

ANNUAL REPORT, 1966-67
STREAM ECOLOGY PHASE OF THE
CASPAR CREEK PROJECT

BY
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Introduction - During the 1966 - June 30, 1967 fiscal year, calibration work on the stream ecology phase of the project continued along about the lines of last year's work. The emphasis was on determining the importance of stream canopy, particularly as it affects the amount of solar radiation being received at the water surface and on stream conditions influenced by the amount of radiation. The fall of insects and spiders into the stream, and the proportions of pools and riffles in the study areas of both forks of the stream were studied. Observations were also made on stream insect drift, gravel composition, fish and algae abundance and distribution. Stream maps were improved and additional photographs were taken at various stations along both forks.

Members of the California Department of Fish and Game gathered, or assisted us in gathering data on gravel composition, fish, insect drift, and proportions of pools and riffles.

This report generally covers the work completed between about June 1, 1966 and June 1, 1967. A few comparisons with data gathered earlier are also presented. Not all information available has been analyzed as yet. Most of the field work reported herein was done by James Andrews. Data analysis

was carried out by John De Witt, William Goodnight, Gary Jackson, Richard Brandon, and Andrews.

Solar Radiation - Solar radiation at various stations on both forks of the creek was measured with a pyr heliograph on different days and under different conditions of weather, or only on clear days between June and September, 1966. In Figures 1A, 1B, 2A and 2B these measurements are compared with the calculated total amount of light available for the latitude and the amount of light reaching a completely exposed hillside station near the mouth of the south fork.

The proportion of the mean maximum radiation available being received by the open hillside station, and thus, no doubt, by the stream stations, depends partly on the time of year as the line (determined by the "least-squares" method) in Figure 3 shows. The distribution of the circles on the figure shows, however, that the weather is a much more important factor in this respect.

Figures 1A and 1B show the amount of radiation reaching various stations on both forks on clear days in the summer of 1966. Figures 2A and 2B show the percentage of available light that reached various stations during the same season.

The recorded amount of radiation reaching the study areas was almost always less than 30 per cent and usually less than 15 per cent of the total available on any given day. Weather conditions, of course, generally accounted for some of the difference, but on the whole, stream shading was much more important. At some stations, shading is such that

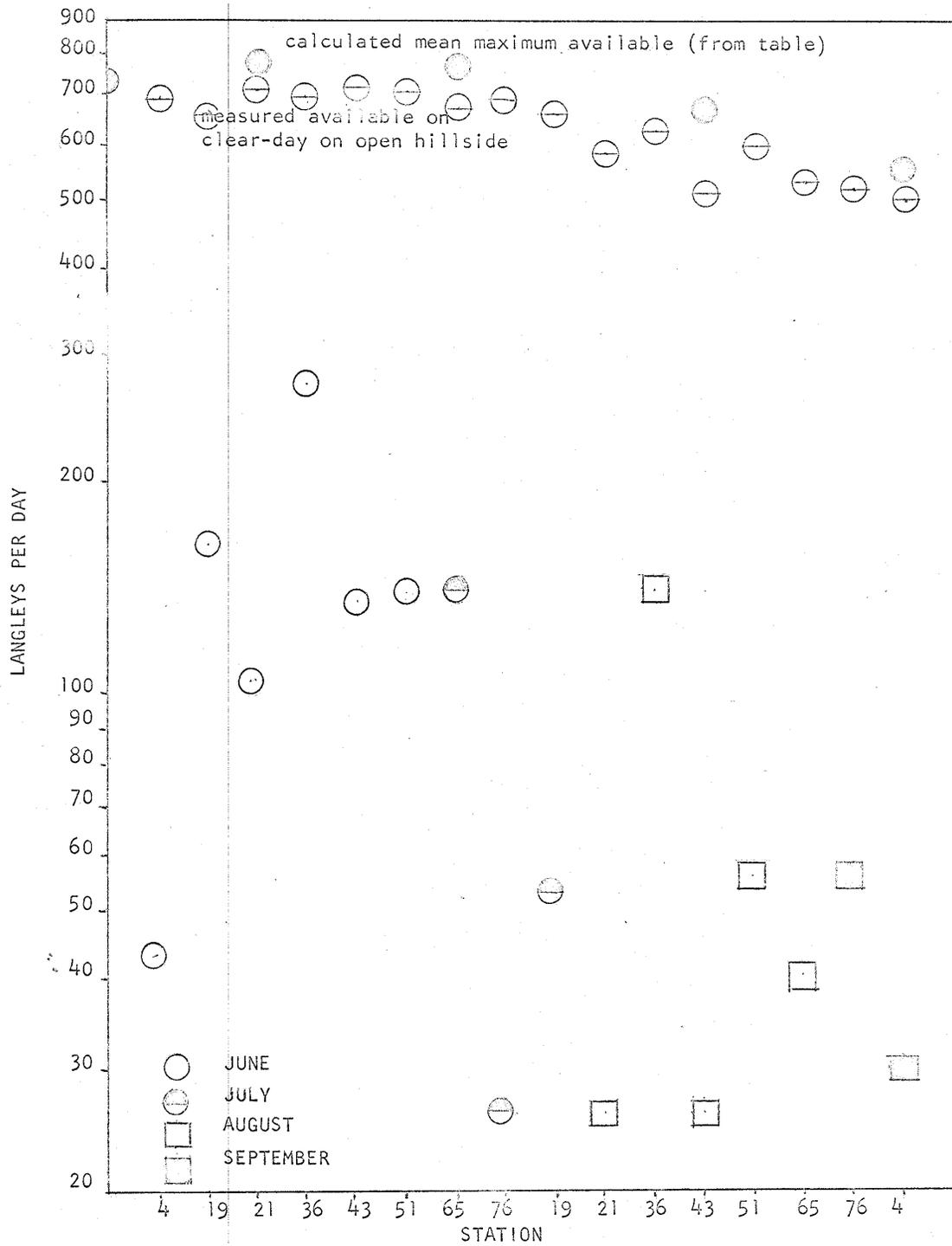


Figure 1A. Comparison of amount of light reaching different stations on clear days on the South Fork of Caspar Creek with calculated available and measured available light, June to September, 1966.

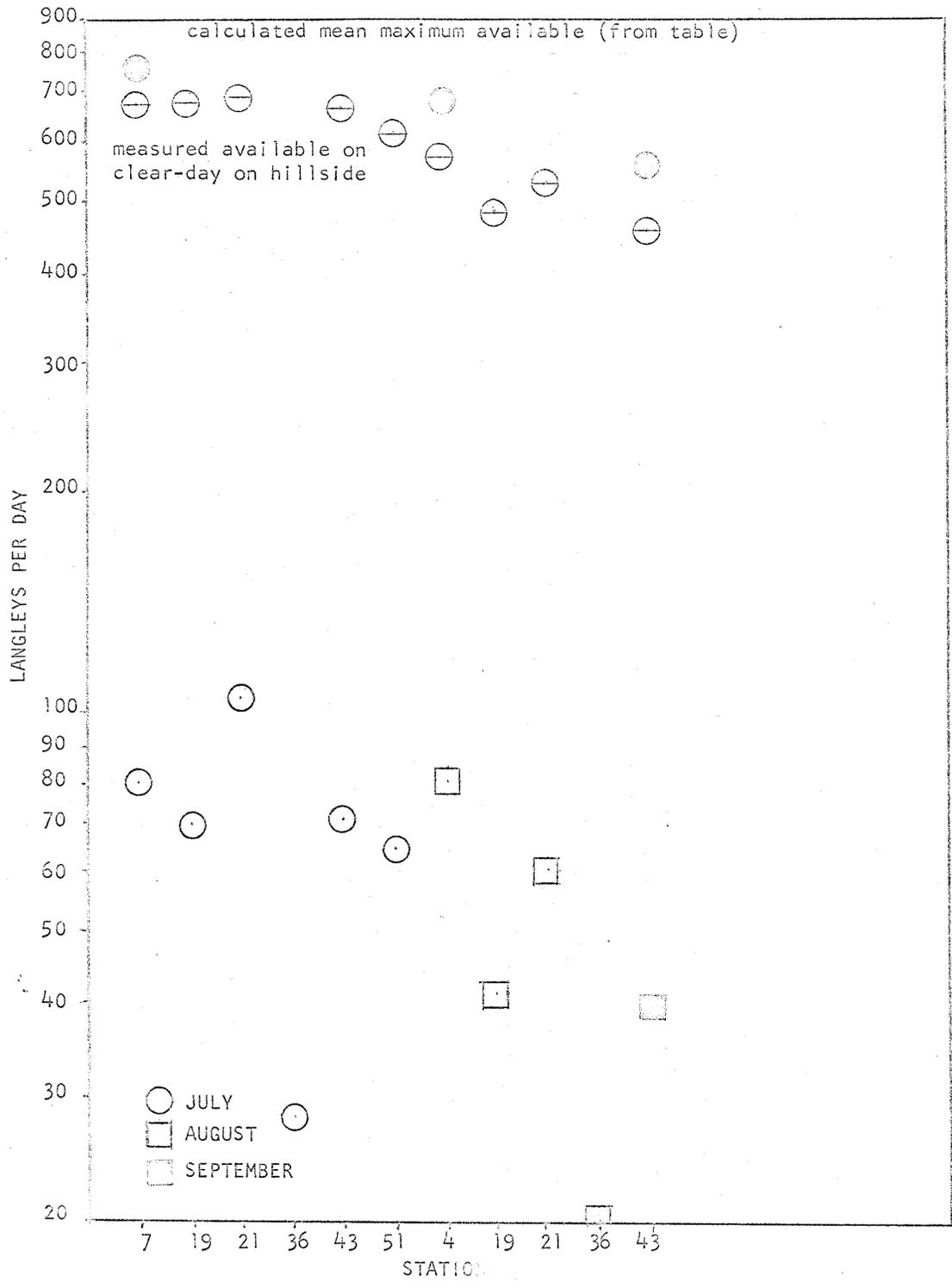


Figure 1B. Comparison of amount of light reaching different stations on clear days on the North Fork of Caspar Creek with calculated available and measured available light, July to September, 1966.

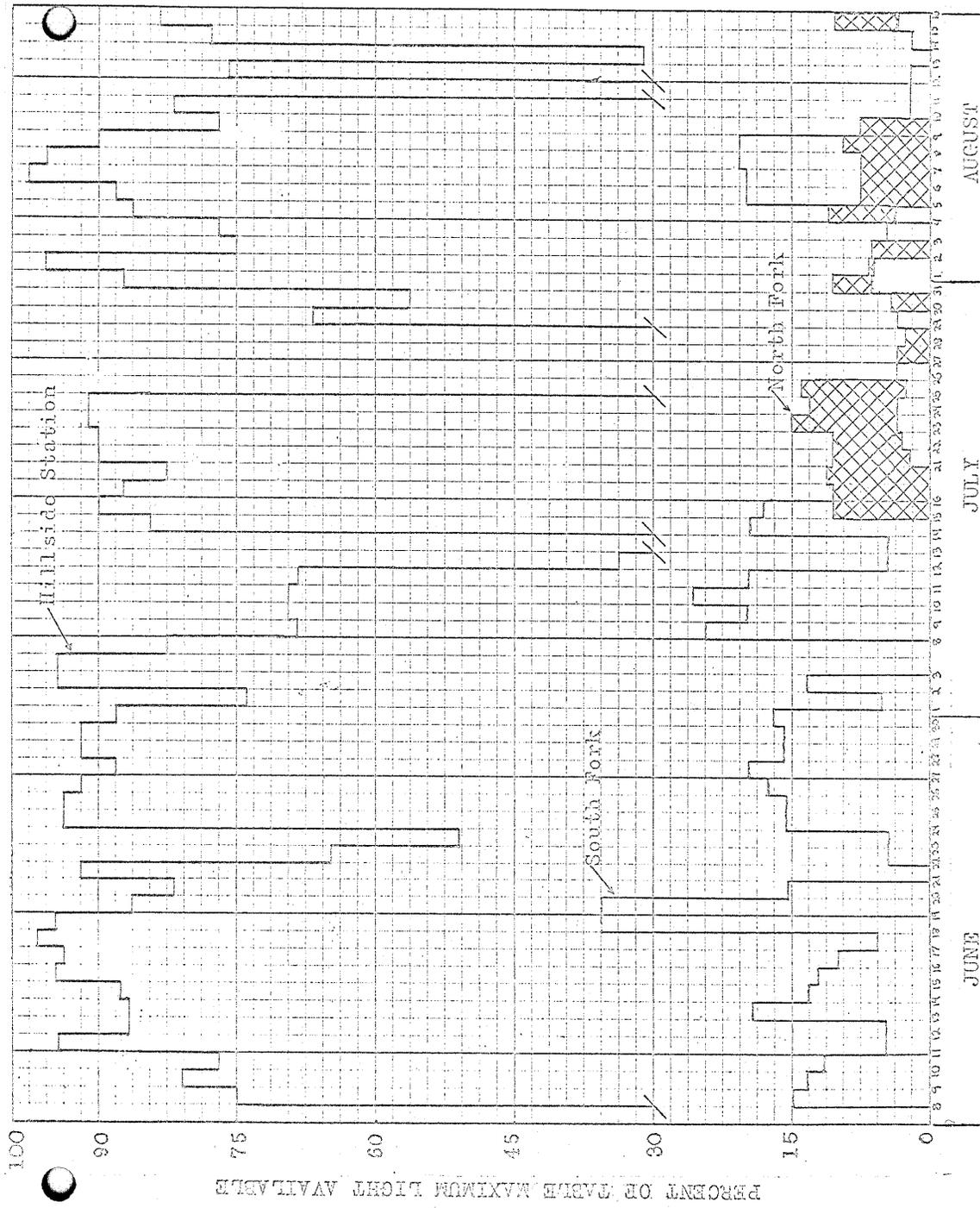


Figure 2A. Percentage of available (mean maximum) solar radiation received daily at various south and north fork Caspar Creek stations and at open hillside station, June - September, 1966.

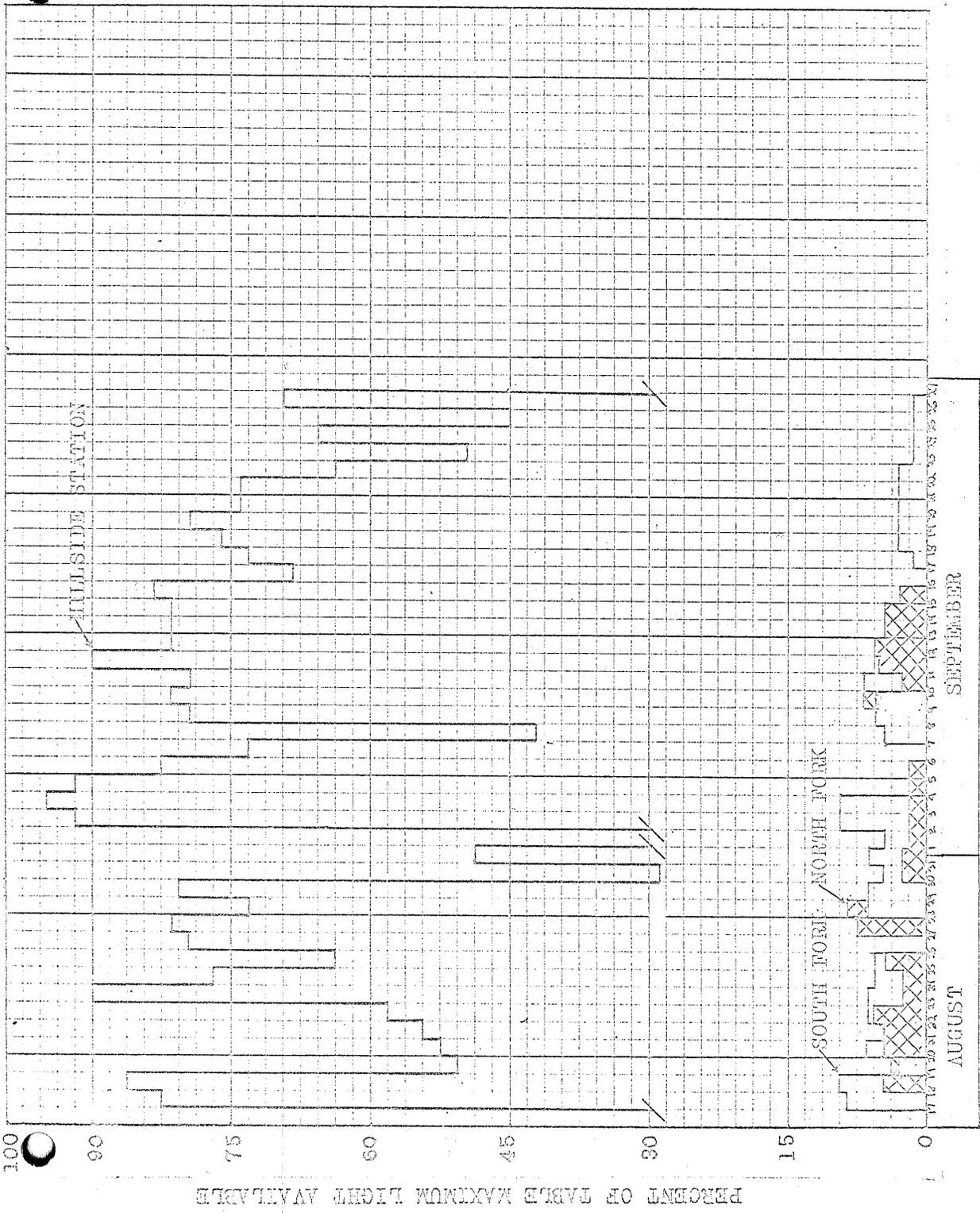


Figure 2A. (Continued)

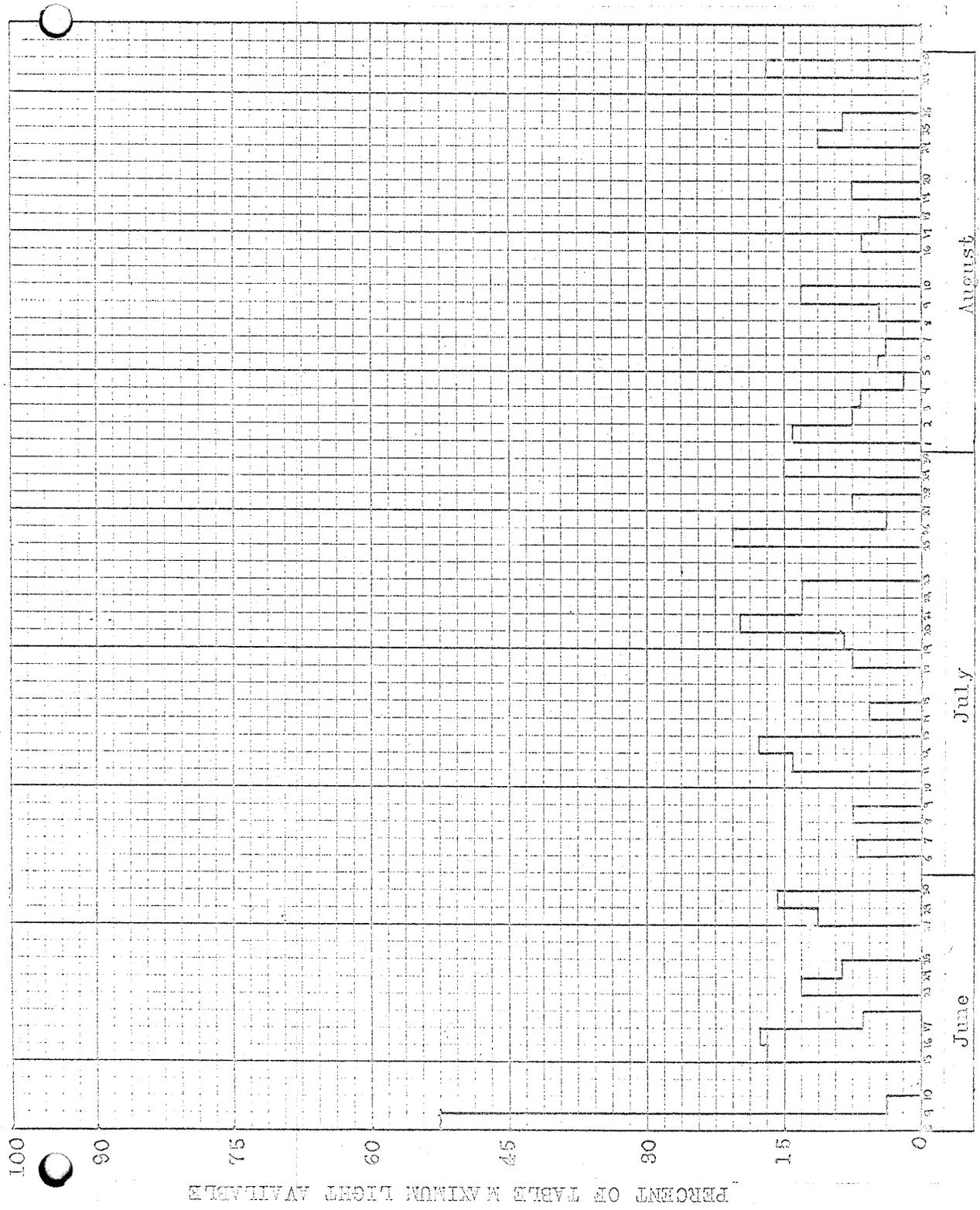


Figure 2B. Percentage of available (mean maximum) solar radiation received daily at various stations on the south fork of Caspar Creek, June - August, 1965.

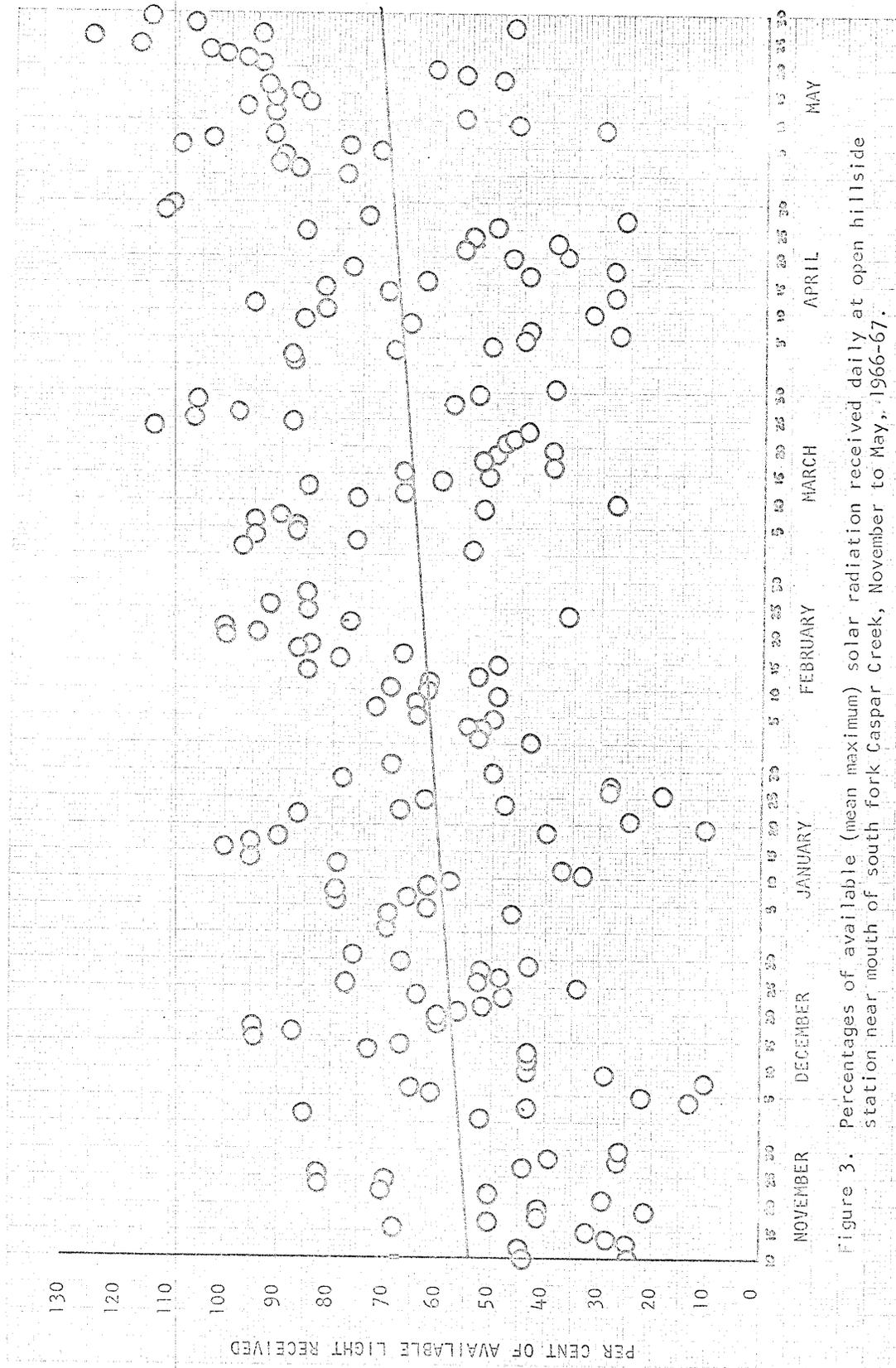


Figure 3. Percentages of available (mean maximum) solar radiation received daily at open hillside station near mouth of south fork Caspar Creek, November to May, 1966-67.

even on clear days only as little as about 2 per cent of the light available reached the stream. For comparative purposes, the 1965 streamside measurements on the south fork are presented in Figure 2B. Based on the data analyzed to date there does not appear to be much difference between the two forks in the amount of radiation received at streamside.

Water and air temperatures - Daily maximum and/or minimum mid-summer temperatures often were 2 to 5° F. lower in the south fork than in the north fork in the three years for which data are available. Figures 4 and 5 give some of the data available for 1966. Early fall temperatures apparently tend also to be lower in the south fork.

On clear mid-summer days, water temperatures tended to be increasingly higher downstream in both forks. The total difference was 2 or 3° over a distance of about 1 mile in both cases. On the other hand, air temperatures tended to be lower by up to 2 or 3° farther downstream (see Figures 6 and 7). All temperature data shown were gathered from upstream (beginning at 1400 hours) to downstream (ending at 1625 hours). Air temperatures peaked around 1400 or 1500 hours and water temperatures peaked about 1200 hours. As would be expected, there seemed to be a general correlation between water temperature and the extent of the floral canopy at the observation stations, although the data so far analyzed are sketchy.

Food organisms - In June, July, and August, 1966, square-meter "drop insect" samples were collected along both forks. Each collecting box was set over the stream at a station

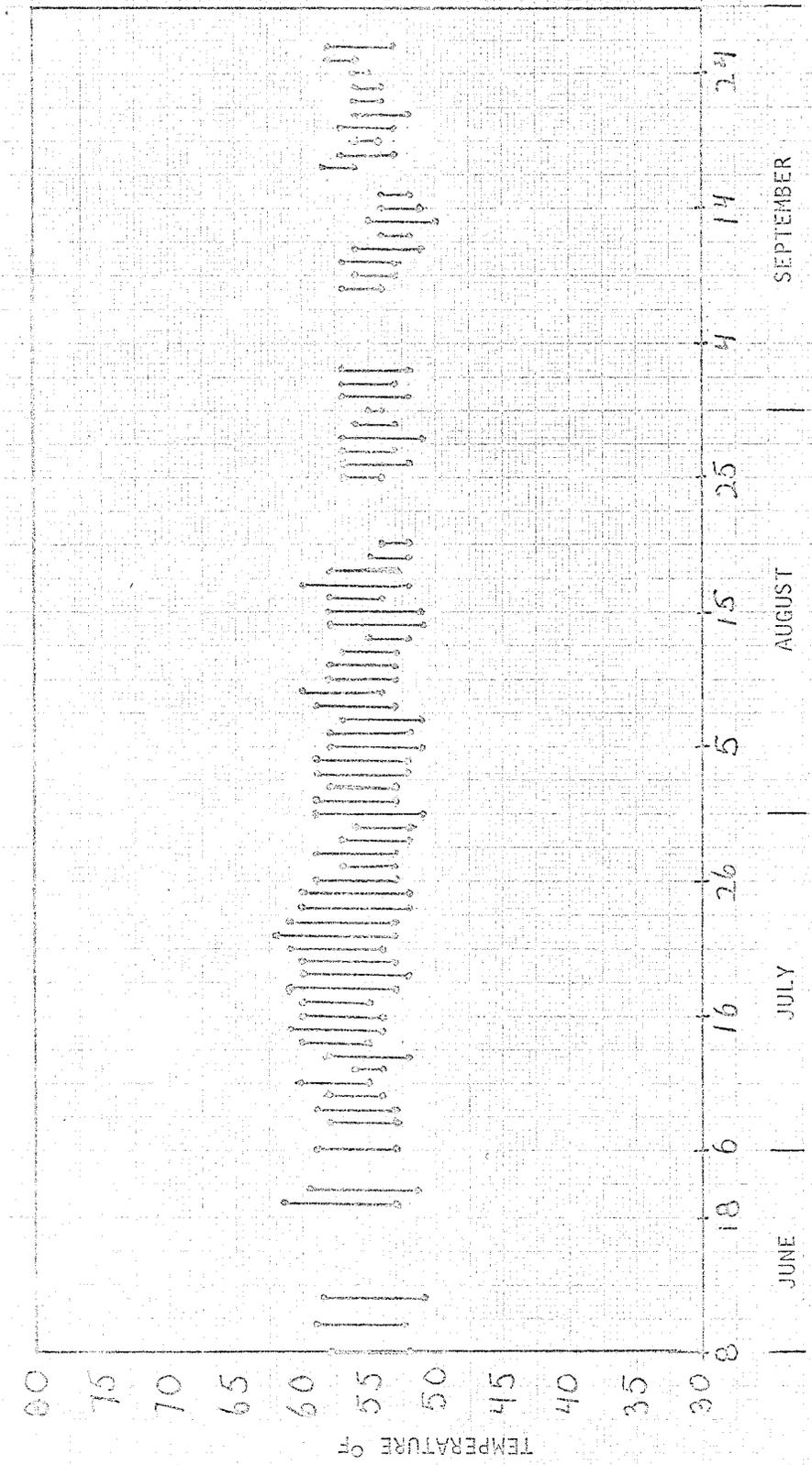


Figure 47. Daily maximum and minimum recorded water temperatures 50 feet above station no. 7, south fork Caspar Creek, 1966.

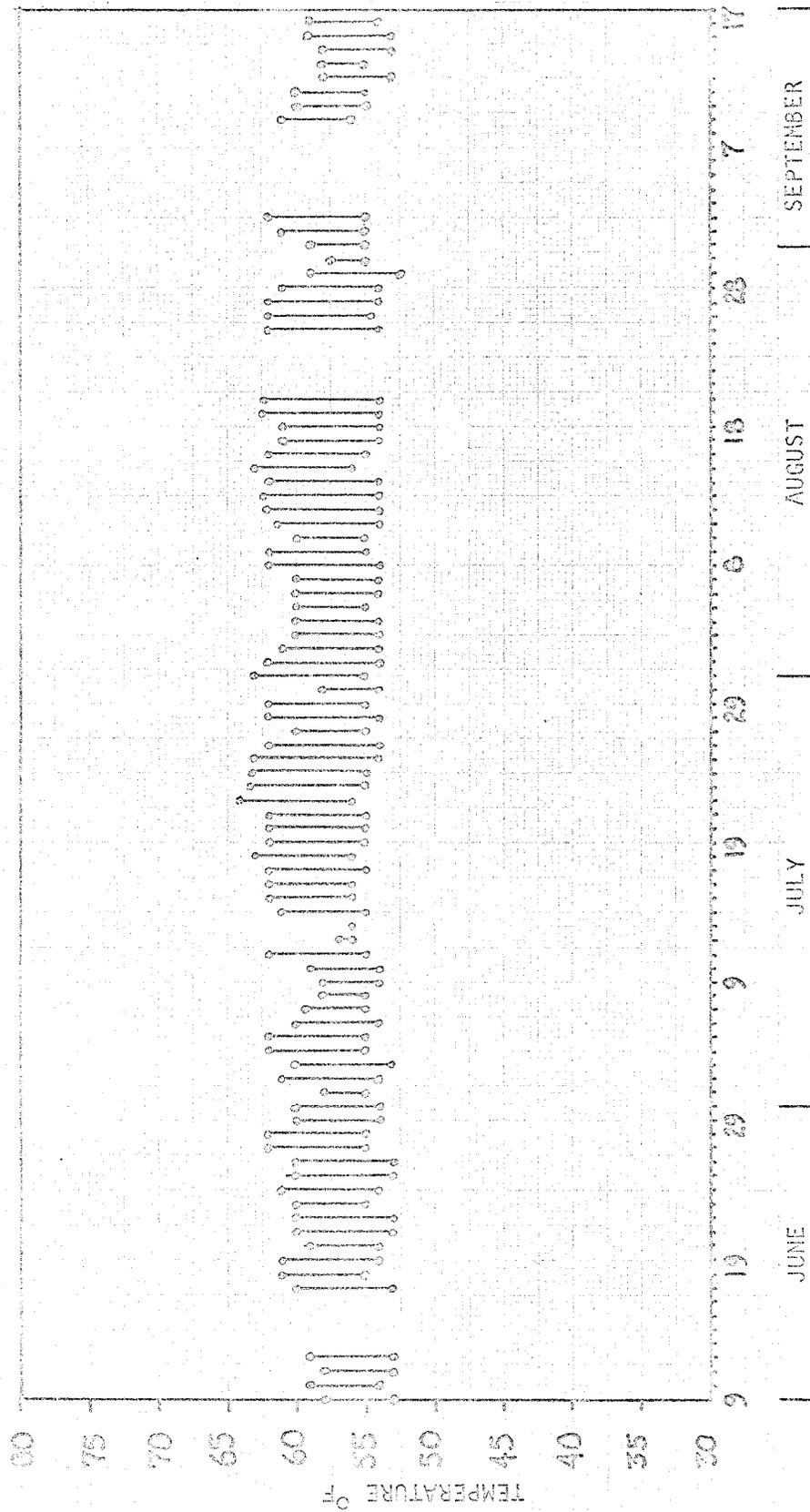


FIGURE 5. Daily maximum and minimum water temperatures measured 50 feet above station no. 7, north fork Caspar Creek, 1966.

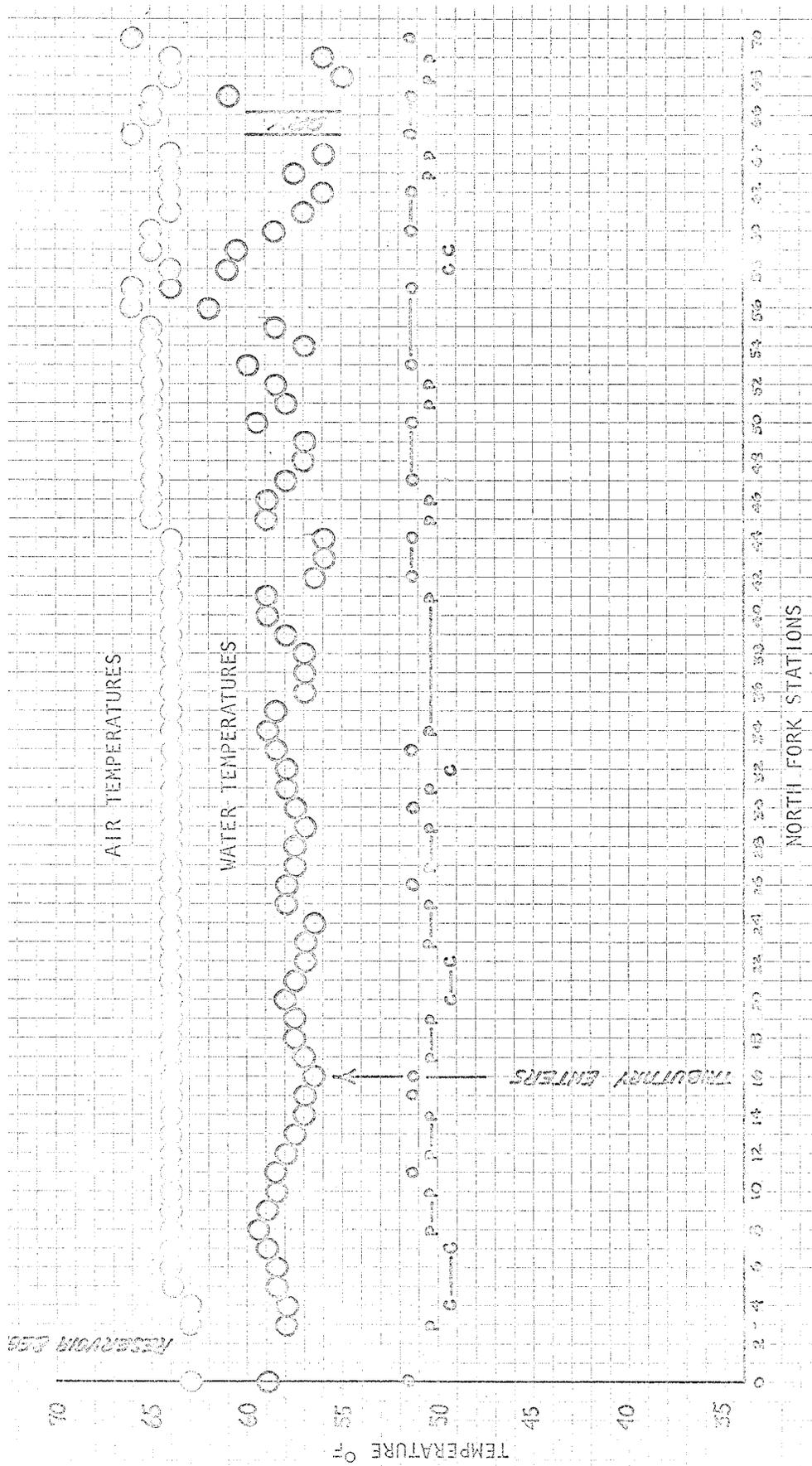


Figure 6. Water and air temperatures at various north fork Caspar Creek stations, between 1400 and 1625 hours on a clear day, July 23, 1966. Dark circles are air temperatures; open circles are water temperatures. Symbols 0, P, C indicate open, partially closed, and completely closed canopy, respectively.

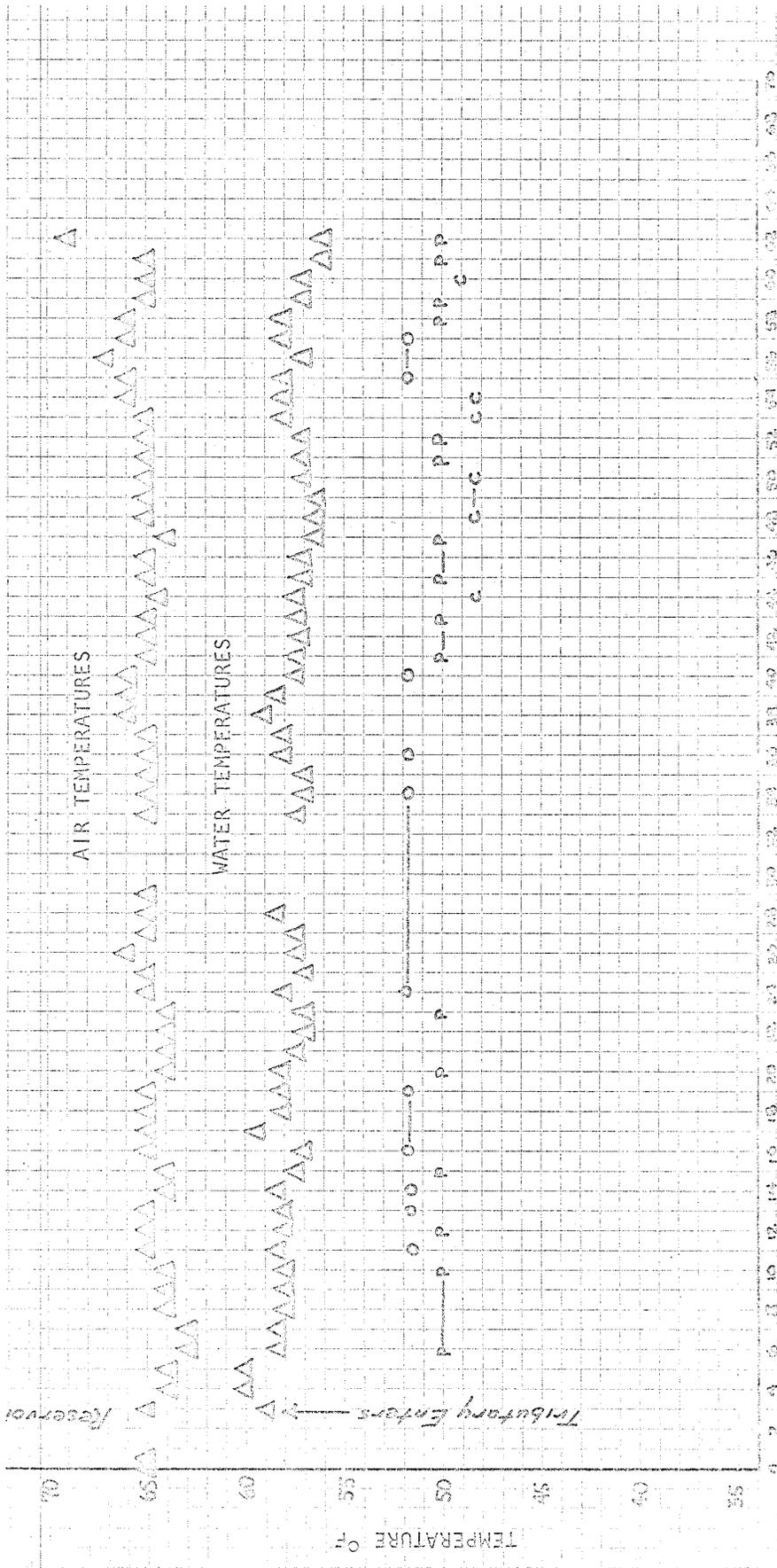


Figure 7. Air and water temperatures along south fork Caspar Creek, between 1400 and 1625 hours on a clear day, July 25, 1966. Dark triangles are air temperatures; open triangles are water temperatures. Symbols O, P, and C indicate open, partially closed, and completely closed canopy, respectively.

for at least 24 hours. Terrestrial insects, adult aquatic insect, or spiders dropped into the boxes and were trapped. The animals collected were keyed to order, counted and weighed. The data obtained are presented in terms of (24-hour) "box-days". A total of 174 box-days of information was obtained, 72 representing each fork of the creek.

The composition of the collections is given in Table 1. Values less than about 1 per cent were not included in the table. The orders, Diptera (true flies), Coleoptera (beetles), Psocoptera (psocids), Homoptera (planthoppers, etc.), and the subclass Arachnida (spiders) were predominate in numbers. Aquatic insects constituted only a minor part of the collections.

If there is any difference between forks in the total numbers of insects dropping, the south fork predominates, as is indicated in Figure 8, but the reverse is true when animal weight is considered. Seasonal patterns of drop by insect order in some cases are suggested.

The mean wet (blotted) weight of insects and spiders collected per box-day varied by sampling period (see Figure 8) from 0.12 to 0.33 grams (overall mean, 0.10 grams) for the south fork. The overall mean for both forks combined was 0.14 grams.

The total weight of all animals collected during the periods in question was 20.08 grams. Of this total, 12.40 grams came from the north fork. Relatively small numbers of large crickets, beetles, and other insects and spiders

Table 1. Percentages the various orders makeup of the total numbers of insects and spiders collected in drop boxes along the south and north forks of Caspar Creek, June - August, 1966.

ORDER	JUNE 11-13		JUNE 22-25		JULY 12-13		JULY 25-29		AUGUST 8-12		SUB- TOTALS		TOTALS
	N.F.	S.F.	N.F.	S.F.	N.F.	S.F.	N.F.	S.F.	N.F.	S.F.	N.F.	S.F.	
COLEOPTERA	13.0	10.5	11.0	10.3	8.4	8.4	5.0	7.3	3.8	10.3	7.0	9.7	8.5
DIPTERA	58.7	70.6	55.5	48.4	55.0	55.0	58.5	46.3	72.4	64.1	63.2	59.2	61.0
EPHEMEROPTERA	1.8	1.2	2.5	-----	1.5	1.5	2.3	2.1	1.6	1.1	1.9	1.3	1.6
HEMIPTERA	1.4	1.5	-----	1.9	-----	-----	1.5	2.5	-----	1.5	0.9	1.7	1.4
HOMOPTERA	-----	3.3	3.5	11.0	3.1	3.1	1.8	8.8	1.5	4.5	1.8	6.1	4.2
HYMENOPTERA	-----	-----	2.2	2.3	3.1	3.1	5.3	2.7	1.2	3.3	2.3	2.7	2.5
ORTHOPTERA	9.4	-----	8.5	1.3	4.6	4.6	1.5	-----	-----	-----	3.7	-----	1.9
PLECOPTERA	2.2	1.2	-----	2.3	-----	-----	2.7	2.5	2.8	2.1	2.6	2.1	2.4
PSOCOPTERA	-----	3.6	2.2	7.4	16.0	16.0	10.6	17.5	4.9	6.9	5.8	8.7	7.5
TRICHOPTERA	-----	-----	-----	2.3	1.5	1.5	4.8	4.0	3.7	-----	2.6	1.5	2.0
ARACHNIDA	10.5	4.5	10.4	9.0	3.8	3.8	3.8	4.4	4.7	2.7	6.3	4.1	5.0
OTHERS	3.0	3.6	4.2	3.8	3.0	3.0	2.2	1.9	2.4	3.5	1.9	2.9	2.0

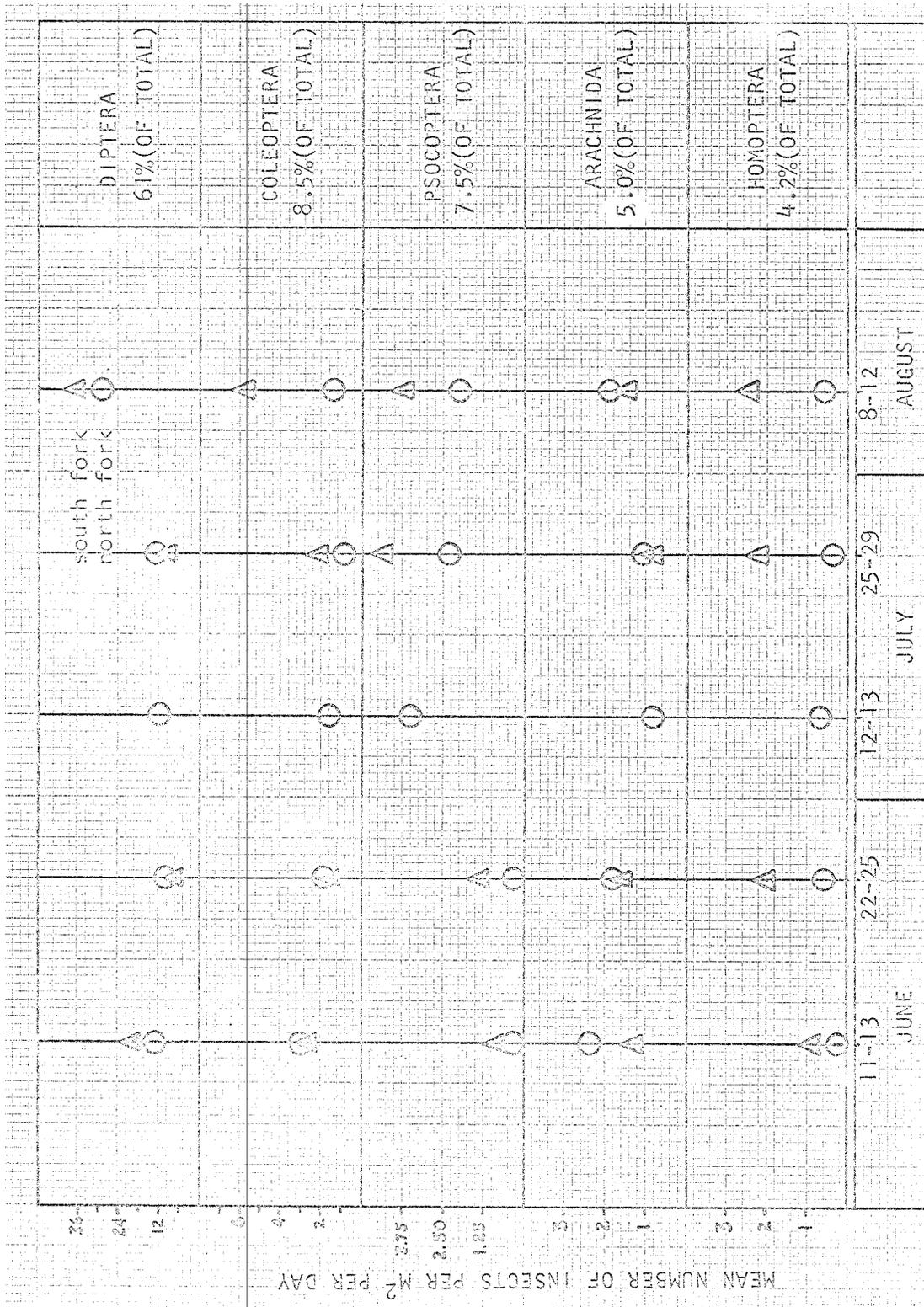


Figure 8. The mean number of the predominate orders of insects and arachnids collected per meter-square box day along the south and north forks of Caspar Creek, 1966. Triangles represent south fork data, circles represent north fork data.

made up a disproportionately large percentage of the total weight of the animals collected.

Pools and riffles - The proportion of "pools", and "riffles", and "runs" in much of both study areas was measured by tentative criteria. Pools are defined as areas of still water 6 or more inches in depth. Riffles are areas of rapidly flowing water under 6 inches deep. Runs are transition zones between pools and riffles and are of slowly flowing water unbroken at the surface and less than 6 inches deep.

In early September, about 17 per cent of the north fork was pool habitat and 40 per cent was riffle habitat. At the same time about 28 per cent of the south fork was pool habitat; an equal amount was riffle habitat.

Stream drying - The seasonal progression of the partial drying-up of both forks generally was observed. About 1000 feet of the south fork (between stations 62 and 80, i.e., between 6200 and 8000 feet upstream from the weir) which flowed continuously (except for about 400 feet.) in June was dry by September 7. About 1130 out of 6100 feet of the north fork dried up over the same period of time (about 500 feet was dry in June).

Photography and mapping - In June of 1967, the entire south fork study area and representative sections of the north fork were photographed. The photographs (black and white) show the stream bed, the banks and well up into the slopes leading to it, and its floral canopy. A collection of 35 mm. color slide photographs of virtually all of the south fork and

much of the north fork was completed. Existing streambed maps were improved.

Algae - In-May, 1966 an independent study of algae in both forks was completed by Lowell Nicolaus of Humboldt State College. The study was designed largely to serve the needs of the stream ecology phase of the Caspar Creek Project. The predominate species of algae, and their distribution and abundance in relation to stream conditions generally was determined.

General -Personnel of the Department of Fish and Game gathered considerable information, designed to assist us in our analysis, on fish abundance, insect drift, gravel composition, and pool and riffle proportions in the south fork in 1966. Additional information on the south fork was obtained by them in June of 1967 and gravel composition measurements were made on the north fork during the same month. All data obtained by them are now or are expected to become available for our use.

While stream ecology calibration was not completed before tree-cutting and road construction along the south fork began in June of 1967, enough background on some conditions had been gathered in the two years of our participation in the project to allow for many meaningful "before and after" comparisons once post-road building data are gathered.