	1683	1970	3000	1851	2370	2500	1936	1970	1800	1995
1770	3700	1676	2070	3000	1850	1570	2400	1912	2070	1800	1990
1870	3700	1675	2170	3000	1846	1670	2400	1902	2170	1800	1998
1970	3700	1665	2270	3000	1844	1770	2400	1902	2270	1800	2010
1570	3600	1682	2370	3000	1848	1870	2400	1903	2370	1800	2028
1670	3600	1700	1470	2900	1860	1970	2400	1917	2470	1800	2035
1770	3600	1699	1570	2900	1853	2070	2400	1922	2570	1800	2043
1870	3600	1687	1670	2900	1854	2170	2400	1925	2670	1800	2060
1970	3600	1675	1770	2900	1855	2270	2400	1940	2770	1800	2068
2070	3600	1680	1870	2900	1856	2370	2400	1949	2870	1800	2082
1570	3500	1702	1970	2900	1856	2470	2400	1967	2970	1800	2087
1670	3500	1720	2070	2900	1856	1570	2300	1934	3070	1800	2089
1770	3500	1712	2170	2900	1852	1670	2300	1914	3170	1800	2095
1870	3500	1697	2270	2900	1850	1770	2300	1911	1970	1700	2012
1970	3500	1700	2370	2900	1853	1870	2300	1919	2070	1700	2006
2070	3500	1717	2470	2900	1884	1970	2300	1930	2170	1700	2012
2170	3500	1720	1370	2800	1908	2070	2300	1936	2270	1700	2020
1470	3400	1753	1470	2800	1874	2170	2300	1942	2370	1700	2029
1570	3400	1744	1570	2800	1862	2270	2300	1950	2470	1700	2040
1670	3400	1746	1670	2800	1863	2370	2300	1952	2570	1700	2050
1770	3400	1732	1770	2800	1862	2470	2300	1964	2670	1700	2058
1870	3400	1722	1870	2800	1860	2570	2300	2003	2770	1700	2068
1970	3400	1737	1970	2800	1861	1670	2200	1938	2870	1700	2083
2070	3400	1746	2070	2800	1857	1770	2200	1925	2970	1700	2094
2170	3400	1744	2170	2800	1855	1870	2200	1930	3070	1700	2104
1470	3300	1771	2270	2800	1855	1970	2200	1939	3170	1700	2122
1570	3300	1766	2370	2800	1871	2070	2200	1945	2070	1600	2035
1670	3300	1767	2470	2800	1899	2170	2200	1949	2170	1600	2025
1770	3300	1765	1370	2700	1929	2270	2200	1958	2270	1600	2030
1870	3300	1748	1470	2700	1885	2370	2200	1960	2370	1600	2031
1970	3300	1772	1570	2700	1871	2470	2200	1968	2470	1600	2040
2070	3300	1767	1670	2700	1870	2570	2200	2007	2570	1600	2053
2170	3300	1764	1770	2700	1870	1770	2100	1948	2670	1600	2063
2270	3300	1766	1870	2700	1867	1870	2100	1950	2770	1600	2072
1470	3200	1798	1970	2700	1865	1970	2100	1952	2870	1600	2087
1570	3200	1794	2070	2700	1862	2070	2100	1954	2970	1600	2105
1670	3200	1796	2170	2700	1864	2170	2100	1959	3070	1600	2128
1770	3200	1809	2270	2700	1874	2270	2100	1961	2170	1500	2052
1870	3200	1819	2370	2700	1884	2370	2100	1968	2270	1500	2044
1970	3200	1817	2470	2700	1925	2470	2100	1978	2370	1500	2040
2070	3200	1805	1570	2600	1880	2570	2100	2008	2470	1500	2048
2170	3200	1800	1670	2600	1878	1870	2000	1974	2570	1500	2055
2270	3200	1790	1770	2600	1880	1970	2000	1964	2670	1500	2068
1470	3100	1826	1870	2600	1872	2070	2000	1966	2770	1500	2080
1570	3100	1822	1970	2600	1874	2170	2000	1965	2870	1500	2096
1670	3100	1820	2070	2600	1875	2270	2000	1968	2270	1400	2082
1770	3100	1829	2170	2600	1882	2370	2000	1972	2370	1400	2064
1870	3100	1838	2270	2600	1903	2470	2000	1987	2470	1400	2060
1970	3100	1842	2370	2600	1915	2570	2000	2026	2570	1400	2064
2070	3100	1838	1470	2500	1909	1870	1900	2000	2670	1400	2093
2170	3100	1830	1570	2500	1892	1970	1900	1983	2770	1400	2116
2270	3100	1820	1670	2500	1890	2070	1900	1977	2370	1300	2125
1370	3000	1874	1770	2500	1890	2170	1900	1981			

Table 5b. South Cascade Glacier altitude grid, September 9, 1987

[Surface altitude (Z), in meters above National Geodetic Vertical Datum of 1929, was measured near the central point for each grid cell. Coordinates X and Y are local, ± 1 meter; Z is accurate to ± 2 meters. Grid map is shown in figure 9b]

X	Y	Z	X	Y	Z	X	Y	Z	X	Y	Z
1570	3800	1641	1770	3000	1842	1570	2400	1912	2170	1800	1997
1670	3800	1651	1870	3000	1847	1670	2400	1902	2270	1800	2008
1770	3800	1650	1970	3000	1849	1770	2400	1900	2370	1800	2025
1870	3800	1648	2070	3000	1850	1870	2400	1904	2470	1800	2036
1570	3700	1667	2170	3000	1843	1970	2400	1914	2570	1800	2042
1670	3700	1681	2270	3000	1842	2070	2400	1919	2670	1800	2062
1770	3700	1674	1470	2900	1857	2170	2400	1925	2770	1800	2067
1870	3700	1668	1570	2900	1849	2270	2400	1940	2870	1800	2082
1570	3600	1678	1670	2900	1852	2370	2400	1947	2970	1800	2086
1670	3600	1697	1770	2900	1851	2470	2400	1966	3070	1800	2088
1770	3600	1693	1870	2900	1853	1570	2300	1933	3170	1800	2094
1870	3600	1684	1970	2900	1855	1670	2300	1914	1970	1700	2013
1970	3600	1668	2070	2900	1855	1770	2300	1910	2070	1700	2006
1570	3500	1700	2170	2900	1850	1870	2300	1918	2170	1700	2008
1670	3500	1717	2270	2900	1848	1970	2300	1929	2270	1700	2023
1770	3500	1710	2370	2900	1853	2070	2300	1936	2370	1700	2027
1870	3500	1695	1370	2800	1905	2170	2300	1940	2470	1700	2040
1970	3500	1695	1470	2800	1874	2270	2300	1948	2570	1700	2050
2070	3500	1710	1570	2800	1860	2370	2300	1950	2670	1700	2059
2170	3500	1715	1670	2800	1857	2470	2300	1963	2770	1700	2069
1570	3400	1740	1770	2800	1860	2570	2300	2002	2870	1700	2083
1670	3400	1742	1870	2800	1857	1670	2200	1935	2970	1700	2094
1770	3400	1730	1970	2800	1858	1770	2200	1925	3070	1700	2104
1870	3400	1719	2070	2800	1854	1870	2200	1927	3170	1700	2123
1970	3400	1731	2170	2800	1851	1970	2200	1936	2070	1600	2034
2070	3400	1741	2270	2800	1853	2070	2200	1945	2170	1600	2026
2170	3400	1740	2370	2800	1870	2170	2200	1948	2270	1600	2029
1470	3300	1767	2470	2800	1898	2270	2200	1957	2370	1600	2032
1570	3300	1767	1370	2700	1928	2370	2200	1958	2470	1600	2041
1670	3300	1766	1470	2700	1883	2470	2200	1969	2570	1600	2052
1770	3300	1762	1570	2700	1869	2570	2200	2008	2670	1600	2061
1870	3300	1743	1670	2700	1865	1770	2100	1950	2770	1600	2071
1970	3300	1766	1770	2700	1868	1870	2100	1950	2870	1600	2086
2070	3300	1762	1870	2700	1866	1970	2100	1951	2970	1600	2103
2170	3300	1760	1970	2700	1865	2070	2100	1951	3070	1600	2125
2270	3300	1764	2070	2700	1858	2170	2100	1957	2170	1500	2056
1470	3200	1796	2170	2700	1863	2270	2100	1962	2270	1500	2040
1570	3200	1793	2270	2700	1873	2370	2100	1969	2370	1500	2041
1670	3200	1792	2370	2700	1882	2470	2100	1976	2470	1500	2050
1770	3200	1804	1570	2600	1881	2570	2100	2006	2570	1500	2055
1870	3200	1813	1670	2600	1875	1870	2000	1970	2670	1500	2067
1970	3200	1816	1770	2600	1878	1970	2000	1962	2770	1500	2079
2070	3200	1800	1870	2600	1871	2070	2000	1965	2870	1500	2097
2170	3200	1795	1970	2600	1873	2170	2000	1963	2270	1400	2080
2270	3200	1786	2070	2600	1874	2270	2000	1969	2370	1400	2064
1470	3100	1825	2170	2600	1882	2370	2000	1970	2470	1400	2060
1570	3100	1819	2270	2600	1901	2470	2000	1985	2570	1400	2062
1670	3100	1819	2370	2600	1913	2570	2000	2024	2670	1400	2090
1770	3100	1828	1470	2500	1907	1870	1900	2000	2770	1400	2113
1870	3100	1836	1570	2500	1890	1970	1900	1983	2370	1300	2122
1970	3100	1835	1670	2500	1887	2070	1900	1976			
2070	3100	1836	1770	2500	1886	2170	1900	1980			
2170	3100	1828	1870	2500	1887	2270	1900	1991			
2270	3100	1816	1970	2500	1893	2370	1900	2000			
1370	3000	1873	2070	2500	1897	2470	1900	2013			
1470	3000	1843	2170	2500	1910	1870	1800	2004			
1570	3000	1837	2270	2500	1924	1970	1800	1995			
1670	3000	1837	2370	2500	1934	2070	1800	1990			

Table 5c. South Cascade Glacier altitude grid, August 21, 1988

[Surface altitude (Z), in meters above National Geodetic Vertical Datum of 1929, was measured near the central point for each grid cell. Coordinates X and Y are local, ± 1 meter; Z is accurate to ± 2 meters. Grid map is shown in figure 9c]

X	Y	Z	X	Y	Z	X	Y	Z	X	Y	Z
1670	3800	1648	1970	3000	1849	1870	2400	1903	2570	1800	2040
1770	3800	1642	2070	3000	1848	1970	2400	1912	2670	1800	2060
1570	3700	1664	2170	3000	1842	2070	2400	1919	2770	1800	2068
1670	3700	1674	2270	3000	1842	2170	2400	1925	2870	1800	2083
1770	3700	1668	1470	2900	1857	2270	2400	1940	2970	1800	2086
1870	3700	1663	1570	2900	1849	2370	2400	1947	3070	1800	2090
1570	3600	1670	1670	2900	1850	2470	2400	1965	3170	1800	2095
1670	3600	1693	1770	2900	1850	1570	2300	1934	1970	1700	2013
1770	3600	1688	1870	2900	1851	1670	2300	1914	2070	1700	2004
1870	3600	1677	1970	2900	1853	1770	2300	1910	2170	1700	2007
1970	3600	1662	2070	2900	1854	1870	2300	1916	2270	1700	2020
1570	3500	1699	2170	2900	1848	1970	2300	1928	2370	1700	2027
1670	3500	1714	2270	2900	1846	2070	2300	1935	2470	1700	2037
1770	3500	1705	2370	2900	1850	2170	2300	1940	2570	1700	2050
1870	3500	1692	1370	2800	1905	2270	2300	1945	2670	1700	2058
1970	3500	1691	1470	2800	1872	2370	2300	1950	2770	1700	2068
2070	3500	1703	1570	2800	1859	2470	2300	1962	2870	1700	2082
2170	3500	1711	1670	2800	1857	2570	2300	2002	2970	1700	2090
1570	3400	1735	1770	2800	1860	1670	2200	1934	3070	1700	2102
1670	3400	1741	1870	2800	1856	1770	2200	1926	3170	1700	2121
1770	3400	1728	1970	2800	1857	1870	2200	1925	2070	1600	2030
1870	3400	1717	2070	2800	1853	1970	2200	1934	2170	1600	2022
1970	3400	1728	2170	2800	1849	2070	2200	1944	2270	1600	2030
2070	3400	1739	2270	2800	1852	2170	2200	1948	2370	1600	2032
2170	3400	1738	2370	2800	1868	2270	2200	1955	2470	1600	2041
1470	3300	1766	1370	2700	1927	2370	2200	1957	2570	1600	2051
1570	3300	1764	1470	2700	1882	2470	2200	1967	2670	1600	2062
1670	3300	1762	1570	2700	1869	2570	2200	2008	2770	1600	2070
1770	3300	1761	1670	2700	1865	1770	2100	1950	2870	1600	2086
1870	3300	1741	1770	2700	1866	1870	2100	1950	2970	1600	2104
1970	3300	1764	1870	2700	1865	1970	2100	1950	3070	1600	2126
2070	3300	1760	1970	2700	1865	2070	2100	1950	2170	1500	2055
2170	3300	1758	2070	2700	1858	2170	2100	1956	2270	1500	2040
2270	3300	1762	2170	2700	1862	2270	2100	1960	2370	1500	2041
1470	3200	1793	2270	2700	1872	2370	2100	1967	2470	1500	2048
1570	3200	1790	2370	2700	1880	2470	2100	1976	2570	1500	2054
1670	3200	1792	1570	2600	1880	2570	2100	2006	2670	1500	2067
1770	3200	1802	1670	2600	1876	1870	2000	1970	2770	1500	2080
1870	3200	1810	1770	2600	1879	1970	2000	1962	2870	1500	2097
1970	3200	1814	1870	2600	1871	2070	2000	1963	2270	1400	2082
2070	3200	1798	1970	2600	1874	2170	2000	1964	2370	1400	2065
2170	3200	1794	2070	2600	1873	2270	2000	1966	2470	1400	2060
2270	3200	1782	2170	2600	1880	2370	2000	1970	2570	1400	2062
1470	3100	1824	2270	2600	1900	2470	2000	1984	2670	1400	2092
1570	3100	1818	2370	2600	1912	1870	1900	1998	2770	1400	2115
1670	3100	1818	1470	2500	1907	1970	1900	1981			
1770	3100	1827	1570	2500	1889	2070	1900	1976			
1870	3100	1834	1670	2500	1887	2170	1900	1980			
1970	3100	1834	1770	2500	1886	2270	1900	1989			
2070	3100	1835	1870	2500	1885	2370	1900	1998			
2170	3100	1829	1970	2500	1893	2470	1900	2010			
2270	3100	1812	2070	2500	1896	1870	1800	2005			
1370	3000	1872	2170	2500	1907	1970	1800	1996			
1470	3000	1841	2270	2500	1923	2070	1800	1988			
1570	3000	1837	2370	2500	1932	2170	1800	1999			
1670	3000	1837	1570	2400	1910	2270	1800	2010			
1770	3000	1840	1670	2400	1900	2370	1800	2020			
1870	3000	1846	1770	2400	1899	2470	1800	2035			

Table 5d. South Cascade Glacier altitude grid, September 12, 1989

[Surface altitude (Z), in meters above National Geodetic Vertical Datum of 1929, was measured near the central point for each grid cell. Coordinates X and Y are local, ± 1 meter; Z is accurate to ± 2 meters. Grid map is shown in figure 9d]

X	Y	Z	X	Y	Z	X	Y	Z	X	Y	Z
1670	3800	1644	2070	3000	1845	1970	2400	1910	2570	1800	2041
1570	3700	1653	2170	3000	1842	2070	2400	1919	2670	1800	2058
1670	3700	1670	2270	3000	1842	2170	2400	1925	2770	1800	2068
1770	3700	1667	1470	2900	1857	2270	2400	1939	2870	1800	2083
1870	3700	1659	1570	2900	1849	2370	2400	1946	2970	1800	2086
1570	3600	1666	1670	2900	1849	2470	2400	1965	3070	1800	2090
1670	3600	1691	1770	2900	1849	1570	2300	1934	3170	1800	2096
1770	3600	1683	1870	2900	1849	1670	2300	1914	1970	1700	2014
1870	3600	1671	1970	2900	1849	1770	2300	1908	2070	1700	2006
1970	3600	1661	2070	2900	1851	1870	2300	1915	2170	1700	2006
1570	3500	1698	2170	2900	1847	1970	2300	1927	2270	1700	2018
1670	3500	1713	2270	2900	1844	2070	2300	1934	2370	1700	2028
1770	3500	1703	2370	2900	1848	2170	2300	1939	2470	1700	2037
1870	3500	1688	1370	2800	1904	2270	2300	1945	2570	1700	2049
1970	3500	1685	1470	2800	1871	2370	2300	1950	2670	1700	2059
2070	3500	1693	1570	2800	1857	2470	2300	1961	2770	1700	2072
2170	3500	1706	1670	2800	1858	2570	2300	2002	2870	1700	2082
1570	3400	1734	1770	2800	1857	1670	2200	1932	2970	1700	2089
1670	3400	1738	1870	2800	1855	1770	2200	1926	3070	1700	2104
1770	3400	1725	1970	2800	1856	1870	2200	1924	3170	1700	2121
1870	3400	1713	2070	2800	1853	1970	2200	1937	2070	1600	2028
1970	3400	1721	2170	2800	1848	2070	2200	1944	2170	1600	2021
2070	3400	1735	2270	2800	1851	2170	2200	1947	2270	1600	2030
2170	3400	1732	2370	2800	1865	2270	2200	1954	2370	1600	2034
1470	3300	1764	1370	2700	1925	2370	2200	1956	2470	1600	2039
1570	3300	1760	1470	2700	1880	2470	2200	1966	2570	1600	2049
1670	3300	1759	1570	2700	1867	2570	2200	2005	2670	1600	2062
1770	3300	1756	1670	2700	1865	1770	2100	1950	2770	1600	2071
1870	3300	1734	1770	2700	1863	1870	2100	1950	2870	1600	2086
1970	3300	1761	1870	2700	1864	1970	2100	1950	2970	1600	2105
2070	3300	1756	1970	2700	1863	2070	2100	1950	3070	1600	2127
2170	3300	1753	2070	2700	1858	2170	2100	1954	2170	1500	2056
2270	3300	1760	2170	2700	1861	2270	2100	1960	2270	1500	2041
1470	3200	1791	2270	2700	1871	2370	2100	1966	2370	1500	2039
1570	3200	1790	2370	2700	1878	2470	2100	1976	2470	1500	2045
1670	3200	1790	1570	2600	1878	2570	2100	2007	2570	1500	2053
1770	3200	1801	1670	2600	1876	1870	2000	1970	2670	1500	2067
1870	3200	1808	1770	2600	1878	1970	2000	1962	2770	1500	2081
1970	3200	1810	1870	2600	1870	2070	2000	1960	2870	1500	2098
2070	3200	1794	1970	2600	1875	2170	2000	1965	2270	1400	2084
2170	3200	1794	2070	2600	1873	2270	2000	1965	2370	1400	2066
2270	3200	1779	2170	2600	1878	2370	2000	1971	2470	1400	2060
1470	3100	1822	2270	2600	1898	2470	2000	1982	2570	1400	2062
1570	3100	1815	2370	2600	1910	2570	2000	2026	2670	1400	2095
1670	3100	1818	1470	2500	1908	1870	1900	1998			
1770	3100	1826	1570	2500	1887	1970	1900	1980			
1870	3100	1834	1670	2500	1886	2070	1900	1975			
1970	3100	1834	1770	2500	1886	2170	1900	1980			
2070	3100	1834	1870	2500	1884	2270	1900	1989			
2170	3100	1829	1970	2500	1892	2370	1900	1997			
2270	3100	1808	2070	2500	1894	2470	1900	2011			
1370	3000	1872	2170	2500	1907	1870	1800	2007			
1470	3000	1840	2270	2500	1923	1970	1800	1995			
1570	3000	1837	2370	2500	1931	2070	1800	1987			
1670	3000	1837	1570	2400	1910	2170	1800	2000			
1770	3000	1839	1670	2400	1897	2270	1800	2010			
1870	3000	1845	1770	2400	1899	2370	1800	2021			
1970	3000	1849	1870	2400	1902	2470	1800	2033			

Table 5e. South Cascade Glacier altitude grid, September 5, 1990

[Surface altitude (Z), in meters above National Geodetic Vertical-Datum of 1929, was measured near the central point for each grid cell. Coordinates X and Y are local, ± 1 meter; Z is accurate to ± 2 meters. Grid map is shown in figure 9e]

X	Y	Z	X	Y	Z	X	Y	Z	X	Y	Z
1670	3800	1638	2170	3000	1839	2070	2400	1918	2770	1800	2067
1570	3700	1652	2270	3000	1841	2170	2400	1924	2870	1800	2080
1670	3700	1668	1470	2900	1855	2270	2400	1938	2970	1800	2084
1770	3700	1662	1570	2900	1848	2370	2400	1945	3070	1800	2085
1870	3700	1654	1670	2900	1848	2470	2400	1966	3170	1800	2094
1570	3600	1663	1770	2900	1848	1570	2300	1936	1970	1700	2014
1670	3600	1685	1870	2900	1849	1670	2300	1914	2070	1700	2008
1770	3600	1677	1970	2900	1849	1770	2300	1907	2170	1700	2010
1870	3600	1670	2070	2900	1848	1870	2300	1915	2270	1700	2017
1970	3600	1659	2170	2900	1846	1970	2300	1926	2370	1700	2030
1570	3500	1690	2270	2900	1843	2070	2300	1932	2470	1700	2037
1670	3500	1713	2370	2900	1847	2170	2300	1939	2570	1700	2045
1770	3500	1701	1370	2800	1904	2270	2300	1945	2670	1700	2057
1870	3500	1686	1470	2800	1870	2370	2300	1949	2770	1700	2070
1970	3500	1682	1570	2800	1858	2470	2300	1960	2870	1700	2080
2070	3500	1690	1670	2800	1857	2570	2300	2001	2970	1700	2080
1570	3400	1733	1770	2800	1856	1670	2200	1931	3070	1700	2104
1670	3400	1735	1870	2800	1854	1770	2200	1928	3170	1700	2121
1770	3400	1721	1970	2800	1854	1870	2200	1925	2070	1600	2028
1870	3400	1704	2070	2800	1852	1970	2200	1934	2170	1600	2020
1970	3400	1719	2170	2800	1846	2070	2200	1940	2270	1600	2030
2070	3400	1734	2270	2800	1849	2170	2200	1946	2370	1600	2031
2170	3400	1730	2370	2800	1865	2270	2200	1953	2470	1600	2042
1470	3300	1764	1370	2700	1923	2370	2200	1957	2570	1600	2048
1570	3300	1759	1470	2700	1878	2470	2200	1965	2670	1600	2060
1670	3300	1756	1570	2700	1866	2570	2200	2007	2770	1600	2072
1770	3300	1754	1670	2700	1865	1770	2100	1947	2870	1600	2087
1870	3300	1733	1770	2700	1862	1870	2100	1950	2970	1600	2102
1970	3300	1759	1870	2700	1863	1970	2100	1948	3070	1600	2125
2070	3300	1753	1970	2700	1862	2070	2100	1949	2170	1500	2055
2170	3300	1748	2070	2700	1856	2170	2100	1953	2270	1500	2042
2270	3300	1758	2170	2700	1859	2270	2100	1959	2370	1500	2040
1470	3200	1788	2270	2700	1869	2370	2100	1964	2470	1500	2047
1570	3200	1785	2370	2700	1876	2470	2100	1975	2570	1500	2055
1670	3200	1787	1570	2600	1877	2570	2100	2006	2670	1500	2068
1770	3200	1800	1670	2600	1875	1870	2000	1968	2770	1500	2078
1870	3200	1807	1770	2600	1875	1970	2000	1960	2870	1500	2099
1970	3200	1806	1870	2600	1870	2070	2000	1960	2270	1400	2084
2070	3200	1791	1970	2600	1873	2170	2000	1962	2370	1400	2065
2170	3200	1787	2070	2600	1870	2270	2000	1962	2470	1400	2061
2270	3200	1778	2170	2600	1877	2370	2000	1968	2570	1400	2062
1470	3100	1819	2270	2600	1898	2470	2000	1982	2670	1400	2092
1570	3100	1814	2370	2600	1912	1870	1900	1999	2770	1400	2113
1670	3100	1817	1470	2500	1907	1970	1900	1978	2370	1300	2128
1770	3100	1826	1570	2500	1886	2070	1900	1975			
1870	3100	1833	1670	2500	1886	2170	1900	1975			
1970	3100	1834	1770	2500	1885	2270	1900	1993			
2070	3100	1832	1870	2500	1885	2370	1900	1997			
2170	3100	1829	1970	2500	1888	2470	1900	2011			
2270	3100	1807	2070	2500	1893	1870	1800	2007			
1370	3000	1871	2170	2500	1908	1970	1800	1995			
1470	3000	1840	2270	2500	1920	2070	1800	1986			
1570	3000	1837	2370	2500	1930	2170	1800	1997			
1670	3000	1837	1570	2400	1908	2270	1800	2010			
1770	3000	1839	1670	2400	1896	2370	1800	2020			
1870	3000	1843	1770	2400	1899	2470	1800	2035			
1970	3000	1848	1870	2400	1901	2570	1800	2040			
2070	3000	1843	1970	2400	1910	2670	1800	2060			

Table 5f. South Cascade Glacier altitude grid, September 9, 1991

[Surface altitude (Z), in meters above National Geodetic Vertical Datum of 1929, was measured near the central point for each grid cell. Coordinates X and Y are local, ± 1 meter; Z is accurate to ± 2 meters. Grid map is shown in figure 9f]

X	Y	Z	X	Y	Z	X	Y	Z	X	Y	Z
1670	3800	1634	2170	3000	1837	2070	2400	1917	2670	1800	2060
1570	3700	1651	2270	3000	1839	2170	2400	1924	2770	1800	2067
1670	3700	1663	1470	2900	1854	2270	2400	1937	2870	1800	2081
1770	3700	1654	1570	2900	1848	2370	2400	1945	2970	1800	2083
1870	3700	1651	1670	2900	1848	2470	2400	1965	3070	1800	2083
1570	3600	1663	1770	2900	1847	1570	2300	1934	3170	1800	2092
1670	3600	1680	1870	2900	1848	1670	2300	1914	1970	1700	2011
1770	3600	1675	1970	2900	1849	1770	2300	1906	2070	1700	2006
1870	3600	1662	2070	2900	1847	1870	2300	1915	2170	1700	2010
1970	3600	1655	2170	2900	1846	1970	2300	1925	2270	1700	2018
1570	3500	1685	2270	2900	1841	2070	2300	1931	2370	1700	2030
1670	3500	1711	2370	2900	1846	2170	2300	1938	2470	1700	2039
1770	3500	1696	1370	2800	1902	2270	2300	1944	2570	1700	2038
1870	3500	1683	1470	2800	1868	2370	2300	1949	2670	1700	2051
1970	3500	1675	1570	2800	1857	2470	2300	1960	2770	1700	2065
2070	3500	1685	1670	2800	1857	2570	2300	2002	2870	1700	2076
1570	3400	1728	1770	2800	1856	1670	2200	1931	2970	1700	2080
1670	3400	1733	1870	2800	1853	1770	2200	1929	3070	1700	2104
1770	3400	1720	1970	2800	1852	1870	2200	1924	3170	1700	2118
1870	3400	1702	2070	2800	1850	1970	2200	1933	2070	1600	2030
1970	3400	1716	2170	2800	1845	2070	2200	1939	2170	1600	2022
2070	3400	1732	2270	2800	1848	2170	2200	1945	2270	1600	2030
2170	3400	1726	2370	2800	1861	2270	2200	1951	2370	1600	2031
1470	3300	1762	1370	2700	1922	2370	2200	1957	2470	1600	2041
1570	3300	1761	1470	2700	1876	2470	2200	1964	2570	1600	2047
1670	3300	1754	1570	2700	1864	2570	2200	2007	2670	1600	2060
1770	3300	1753	1670	2700	1864	1770	2100	1947	2770	1600	2072
1870	3300	1732	1770	2700	1862	1870	2100	1948	2870	1600	2086
1970	3300	1755	1870	2700	1860	1970	2100	1947	2970	1600	2102
2070	3300	1752	1970	2700	1860	2070	2100	1949	3070	1600	2126
2170	3300	1744	2070	2700	1853	2170	2100	1952	2170	1500	2053
2270	3300	1756	2170	2700	1858	2270	2100	1958	2270	1500	2043
1470	3200	1788	2270	2700	1866	2370	2100	1962	2370	1500	2042
1570	3200	1784	2370	2700	1874	2470	2100	1974	2470	1500	2047
1670	3200	1787	1570	2600	1876	2570	2100	2007	2570	1500	2054
1770	3200	1799	1670	2600	1874	1870	2000	1967	2670	1500	2068
1870	3200	1806	1770	2600	1874	1970	2000	1961	2770	1500	2077
1970	3200	1806	1870	2600	1869	2070	2000	1960	2870	1500	2091
2070	3200	1791	1970	2600	1870	2170	2000	1960	2270	1400	2082
2170	3200	1786	2070	2600	1868	2270	2000	1963	2370	1400	2062
2270	3200	1775	2170	2600	1876	2370	2000	1967	2470	1400	2060
1470	3100	1819	2270	2600	1896	2470	2000	1981	2570	1400	2061
1570	3100	1813	2370	2600	1910	1870	1900	1997	2670	1400	2087
1670	3100	1817	1470	2500	1905	1970	1900	1977	2770	1400	2111
1770	3100	1826	1570	2500	1887	2070	1900	1974			
1870	3100	1833	1670	2500	1885	2170	1900	1974			
1970	3100	1833	1770	2500	1884	2270	1900	1994			
2070	3100	1832	1870	2500	1884	2370	1900	2000			
2170	3100	1828	1970	2500	1887	2470	1900	2010			
2270	3100	1806	2070	2500	1893	3070	1900	2098			
1370	3000	1870	2170	2500	1906	1870	1800	2011			
1470	3000	1840	2270	2500	1917	1970	1800	1996			
1570	3000	1836	2370	2500	1930	2070	1800	1986			
1670	3000	1837	1570	2400	1908	2170	1800	1996			
1770	3000	1838	1670	2400	1896	2270	1800	2010			
1870	3000	1843	1770	2400	1898	2370	1800	2020			
1970	3000	1845	1870	2400	1901	2470	1800	2035			
2070	3000	1842	1970	2400	1910	2570	1800	2041			

Table 6. Positions of velocity features on South Cascade Glacier
[Coordinates X, Y, and Z are local, in meters, ± 0.1 meter]

	September 5, 1986			September 9, 1987		
ID	X	Y	Z	X	Y	Z
1	1,588.6	3,350.0	1,757.0	1,587.1	3,370.4	1,751.3
2	1,522.5	3,238.5	1,781.5	1,525.1	3,251.0	1,773.4
3	1,511.3	3,090.5	1,822.7	1,516.2	3,098.9	1,819.8
4	1,621.3	3,168.1	1,803.4	1,619.4	3,188.4	1,793.9
5	1,722.5	3,285.8	1,773.7	1,725.0	3,306.7	1,763.7
6	1,895.9	3,340.3	1,745.3	1,891.9	3,350.6	1,740.2
7	1,766.1	3,127.8	1,822.9	1,765.4	3,147.5	1,816.6
8	1,641.8	3,003.8	1,836.4	1,645.8	3,018.7	1,834.5
9	1,724.2	2,896.8	1,854.0	1,723.2	2,907.7	1,850.4
10	1,816.7	3,028.5	1,844.4	1,814.3	3,043.6	1,837.5
11	1,882.3	3,124.0	1,836.0	1,882.9	3,137.6	1,829.1
12	2,026.0	3,139.9	1,833.4	2,026.8	3,151.7	1,821.4
13	1,966.0	3,035.6	1,850.1	1,962.8	3,046.5	1,843.8
14	1,898.2	2,923.9	1,855.3	1,898.9	2,936.0	1,853.8
15	2,165.4	3,088.3	1,835.3	2,165.6	3,093.0	1,830.1
16	2,109.9	2,940.8	1,853.1	2,110.1	2,945.3	1,850.0
17	2,222.2	2,664.5	1,881.1	2,221.6	2,668.4	1,878.8
18	2,021.6	2,617.1	1,872.4	2,020.2	2,624.8	1,869.9
19	2,220.4	2,573.5	1,904.5	2,217.5	2,576.9	1,901.3
20	2,034.3	2,448.7	1,909.9	2,031.5	2,460.1	1,903.7
21	1,931.3	2,311.2	1,923.8	1,925.9	2,319.4	1,920.8
22	2,269.0	2,179.4	1,960.4	2,266.7	2,179.2	1,958.0
23	2,313.4	1,886.1	1,999.3	2,307.3	1,886.2	2,000.7

	September 9, 1987			September 12, 1989		
ID	X	Y	Z	X	Y	Z
1	1,925.1	3,166.1	1,825.5	1,926.2	3,190.9	1,816.2
2	2,050.1	3,125.1	1,831.5	2,049.1	3,144.7	1,822.4
3	1,935.0	3,087.4	1,841.0	1,932.7	3,113.6	1,832.8
4	1,771.9	3,015.5	1,841.2	1,766.4	3,044.6	1,832.0
5	1,724.9	2,923.0	1,849.2	1,720.1	2,950.1	1,842.9
6	1,857.6	2,942.7	1,852.4	1,860.3	2,972.4	1,845.9
7	1,875.6	2,843.7	1,855.8	1,874.0	2,871.8	1,850.2
8	1,981.3	2,912.6	1,856.4	1,984.1	2,931.7	1,847.4
9	2,040.2	2,982.2	1,851.4	2,041.1	2,997.2	1,846.1
10	2,154.5	2,915.7	1,850.0	2,148.9	2,927.3	1,846.4

Table 7. Snow density at South Cascade Glacier near P1 (fig. 1)

[Lengths are accurate to ± 0.01 meter and mass is accurate to ± 0.05 kilogram. Inconsistencies in depth summation and sample lengths, and bulk density are due to imprecise field measurements and rounding errors.]

A

May 16, 1986

[Measured in a snow pit, through the entire thickness of the snow, at local X = 1,811, Y = 2,764, Z = 1,863, cross section of snow tube = 4,100 mm^2]

Sample bottom depth (meters)	Sample length (meters)	Sample mass (kilograms)	Sample density (kilograms/meter^3)
0.43	0.43	0.395	219
0.84	0.41	0.440	256
1.31	0.47	0.760	391
1.73	0.43	0.715	402
2.09	0.36	0.730	485
2.46	0.37	0.735	475
2.87	0.41	0.885	516
3.25	0.38	0.830	522
3.59	0.34	0.740	520
3.87	0.28	0.645	550
4.28	0.41	0.890	519
4.63	0.35	0.810	553
5.01	0.38	0.815	512
5.40	0.39	0.895	548
5.80	0.40	0.860	514
5.92	0.12	0.315	627

Total water equivalent = 2.74 meters
Average density = 460

B

May 5-6, 1987

[Measured in a snow pit, through the entire thickness of the snow, at local X = 1,869, Y = 2,780, Z = 1,860, cross section of snow tube = 4,100 mm^2]

Sample bottom depth (meters)	Sample length (meters)	Sample mass (kilograms)	Sample density (kilograms/meter^3)
0.46	0.46	0.800	416
0.88	0.42	0.705	401
1.32	0.44	0.780	424
1.65	0.33	0.675	489
2.09	0.44	0.850	462
2.51	0.42	0.840	478
2.93	0.42	0.900	512
3.35	0.42	0.885	504
3.76	0.41	0.855	498
4.15	0.39	0.810	496
4.44	0.29	0.630	519

Total water equivalent = 2.09 meters
Average density = 470

C

May 19, 1988

[Measured in a snow pit, at local X = 1,910, Y = 2,900, Z = 1,852, cross section of snow tube = 4,100 mm^2]

Sample bottom depth (meters)	Sample length (meters)	Sample mass (kilograms)	Sample density (kilograms/meter^3)
0.48	0.48	0.880	443
0.88	0.40	0.670	400
1.32	0.44	0.895	485
1.72	0.40	0.829	490
2.05	0.33	0.658	484

Probes at the sample site showed a total snow thickness of 4.39 meters. The snow density below 2.04 meters depth is assumed to be 500.
Total water equivalent = 2.11 meters
Average density = 452

D

May 3, 1989

[Measured in a snow pit, through the entire thickness of the snow, at local X = 1,855, Y = 2,741, Z = 1,860, cross section of snow tube = 4,100 mm^2]

Sample bottom depth (meters)	Sample length (meters)	Sample mass (kilograms)	Sample density (kilograms/meter^3)
0.45	0.45	0.975	518
0.88	0.43	0.885	492
1.32	0.44	0.870	473
1.69	0.37	0.815	526
2.02	0.33	0.705	511
2.43	0.41	0.880	513
2.86	0.43	0.875	486
3.27	0.41	0.865	504
3.49	0.22	0.470	511
3.98	0.49	1.035	505
4.44	0.46	0.995	517
4.85	0.41	0.965	562
5.16	0.31	0.770	594

Total water equivalent = 2.65 meters
Average density = 514

Table 7. Snow density at South Cascade Glacier near P1 (fig. 1)--Continued

E

April 30-May 1, 1990

[Measured in a snow pit, through the entire thickness of the snow, at local X = 1,872, Y = 2,944, Z = 1,845, cross section of snow tube = 4,100 mm^2, and of auger = 4,570 mm^2]

Sample bottom depth (meters)	Sample length (meters)	Sample mass (kilograms)	Sample density (kilograms/ meter^3)
0.47	0.47	0.450	229
0.65	0.18	0.225	299
0.92	0.27	0.510	451
1.32	0.40	0.840	500
1.75	0.43	0.915	509
2.12	0.37	0.805	520
2.53	0.41	0.975	568
2.93	0.40	0.940	562
3.31	0.38	0.890	560
3.58	0.27	0.590	522
Begin auger			
4.19	0.61	1.355	486
4.81	0.62	1.490	526
5.12	0.31	0.750	529
5.81	0.69	1.520	482
6.28	0.47	1.230	573
6.45	0.17	0.250	322

Total water equivalent = 3.15 meters
Average density = 488

F

May 1-2, 1991

[Measured in a snow pit, through the entire thickness of the snow, at local X = 1,833, Y = 2,851, Z = 1,850, cross section of snow tube = 4,100 mm^2, and of auger = 4570 mm^2]

Sample bottom depth (meters)	Sample length (meters)	Sample mass (kilograms)	Sample density (kilograms/ meter^3)
0.45	0.45	0.685	364
0.90	0.45	0.690	366
1.36	0.46	0.795	413
1.71	0.35	0.670	457
2.15	0.44	0.795	432
2.59	0.44	0.895	486
2.98	0.39	0.825	506
Begin auger			
	0.43	1.010	514
	0.25	0.655	573
3.76	0.09 (0.10)	0.195	474
	0.45 (0.44)	1.195	581
4.50	0.30	0.730	532
	0.44 (0.46)	1.100	547
5.39	0.43	1.095	557
	0.52 (0.60)	1.225	515
6.35	0.26 (0.36)	0.625	526
	0.39 (0.35)	0.960	539
7.07	0.40 (0.37)	0.960	525
	0.29 (0.28)	0.695	524
7.63	0.28	0.745	582

Total water equivalent = 3.79 meters
Average density = 497

Table 8. Snow density near the South Fork Cascade gaging station, at 1,618 meters altitude
[Measured with a snow tube that penetrated the entire snowpack in one sample. The distance between sample locations was about 15 meters. Depths in meters, density (Den) in kilograms per meter cubed]

	May 17, 1986		May 6, 1987		May 19, 1988		May 4, 1989		May 1, 1990		May 2, 1991	
	Depth	Den	Depth	Den	Depth	Den	Depth	Den	Depth	Den	Depth	Den
	2.78	--	1.96	546	1.40	546	2.50	--	2.47	--	3.12	504
	2.70	--	1.78	514	1.35	472	2.60	--	2.99	--	3.20	516
	2.30	--	1.60	540	1.55	557	2.30	--	2.78	--	3.12	504
	2.15	--	1.68	515	1.45	527	1.90	--	2.78	--	3.02	487
	1.95	--	1.40	527	1.91	440	1.60	--	2.16	--	3.07	496
	1.95	--	1.57	484	1.52	517	1.70	--	2.37	--	3.25	523
	1.80	--	1.65	523	1.96	558	1.80	--	2.58	--	3.18	512
	1.75	--	1.63	563	--	--	1.70	--	2.69	--	3.23	520
	1.70	--	1.45	561	--	--	1.65	--	2.58	--	--	--
Average	2.12	--	1.64	530	1.59	517	1.97	--	2.60	--	3.15	508

Table 9. Snow depths at South Cascade Glacier

[Depths; in meters (m) measured with a probe rod; X, Y, and Z are local coordinates, ± 100 meters. The snow course is a line about 100 meters long and about 100 meters northwest of the South Fork Cascade River gaging station; its location is indicated by "--"]

May 16, 1986

X	Y	Z	Snow depth (m)	Name
2,476	1,675	2,040	6.25	Stake 1
1,811	2,764	1,863	5.98	Stake 2
1,891	3,632	1,682	2.42	Stake 3
1,769	3,824	1,650	2.80	Stake 4
--	--	1,619	2.12	Snow Course

May 5, 1987

X	Y	Z	Snow depth (m)	Name
2,712	1,655	2,062	4.85	Stake 1
2,139	2,024	1,960	4.90	Stake 2
1,869	2,780	1,860	4.46	Stake 3
1,684	3,447	1,730	3.73	Stake 4
1,891	3,671	1,668	2.58	Stake 5
1,745	3,825	1,645	3.04	Stake 6
1,560	3,960	1,616	1.10	DELTA
--	--	1,619	1.64	Snow Course

May 19, 1988

X	Y	Z	Snow depth (m)	Name
1,958	3,011	1,849	4.67	
2,035	3,051	1,840	5.40	
2,091	3,077	1,835	5.00	
2,128	3,096	1,825	3.75	
2,182	3,118	1,805	5.50	
2,238	3,150	1,795	4.40	
2,205	3,221	1,780	3.30	
2,185	3,268	1,760	4.30	
2,170	3,326	1,750	2.75	
2.104	3,351	1,740	2.45	
1,991	3,435	1,710	2.30	
1,939	3,499	1,690	3.50	
1,892	3,582	1,675	2.70	
1,837	3,700	1,665	0.87	
1,772	3,797	1,642	2.60	
1,591	3,953	1,616	1.80	
1,568	3,988	1,616	2.10	
1,539	4,027	1,616	1.28	
1,910	2,900	1,852	4.67	Stake 1
--	--	1,619	1.59	Snow Course

May 3, 1989

X	Y	Z	Snow depth (m)	Name
2,751	1,670	2,070	5.30	Stake 1
2,591	1,644	2,055	5.15	
2,463	1,651	2,078	5.75	
2,351	1,682	2,025	5.65	
2,257	1,728	2,015	5.65	
2,173	1,796	2,000	5.25	
2,107	1,862	1,978	5.45	
2,063	1,956	1,965	5.75	
2,031	2,051	1,952	5.35	
1,999	2,153	1,945	5.05	
1,972	2,252	1,933	4.85	
1,941	2,346	1,920	4.85	
1,908	2,440	1,890	5.45	
1,885	2,544	1,876	5.25	
1,865	2,640	1,868	5.20	
1,855	2,741	1,860	5.30	Stake 2
1,923	2,796	1,856	5.05	
1,986	2,848	1,850	5.05	
2,033	2,889	1,848	4.60	
2,111	2,939	1,846	4.40	
2,176	3,006	1,835	4.30	
2,214	3,082	1,820	4.00	
2,203	3,173	1,805	4.10	
2,156	3,263	1,760	3.20	
2,105	3,348	1,740	4.35	Stake 3
2,029	3,429	1,705	2.60	
1,951	3,500	1,686	3.55	
1,892	3,577	1,670	3.15	
1,866	3,682	1,660	1.65	Stake 4
1,793	3,783	1,640	2.85	
1,606	3,989	1,616	1.75	
1,580	4,014	1,616	2.10	
1,558	4,050	1,616	2.30	
--	--	1,619	1.97	Snow Course

April 30, 1990

X	Y	Z	Snow depth (m)	Name
2,687	1,528	2,065	7.75	
2,574	1,566	2,051	7.40	Stake 1
2,479	1,621	2,041	7.30	
2,376	1,687	2,030	7.10	
2,288	1,744	2,012	6.70	
2,204	1,812	1,994	6.70	
2,143	1,915	1,972	6.00	
2.097	2,012	1,958	6.90	
2,048	2,124	1,945	7.10	
2,028	2,215	1,938	6.45	
2,003	2,316	1,925	6.10	
1,978	2,425	1,900	6.20	
1,951	2,522	1,880	6.40	
1,920	2,610	1,864	6.80	
1889	2,706	1,861	6.40	
1869	2,806	1,852	6.45	
1,872	2,944	1,845	6.35	Stake 2

April 30, 1990--Continued

X	Y	Z	Snow depth (m)	Name
1,935	2,986	1,844	6.00	
1,996	3,021	1,842	5.65	
2,087	3,060	1,840	5.15	
2,166	3,116	1,825	6.20	
2,203	3,182	1,790	4.40	
2,171	3,244	1,768	3.00	
2,109	3,315	1,750	3.90	Stake 3
2,040	3,358	1,741	3.00	
1,970	3,381	1,719	3.70	
1,903	3,418	1,695	4.35	Stake 4
1,954	3,543	1,670	3.50	
1,909	3,658	1,660	1.30	Stake 5
1,845	3,790	1,640	2.95	
1,678	3,911	1,616	2.25	
--	--	1,619	2.60	Snow Course

May 1, 1991

X	Y	Z	Snow depth (m)	Name
2,728	1,686	2,056	8.03	Stake 1
2,340	1,733	2,025	7.93	
2,303	1,802	2,015	7.26	
2,224	1,923	1,975	7.96	
2,191	1,988	1,961	7.77	
2,154	2,065	1,958	8.44	
2,119	2,136	1,945	8.55	
2,092	2,201	1,942	8.26	
2,065	2,256	1,935	7.83	
2,031	2,331	1,922	7.91	
2,008	2,407	1,906	7.57	
1,984	2,482	1,890	8.14	
1,950	2,559	1,873	7.93	
1,916	2,619	1,865	7.88	
1,884	2,691	1,860	7.83	
1,858	2,765	1,856	7.73	
1,833	2,851	1,850	7.51	Stake 2
1,923	2,919	1,845	7.33	
2,000	2,965	1,844	6.98	
2,068	3,009	1,840	6.61	
2,123	3,051	1,835	6.38	
2,170	3,101	1,825	7.03	
2,181	3,168	1,790	4.99	
2,175	3,239	1,760	5.71	
2,117	3,281	1,750	5.46	
2,046	3,312	1,745	7.11	Stake 3
1,971	3,350	1,732	5.34	
1,920	3,383	1,710	3.30	
1,870	3,422	1,690	3.19	
1,823	3,476	1,685	5.27	Stake 4
1,833	3,545	1,675	4.22	
1,860	3,621	1,660	4.84	
1,875	3,680	1,651	2.80	Stake 5
1,560	3,966	1,616	2.30	
--	--	1,619	3.15	Snow Course

Table 10. Stake measurements at South Cascade Glacier in the 1986-91 balance year

[Surface material may be snow (s), firn (f), or ice (i); density estimated based on interpolation between measurements made in early May, and assumed density of firn of 0.6. Balance is the gain or loss of material, referenced to the previous year's melt horizon, in water content. Local X, Y, and Z coordinates (in meters ± 50 m) given for each stake. min, minimum; est min, estimated minimum; and min bal, minimum balance]

Date	Surface material	Depth (meters)	Density	Balance (meters)
Stake 1-86 [X = 2476, Y = 1675, Z =2040] (P-3 area)				
May 15	s	6.45	0.46	2.97
Sept. 23	s	0.26	0.60	0.16 (min)
Stake 2-86 [X = 1811, Y = 2764, Z =1863] (P-1 area)				
May 15	s	6.16	0.46	2.83
July 16	s	3.00	0.50	1.50
Sept. 22	i	-0.25	0.9	-0.23
Nov. 5	i	-0.31	0.9	-0.28 (est min)
Stake 3-86 [X = 1891, Y = 3632, Z =1682]				
May 16	s	2.50	0.49	1.23
July 16	i	-1.00	0.9	-0.90
July 18	i	-1.08	0.9	-0.97
Sept. 23	i	-5.15	0.9	4.64
Nov. 5	i	-5.45	0.9	-4.90 (est min)
Stake 4-86 [X = 1769, Y = 3824, Z =1650]				
May 16	s	2.90	0.50	1.45
July 16	i	-1.12	0.9	-1.01
July 18	i	-1.22	0.9	-1.10
Sept. 22	i	-5.47	0.9	-4.92
Oct. 15	i	-5.85	0.9	-5.27
Nov. 5	i	-5.90	0.9	-5.31 (est min)
Stake 1-87 [X = 2712, Y = 1655, Z =2062]				
May 6	s	5.00	0.42	2.10
July 1	s	2.90	0.50	1.45
July 15	s	2.32	0.52	1.21
July 21	s	2.06	0.52	1.07
Aug. 9	s	1.07	0.54	0.58
Aug. 23	s	0.45	0.56	0.25
Aug. 29	s	0.23	0.57	0.13
Sept. 17	f	-0.81	0.60	-0.49
Oct. 28	f	-1.48	0.60	-0.88
Nov. 10	f	-1.49	0.60	-0.89 (est min)
Stake 2-87 [X = 2139, Y = 2024, Z =1960]				
May 6	s	5.05	0.44	2.22
July 1	s	2.85	0.50	1.43
July 15	s	2.16	0.52	1.12
July 21	s	1.94	0.52	1.01
Aug. 9	s	0.88	0.54	0.48
Aug. 23	s	0.22	0.56	0.12
Aug. 29	s	0.04	0.57	0.02
Sept. 17	f	-1.03	0.60	-0.62
Sept. 21	f	-1.10	0.60	-0.66
Sept. 20	f	-1.26	0.60	-0.76
Nov. 10	f	-1.80	0.60	-1.08 (est min
Stake 3-87 [X = 1869, Y = 2780, Z =1860]				
May 6	s	4.40	0.47	2.07
July 1	s	2.03	0.50	1.02
July 16	s	1.33	0.52	0.69
July 21	s	1.13	0.52	0.59
July 30	s	0.48	0.53	0.25
Aug. 9	s	0.02	0.54	0.01
Aug. 18	i	-0.38	0.9	-0.34
Aug. 22	i	-0.65	0.9	-0.59
Aug. 29	i	-0.88	0.9	-0.79
Sept. 17	i	-1.81	0.9	-1.63
Nov. 10	i	-2.61	0.9	-2.35 (est min)
Stake 4-87 [X = 1684, Y = 3447, Z =1730]				
May 6	s	3.20	0.50	1.60
July 1	s	0.43	0.52	0.22
July 15	i	-0.36	0.90	-0.32
July 23	i	-0.80	0.90	-0.72
July 26	i	-0.95	0.90	-0.86
Aug. 9	i	-1.62	0.90	-1.46
Aug. 17	i	-1.92	0.90	-1.73
Aug. 22	i	-2.17	0.90	-1.95
Aug. 29	i	-2.50	0.90	-2.25
Sept. 15	i	-3.41	0.90	-3.07
Sept. 23	i	-3.64	0.90	-3.28
Oct. 28	i	-3.90	0.90	-3.51
Nov. 10	i	-3.95	0.90	-3.56 (est min)
Stake 5-87 [X = 1891, Y = 3671, Z =1668]				
May 6	s	2.70	0.52	1.40
July 1	i	-0.31	0.9	-0.28
July 10	i	-0.71	-0.64	
July 15	i	-1.27	-1.14	
July 26	i	-2.12	-1.91	
Aug. 10	i	-3.00	-2.70	
Aug. 17	i	-3.30	-2.97	
Aug. 22	i	-3.57	-3.21	
Aug. 29	i	-4.06	-3.65	
Nov. 10	i	-5.60	-5.04 (est min)	
Stake 6-87 [X = 1745, Y = 3825, Z =1645]				
May 6	s	3.12	0.52	1.62
July 1	i	-0.29	0.90	-0.26
July 10	i	-0.76	0.90	-0.68
July 15	i	-1.22	0.90	-1.10
July 23	i	-1.64	0.90	-1.48
July 26	i	-1.97	0.90	-1.77
Aug. 10	i	-3.12	0.90	-2.81
Aug. 16	i	-3.41	0.90	-3.07
Aug. 22	i	-3.70	0.90	-3.33
Aug. 29	i	-4.29	0.90	-3.86
Nov. 10	i	-5.90	0.90	-5.31 (est min)

Table 10. Stake measurements at South Cascade Glacier in the 1986-91 balance year--Continued

Date	Surface material	Depth (meters)	Density	Balance (meters)
Stake 1-88 [X = 1910, Y = 2900, Z =1852]				
May 19	s	4.67	0.45	2.10
July 22	s	2.15	0.50	1.08
Sept. 13	i	-0.58	0.90	-0.52
Oct. 27	i	-1.44	0.90	-1.29 (min bal)
Stake 1-89 [X = 2751, Y = 1670, Z =2070]				
May 3	s	5.30	0.47	2.49
July 6	s	3.78	0.51	1.93
Aug. 8	s	1.56	0.55	0.89
Sept. 26	f	-0.32	0.60	-0.19
Oct. 9	f	-0.34	0.60	-0.20 (min bal)
Stake 2-89 [X = 1855, Y = 2741, Z =1860]				
May 3	s	5.30	0.51	2.70
July 6	s	3.60	0.55	1.98
Aug. 8	s	1.48	0.57	0.84
Sept. 26	i	-0.37	0.90	-0.33
Oct. 9	i	-0.39	0.90	-0.35 (min bal)
Stake 3-89 [X = 2105, Y = 3348, Z =1740]				
May 4	s	4.35	0.54	2.35
July 6	s	2.07	0.56	1.16
Aug. 8	i	-0.31	0.90	-0.28
Sept. 27	i	-2.21	0.90	-1.99
Oct. 9	i	-2.70	0.90	-2.43 (min bal)
Stake 4-89 [X = 1866, Y = 3682, Z =1660]				
May 4	s	1.65	0.55	0.91
July 6	i	-0.95	0.90	-0.86
Aug. 8	i	-3.41	0.90	-3.07
Aug. 23	i	-4.16	0.90	-3.74
Sept. 27	i	-5.95	0.90	-5.36
Oct. 9	i	-6.66	0.90	-5.99 (min bal)
Stake 1-90 [X = 2574, Y = 1566, Z =2051]				
May 1	s	7.74	0.41	3.17
June 20	s	7.54	0.45	3.39
July 19	s	5.70	0.52	2.96
Sept. 23	s	2.44	0.55	1.34
Oct. 3	s	2.24	0.55	1.23
Stake 2-90 [X = 1872, Y = 2944, Z =1845]				
May 1	s	6.20	0.45	2.79
June 20	s	5.52	0.50	2.76
July 19	s	3.68	0.54	1.99
Sept. 24	s	0.10	0.55	0.05
Oct. 3	i	-0.40	0.90	-0.36
Stake 3-90 [X = 2109, Y = 3315, Z =1750]				
May 1	s	3.88	0.47	1.82
June 20	s	2.90	0.52	1.51
July 19	s	0.80	0.54	0.43
Stake 4-90 [X = 1903, Y = 3418, Z =1695]				
May 1	s	3.92	0.48	1.88
June 20	s	2.67	0.52	1.39
July 19	s	0.30	0.54	0.16
Stake 5-90 [X = 1909, Y = 3658, Z =1660]				
May 1	s	1.20	0.49	0.59
June 20	i	-0.02	0.90	-0.02
July 19	i	-2.93	0.90	-2.64
Stake 1-91 [X = 2728, Y = 1686, Z =2056]				
May 1	s	8.03	0.49	3.93
July 16	s	5.41	0.53	2.87
Aug. 13	s	3.57	0.55	1.96
Sept. 19	s	1.86	0.57	1.06
Oct. 16	s	1.25	0.57	0.71 (min bal)
Stake 2-91 [X = 1833, Y = 2851, Z =1850]				
May 1	s	7.65	0.50	3.83
July 16	s	5.04	0.54	2.72
Aug. 12	s	3.23	0.56	1.81
Sept. 20	s	1.11	0.57	0.63
Oct. 16	s	0.60	0.58	0.35 (min bal)
Stake 3-91 [X = 2046, Y = 3312, Z =1745]				
May 1	s	7.11	0.50	3.56
July 16	s	4.11	0.54	2.22
Aug. 12	s	2.06	0.56	1.15
Sept. 20	i	-0.24	0.90	-0.22
Oct. 21	i	-1.00	0.90	-0.90 (min bal)
Stake 4-91 [X = 1823, Y = 3476, Z =1685]				
May 1	s	5.27	0.50	2.64
July 16	s	1.97	0.54	1.06
Aug. 12	i	-0.23	0.90	-0.21
Sept. 20	i	-2.56	0.90	-2.30
Oct. 21	i	-3.36	0.90	-3.02 (min bal)
Stake 5-91 [X = 1875, Y = 3680, Z =1651]				
May 1	s	2.79	0.51	1.42
July 16	i	-0.37	0.90	-0.33
Aug. 12	i	-2.27	0.90	-2.04
Sept. 20	i	-4.88	0.90	-4.39
Oct. 21	i	-5.82	0.90	-5.24 (min bal)

Table 11. Runoff from South Fork Basin

[Daily values in millimeters, averaged over the basin; no data indicated by -99.9]

	1986 water year											
DAY	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	3.9	4.0	2.1	1.4	1.1	4.8	2.6	2.6	61.2	28.4	21.2	20.8
2	4.8	8.0	2.1	1.4	1.0	4.0	2.2	2.5	54.4	38.8	29.6	20.0
3	8.0	14.8	2.1	1.4	1.0	3.6	1.9	2.4	44.4	32.8	34.4	24.0
4	7.2	9.2	2.1	1.4	1.0	3.2	1.6	2.4	40.4	20.4	32.8	23.2
5	7.2	5.6	2.0	1.4	0.9	3.1	1.4	2.3	37.2	13.6	28.4	22.0
6	11.2	3.9	2.0	1.3	0.9	2.8	1.2	2.1	37.2	12.0	27.6	22.0
7	7.6	3.2	2.0	1.3	0.9	3.2	1.2	2.0	28.0	14.8	30.8	18.8
8	4.8	2.6	2.0	1.3	0.9	4.0	1.9	2.2	23.2	18.4	34.4	15.2
9	3.5	2.2	2.0	1.3	0.9	3.8	2.3	2.2	19.6	19.2	39.6	12.4
10	3.1	2.1	2.0	1.3	0.9	2.9	2.4	2.2	24.4	22.4	40.4	15.6
11	7.6	2.1	2.0	1.3	0.9	2.4	2.3	2.1	30.8	42.0	30.8	13.2
12	5.2	2.1	2.0	1.2	0.9	2.1	2.2	2.0	32.0	47.2	24.4	10.0
13	3.6	2.1	2.0	1.2	0.9	1.7	2.1	2.5	28.4	33.6	26.0	8.0
14	5.6	2.1	2.0	1.2	0.9	1.5	1.7	2.6	31.2	25.6	29.6	6.0
15	28.4	2.1	2.0	1.2	0.9	1.3	1.4	2.1	28.0	20.0	27.2	4.8
16	23.6	2.1	2.0	1.3	0.9	1.1	1.3	1.8	20.0	16.0	22.0	4.4
17	13.2	2.1	2.0	1.2	0.9	1.0	1.2	1.7	18.4	13.2	18.8	4.0
18	10.4	2.1	2.0	4.4	0.9	0.9	1.1	4.4	28.0	11.6	18.0	6.0
19	10.0	2.1	2.0	17.6	0.9	0.8	1.0	14.0	21.6	13.6	18.0	6.4
20	10.0	2.1	1.8	8.4	0.9	0.8	0.9	19.2	16.0	20.0	20.0	5.6
21	7.2	2.1	1.6	5.6	0.9	0.8	3.3	12.8	12.4	26.0	22.0	4.4
22	5.2	2.1	1.6	3.5	0.9	1.0	10.8	8.8	12.4	30.4	21.2	4.4
23	4.4	2.1	1.6	2.8	1.0	0.9	7.6	6.8	20.0	30.0	20.4	15.2
24	4.8	2.1	1.5	2.6	12.4	1.0	6.0	6.8	28.8	25.2	18.8	18.8
25	6.0	2.1	1.5	2.0	27.6	1.0	4.8	19.6	30.0	24.8	19.2	8.8
26	4.8	2.1	1.4	1.6	14.4	1.0	3.5	34.4	26.4	20.8	25.2	6.0
27	12.8	2.0	1.4	1.4	7.2	1.0	3.0	33.2	22.4	17.6	30.8	4.8
28	12.8	2.0	1.3	1.4	6.0	1.8	2.9	34.4	30.4	16.4	36.0	3.9
29	6.4	2.0	1.4	1.3		2.8	2.9	42.4	40.4	18.4	29.6	5.6
30	4.4	2.1	1.4	1.2		3.2	2.8	58.4	28.8	17.2	28.8	7.2
31	3.4		1.4	1.2		3.0		66.0		18.0	25.2	
SUM	251.1	97.3	56.3	77.1	88.9	66.5	81.5	398.9	876.4	708.4	831.2	341.5

	1987 water year											
DAY	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	7.6	6.8	2.1	1.0	1.1	0.1	0.1	20.4	12.0	46.4	20.4	38.8
2	5.6	5.6	1.7	1.1	0.9	0.1	0.2	12.8	8.8	42.0	18.8	41.2
3	4.8	4.8	1.4	1.2	0.6	0.6	0.3	8.4	10.0	34.0	22.4	26.4
4	5.6	4.8	1.2	1.0	0.5	1.6	0.4	6.0	19.2	28.8	28.0	22.4
5	7.2	7.6	1.0	0.8	0.4	3.1	0.5	6.0	26.8	34.0	27.2	25.6
6	7.6	6.8	0.9	0.6	0.3	3.9	0.6	8.8	24.0	30.4	26.4	30.4
7	6.8	5.6	0.8	0.5	0.3	3.1	0.6	18.4	28.4	24.4	29.2	32.0
8	6.8	4.4	0.7	0.4	0.2	2.2	0.6	26.4	32.4	24.8	34.8	27.6
9	6.8	3.7	0.6	0.4	0.2	1.6	0.6	27.2	31.6	19.2	39.2	26.4
10	6.0	3.2	0.6	0.3	0.2	1.2	0.6	24.8	28.4	16.8	35.2	30.0
11	4.8	3.2	0.5	0.5	0.2	0.8	0.7	25.6	23.6	20.4	26.4	30.8
12	4.4	2.8	0.5	1.6	0.2	0.6	0.6	67.6	30.0	24.4	22.4	28.4
13	4.4	2.5	0.5	2.7	0.1	0.5	0.4	41.2	38.8	30.4	23.6	26.0
14	4.4	2.4	0.5	2.3	0.2	0.4	0.4	41.6	37.6	33.2	32.0	22.8
15	4.4	2.2	0.5	1.8	0.1	0.3	0.7	34.8	34.8	32.8	26.4	22.0
16	4.8	2.4	0.4	1.3	0.2	0.3	1.1	22.0	28.8	24.4	23.6	12.0
17	4.8	2.5	0.4	1.0	0.2	0.3	1.2	18.0	20.4	20.0	20.4	8.8
18	4.4	2.6	0.4	0.8	0.1	0.3	1.1	17.2	19.2	21.6	20.8	7.2
19	4.4	3.2	0.4	0.6	0.1	0.3	0.8	13.2	23.2	32.0	23.6	7.2
20	4.4	6.4	0.4	0.5	0.1	0.2	0.6	9.6	29.6	30.4	24.8	9.2
21	4.4	6.4	0.5	0.4	0.1	0.2	0.4	8.0	32.4	30.8	18.8	15.2
22	4.0	4.4	1.0	0.4	0.1	0.1	0.4	7.2	22.0	26.0	20.4	20.4
23	4.4	13.2	1.5	0.4	0.1	0.1	0.4	7.2	15.6	25.6	23.2	20.8
24	4.4	16.0	1.4	0.4	0.1	0.1	0.7	8.4	14.0	36.4	24.0	19.2
25	7.2	7.2	1.2	0.4	0.1	0.1	1.0	10.8	17.2	38.0	25.6	16.4
26	39.6	5.2	1.0	0.4	0.1	0.1	1.5	13.6	25.6	29.6	25.6	15.6
27	48.0	4.4	0.8	0.4	0.1	0.1	3.7	14.4	33.2	34.0	25.6	9.2
28	28.8	3.2	0.7	0.5	0.1	0.1	11.2	13.6	40.0	31.2	27.2	7.6
29	16.8	2.6	1.1	0.4		0.1	16.0	11.6	46.4	31.2	27.2	10.4
30	12.8	2.2	1.4	0.4		0.1	24.0	16.4	47.2	27.2	29.2	14.4
31	9.2		1.1	0.4		0.1		17.6		23.6	32.4	
SUM	289.6	148.3	27.2	24.9	7.0	22.7	71.4	578.8	801.2	904.0	804.8	624.4

Table 11. Runoff from South Fork Basin--Continued

DAY	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
						1988 water year						
1	16.0	6.0	1.1	0.2	0.2	0.2	0.3	3.3	8.0	14.8	32.4	23.2
2	19.2	6.8	1.3	0.2	0.2	0.2	0.3	2.5	7.2	33.6	28.0	33.6
3	18.8	5.6	1.8	0.2	0.2	0.2	0.4	2.0	10.4	36.4	27.2	38.4
4	15.6	4.8	1.6	0.2	0.2	0.3	0.5	1.6	12.0	24.8	31.2	40.0
5	13.2	4.4	1.2	0.2	0.2	0.3	0.5	1.4	9.6	21.2	32.0	39.2
6	14.0	4.0	1.8	0.1	0.1	0.3	0.8	1.3	7.6	18.0	28.8	33.2
7	16.0	3.5	2.2	0.1	0.2	0.3	0.8	1.2	7.6	15.2	22.8	45.2
8	14.4	3.0	1.9	0.1	0.2	0.3	0.6	1.7	8.4	19.2	23.2	24.0
9	10.8	2.7	2.7	0.2	0.3	0.5	0.4	3.6	9.6	28.8	23.6	16.8
10	8.4	2.6	7.2	0.2	0.3	0.4	0.3	5.6	12.0	33.6	27.2	14.4
11	8.0	7.6	6.4	0.2	0.3	0.4	0.3	10.8	11.2	34.8	29.2	10.8
12	8.0	10.4	4.0	0.2	0.2	0.3	0.4	27.2	11.6	29.2	30.8	13.2
13	6.8	8.0	2.8	0.2	0.3	0.3	0.9	40.8	14.8	46.4	30.0	19.6
14	6.0	6.4	2.1	0.6	0.3	0.2	2.8	25.2	21.2	36.0	25.6	23.6
15	4.4	4.8	1.6	1.3	0.4	0.2	6.4	16.4	30.8	26.0	23.6	20.0
16	3.5	3.7	1.3	1.3	0.5	0.2	10.0	17.2	40.0	22.0	23.2	14.4
17	2.9	2.8	1.0	1.0	0.4	0.2	9.6	15.2	39.2	25.2	24.4	9.6
18	2.4	2.5	0.8	0.7	0.3	0.2	6.8	11.2	36.4	28.4	22.8	6.4
19	2.1	2.8	0.7	0.5	0.3	0.2	4.8	8.8	36.0	34.8	21.2	7.2
20	1.8	2.8	0.6	0.5	0.2	0.2	4.8	8.4	33.2	44.4	17.6	6.4
21	1.8	3.1	0.8	0.4	0.2	0.3	5.6	10.4	36.0	46.4	15.2	5.2
22	1.8	3.1	0.8	0.4	0.1	0.3	6.4	19.6	44.0	40.8	17.2	4.4
23	1.8	3.0	0.7	0.4	0.1	0.4	5.6	20.4	45.2	37.2	23.6	7.6
24	2.0	2.8	0.5	0.3	0.1	0.5	4.4	14.0	38.8	34.8	34.4	11.2
25	2.0	2.5	0.4	0.3	0.1	0.6	3.6	13.6	40.4	37.6	36.4	37.2
26	2.4	1.9	0.4	0.3	0.1	1.5	2.8	13.6	41.2	44.4	30.4	21.2
27	2.2	1.5	0.3	0.2	0.1	1.6	2.7	15.6	35.6	42.8	28.0	16.0
28	2.0	1.2	0.3	0.2	0.1	1.0	3.2	20.0	26.4	38.8	31.2	10.8
29	2.1	1.0	0.3	0.2	0.1	0.7	4.4	15.6	20.8	34.0	32.4	10.8
30	2.7	0.9	0.3	0.3		0.5	4.0	11.2	17.2	34.4	26.0	14.4
31	4.0		0.3	0.3		0.4		8.8		33.6	20.8	
SUM	217.1	116.2	49.2	11.5	6.3	13.2	94.4	368.2	712.4	997.6	820.4	578.0

DAY	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
						1989 water year						
1	17.6	16.8	1.3	0.8	1.8	-99.9	0.2	6.0	14.0	31.2	26.4	16.0
2	23.6	13.6	1.1	0.7	-99.9	-99.9	0.2	6.0	24.4	24.4	23.2	16.4
3	25.6	11.6	0.9	0.9	-99.9	-99.9	0.2	5.2	30.0	24.0	23.2	14.8
4	24.0	8.0	0.8	1.2	-99.9	-99.9	0.2	6.8	32.8	20.0	23.2	14.0
5	18.4	19.2	0.8	1.1	-99.9	-99.9	0.7	8.8	35.2	16.4	28.0	14.0
6	16.8	36.8	0.8	0.9	-99.9	-99.9	1.0	11.6	41.2	18.0	37.6	13.2
7	18.4	15.2	0.9	0.7	-99.9	-99.9	1.6	18.8	44.4	22.4	45.2	14.4
8	18.4	9.2	0.9	0.6	-99.9	-99.9	1.8	23.6	39.6	25.2	43.2	17.6
9	16.8	6.8	0.8	0.8	-99.9	-99.9	1.7	23.6	34.4	24.8	36.8	16.8
10	19.2	5.6	0.8	0.9	-99.9	-99.9	1.4	22.0	29.6	24.8	31.2	13.6
11	19.6	5.2	0.8	0.9	-99.9	-99.9	1.2	16.4	36.0	24.0	24.4	12.4
12	15.6	5.2	1.6	0.7	-99.9	-99.9	1.2	12.4	44.8	35.6	22.4	13.2
13	16.8	4.0	7.2	0.8	-99.9	-99.9	2.0	9.6	46.4	51.6	23.2	15.2
14	43.2	3.4	6.0	1.3	-99.9	-99.9	3.7	8.8	51.2	60.0	25.6	16.0
15	87.6	3.0	4.0	1.3	-99.9	-99.9	4.8	10.0	46.4	62.4	27.6	15.6
16	122.0	2.6	2.9	1.4	-99.9	-99.9	4.8	11.6	31.2	44.8	27.6	13.6
17	48.0	2.5	2.2	1.8	-99.9	-99.9	4.4	11.6	23.6	42.0	26.0	9.2
18	21.6	2.3	1.9	1.6	-99.9	0.2	4.0	10.0	21.2	37.6	24.8	6.8
19	20.8	2.2	1.7	1.1	-99.9	0.2	4.4	8.0	21.2	40.8	27.6	6.0
20	18.8	2.6	1.4	0.8	-99.9	0.2	5.2	6.0	17.2	40.0	28.4	6.8
21	16.4	2.4	1.2	0.7	-99.9	0.2	5.6	5.2	12.8	30.8	51.6	9.6
22	17.6	2.5	1.1	0.6	-99.9	0.2	4.8	5.2	12.8	24.0	56.4	15.2
23	11.2	2.9	1.0	0.5	-99.9	0.2	3.5	5.2	20.0	24.4	28.4	18.0
24	14.4	2.6	0.8	0.4	-99.9	0.2	3.0	5.2	28.4	27.2	20.8	17.6
25	11.2	2.3	0.8	0.3	-99.9	0.1	3.1	4.4	34.4	30.8	18.8	21.2
26	11.6	2.1	0.8	0.3	-99.9	0.1	3.0	3.6	35.6	38.0	19.6	24.0
27	8.4	2.0	0.7	0.3	-99.9	0.2	2.8	3.6	26.8	38.8	19.6	19.2
28	6.0	2.3	0.6	0.3	-99.9	0.2	2.8	3.7	22.4	32.4	18.0	17.2
29	5.2	2.2	0.6	0.3		0.2	2.9	3.5	21.6	30.8	18.0	16.8
30	15.2	1.7	1.0	0.8		0.2	4.0	4.0	28.4	32.4	17.2	19.2
31	20.4		0.9	1.8		0.2		7.2		28.4	17.6	
SUM	750.4	198.8	48.3	26.6	--	--	80.2	287.6	908.0	1008.0	861.6	443.6

Table 11. Runoff from South Fork Basin--Continued

DAY	1990 water year Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	14.4	1.4	1.9	1.1	1.6	0.2	0.5	1.8	13.6	33.2	40.0	28.4
2	9.6	1.2	2.0	1.3	1.4	0.2	0.8	1.9	10.8	28.0	34.0	19.6
3	7.2	3.3	12.8	1.2	1.0	0.2	0.9	2.4	13.6	27.2	33.2	17.2
4	6.0	11.6	97.2	1.4	0.8	0.2	1.1	3.8	16.0	28.4	35.6	18.8
5	6.0	7.2	41.6	1.6	2.0	0.2	1.5	9.2	11.6	32.8	44.4	21.2
6	8.4	5.6	15.2	1.9	2.6	0.2	2.0	15.6	11.2	35.2	46.8	21.6
7	9.6	4.8	9.2	2.1	3.2	0.2	2.6	10.0	15.2	38.0	38.0	20.0
8	10.0	4.4	8.4	2.1	3.9	0.3	3.1	6.4	12.8	40.0	28.4	19.6
9	9.2	65.2	7.2	3.1	4.8	0.3	2.8	5.6	13.6	43.2	26.4	19.2
10	13.6	127.2	5.2	3.3	8.0	0.3	2.1	5.2	21.6	42.0	32.8	17.6
11	12.0	58.0	4.4	2.1	10.8	0.3	2.0	5.6	18.0	56.4	41.6	17.6
12	22.0	23.6	3.7	1.6	14.0	0.3	2.6	5.6	13.6	82.4	50.0	18.4
13	17.2	13.2	3.2	1.2	11.2	0.3	2.6	5.2	10.0	72.0	47.2	18.0
14	10.8	9.2	2.8	1.0	6.4	0.3	2.6	4.8	9.2	54.8	37.2	18.8
15	6.4	6.8	2.5	0.9	3.9	0.3	3.4	4.4	12.4	54.0	28.4	16.8
16	4.4	5.6	2.2	0.7	2.2	0.3	5.6	3.8	16.8	51.6	26.0	18.4
17	3.4	5.2	2.0	0.6	1.4	0.3	9.2	4.0	16.4	40.8	23.2	17.6
18	4.8	4.4	1.8	0.6	0.9	0.3	7.6	4.0	18.0	33.6	28.4	16.0
19	6.8	7.6	1.8	0.5	0.6	0.3	6.0	3.8	18.8	31.6	27.2	15.6
20	5.6	11.6	1.7	0.4	0.7	0.3	6.0	4.0	24.0	35.2	28.0	13.2
21	5.2	10.4	1.5	0.4	0.6	0.3	6.4	4.0	36.0	44.4	48.8	14.8
22	4.4	6.8	1.3	0.7	0.5	0.3	6.8	4.8	54.8	50.4	59.6	23.6
23	7.2	5.6	1.3	1.4	0.4	0.3	6.4	5.6	61.2	46.4	37.6	25.6
24	10.0	5.2	1.3	1.4	0.4	0.3	5.2	5.6	59.6	34.4	22.0	20.8
25	6.4	4.4	1.2	1.6	0.4	0.3	4.4	4.4	46.8	30.0	21.2	16.8
26	4.8	3.7	1.1	1.9	0.3	0.3	4.0	3.7	37.2	28.0	15.6	16.8
27	3.8	3.2	1.0	1.7	0.3	0.3	3.2	4.8	30.8	30.8	12.8	15.2
28	3.0	2.7	1.0	2.2	0.3	0.3	2.8	10.8	28.8	38.8	14.0	14.4
29	2.3	2.3	0.9	10.0		0.3	2.2	18.8	30.4	46.8	18.0	14.4
30	1.9	2.1	0.9	4.0		0.3	1.8	14.8	36.8	48.8	44.0	12.4
31	1.6		0.9	2.4		0.4		16.0		47.6	47.2	
SUM	238.0	423.5	239.2	56.4	84.6	8.7	108.2	200.4	719.6	1306.8	1037.6	548.4

DAY	1991 water year Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	10.8	3.8	3.8	1.7	0.6	0.8	0.4	1.4	7.2	30.4	32.8	39.6
2	8.8	3.2	3.5	1.4	2.0	1.2	0.4	1.8	10.0	40.0	36.0	23.6
3	30.8	3.7	3.1	1.0	3.3	1.5	0.6	2.5	9.6	58.4	36.4	18.8
4	153.6	6.0	3.4	0.8	3.8	1.6	1.1	3.5	8.0	59.6	44.0	22.4
5	63.2	5.2	3.1	0.6	5.2	1.4	1.5	4.4	6.8	51.2	46.8	25.6
6	23.6	3.8	2.3	0.6	4.4	1.0	1.4	4.8	9.6	44.4	42.8	25.2
7	12.8	3.5	1.8	0.6	3.0	0.8	1.1	4.4	14.4	38.8	47.6	28.8
8	8.4	3.4	2.0	0.8	2.8	0.7	0.9	4.0	16.4	41.2	50.4	28.0
9	8.0	29.2	2.5	0.9	2.9	0.6	0.8	3.5	18.0	41.2	50.8	19.6
10	11.6	120.8	2.5	0.8	2.7	0.6	0.8	2.8	22.4	44.8	42.0	16.4
11	7.6	70.0	2.1	1.0	2.2	0.6	0.6	2.6	28.0	42.8	34.4	15.6
12	6.8	29.2	1.7	2.0	2.0	0.6	0.6	3.6	22.4	44.0	26.0	15.6
13	6.0	26.0	1.4	2.8	1.6	0.5	0.5	4.4	15.6	56.8	23.2	19.2
14	5.2	14.8	1.2	2.6	1.5	0.4	0.5	4.8	11.6	48.8	26.0	17.6
15	4.8	9.2	1.1	2.5	2.1	0.4	0.6	4.8	9.6	40.8	32.0	13.2
16	5.2	6.8	1.1	1.6	3.0	0.4	0.6	5.2	9.2	37.6	40.0	12.8
17	4.4	6.0	1.5	1.2	2.9	0.3	0.6	7.2	8.8	32.8	47.2	16.4
18	4.4	4.8	2.0	0.9	2.5	0.3	0.6	9.2	8.0	27.6	46.8	20.4
19	3.9	4.4	1.5	0.7	3.4	0.3	0.8	10.4	11.2	27.2	48.0	21.2
20	3.3	4.4	1.4	0.6	3.4	0.3	1.2	14.4	16.8	30.8	44.0	19.2
21	10.8	3.9	1.2	0.5	2.4	0.3	2.2	15.2	21.2	35.6	40.4	13.2
22	10.4	4.8	1.0	0.4	1.7	0.3	3.9	15.2	20.4	41.6	36.4	9.6
23	6.4	8.4	0.8	0.4	1.2	0.3	5.6	13.2	19.6	54.8	34.8	8.8
24	4.8	34.4	0.7	0.4	1.0	0.3	5.6	12.0	21.6	74.0	29.6	11.6
25	12.0	20.0	0.7	0.4	0.8	0.3	4.4	10.0	22.0	75.6	22.8	21.2
26	19.6	8.0	0.7	0.3	0.7	0.3	3.2	8.4	22.0	46.8	17.6	26.8
27	9.6	5.6	0.9	0.3	0.7	0.3	2.5	6.8	25.6	37.6	25.6	24.4
28	9.2	4.0	1.0	0.4	0.7	0.3	2.0	6.0	32.0	34.0	42.4	20.4
29	6.4	4.0	0.8	0.4		0.3	1.6	7.6	36.0	39.2	45.6	14.8
30	5.6	3.9	0.8	0.4		0.3	1.3	8.0	31.2	32.8	59.2	12.8
31	4.4		1.4	0.4		0.3		7.2		30.4	44.8	
SUM	482.4	455.2	53.0	29.4	64.5	17.6	47.9	209.3	515.2	1341.6	1196.4	582.8

Table 12. Runoff from Salix Basin
[Daily values in millimeters, averaged over the basin; no data indicated by -99.9]

	1986 water year											
DAY	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	0.2	8.5	0.9	0.7	2.0	5.7	2.7	0.9	38.9	-99.9	0.9	0.3
2	0.8	24.8	0.9	0.7	1.9	5.2	2.2	1.3	31.9	-99.9	0.8	0.2
3	0.6	31.9	0.9	0.7	1.8	5.0	2.1	2.4	29.5	-99.9	0.8	0.2
4	0.3	8.0	0.9	0.7	1.5	5.9	2.0	2.2	22.4	-99.9	0.8	0.1
5	0.3	4.3	0.9	0.7	1.4	6.3	1.6	1.5	24.8	-99.9	0.8	0.1
6	3.1	3.7	0.9	0.7	1.4	5.6	1.9	2.4	18.9	-99.9	0.7	0.1
7	1.1	2.6	0.9	0.7	1.3	13.0	4.8	4.1	16.5	-99.9	0.7	0.1
8	0.6	2.1	0.9	0.7	1.3	8.9	8.6	3.5	14.2	-99.9	0.6	0.2
9	0.5	1.8	0.9	0.6	1.2	5.3	7.0	3.1	17.7	-99.9	0.6	0.1
10	0.5	1.5	0.9	0.6	1.1	4.0	6.3	2.4	20.1	-99.9	0.5	0.3
11	10.0	1.5	0.9	0.6	1.1	3.1	4.4	1.9	21.2	-99.9	0.6	0.2
12	2.7	1.3	0.9	0.5	1.1	2.6	3.2	1.5	20.1	-99.9	0.5	0.1
13	2.1	1.1	0.9	0.5	1.1	2.2	2.5	1.3	-99.9	-99.9	0.5	0.2
14	20.1	1.1	0.9	0.5	1.1	2.0	2.1	1.2	-99.9	-99.9	0.3	0.2
15	17.7	1.5	0.9	0.5	1.1	1.8	1.8	1.1	-99.9	-99.9	0.3	0.2
16	10.9	1.6	0.9	0.5	1.1	1.5	1.4	1.1	-99.9	-99.9	0.3	0.2
17	7.9	1.3	0.9	0.5	1.1	1.3	1.3	3.4	-99.9	8.3	0.2	0.2
18	5.8	1.2	0.8	15.3	1.1	1.2	1.1	22.4	-99.9	4.6	0.2	0.6
19	11.3	1.1	0.7	37.8	1.1	1.2	0.9	24.8	-99.9	3.8	0.2	0.2
20	11.4	0.9	0.5	11.1	1.1	1.2	3.9	24.8	-99.9	3.2	0.2	0.2
21	5.2	0.9	0.5	4.1	1.1	1.8	17.7	10.5	-99.9	2.8	0.2	0.2
22	3.3	0.9	0.5	3.3	1.1	1.9	13.0	5.7	-99.9	2.8	0.2	0.1
23	2.8	0.9	0.5	3.2	1.1	1.6	5.7	4.1	-99.9	2.8	0.2	17.7
24	11.0	0.9	0.5	2.8	40.1	1.5	3.7	11.8	-99.9	2.6	0.2	3.9
25	11.1	0.9	0.5	2.2	54.3	1.3	2.7	34.2	-99.9	2.2	0.2	0.9
26	13.0	0.9	0.6	1.4	15.3	1.3	2.1	33.0	-99.9	2.0	0.1	2.0
27	34.2	0.9	0.7	2.2	7.1	2.8	1.6	31.9	-99.9	1.8	0.1	3.3
28	10.1	0.9	0.7	3.3	5.8	16.5	1.4	31.9	-99.9	1.5	0.1	3.8
29	5.1	0.9	0.7	2.7		7.8	1.2	40.1	-99.9	1.3	0.2	5.9
30	3.5	0.9	0.7	2.0		4.5	1.1	46.0	-99.9	1.1	0.6	4.4
31	3.1		0.7	1.9		3.3		40.1		0.9	0.6	
SUM	210.3	110.8	23.9	103.7	151.8	127.3	112.0	396.6	--	--	13.2	46.2

	1987 water year											
DAY	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	1.9	1.6	1.2	0.8	0.3	0.2	1.1	15.3	7.0	3.5	1.3	0.1
2	0.9	1.3	1.1	0.7	0.5	0.2	3.3	7.6	7.2	3.2	0.7	0.7
3	0.7	1.1	0.9	0.6	0.3	6.1	4.8	4.7	17.7	3.1	0.6	0.2
4	0.5	1.1	0.9	0.6	0.3	21.2	3.9	5.6	26.0	4.8	0.5	0.1
5	0.3	5.6	0.8	0.5	0.3	13.0	3.2	9.6	18.9	11.3	0.5	0.1
6	0.3	3.1	0.8	0.5	0.3	6.0	2.7	18.9	21.2	5.6	0.3	0.1
7	0.2	2.4	0.7	0.5	0.3	2.8	2.6	34.2	23.6	3.0	0.3	0.1
8	0.2	1.9	0.7	0.5	0.3	1.9	2.5	35.4	20.1	2.6	0.2	0.1
9	0.2	1.4	0.7	0.5	0.2	1.3	2.1	30.7	17.7	2.0	0.2	0.1
10	0.2	1.3	0.6	0.5	0.2	1.1	2.0	24.8	13.0	1.5	0.2	0.1
11	0.2	1.2	0.6	6.1	0.3	0.8	2.0	43.7	14.2	1.3	0.2	0.1
12	0.2	1.1	0.6	9.3	0.3	0.7	1.4	49.6	17.7	1.1	0.2	0.1
13	0.2	1.1	0.6	3.3	0.3	0.6	1.2	20.1	14.2	0.9	0.6	0.1
14	0.2	1.1	0.6	2.2	0.3	0.6	1.8	41.3	13.0	0.8	1.3	1.9
15	0.2	0.9	0.6	1.9	0.2	0.5	6.6	21.2	11.1	0.8	1.2	4.7
16	0.2	0.7	0.5	1.4	0.2	0.5	3.2	17.7	7.6	0.8	1.5	1.8
17	0.2	1.1	0.5	1.1	0.2	0.3	2.1	17.7	6.1	0.8	0.9	0.6
18	0.2	1.1	0.5	0.9	0.2	0.3	1.5	13.0	6.0	0.7	0.6	0.5
19	0.2	0.9	0.5	0.9	0.2	0.3	0.9	7.4	6.1	5.0	0.3	0.2
20	0.2	20.1	0.5	0.8	0.2	0.3	0.8	6.3	8.7	3.4	0.3	0.2
21	0.2	6.7	5.1	0.7	0.2	0.3	0.9	7.2	10.4	2.6	0.2	0.1
22	0.2	2.5	5.2	0.7	0.2	0.3	2.0	7.7	9.7	1.4	0.2	0.1
23	0.2	60.2	1.8	0.6	0.2	0.2	4.7	10.9	5.7	0.9	0.2	0.1
24	0.2	14.2	1.2	0.6	0.2	0.2	4.8	14.2	4.3	2.0	0.2	0.1
25	0.6	4.5	0.9	0.6	0.2	0.2	4.5	18.9	4.0	1.4	0.2	0.1
26	20.1	3.0	0.8	0.5	0.2	0.2	7.9	14.2	3.9	0.9	0.2	0.7
27	15.3	2.4	0.7	0.5	0.2	0.2	17.7	11.4	3.9	0.9	0.2	0.3
28	7.6	1.9	1.2	0.5	0.2	0.2	23.6	11.2	4.3	0.7	0.2	0.2
29	2.6	1.5	3.3	0.5		0.2	22.4	11.8	4.3	0.6	0.1	0.1
30	4.4	1.3	1.5	0.5		0.2	30.7	27.1	3.9	0.6	0.1	0.1
31	3.4		0.9	0.5		0.5		11.8		1.4	0.1	
SUM	62.2	148.3	36.5	39.8	7.0	61.4	168.9	571.2	331.5	69.6	13.8	13.8

Table 12. Runoff from Salix Basin--Continued

DAY	Oct.	Nov.	Dec.	Jan.	Feb.	Mar. (1988 water year)	Apr.	May	June	July	Aug.	Sept.
1	0.1	0.3	0.5	0.5	0.6	2.4	0.7	3.2	6.1	11.4	-99.9	-99.9
2	0.1	0.3	0.3	0.5	0.6	2.0	0.9	2.4	8.7	26.0	-99.9	-99.9
3	0.1	0.2	0.5	0.5	0.6	1.5	0.9	2.0	20.1	11.2	-99.9	-99.9
4	0.1	0.1	0.5	0.5	0.6	1.4	0.8	1.6	11.2	10.9	-99.9	-99.9
5	0.1	0.1	0.5	0.5	0.5	1.6	0.7	1.6	6.3	10.6	-99.9	-99.9
6	0.1	0.1	7.0	0.5	0.5	1.3	1.5	1.9	7.0	7.7	-99.9	-99.9
7	0.1	0.1	3.0	0.5	0.3	1.1	1.8	2.8	11.0	8.4	-99.9	-99.9
8	0.1	0.1	1.3	0.5	0.3	2.2	1.2	9.1	13.0	10.4	-99.9	-99.9
9	0.1	0.1	5.0	0.5	0.3	3.2	1.1	13.0	16.5	9.7	-99.9	-99.9
10	0.1	0.1	16.5	0.5	0.3	1.9	0.9	14.2	17.7	9.2	-99.9	-99.9
11	0.1	14.2	2.7	0.5	0.3	1.4	2.2	28.3	15.3	-99.9	-99.9	-99.9
12	0.1	4.3	1.6	0.5	0.3	1.3	5.0	54.3	18.9	-99.9	-99.9	-99.9
13	0.1	4.6	1.4	0.5	0.3	1.2	14.2	34.2	23.6	-99.9	-99.9	-99.9
14	0.1	2.5	1.2	3.5	0.3	1.1	20.1	13.0	34.2	-99.9	-99.9	-99.9
15	0.1	1.3	1.1	4.7	0.3	1.1	23.6	15.3	38.9	-99.9	-99.9	-99.9
16	0.1	1.1	0.9	2.5	0.3	1.1	20.1	22.4	37.8	-99.9	-99.9	0.1
17	0.1	0.7	0.9	2.0	0.3	1.1	13.0	11.8	26.0	-99.9	-99.9	0.2
18	0.1	3.7	0.8	2.0	0.3	1.2	8.4	7.1	36.6	-99.9	-99.9	0.5
19	0.1	4.1	0.7	2.0	0.3	1.6	7.8	6.5	26.0	-99.9	-99.9	3.5
20	0.1	3.2	0.7	1.3	0.3	2.0	13.0	11.8	27.1	-99.9	-99.9	1.3
21	0.1	2.8	0.6	0.9	0.3	1.9	14.2	24.8	29.5	-99.9	-99.9	0.6
22	0.1	1.4	0.6	0.8	0.3	1.5	14.2	30.7	31.9	-99.9	-99.9	0.3
23	0.1	1.2	0.6	0.6	0.3	1.4	9.0	17.7	27.1	-99.9	-99.9	4.1
24	0.1	0.8	0.6	0.6	0.3	1.2	5.6	16.5	26.0	-99.9	-99.9	11.8
25	0.1	0.7	0.6	0.5	0.3	1.1	3.8	17.7	26.0	-99.9	-99.9	34.2
26	0.1	0.6	0.6	0.5	0.3	0.9	3.7	16.5	20.1	-99.9	-99.9	4.3
27	0.1	0.6	0.5	0.5	0.6	0.9	5.7	24.8	16.5	-99.9	-99.9	9.2
28	0.1	0.6	0.5	0.7	1.8	0.9	11.1	26.0	11.3	-99.9	-99.9	5.0
29	0.1	0.5	0.5	0.6	3.3	0.8	10.4	11.8	9.1	-99.9	-99.9	2.6
30	0.1	0.5	0.5	0.6		0.7	5.0	7.3	8.0	-99.9	-99.9	1.3
31	0.3		0.5	0.6		0.7		6.0		-99.9	-99.9	
SUM	3.3	50.9	53.2	31.4	15.1	43.7	220.6	456.3	607.5	--	--	--

DAY	Oct.	Nov.	Dec.	Jan.	Feb.	Mar. (1989 water year)	Apr.	May	June	July	Aug.	Sept.
1	0.8	11.6	0.6	0.6	3.3	1.3	0.3	14.2	34.2	14.2	1.1	0.7
2	0.7	11.8	-99.9	-99.9	-99.9	1.3	0.3	8.4	35.4	13.0	1.5	1.1
3	0.5	9.3	0.5	1.2	-99.9	1.3	0.3	11.8	35.4	8.7	1.2	0.6
4	0.5	4.5	0.5	1.5	-99.9	1.3	0.3	14.2	38.9	8.5	0.8	0.5
5	0.5	44.8	0.5	1.2	-99.9	1.3	0.3	22.4	34.2	9.9	0.7	0.3
6	0.5	17.7	1.2	0.9	-99.9	1.3	2.0	27.1	34.2	-99.9	0.6	0.3
7	0.3	7.3	1.3	0.9	-99.9	1.3	8.9	26.0	33.0	-99.9	0.5	0.2
8	0.3	4.7	0.9	0.9	3.3	1.3	8.7	23.6	27.1	-99.9	0.5	0.2
9	0.3	3.2	1.3	0.7	3.3	1.3	6.4	21.2	26.0	8.5	0.3	0.2
10	0.3	3.5	0.9	0.6	3.3	1.2	4.5	11.4	31.9	7.2	0.3	0.2
11	0.3	2.6	0.9	0.6	3.3	1.2	3.4	7.6	35.4	7.4	0.3	0.2
12	0.3	2.4	4.6	0.6	3.3	1.1	4.0	7.2	33.0	8.9	0.3	0.2
13	0.7	2.0	26.0	0.5	3.3	0.8	6.5	10.7	33.0	8.3	0.3	0.1
14	27.1	1.8	6.6	0.5	3.3	0.7	10.1	14.2	27.1	7.4	0.6	0.1
15	59.0	1.5	3.8	0.5	3.3	0.6	13.0	16.5	17.7	6.8	1.2	0.1
16	66.1	1.4	2.2	0.5	3.3	0.6	11.4	13.0	13.0	6.6	1.8	0.2
17	11.4	1.3	1.9	0.3	3.3	0.6	9.1	9.3	18.9	5.6	0.9	0.2
18	14.2	1.2	1.8	0.3	3.3	0.6	10.0	6.0	15.3	4.0	0.6	0.2
19	7.6	1.1	1.5	0.3	3.3	0.6	11.8	4.5	8.3	3.4	0.5	0.1
20	4.7	0.9	1.4	0.3	3.3	0.6	13.0	4.7	9.1	2.8	0.5	0.1
21	6.1	0.9	1.3	0.3	3.3	0.6	10.9	6.8	15.3	2.6	5.7	0.1
22	4.5	0.9	1.2	0.3	2.7	0.6	6.4	7.0	21.2	2.1	5.6	0.1
23	3.1	0.9	1.1	0.3	1.6	0.5	5.9	4.8	23.6	1.9	1.4	0.1
24	3.0	0.8	0.9	0.3	1.3	0.5	7.0	3.7	24.8	1.5	0.8	0.1
25	2.2	0.8	0.9	0.3	1.3	0.5	8.4	3.3	20.1	1.4	0.9	0.1
26	3.1	0.7	0.9	0.3	1.3	0.5	7.2	4.3	16.5	1.2	1.1	0.2
27	1.9	0.7	0.9	0.3	1.3	0.5	7.2	3.7	14.2	1.2	0.9	0.1
28	1.5	0.6	0.9	0.3	1.3	0.5	8.5	3.8	13.0	1.1	0.7	0.2
29	1.3	0.6	0.9	0.9		0.3	10.4	9.4	17.7	0.9	0.5	0.3
30	7.2	0.6	0.7	6.5		0.3	15.3	17.7	16.5	0.9	0.5	0.3
31	3.4		0.6	3.7		0.3		24.8		0.9	0.5	
SUM	233.4	142.1	--	--	--	25.4	211.5	363.3	724.0	--	33.1	7.4

Table 12. Runoff from Salix Basin--Continued

	1990 water year											
DAY	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	0.5	1.2	1.9	1.1	1.1	0.9	-99.9	-99.9	14.2	26.0	2.8	3.2
2	0.3	1.2	8.9	1.1	1.1	0.9	-99.9	6.8	15.3	26.0	2.5	2.1
3	0.3	29.5	50.7	1.1	1.1	0.9	-99.9	9.9	41.3	30.7	2.2	1.4
4	0.3	13.0	129.8	1.1	1.1	0.9	-99.9	16.5	22.4	35.4	2.0	1.2
5	0.3	4.6	22.4	1.9	1.1	0.9	-99.9	37.8	14.2	23.6	1.8	0.9
6	0.2	2.4	11.8	2.6	1.1	0.9	-99.9	27.1	23.6	31.9	1.6	0.9
7	0.2	3.5	8.4	2.5	1.1	0.9	-99.9	11.2	26.0	29.5	1.4	0.8
8	0.2	5.8	7.4	2.1	1.1	0.9	-99.9	8.0	18.9	30.7	1.4	0.8
9	0.2	118.0	6.0	2.2	1.1	0.9	-99.9	8.0	24.8	28.3	1.3	0.7
10	0.9	92.0	5.0	3.3	1.1	0.9	-99.9	9.1	29.5	29.5	1.2	0.7
11	8.0	22.4	4.6	3.3	1.1	0.9	-99.9	13.0	14.2	33.0	1.2	0.7
12	15.3	11.8	4.1	2.0	0.9	0.9	-99.9	11.3	10.7	33.0	1.1	0.8
13	15.3	7.8	3.1	1.4	0.9	0.9	-99.9	9.2	10.5	24.8	1.1	0.7
14	5.0	6.0	2.5	1.3	0.9	0.9	-99.9	7.6	18.9	20.1	0.9	0.6
15	2.2	5.0	2.4	1.2	0.9	0.9	-99.9	6.3	27.1	17.7	0.9	0.7
16	1.4	4.5	2.2	1.2	0.9	0.9	-99.9	7.1	21.2	15.3	0.9	1.1
17	1.1	4.1	2.2	1.2	0.9	1.5	-99.9	11.8	27.1	13.0	1.3	0.7
18	2.0	3.9	2.2	1.2	0.9	2.7	-99.9	8.5	22.4	10.7	3.0	0.6
19	1.4	27.1	2.2	1.2	0.9	3.0	-99.9	7.7	24.8	9.3	1.4	0.6
20	1.4	23.6	2.2	1.2	0.9	2.7	-99.9	11.1	34.2	8.7	1.1	0.5
21	3.1	11.7	1.9	1.2	0.9	2.2	-99.9	7.8	53.1	8.1	4.8	0.5
22	2.1	6.7	2.2	1.2	0.9	1.8	-99.9	22.4	51.9	7.6	4.1	0.5
23	10.0	4.5	2.0	1.1	0.9	-99.9	-99.9	14.2	47.2	6.8	2.2	0.5
24	6.6	4.1	1.8	1.1	0.8	-99.9	-99.9	8.3	42.5	6.0	2.8	0.5
25	3.4	3.8	1.5	1.1	0.9	-99.9	-99.9	5.9	36.6	6.4	7.6	0.5
26	2.7	3.4	1.5	1.1	0.9	-99.9	-99.9	5.2	30.7	5.1	3.1	0.5
27	2.4	2.8	1.5	1.1	0.9	-99.9	-99.9	29.5	24.8	4.1	1.8	0.3
28	2.0	2.5	1.4	1.1	0.9	-99.9	-99.9	29.5	28.3	3.5	1.2	0.3
29	1.6	2.2	1.4	1.1		-99.9	-99.9	31.9	33.0	3.3	2.2	0.3
30	1.5	2.0	1.4	1.1		-99.9	-99.9	21.2	31.9	3.2	13.0	0.3
31	1.3		1.2	1.1		-99.9		23.6		3.0	8.6	
SUM	93.2	431.1	297.8	46.5	27.3	--	--	--	821.3	534.3	82.5	23.9

	1991 water year											
DAY	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	1.8	4.1	1.8	0.8	1.3	2.8	3.0	-99.9	18.9	36.6	9.3	5.8
2	2.1	3.4	1.5	0.8	11.2	2.8	3.4	-99.9	18.9	57.8	9.2	3.1
3	54.3	13.0	1.4	0.8	9.4	2.6	3.1	13.0	13.0	66.1	9.1	2.4
4	59.0	10.5	1.3	0.8	9.8	2.4	2.7	17.7	9.3	49.6	8.6	2.0
5	11.8	5.2	1.2	0.8	15.3	2.4	2.4	17.7	11.6	44.8	8.1	1.8
6	6.6	3.9	1.1	0.8	9.7	2.2	2.0	17.7	27.1	36.6	7.7	1.5
7	5.4	3.4	1.1	0.8	5.6	2.1	1.8	13.0	27.1	43.7	6.5	2.4
8	5.6	3.1	1.3	0.8	6.8	1.9	1.6	11.1	26.0	41.3	5.9	2.0
9	21.2	118.0	3.2	0.8	7.3	1.9	1.5	8.3	26.0	46.0	5.9	1.5
10	10.6	138.1	3.7	0.8	5.4	1.9	-99.9	6.5	29.5	40.1	9.0	1.3
11	5.4	46.0	2.0	1.3	4.4	1.9	-99.9	9.0	34.2	37.8	6.1	1.2
12	8.1	26.0	1.5	2.6	3.7	1.9	-99.9	15.3	18.9	48.4	5.0	1.1
13	5.6	41.3	1.3	2.7	3.1	1.9	-99.9	15.3	13.0	42.5	4.1	2.8
14	4.6	15.3	1.2	1.9	4.8	1.9	-99.9	15.3	9.4	33.0	3.5	1.5
15	7.4	8.9	1.1	1.3	9.1	1.9	-99.9	15.3	8.9	31.9	3.2	1.2
16	6.5	6.3	0.9	1.1	9.2	1.9	-99.9	20.1	11.3	26.0	3.1	1.1
17	4.3	5.1	0.8	0.9	6.0	1.9	-99.9	24.8	9.4	23.6	3.0	0.9
18	5.8	4.1	0.8	0.8	5.0	1.9	-99.9	24.8	15.3	18.9	2.8	0.8
19	4.0	3.9	0.8	0.8	4.1	1.8	-99.9	24.8	22.4	21.2	2.7	0.8
20	3.4	3.3	0.8	0.8	3.9	1.4	-99.9	27.1	30.7	22.4	2.6	0.8
21	41.3	3.0	0.8	0.8	3.3	1.4	-99.9	26.0	29.5	26.0	2.4	0.7
22	9.7	3.1	0.8	0.8	3.3	1.4	-99.9	21.2	24.8	26.0	2.2	0.7
23	5.8	13.0	0.8	0.8	3.3	1.4	-99.9	17.7	30.7	29.5	2.1	0.7
24	6.4	160.5	0.8	0.8	3.2	1.4	-99.9	15.3	30.7	33.0	1.8	0.6
25	40.1	22.4	0.8	0.8	2.6	1.4	-99.9	11.0	28.3	21.2	1.6	0.6
26	16.5	6.3	0.8	0.8	2.0	1.4	-99.9	8.1	28.3	16.5	1.5	0.6
27	14.2	4.5	0.8	0.8	2.1	1.4	-99.9	7.7	40.1	14.2	6.8	0.6
28	14.2	3.7	0.8	0.8	2.6	1.4	-99.9	13.0	46.0	13.0	14.2	0.6
29	7.7	2.6	0.8	0.8		1.4	-99.9	15.3	36.6	11.2	9.3	0.5
30	7.2	2.1	0.8	0.8		1.4	-99.9	13.0	31.9	10.1	4.6	0.5
31	5.2		0.8	0.8		1.4		13.0		9.6	6.8	
SUM	401.8	684.1	37.6	31.0	157.5	56.8	--	--	707.8	978.6	168.7	42.1

Table 13. Values used to interpolate snow depth (in meters) at any altitude (in meters)

1986

Altitude	Snow Depth
1,600	1.2
1,650	2.4
1,700	3.3
1,750	4.0
1,800	4.6
1,850	5.2
1,900	5.6
1,950	6.0
2,000	6.4
2,050	6.8
2,100	7.2
2,150	7.6
2,200	7.9

1987

Altitude	Snow Depth
1,600	0.9
1,650	2.6
1,700	3.3
1,750	3.8
1,800	4.2
1,850	4.5
1,900	4.7
1,950	4.8
2,000	4.9
2,050	5.0
2,100	5.1
2,150	5.1
2,200	5.1

1988

Altitude	Snow Depth
1,600	-0.5
1,650	1.0
1,700	2.6
1,750	3.7
1,800	4.6
1,850	5.3
1,900	5.9
1,950	6.5
2,000	6.9
2,050	7.4
2,100	7.7
2,150	8.1
2,200	8.5

1989

Altitude	Snow Depth
1,600	1.0
1,650	2.3
1,700	3.2
1,750	3.8
1,800	4.3
1,850	4.7
1,900	5.0
1,950	5.3
2,000	5.5
2,050	5.7
2,100	5.9
2,150	6.0
2,200	6.1

1990

Altitude	Snow Depth
1,600	0.6
1,650	2.1
1,700	3.3
1,750	4.2
1,800	5.0
1,850	5.6
1,900	6.2
1,950	6.7
2,000	7.1
2,050	7.5
2,100	7.9
2,150	8.3
2,200	8.6

1991

Altitude	Snow Depth
1,600	1.6
1,650	3.1
1,700	4.5
1,750	5.5
1,800	6.3
1,850	6.9
1,900	7.5
1,950	7.8
2,000	8.2
2,050	8.5
2,100	8.8
2,150	9.0
2,200	9.2

Table 14. Linear interpolations used to determine the bulk snowpack density at any altitude near the spring snowpack maximum depth

1986	-0.0002 * altitude + 0.83
1987	-0.000255 * altitude + 0.942
1988	-0.000277 * altitude + 0.964
1989	-0.0002 * altitude + 0.884
1990	-0.0002 * altitude + 0.818
1991	-0.000468 * altitude + 0.584

Table 15. Values used to interpolate net balance (in meters) at any altitude (in meters)

1986		1987		1988	
Altitude	Net Balance	Altitude	Net Balance	Altitude	Net Balance
1,637	-6.90	1,609	-6.36	1,639	-6.78
1,645	-6.30	1,635	-5.79	1,650	-6.16
1,656	-5.68	1,661	-5.21	1,664	-5.54
1,666	-5.04	1,690	-4.63	1,677	-4.96
1,677	-4.41	1,718	-4.11	1,692	-4.33
1,688	-3.78	1,753	-3.53	1,709	-3.71
1,701	-3.17	1,789	-3.03	1,730	-3.11
1,717	-2.60	1,829	-2.56	1,754	-2.56
1,738	-2.00	1,872	-2.10	1,789	-2.01
1,770	-1.37	1,919	-1.68	1,830	-1.51
1,813	-0.78	1,973	-1.29	1,877	-1.12
1,856	-0.40	2,024	-1.01	1,935	-0.76
1,913	-0.08	2,083	-0.77	1,996	-0.52
1,973	0.09	2,137	-0.59	2,056	-0.36
2,030	0.18	2,200	-0.43	2,120	-0.22
2,085	0.22			2,178	-0.14
2,143	0.25			2,214	-0.11
2,177	0.26				

1989		1990		1991	
Altitude	Net Balance	Altitude	Net Balance	Altitude	Net Balance
1,643	-6.67	1,613	-6.81	1,631	-6.94
1,654	-6.07	1,623	-6.27	1,638	-6.32
1,667	-5.44	1,632	-5.67	1,644	-5.71
1,679	-4.83	1,642	-5.10	1,651	-5.08
1,689	-4.22	1,652	-4.49	1,658	-4.43
1,700	-3.60	1,665	-3.88	1,668	-3.81
1,716	-2.97	1,679	-3.29	1,677	-3.18
1,740	-2.32	1,696	-2.70	1,687	-2.52
1,771	-1.70	1,718	-2.15	1,700	-1.88
1,804	-1.26	1,744	-1.66	1,722	-1.28
1,848	-0.81	1,776	-1.17	1,749	-0.71
1,900	-0.48	1,818	-0.69	1,790	-0.21
1,958	-0.23	1,859	-0.24	1,837	0.18
2,013	-0.09	1,909	0.20	1,891	0.46
2,079	-0.02	1,958	0.57	1,950	0.62
2,137	0.04	2,012	0.90	2,009	0.69
2,180	0.05	2,070	1.20	2,074	0.76
		2,123	1.43	2,136	0.79
		2,168	1.59	2,197	0.82
		2,196	1.68		

Table 16. Dates of South Cascade Glacier measured snow balance, $\bar{b}_m(s)$, and net balance, $\bar{b}_n$, number of measurement sites, and errors

	1986	1987	1988	1989	1990	1991
Date of $\bar{b}_m(s)$	May 17	May 6	May 19	May 4	May 1	May 2
Number of probes	5	8	19	32	31	35
$\bar{b}_m(s)$	2.45	2.04	2.44	2.43	2.60	3.54
estimated error in $\bar{b}_m(s)$	0.25	0.25	0.30	0.20	0.20	0.20
Date of $\bar{b}_n$	Nov 5	Nov 12	Nov 5	early Nov	Oct 16	Oct 15
Number of measurements	4	6	1	4	2	5
$\bar{b}_n$	-0.61	-2.06	-1.34	-0.91	-0.11	0.07
estimated error in $\bar{b}_n$	0.20	0.20	0.30	0.20	0.25	0.020

☆ U.S. GOVERNMENT PRINTING OFFICE: 2000 - 589-121 / 03020 REGION NO. 10

Krimmel -- SOUTH CASCADE GLACIER, 1986-1991 BALANCE YEARS -- WRIR 00-4006