WATER RESOURCES ALONG THE TAPS ROUTE, ALASKA, 1970-74

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GEOLOGICAL SURVEY

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By

Joseph M. Childers
Jon W. Nauman
Donald R. Kernodle
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OPEN-FILE REPORT

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CONVERSION FACTORS

For use of those readers who may prefer to use metric units rather than English units, the conversion factors for the terms used in this report are listed below:

Multiply English units	by	To obtain metric units
feet (ft)	0.3048	meters (m)
miles (mi)	1.609	kilometers (km)
square miles (mi^2)	2.590	square kilometers (km^2)
cubic feet per second (ft^3/s)	0.02832	cubic meters per second (m^3/s)
cubic feet per second per square mile [$(ft^3/s)/mi^2$]	0.01093	cubic meters per second per square kilometer [$(m^3/s)/km^2$]

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ABSTRACT

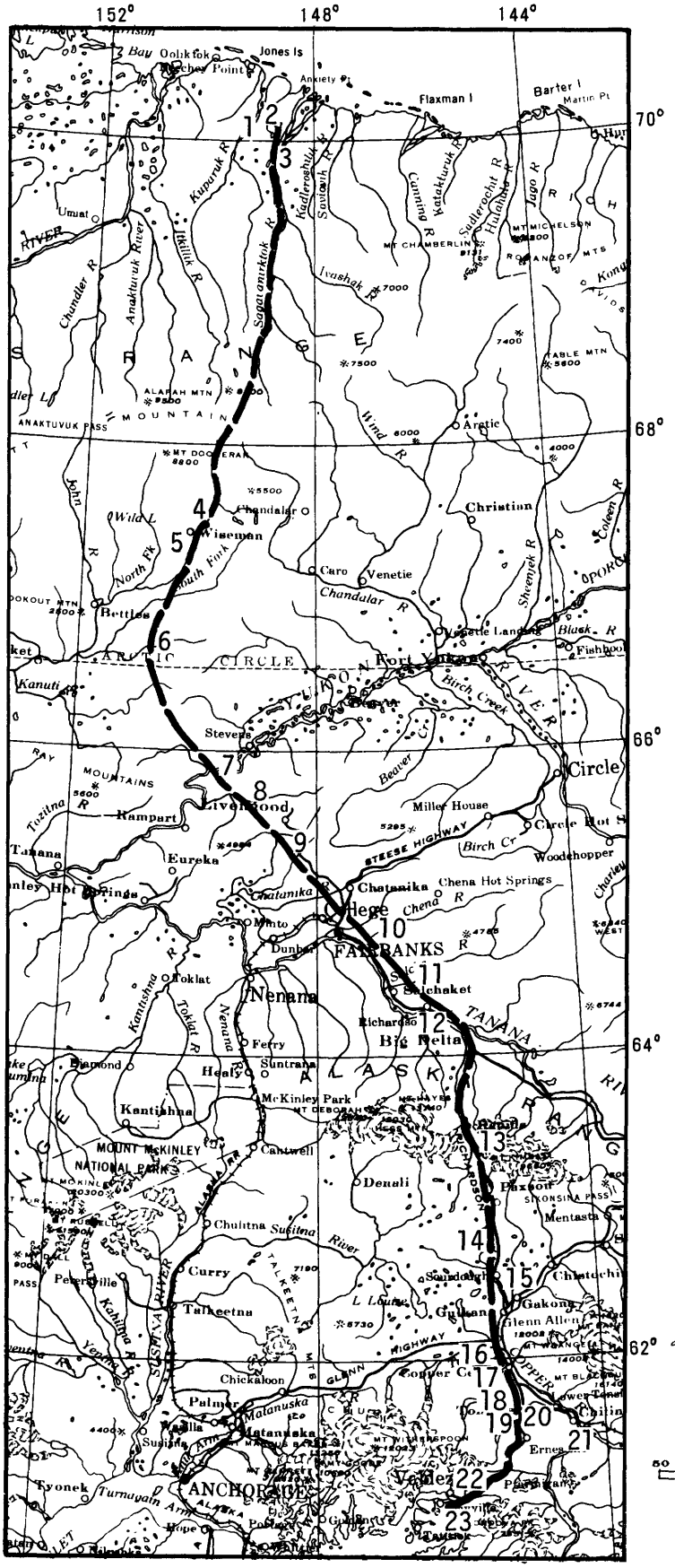
The U.S. Geological Survey installed 10 streamgaging and water-quality stations along the trans-Alaska pipeline route starting in 1970. These stations, mostly north of Fairbanks, add to the historical network of gaging stations and provide records of hydrologic conditions along the TAPS route. Selected data from 23 gaging stations along the TAPS route for the period 1970-74 (prior to construction of the pipeline) are compiled in graphic form. The data include annual hydrographs of daily mean or instantaneous values of a standard set of parameters which are indicative of physical, chemical and biological conditions of the streams. The hydrographs facilitate comparisons of data, both in time and between stream sites. Thus, they are a tool for evaluating streamflow characteristics along the TAPS route during the preconstruction period.

INTRODUCTION

The trans-Alaska pipeline system (TAPS) traverses four major physiographic provinces along its 800-mile length: (1) the Interior Plains, (2) the Rocky Mountain System, (3) the Intermontane Plateau and (4) the Pacific Mountain System. Prior to 1970, little hydrologic data were available for many streams along the TAPS route. The streams were selected to provide a representative sample of the types of drainage basins within each of the physiographic regions. The location of the gaging station on each stream was chosen so as to have satisfactory hydraulic conditions and accessibility. On those streams which the pipeline would cross, the location of new gaging stations was also governed by proximity to the pipeline crossing.

The objective of this report is to present to the public and interested agencies some of the hydrologic data that has been collected along the TAPS route during the study period, 1970-1974. This period provides a preconstruction base of comparative data at most of the stream-gaging stations. A graphic format was selected because it facilitates comparison of the data.

This report is a compilation of yearly hydrographs showing water discharge and selected water-quality parameters obtained at 23 stream-gaging stations in the TAPS corridor from 1970 through 1974. These include the ten new stations and thirteen which had been installed earlier. All but four of the 23 streams in this report are crossed by the pipeline. Figure 1 lists and shows the location of the 23 gaging



EXPLANATION

Trans-Alaska pipeline

1. Kuparuk River
2. Putuligayuk River
3. Sagavanirktok River
4. Middle Fork Koyukuk River
5. Wiseman Creek
6. Jim River
7. Yukon River
8. Hess Creek
9. Caribou Creek
10. Chena River
11. Salcha River
12. Tanana River
13. Phelan Creek
14. Gulkana River
15. Gakona River
16. Tazlina River
17. Klutina River
18. Squirrel Creek
19. Tonsina River
20. Little Tonsina River
21. Copper River
22. Lowe River
23. Solomon Gulch

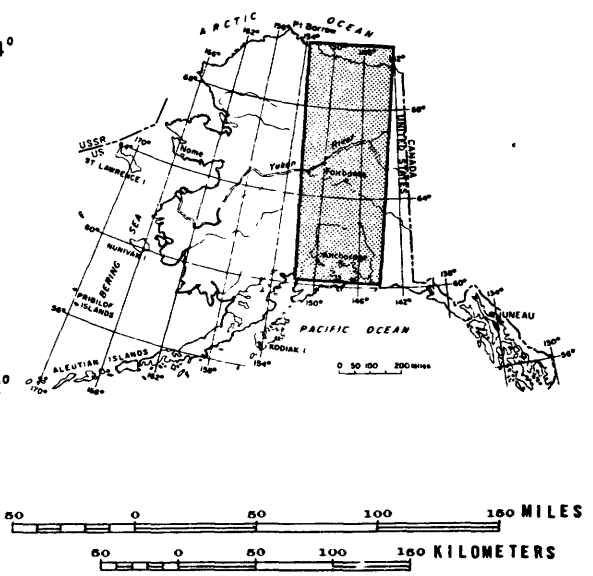


Figure 1. --Stream gaging stations along the TAPS route, 1970-74.

stations. The haul road north of the Yukon River was built during the summer of 1974 and construction of the pipeline commenced in 1975; therefore all the data in this report except that for the summer of 1974 north of the Yukon was collected prior to pipeline construction.

The discharge hydrograph for each station for each water year is a plot of daily mean discharge as shown by the scale on the left side of each hydrograph. The instantaneous annual peak discharge is also plotted on each hydrograph.

Water temperature, dissolved oxygen, suspended-sediment concentration, specific conductance, turbidity, color, and numbers of benthic invertebrates are the water-quality parameters included in this report. These parameters are general indicators of the physical, chemical, and biological conditions of the streams. The scale for suspended sediment and benthic invertebrates where available is plotted on the right side of each discharge hydrograph.

Several of the streams covered in this report have a data base for streamflow and water quality that extends back to the early 1950's or beyond. In some instances there are daily measurements for specific conductance, temperature or suspended-sediment concentration as well as continuous streamflow information. All of this data is available from the U.S. Geological Survey WATSTORE computer files.[1/] Inquiries should be sent to the District Chief, Alaska, Water Resources Division, U.S. Geological Survey, 218 E St., Anchorage, Alaska 99501.

The discharge hydrographs for the winter seasons and spring break-up are mostly estimated and may be significantly in error. The water-quality data was collected during infrequent random visits as may be seen on the hydrographs. The data are not adequate to define seasonal or discharge-related variability of water-quality. However, the data give an indication of the variability from stream to stream and between summer and winter conditions.

The following discussion describes in general terms the water-quality parameters included in the report. The reader is referred to the annual series "Water Resources Data for Alaska", Water Years 1970-1974, for more detailed information.

Suspended-sediment concentration.--Suspended-sediment concentration is the velocity-weighted concentration of suspended sediment in the sampled zone (from the water surface to a point approximately 0.3 feet above the bed). Suspended sediment includes rock and organic particles. Usually rock particles account for most of the concentration value.

[1/] Hutchison, N.E., comp., 1975, WATSTORE -- National Water Data Storage and Retrieval System of the U.S. Geological Survey -- User's Guide: U.S. Geol. Survey open-file rept. 75-426, 791 p.

organisms collected with basket samplers are plotted on the stream hydrograph at the time of collection.

A short text accompanies the data plot for each stream and includes the location, period of record, purpose of gage, and drainage basin description.

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Kuparuk River near Deadhorse

Location.--Lat 70°16'54", long 148°57'35", in NE¼ sec. 25, T.11 N., R.12 E., North Slope Borough, near right bank, 1.8 mi northeast of SE Eileen State No. 1, 2.1 mi south of Rivers Camp Service City, 10 mi upstream from mouth on Gwyder Bay, and 13 mi northwest of Deadhorse.

Period of Record.--June 1971 to current year.

Purpose.--To document hydrologic conditions along the trans-Alaska pipeline and in the Prudhoe Bay oil field and to define streamflow characteristics of this principal stream.

Drainage Basin.--Drainage area is 3,130 mi^2. The basin is comprised of the Arctic Coastal Plain lowlands and the Arctic Foothills in about equal proportion. The basin is in the Arctic climatic zone, is within the continuous permafrost zone, and is treeless. It contains many small shallow lakes. Much of the basin is underlain by approximately 2,000 ft of permafrost. Oil resources are being developed, and the trans-Alaska pipeline crosses the headwaters of the basin.

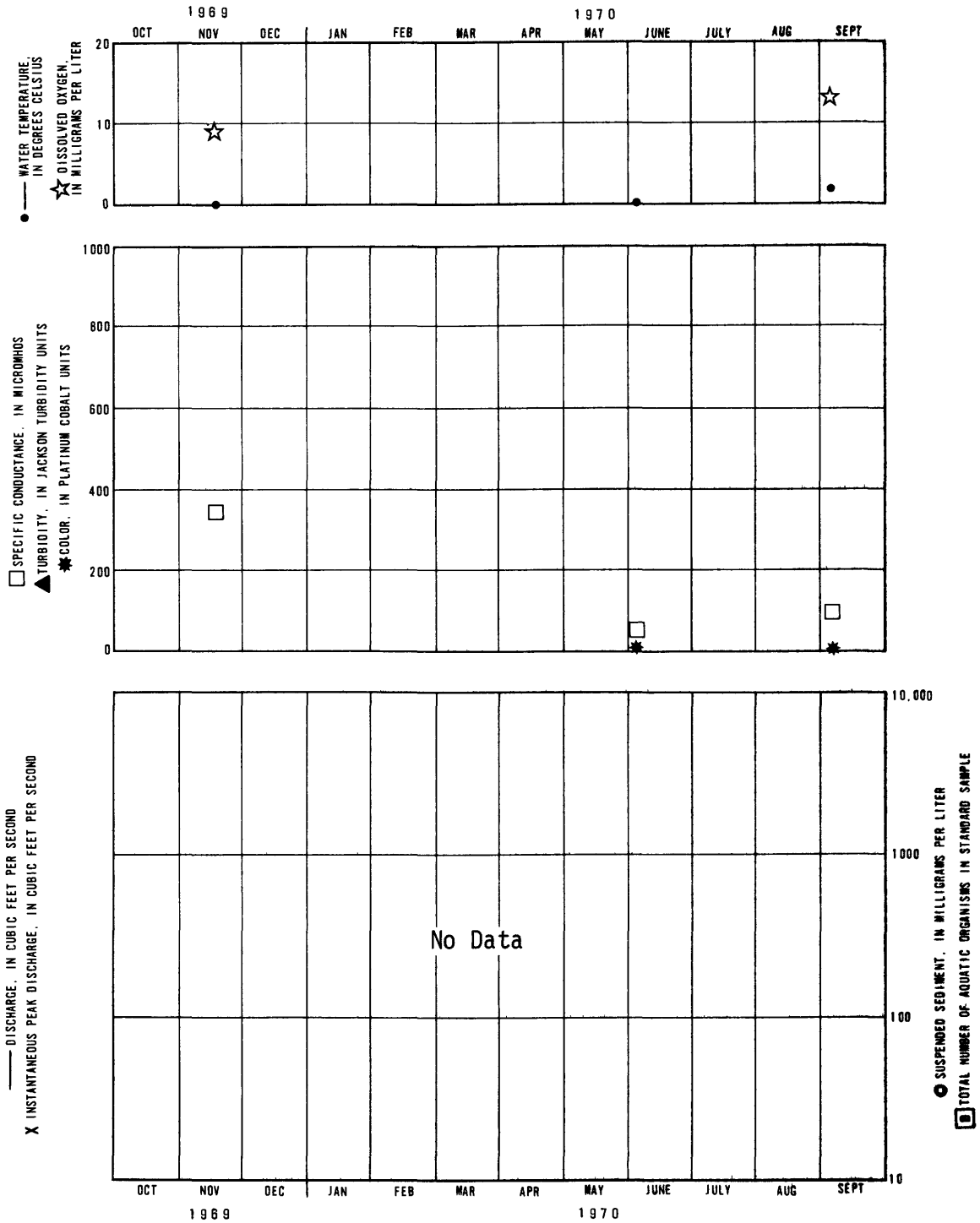


Figure 1.-- Kuparuk River near Deadhorse.

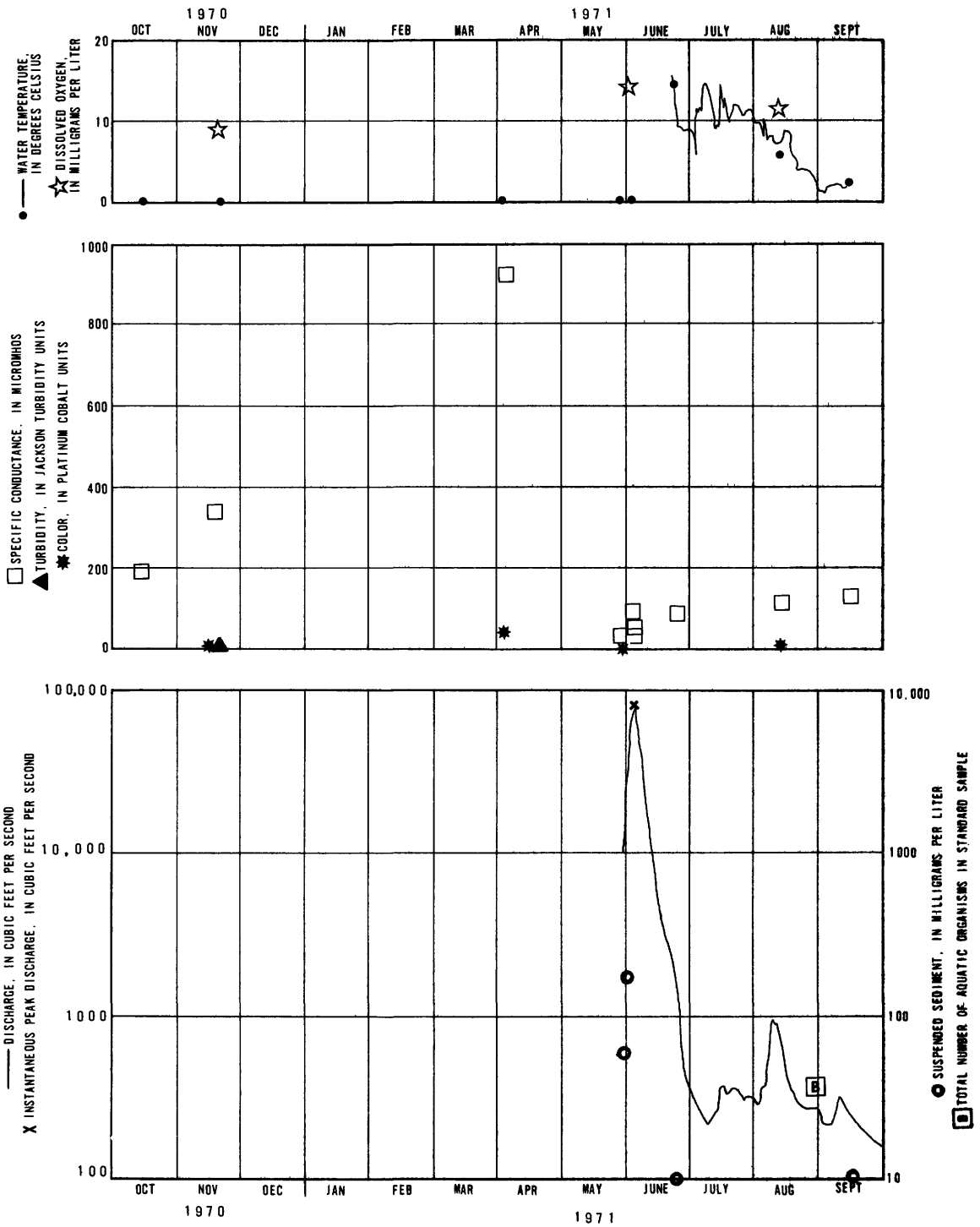


Figure 1.-- Kuparuk River near Deadhorse--Continued.

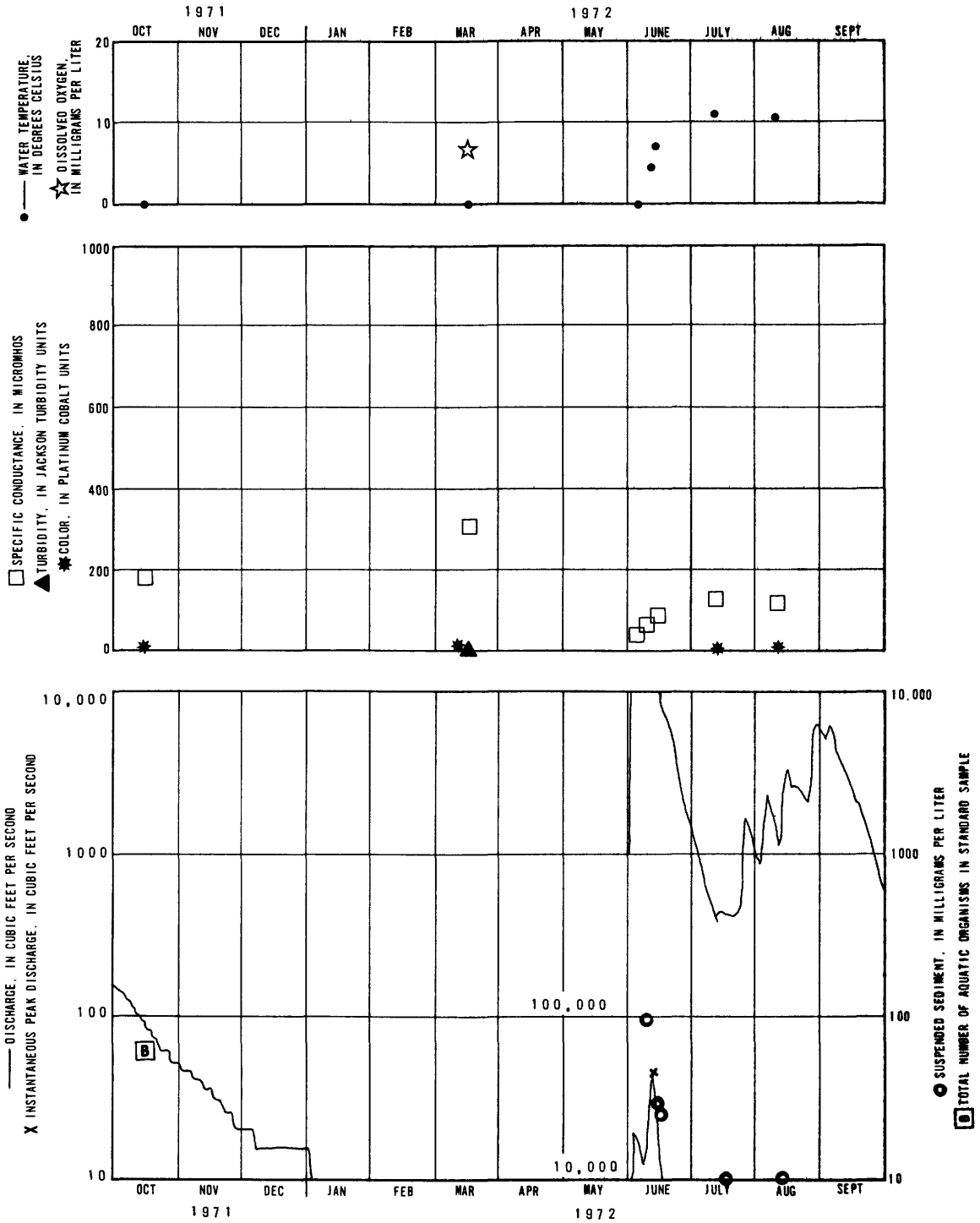


Figure 1.-- Kuparuk River near Deadhorse--Continued.

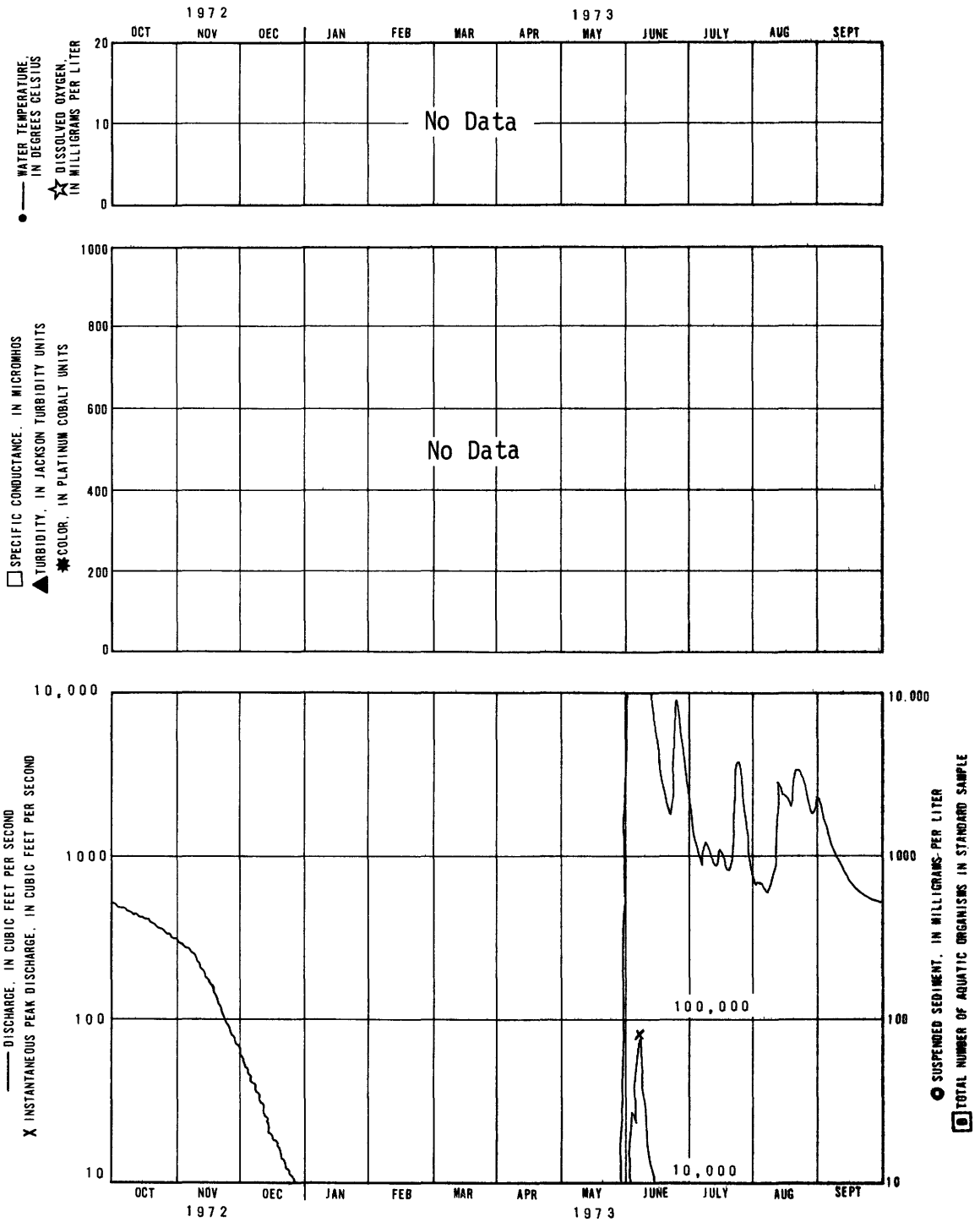


Figure 1.-- Kuparuk River near Deadhorse--Continued.

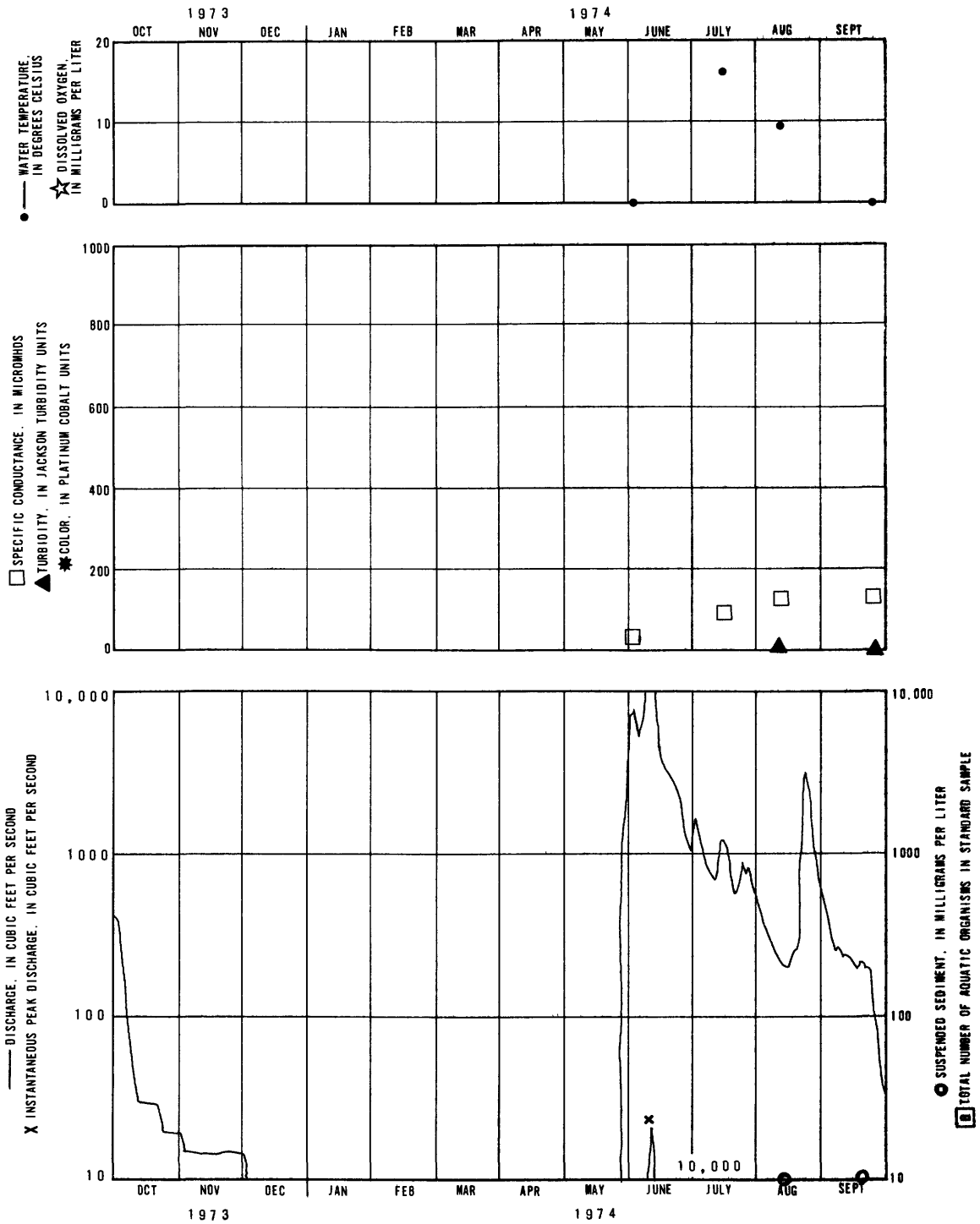


Figure 1.-- Kuparuk River near Deadhorse--Continued.

Putuligayuk River near Deadhorse

Location.--Lat 70°16'04", long 148°37'36", in NE¼ sec. 32, T.11 N., R.14 E., North Slope Borough, at midchannel 200 ft upstream from culvert causeway, 0.2 mi downstream from unnamed tributary, 6.2 mi northwest of Deadhorse, and 7.3 mi upstream from mouth on Prudhoe Bay.

Period of Record.--May 1970 to current year.

Purpose.--To document hydrologic conditions along the trans-Alaska pipeline and at the Prudhoe Bay oil field and to provide a hydrologic sample from a representative basin in the region.

Drainage Basin.--Drainage area is approximately 176 mi^2. The basin is in the Arctic Coastal Plain lowlands, the Arctic climatic zone, and the continuous permafrost zone, and is treeless. The basin contains many small shallow lakes and is underlain by approximately 2,000 ft of permafrost. Oil resources are being developed in this area. The trans-Alaska pipeline origin station is near the gaging station.

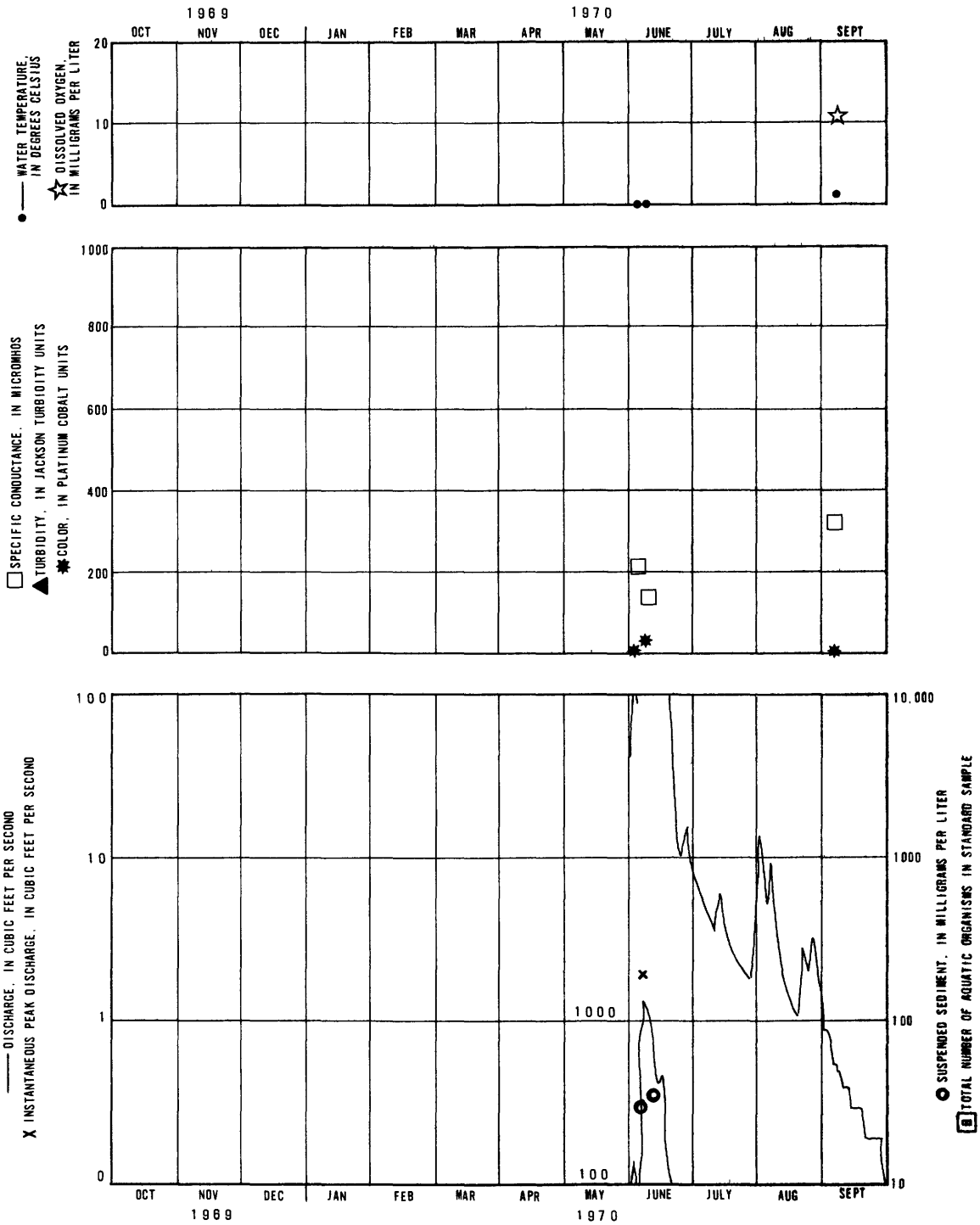


Figure 2.-- Putuligayuk River near Deadhorse.

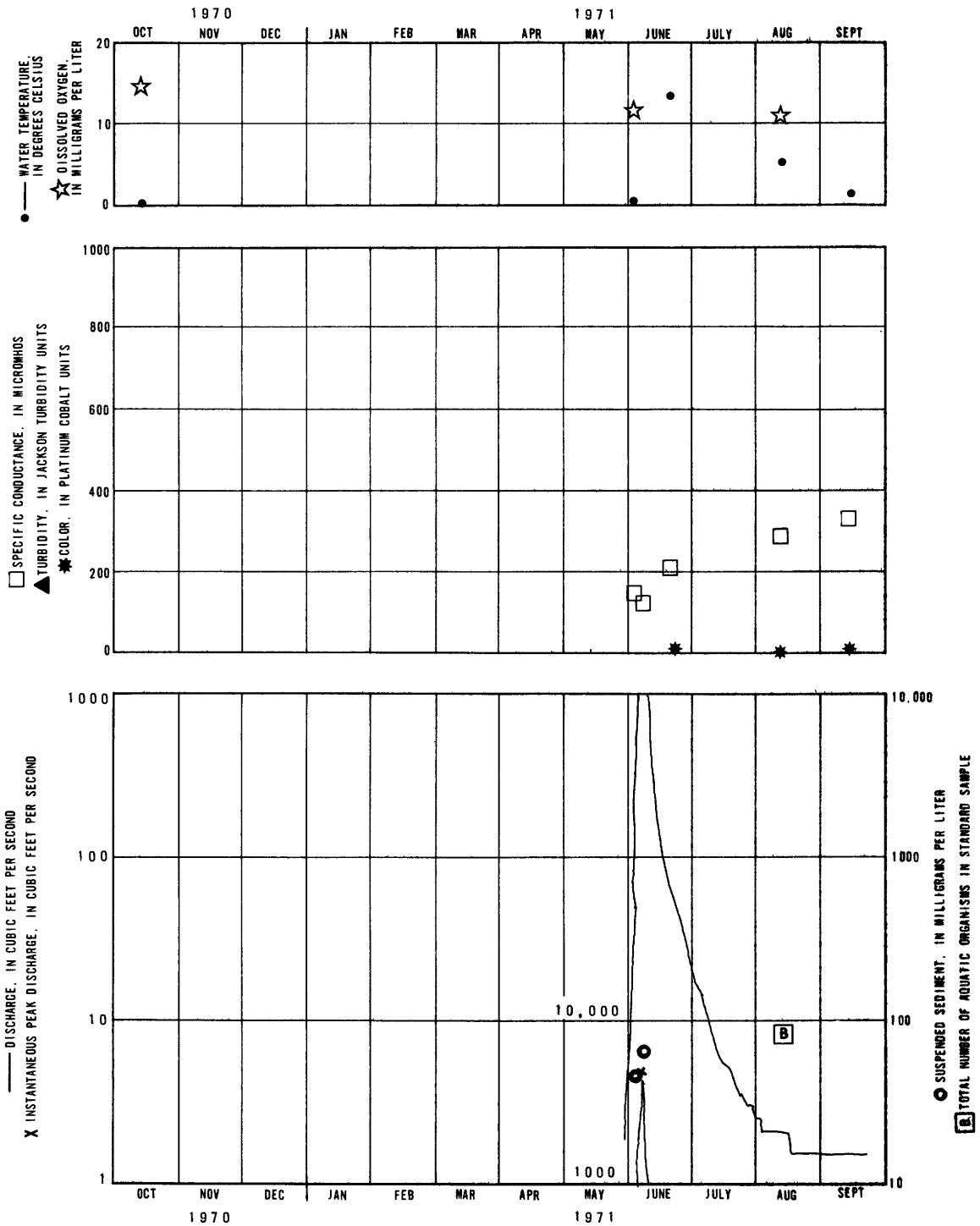


Figure 2.-- Putuligayuk River near Deadhorse--Continued.

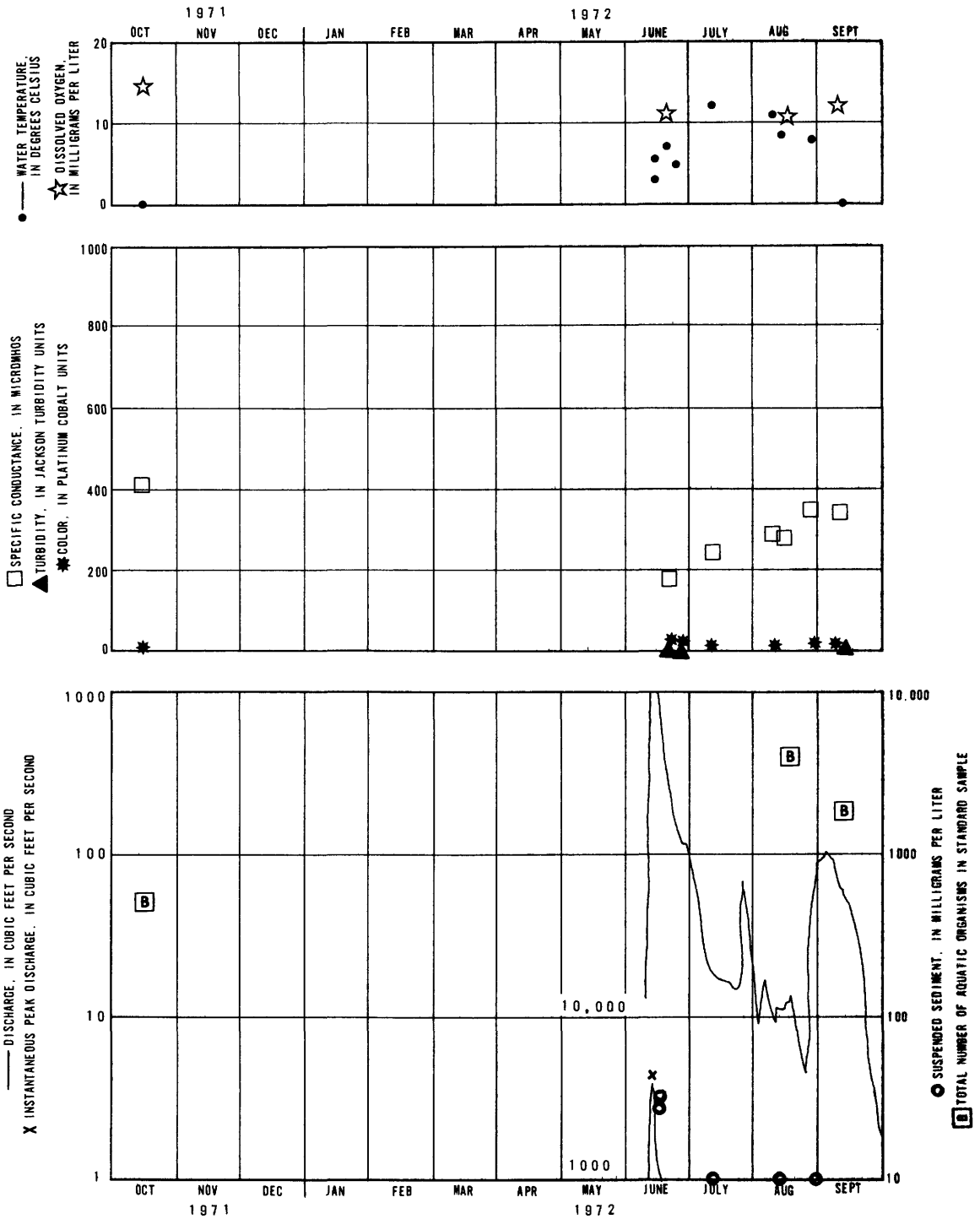


Figure 2.-- Putuligayuk River near Deadhorse--Continued.

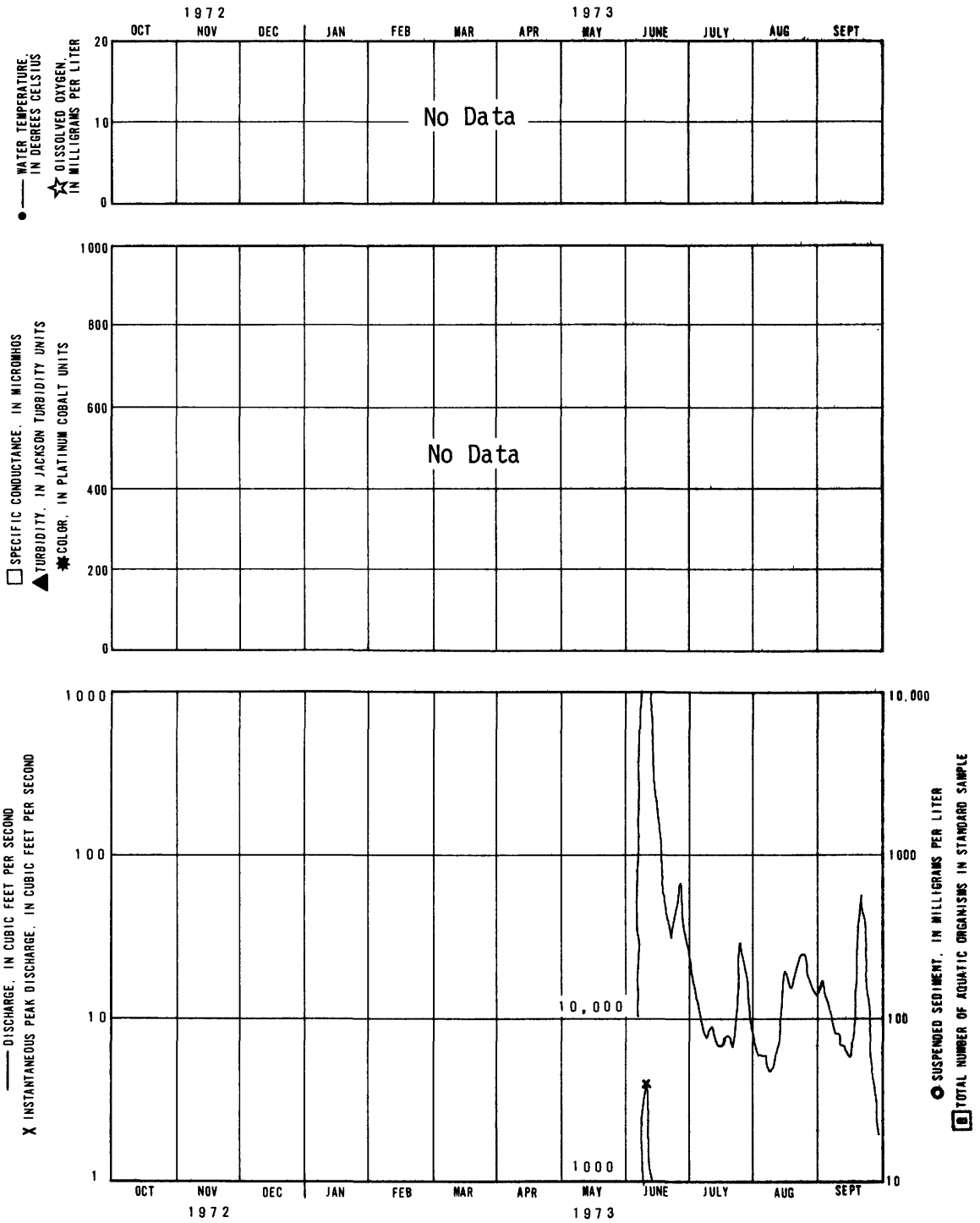


Figure 2.-- Putuligayuk River near Deadhorse-- Continued.

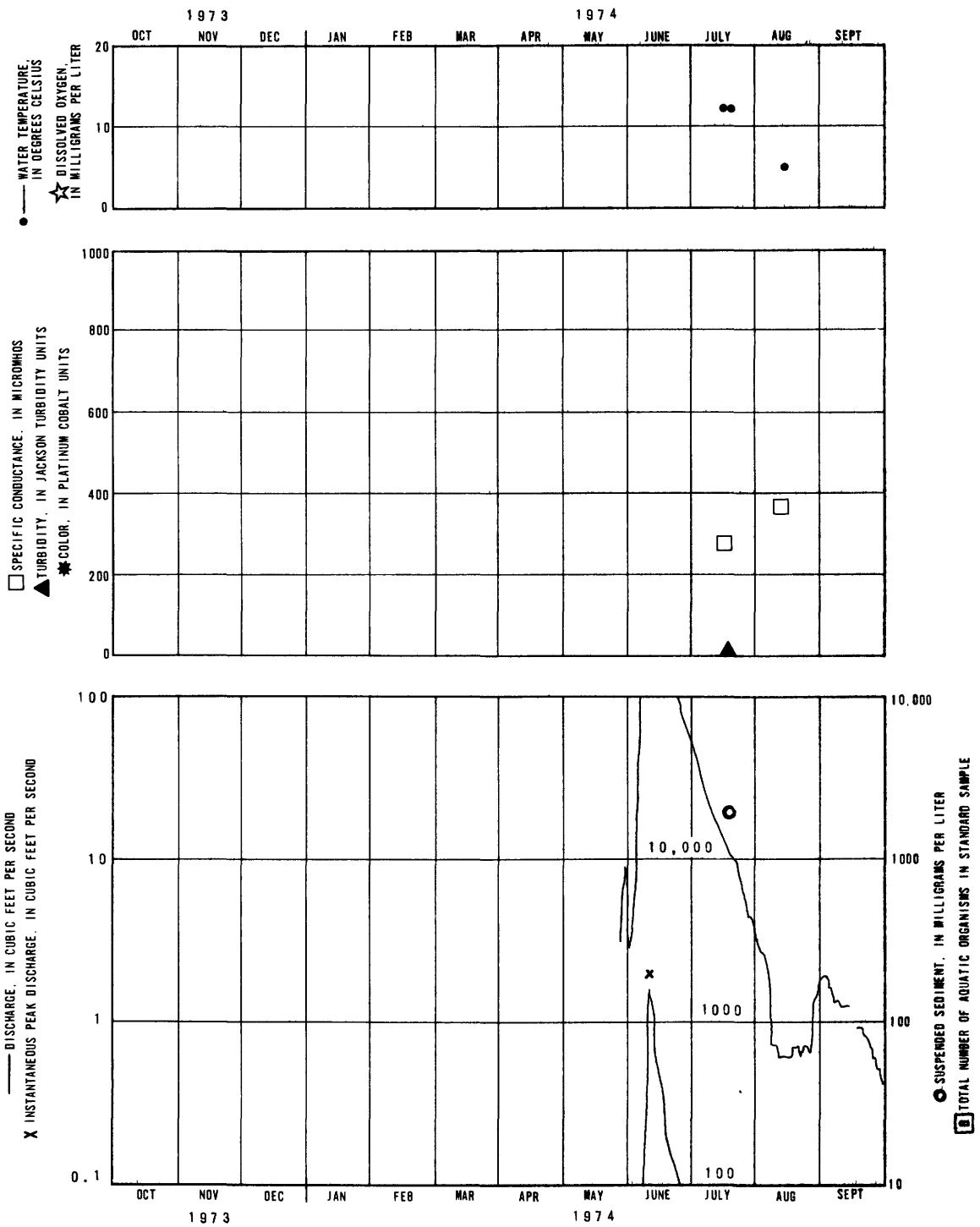


Figure 2.-- Putuligayuk River near Deadhorse--Continued.

Sagavanirktok River near Sagwon

Location.--Lat 69°05'20", long 148°45'10", North Slope Borough, on right bank 0.6 mi downstream from Lupine River, 20 mi south of Sagwon, and 33.5 mi upstream from Ivishak River.

Period of Record.--August 1970 to current year.

Purpose.--To document hydrologic conditions along the trans-Alaska pipeline and to define streamflow characteristics on this principal stream.

Drainage Basin.--Drainage area is 2,208 mi^2. The basin is mostly in high mountains but includes some foothills. The basin is in the Arctic climatic zone, in the continuous permafrost zone, and is unforested. Permafrost, ground ice, and stream overflow and hillside icings are cold region features of this basin. The basin contains many perennial springs (some with low flows exceeding 30 ft^3/s) issuing along the flanks of the Brooks Range from the Lisburne Limestone. These springs feed icings, some of which are many miles long and wide and up to 20 ft thick and visible on LANDSAT imagery. These icings are indicators of perennial flows in the arctic Alaskan drainages.

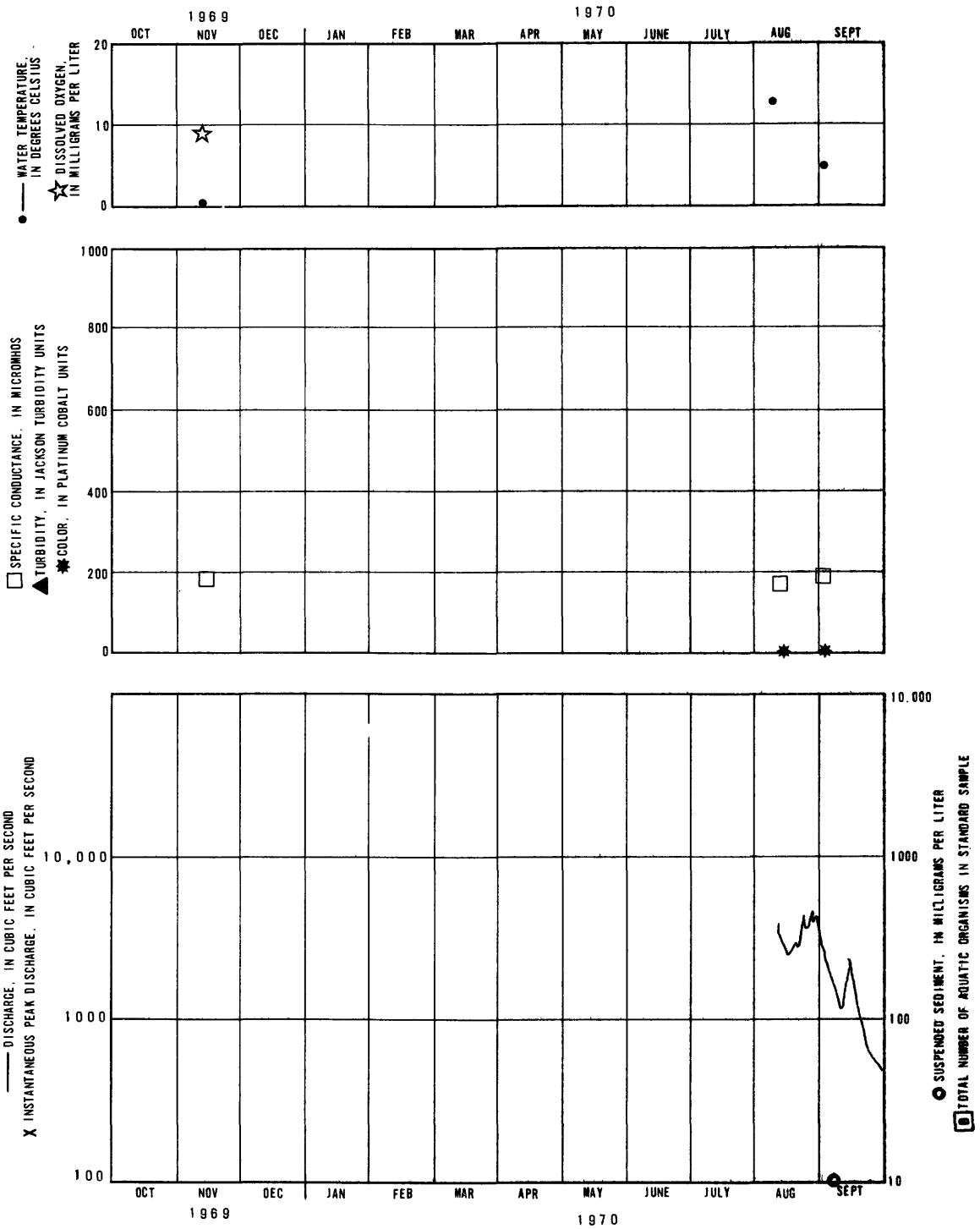


Figure 3.-- Sagavanirktok River near Sagwon.

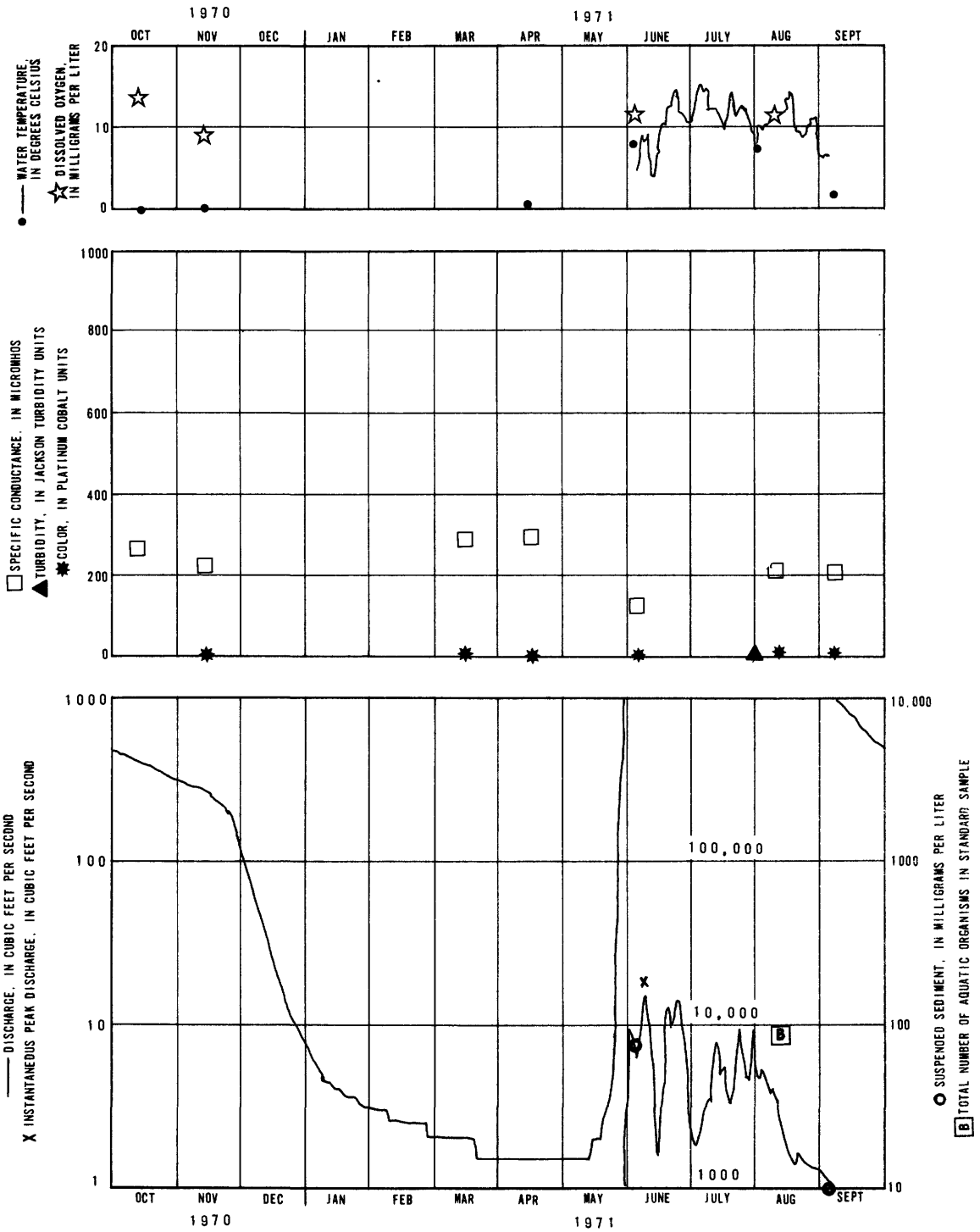


Figure 3.-- Sagavanirktok River near Sagwon--Continued.

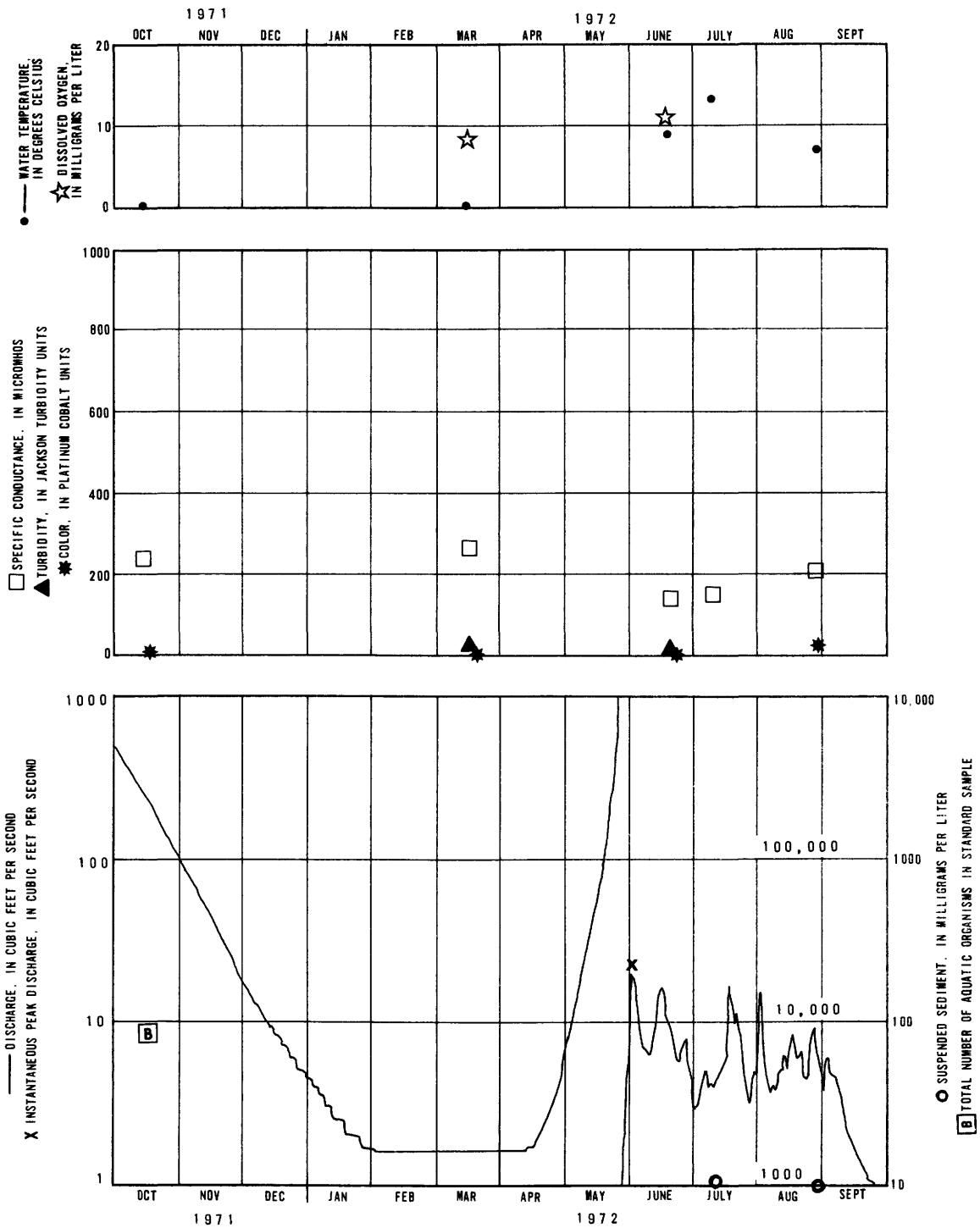


Figure 3.-- Sagavanirktok River near Sagwon--Continued.

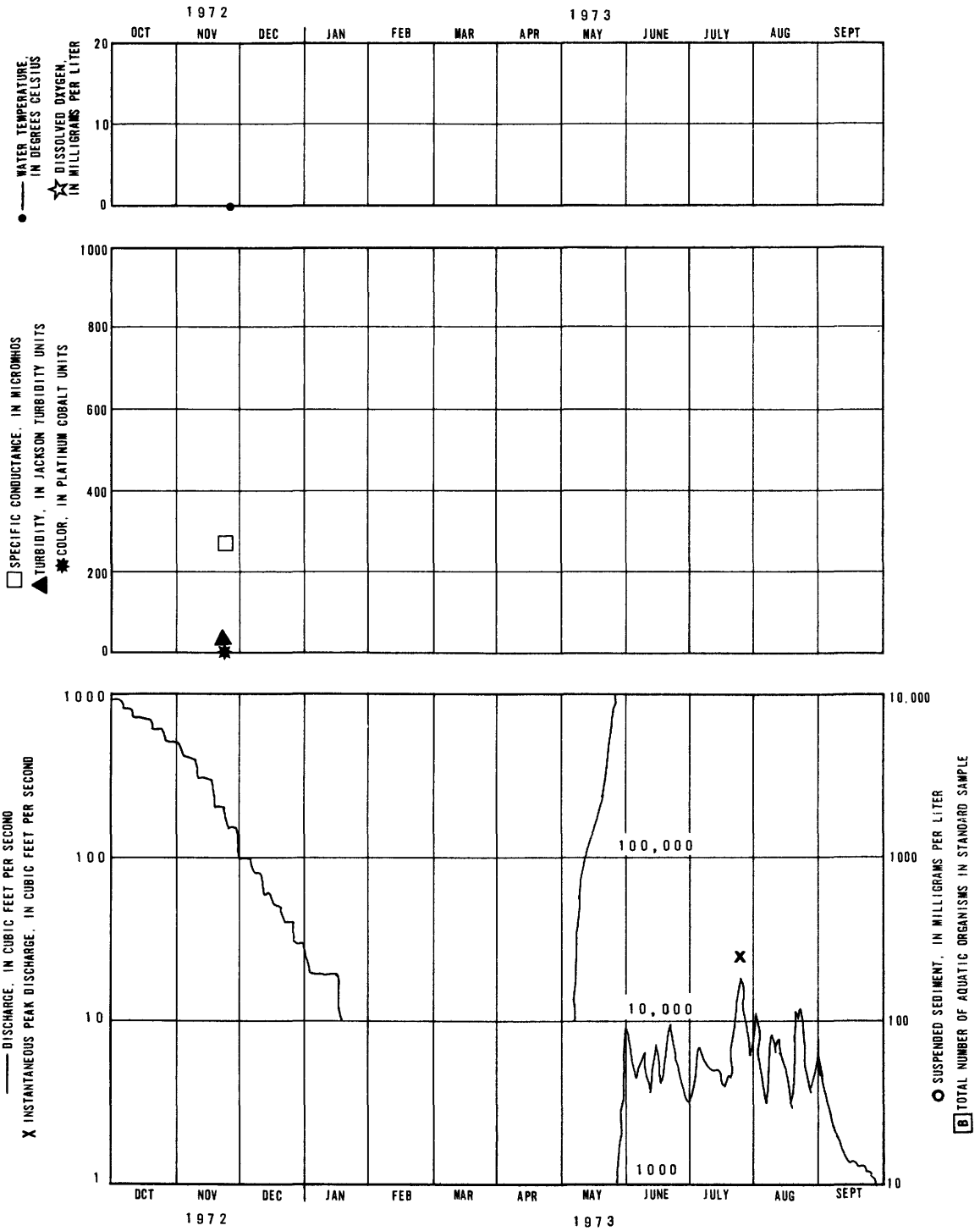


Figure 3.-- Sagavanirktok River near Sagwon-- Continued.

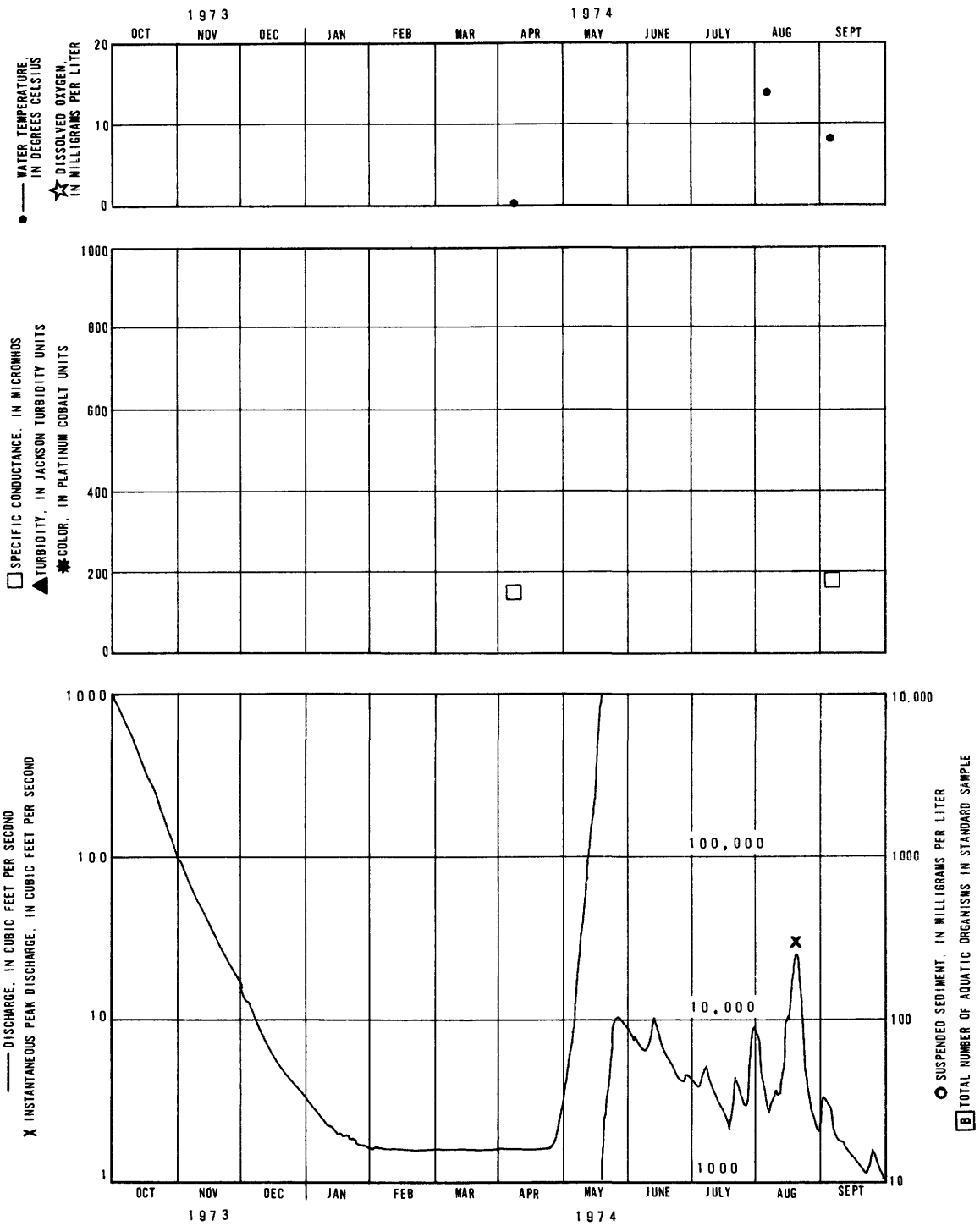


Figure 3.-- Sagavanirktok River near Sagwon--Continued.

Middle Fork Koyukuk River near Wiseman

Location.--Lat 67°25'54", long 150°04'55", in NE¼ sec. 18, T.30 N., R.11 W., on left bank 1.0 mi upstream from Minnie Creek, 1.6 mi north of Wiseman, and 2.6 mi downstream from Hammond River.

Period of Record.--August 1970 to current year.

Purpose.--To document streamflow conditions along the trans-Alaska pipeline and define streamflow characteristics on this principal stream.

Drainage Basin.--Drainage area is 1,426 mi^2. The basin is in high mountains in the Continental climatic zone, within the continuous permafrost zone, and sparsely forested. Permafrost, ground ice, and stream overflow and hillside icings are cold region features of this basin. There has been and is some placer mining in this basin. The TAPS route follows the river and crosses it and its tributary Dietrich River several times within the basin.

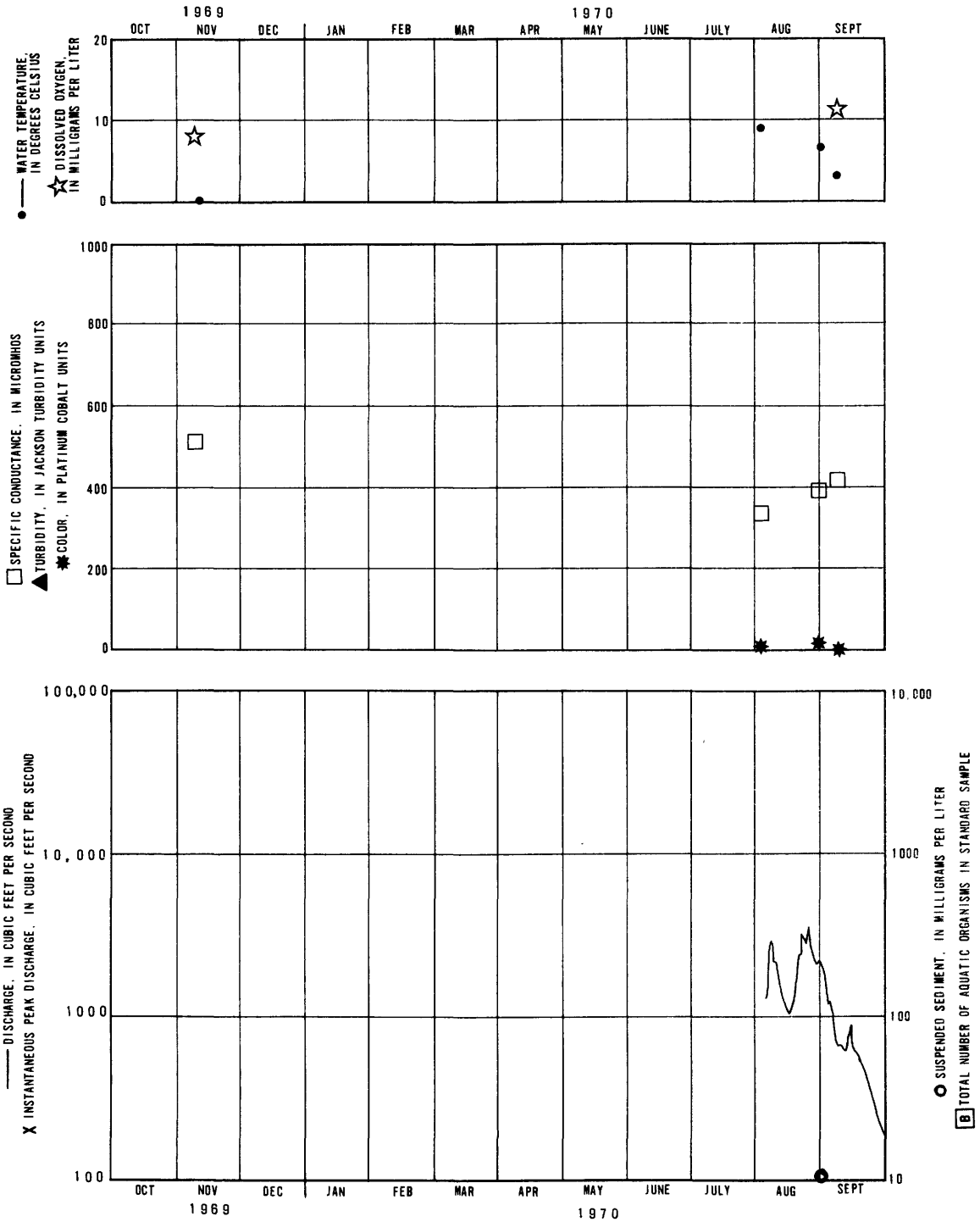


Figure 4.-- Middle Fork Koyukuk River near Wiseman.

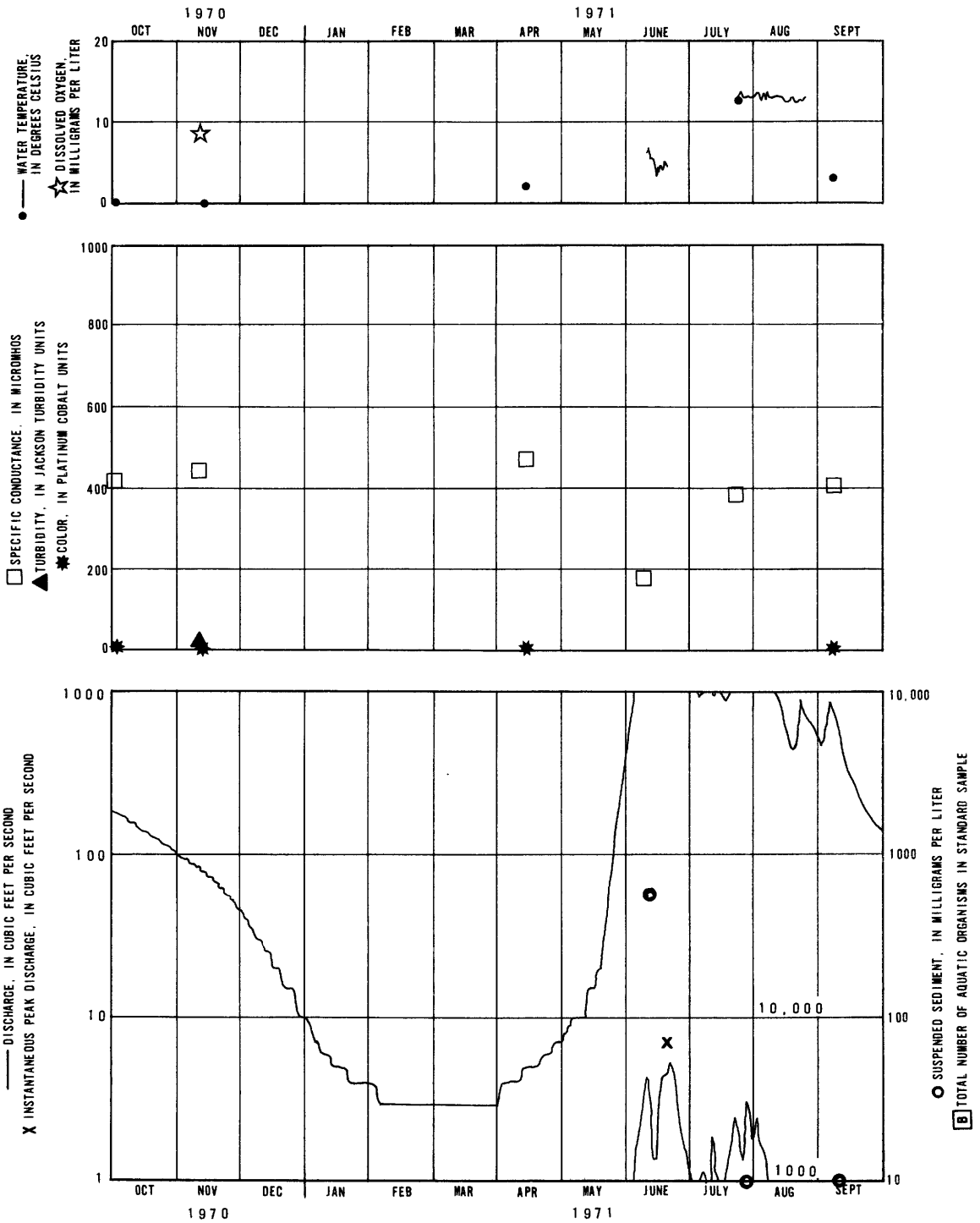


Figure 4.-- Middle Fork Koyukuk River near Wiseman--Continued.

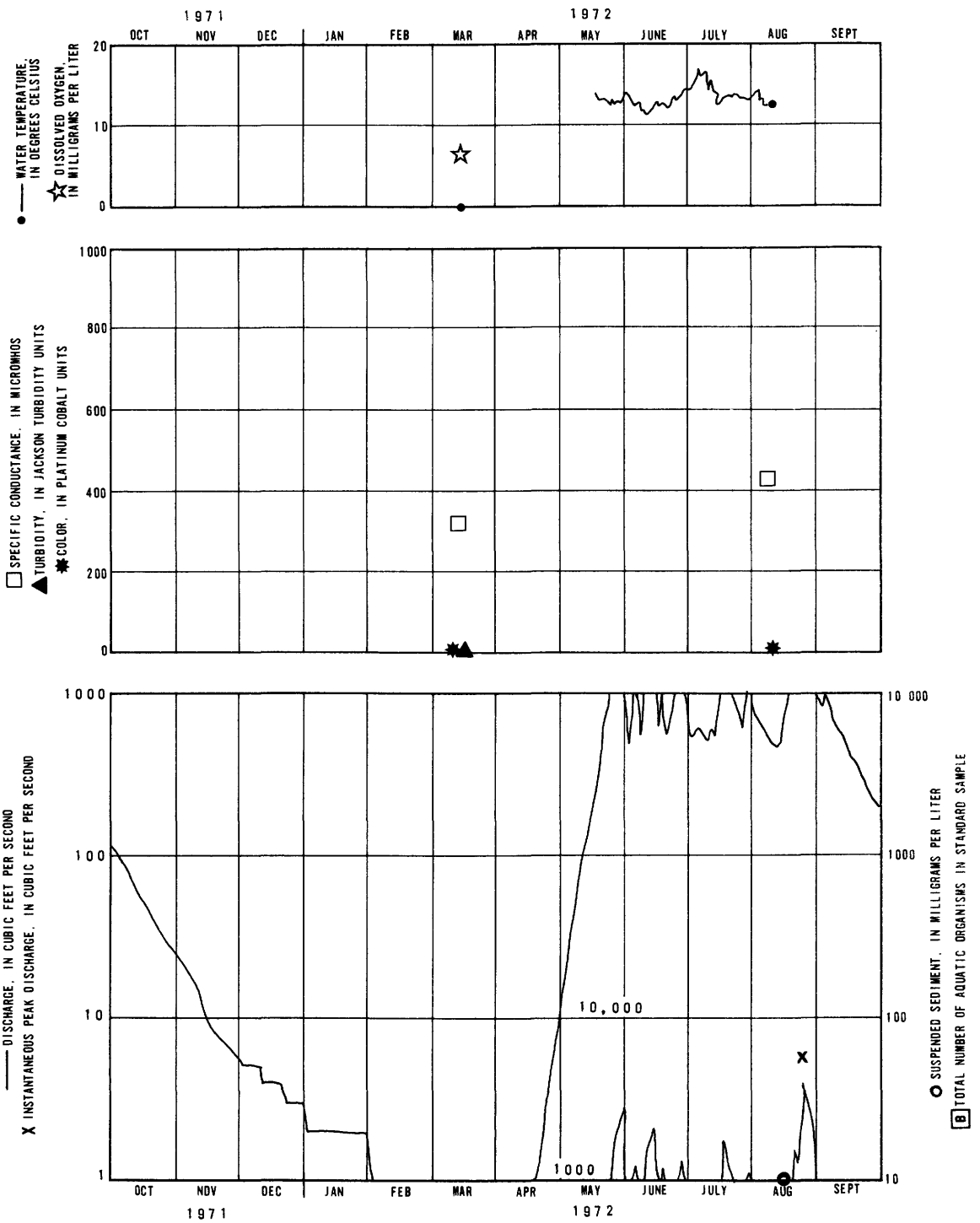


Figure 4.-- Middle Fork Koyukuk River near Wiseman--Continued.

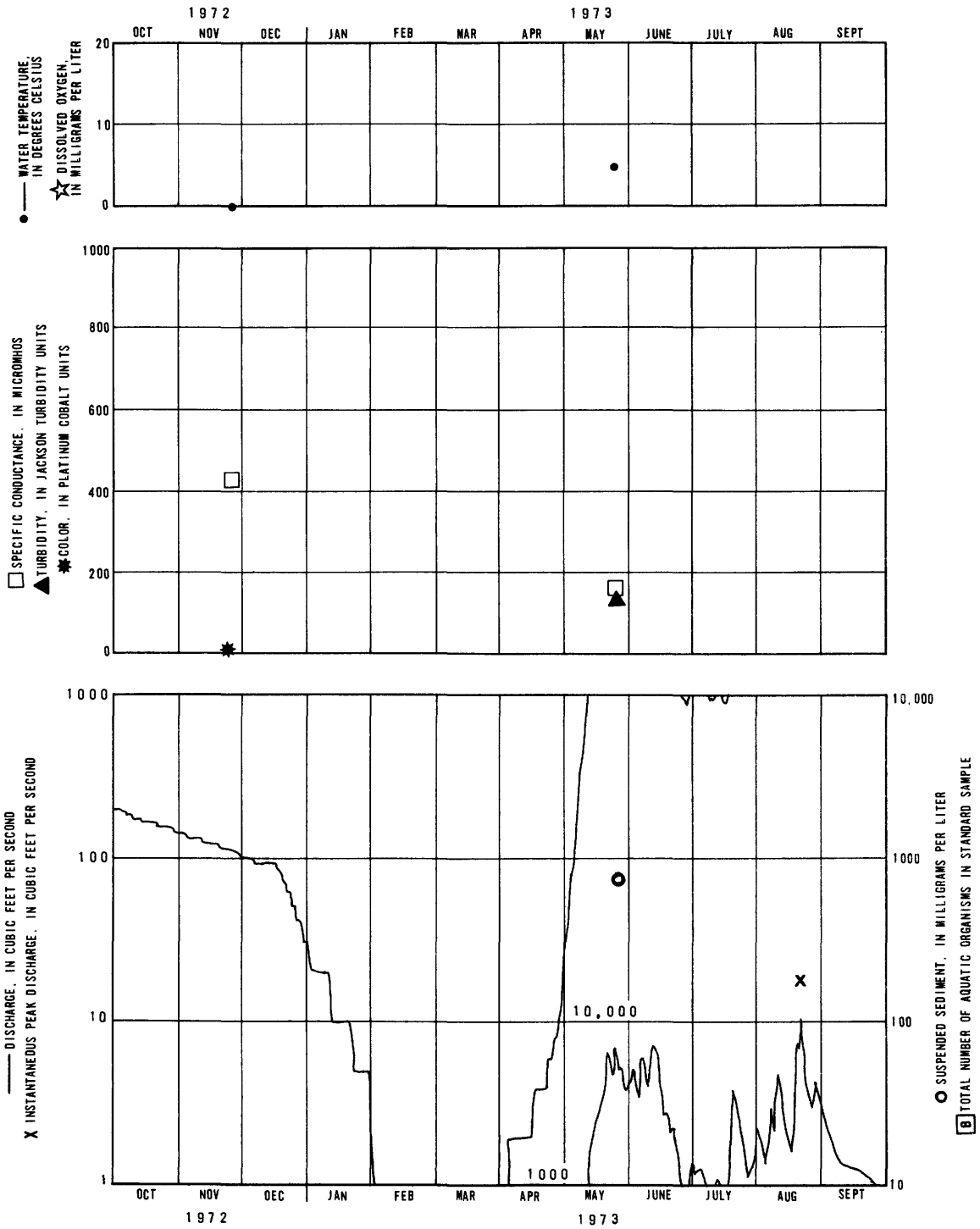


Figure 4.-- Middle Fork Koyukuk River near Wiseman--Continued.

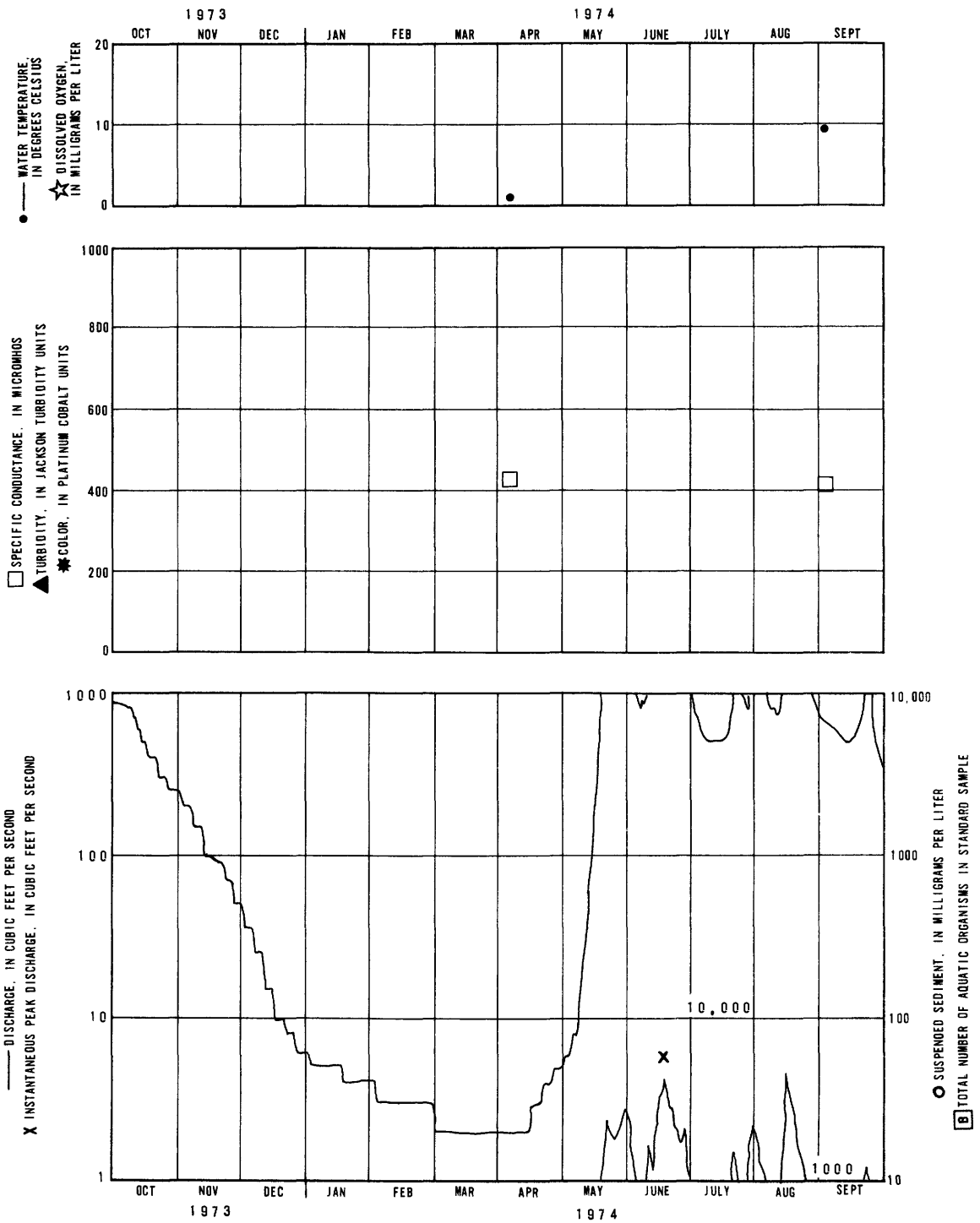


Figure 4.-- Middle Fork Koyukuk River near Wiseman--Continued.

Wiseman Creek at Wiseman

Location.--Lat 67°24'38", long 150°06'21", in SE¼ sec. 24, T.30 N., R.12 W., on left abutment of footbridge at mouth, 0.2 mi from north end of landing strip at Wiseman.

Period of Record.--August 1970 to current year.

Purpose.--To document streamflow conditions along the trans-Alaska pipeline route and provide a hydrologic sample from a representative basin in the region.

Drainage Basin.--Drainage area is 49.2 mi^2. The basin is in high mountains, in the Continental climatic zone, within the continuous permafrost zone, and is sparsely forested. Considerable placer mining in the basin continues. Permafrost, ground ice, and stream overflow icings are cold region features of this basin.

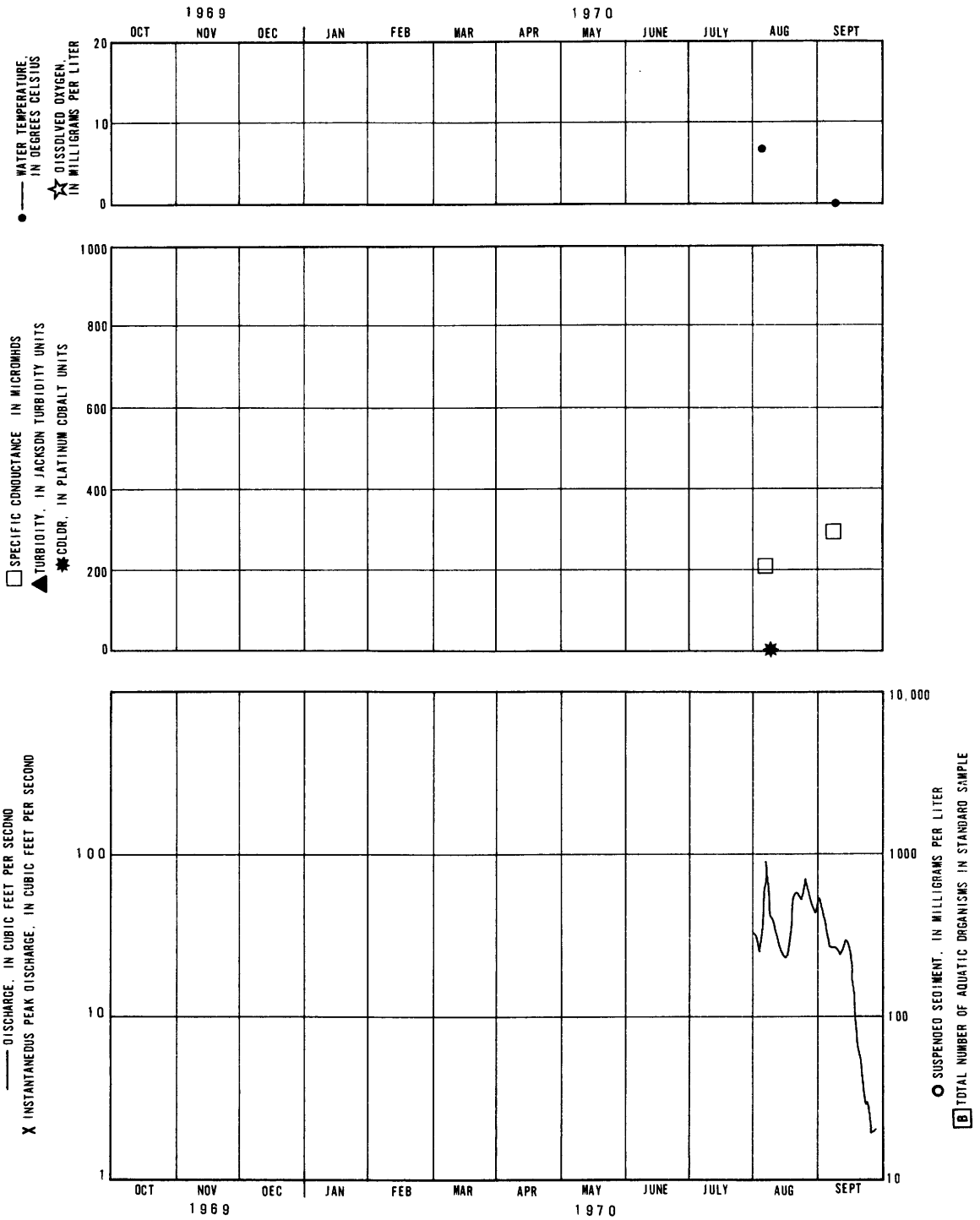


Figure 5.-- Wiseman Creek at Wiseman.

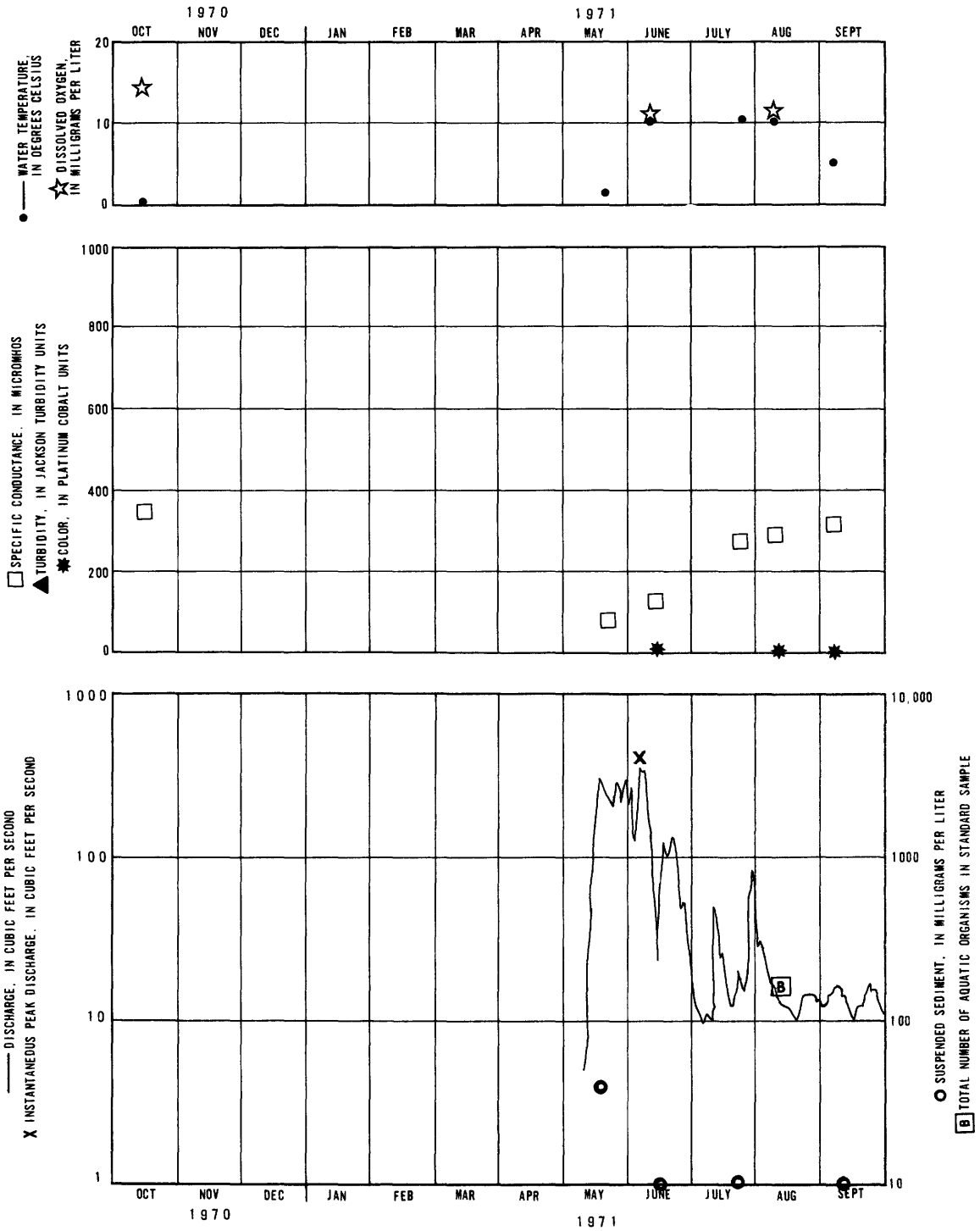


Figure 5.-- Wiseman Creek at Wiseman--Continued.

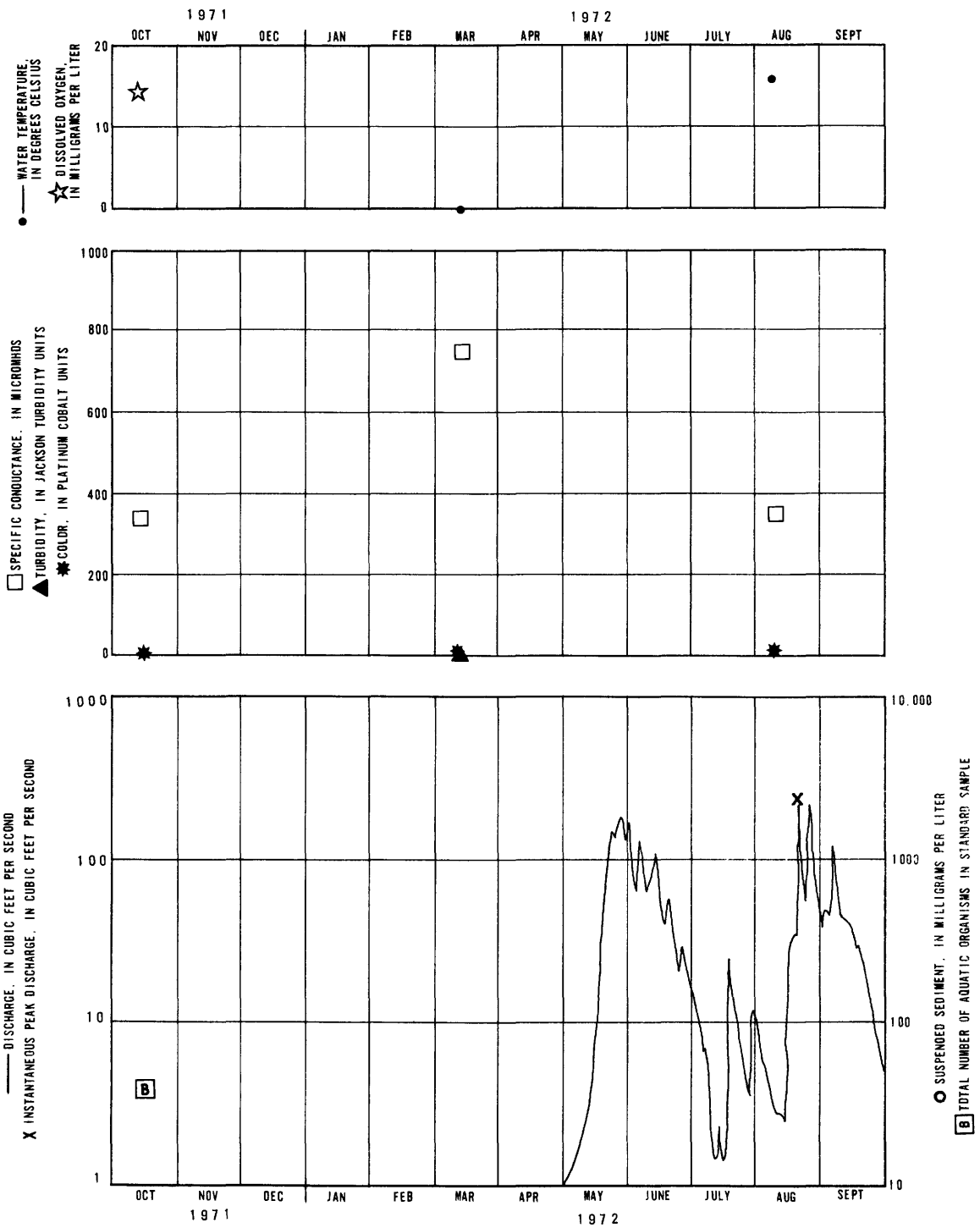


Figure 5.-- Wiseman Creek at Wiseman--Continued.

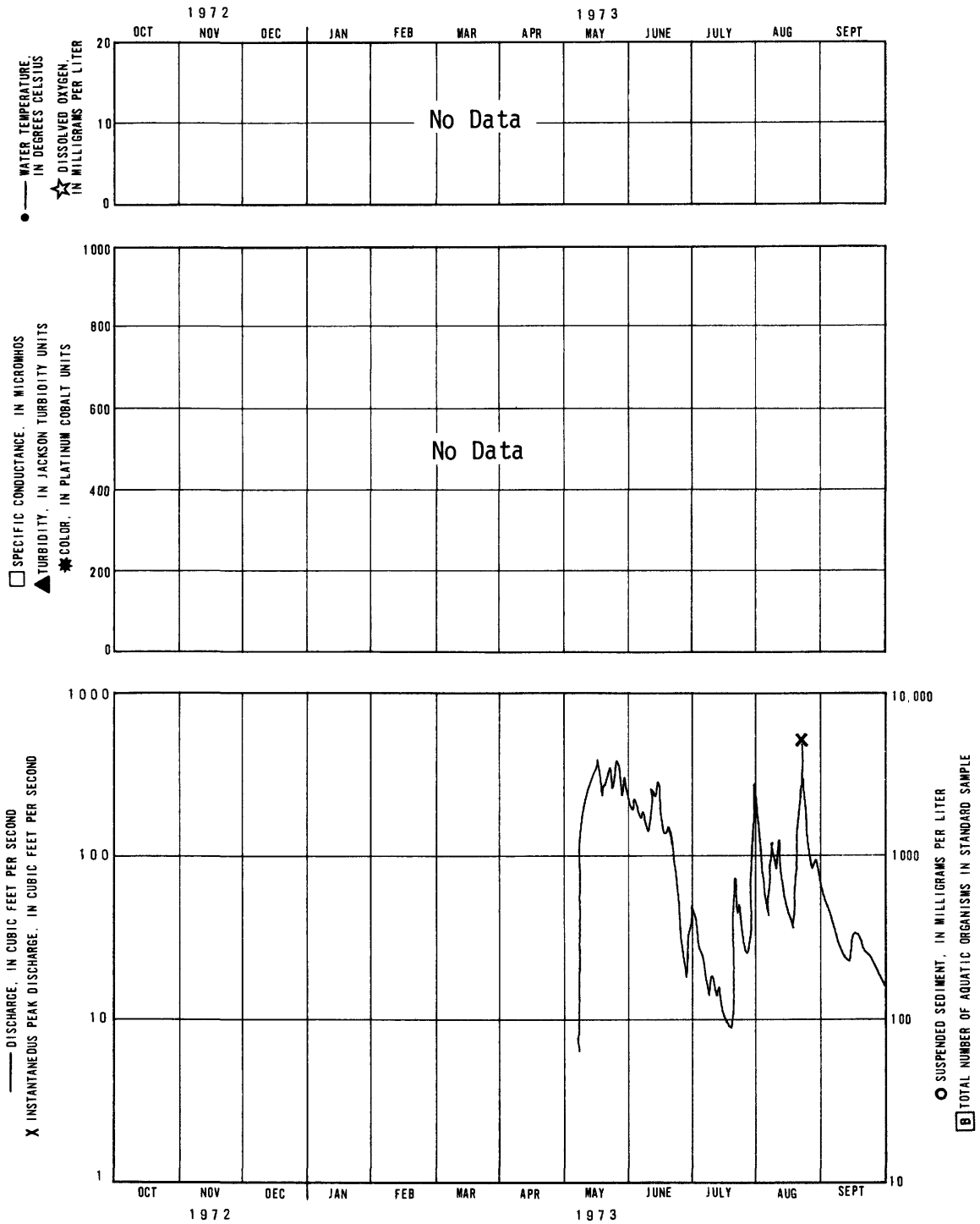


Figure 5.-- Wiseman Creek at Wiseman--Continued.

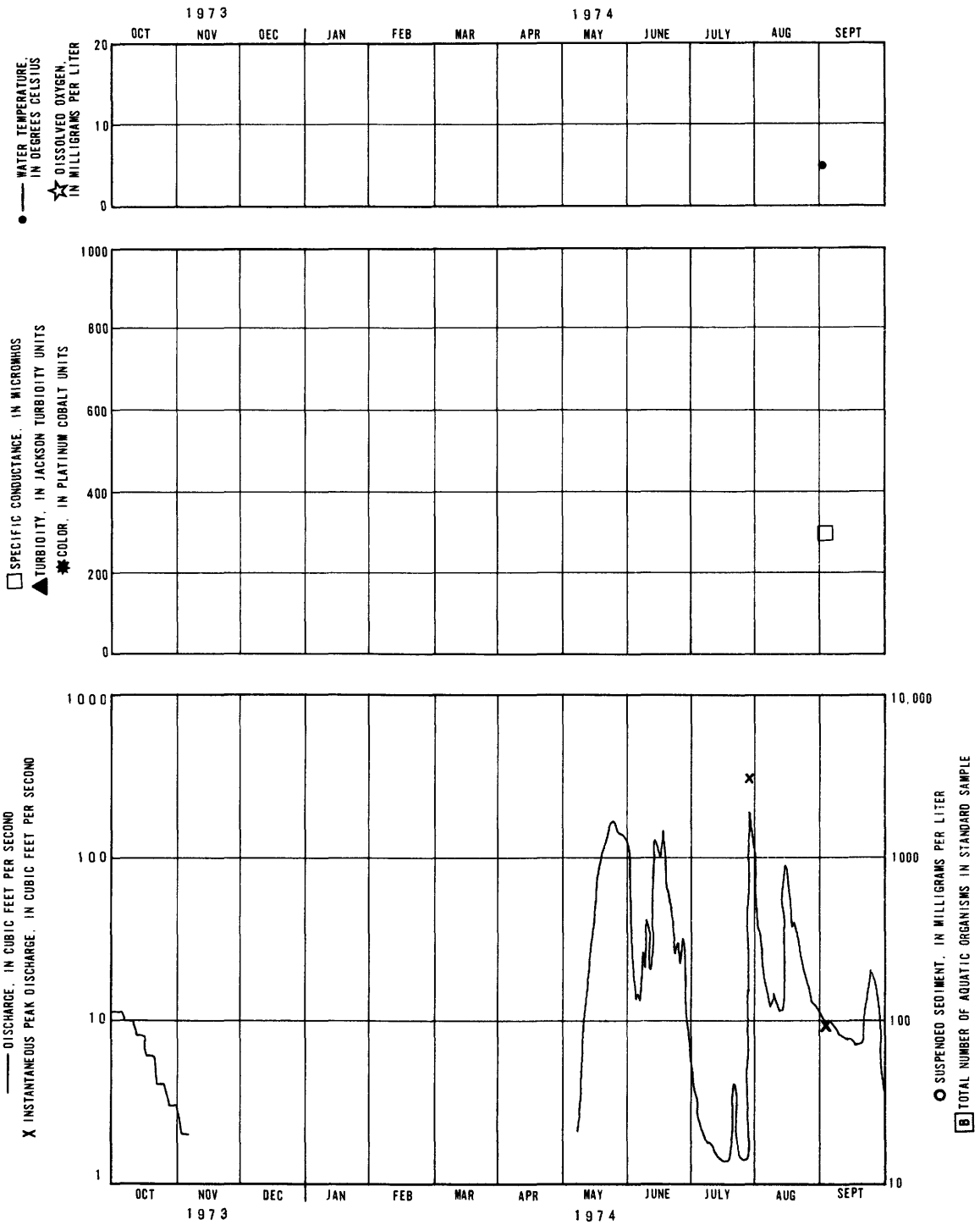


Figure 5.-- Wiseman Creek at Wiseman--Continued.

Jim River near Bettles

Location.--Lat 66°47'10", long 150°52'23", in SW¼ sec. 30, T.23 N., R.15 W., on right bank, 4.2 mi west of Prospect Camp, 4.8 mi downstream from Prospect Creek, 12.3 mi upstream from mouth, and 20 mi southeast of Bettles.

Period of Record.--August 1970 to current year.

Purpose.--To document streamflow conditions along the trans-Alaska pipeline and to provide a representative sample from the hydrologic region for estimating streamflow characteristics.

Drainage Basin.--The drainage area is 465 mi^2. The basin is in low mountains, within the Continental climatic zone, within the discontinuous permafrost zone, and is sparsely forested. Permafrost, ground ice, stream overflow and hillside icings are cold region features of this basin. The basin has not been significantly disturbed by man except for the trans-Alaska pipeline which follows the river for several miles and crosses it.

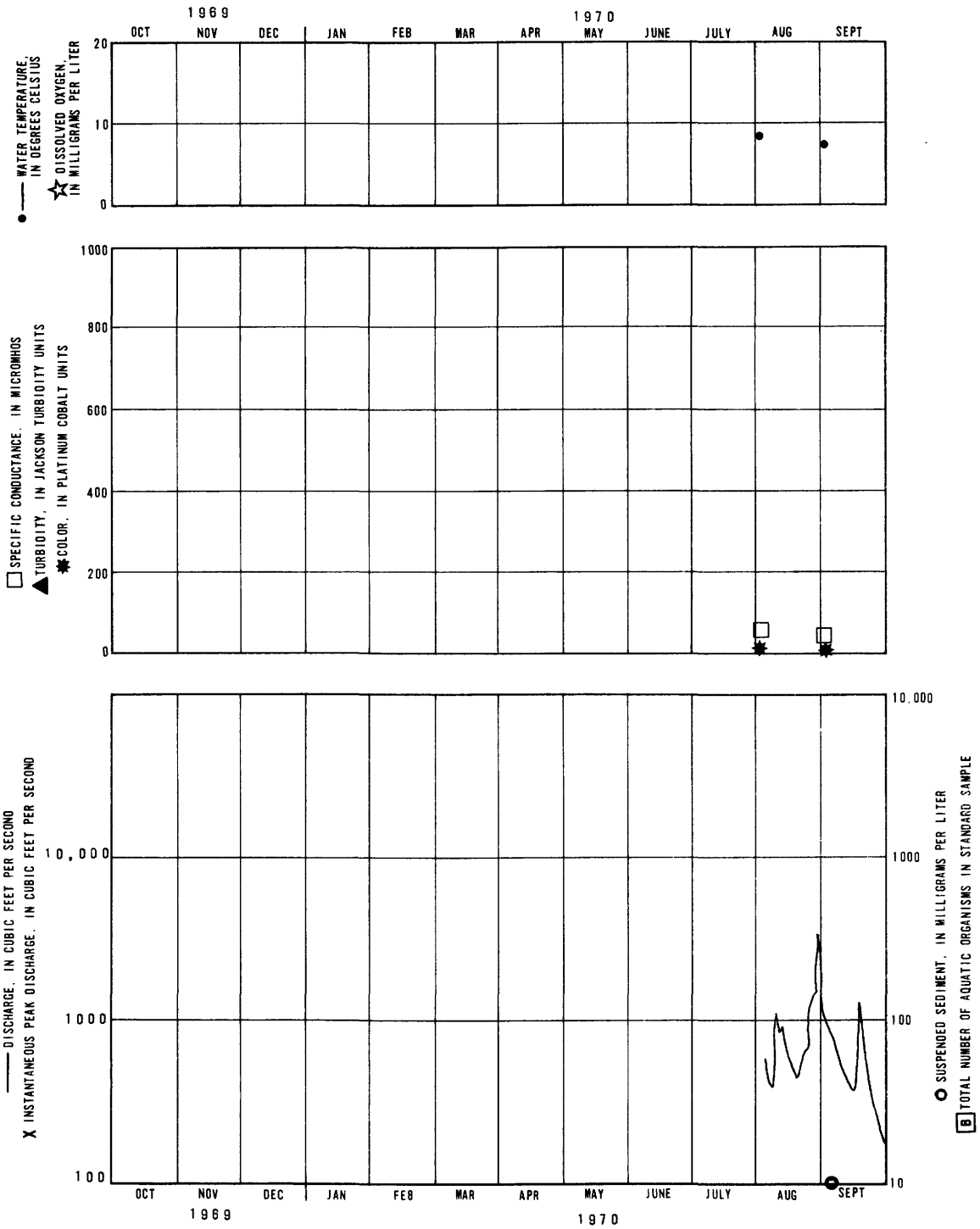
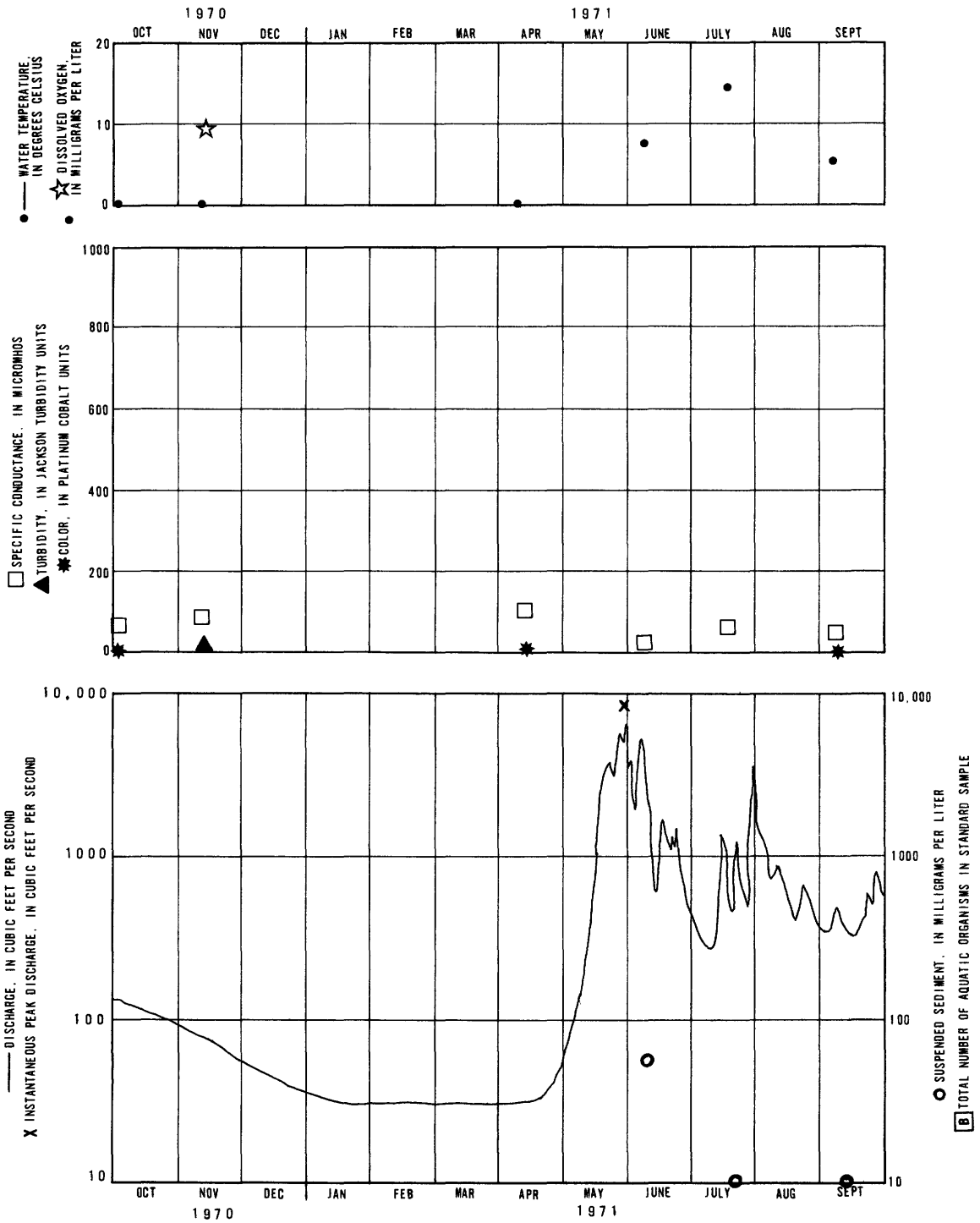


Figure 6.-- Jim River near Bettles.



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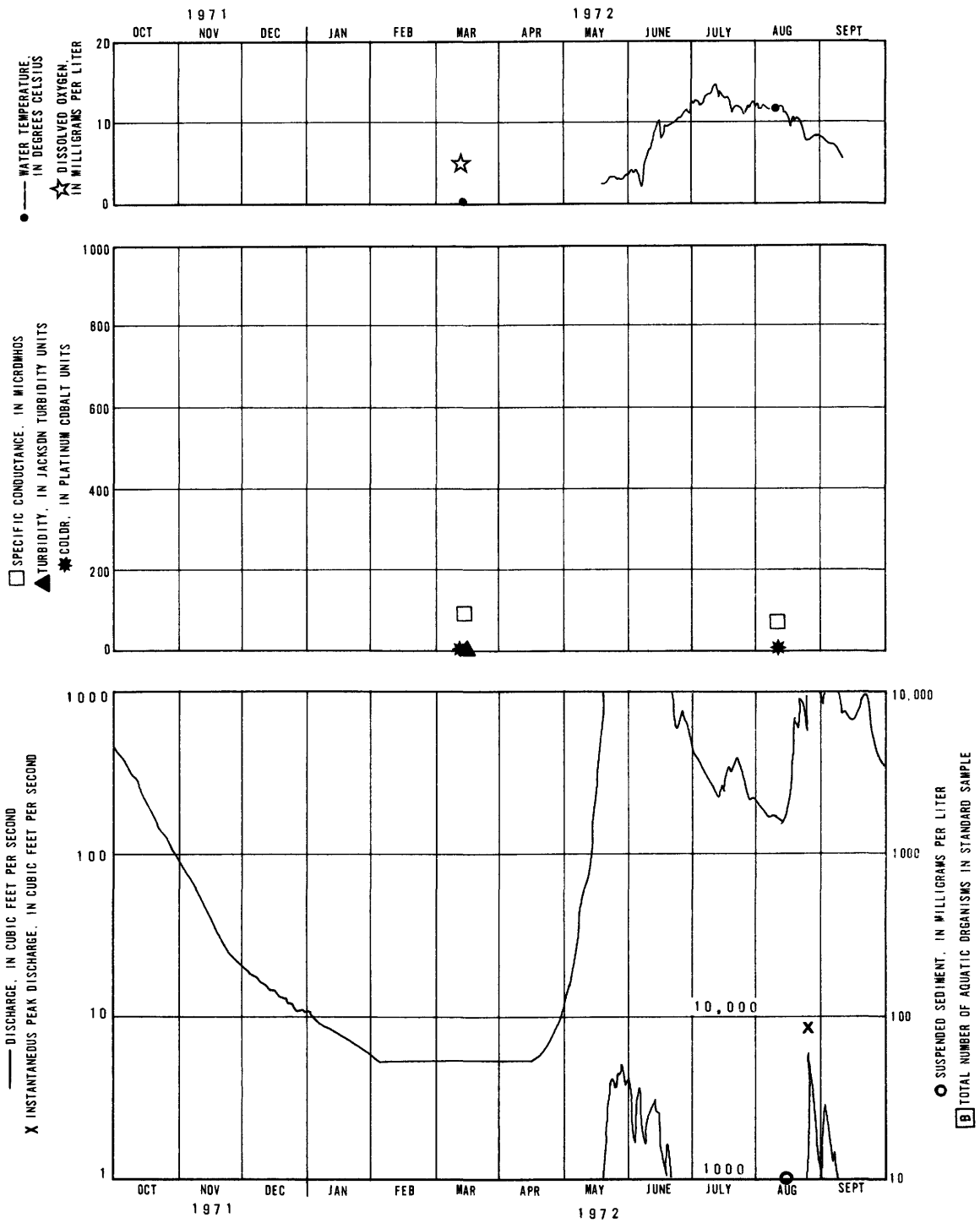

Figure 6.-- Jim River near Bettles--Continued.

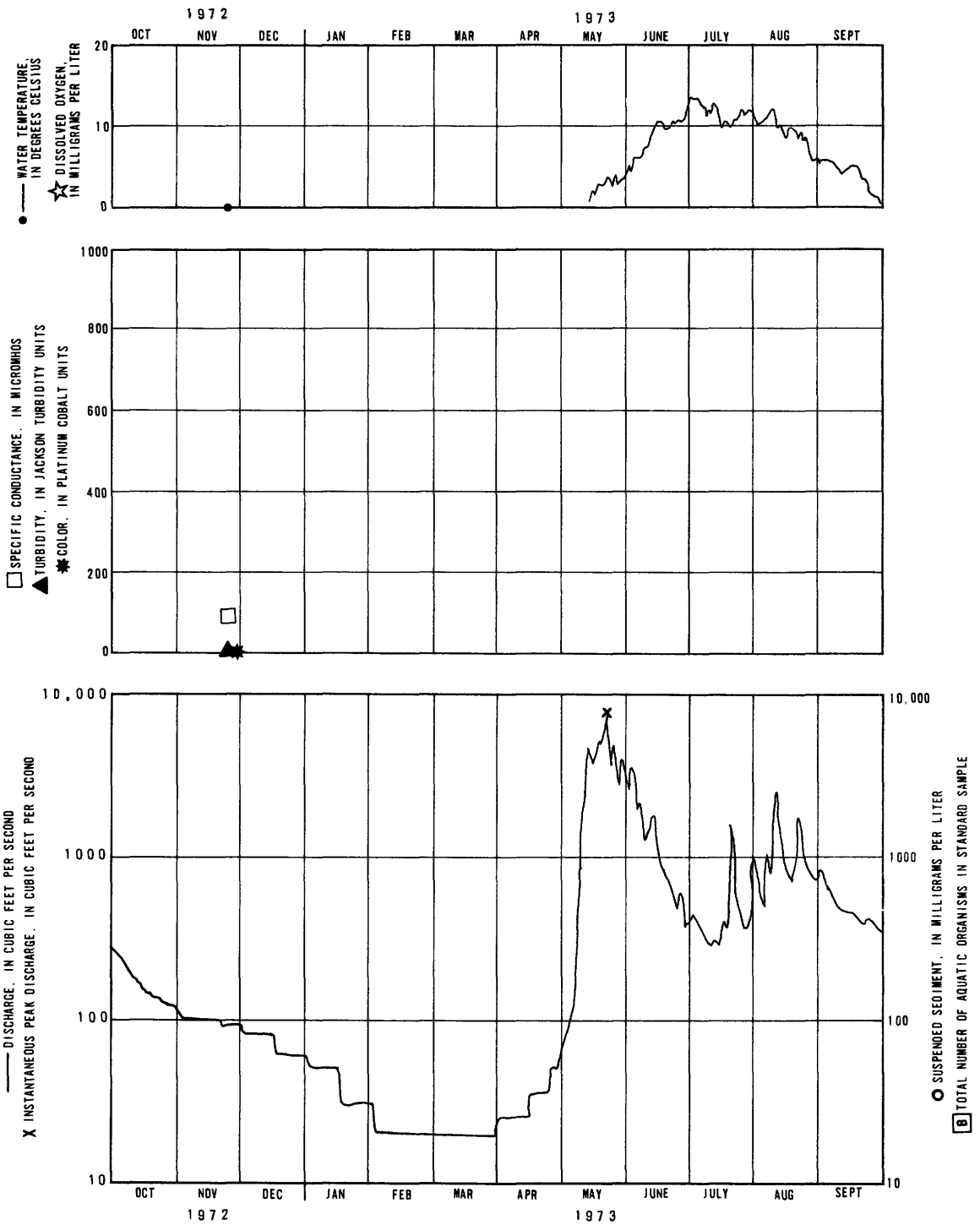

Figure 6.-- Jim River near Bettles--Continued.

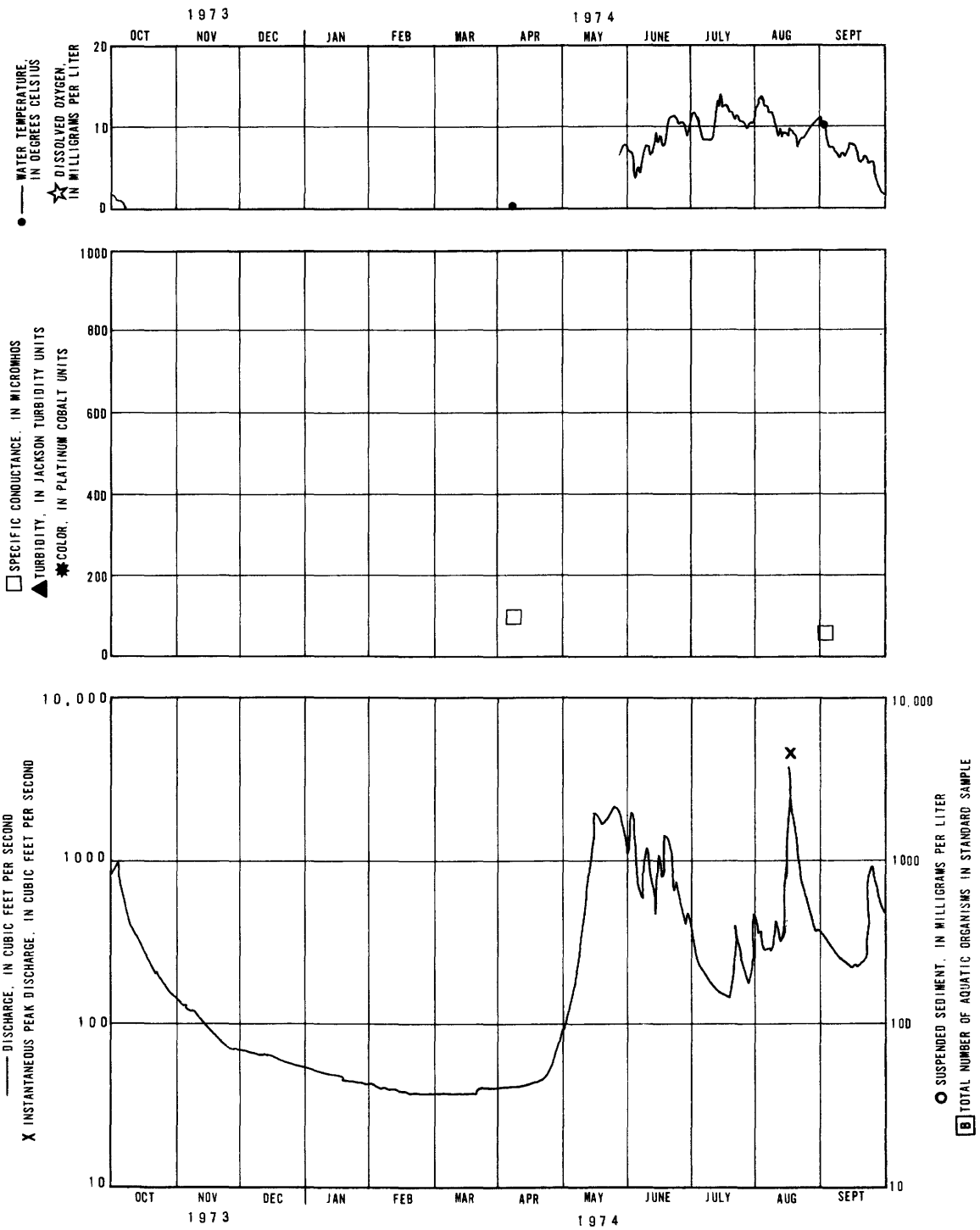

Figure 6.-- Jim River near Bettles--Continued.

Yukon River at Ruby

Location.--Lat 64°44'28", long 155°29'22", on left bank at Ruby, 300 ft downstream from Ruby Creek, 1.5 mi downstream from Melozitna River, and 2.5 mi upstream from Ruby Slough.

Period of Record.--October 1956 to current year.

Purpose.--To provide data for planning and design on this principal stream. The gaging station also serves as an International Hydrologic Decade river station.

Drainage Basin.--The drainage area is approximately 259,000 mi^2.

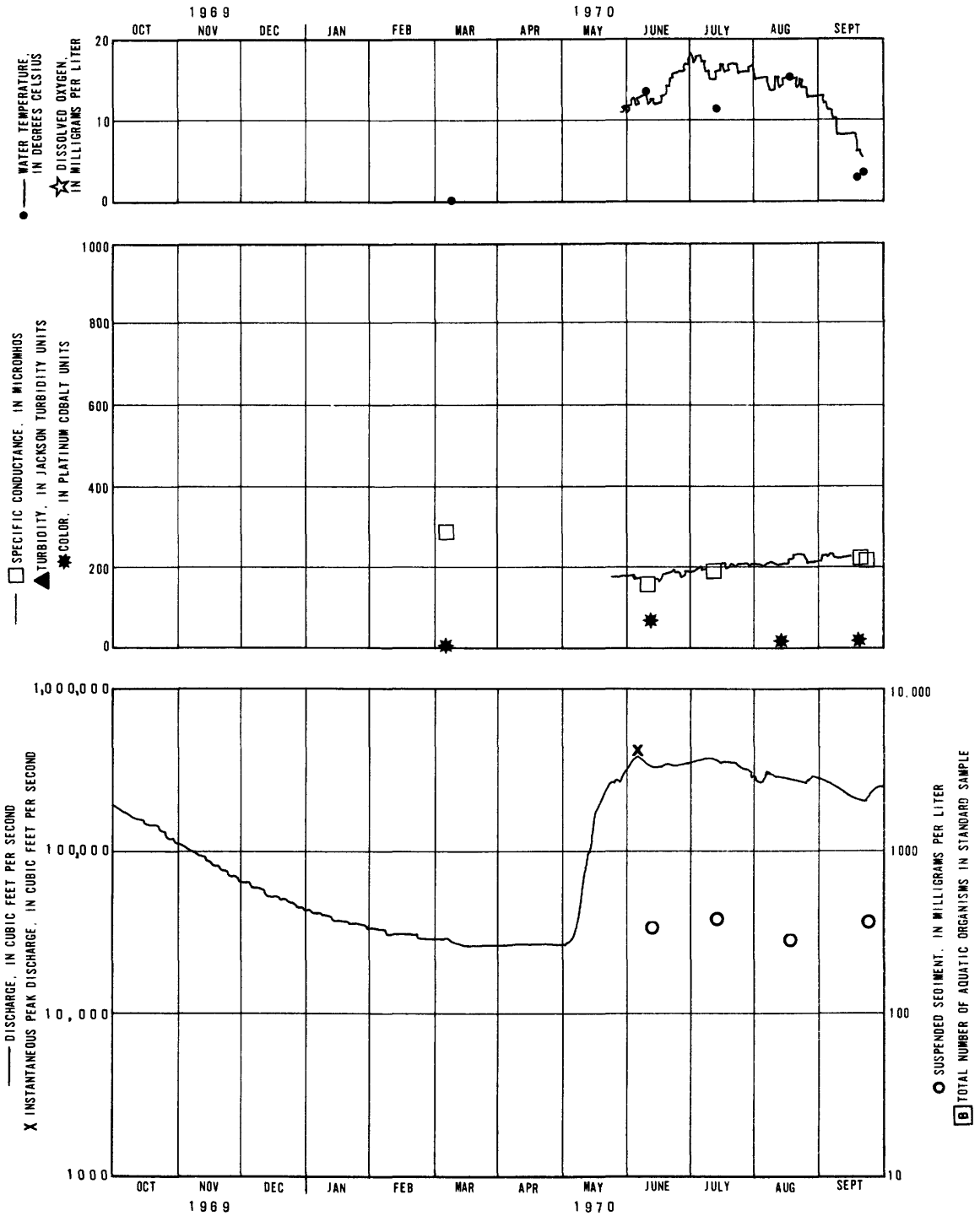

Figure 7.-- Yukon River at Ruby.

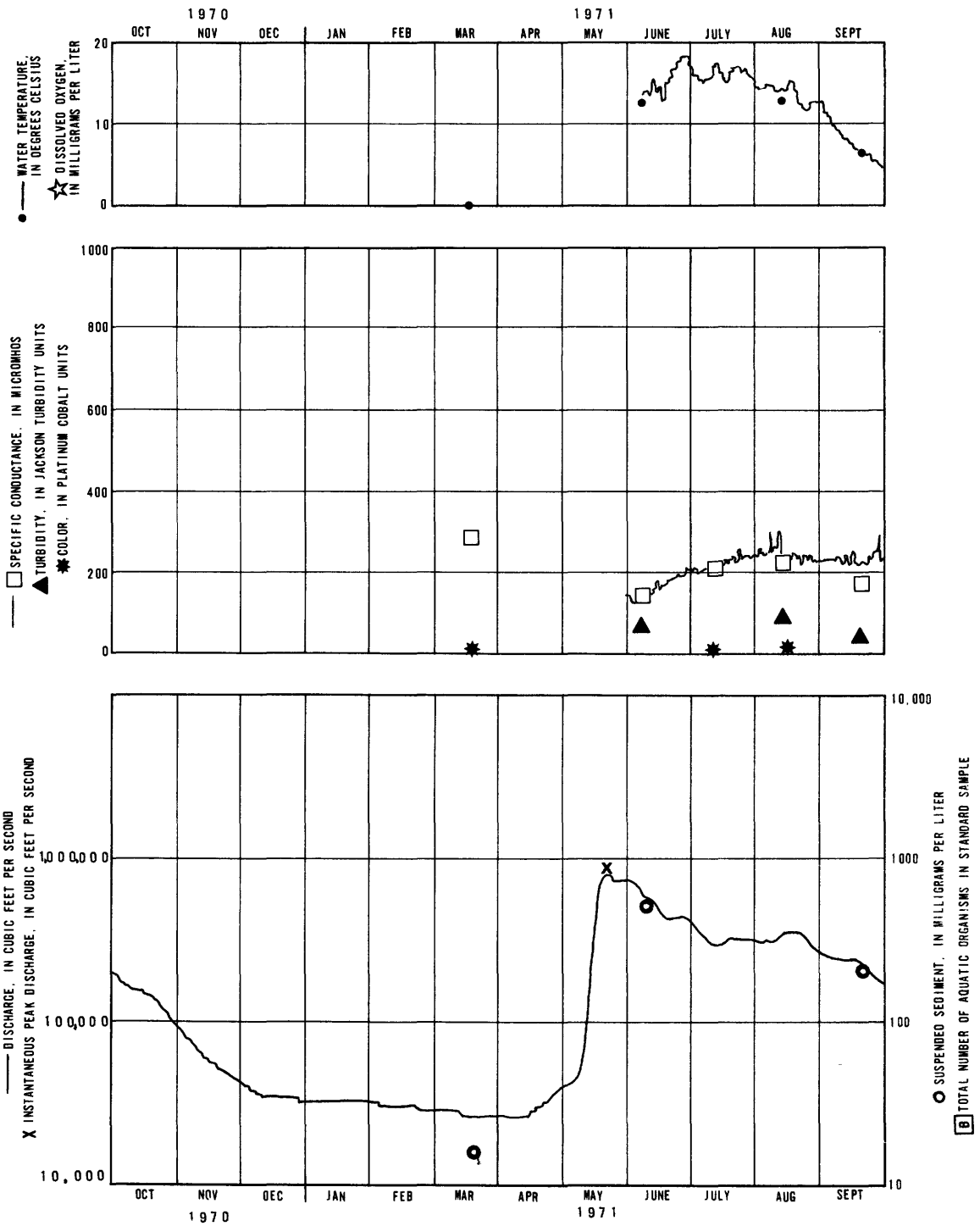

Figure 7.-- Yukon River at Ruby--Continued.

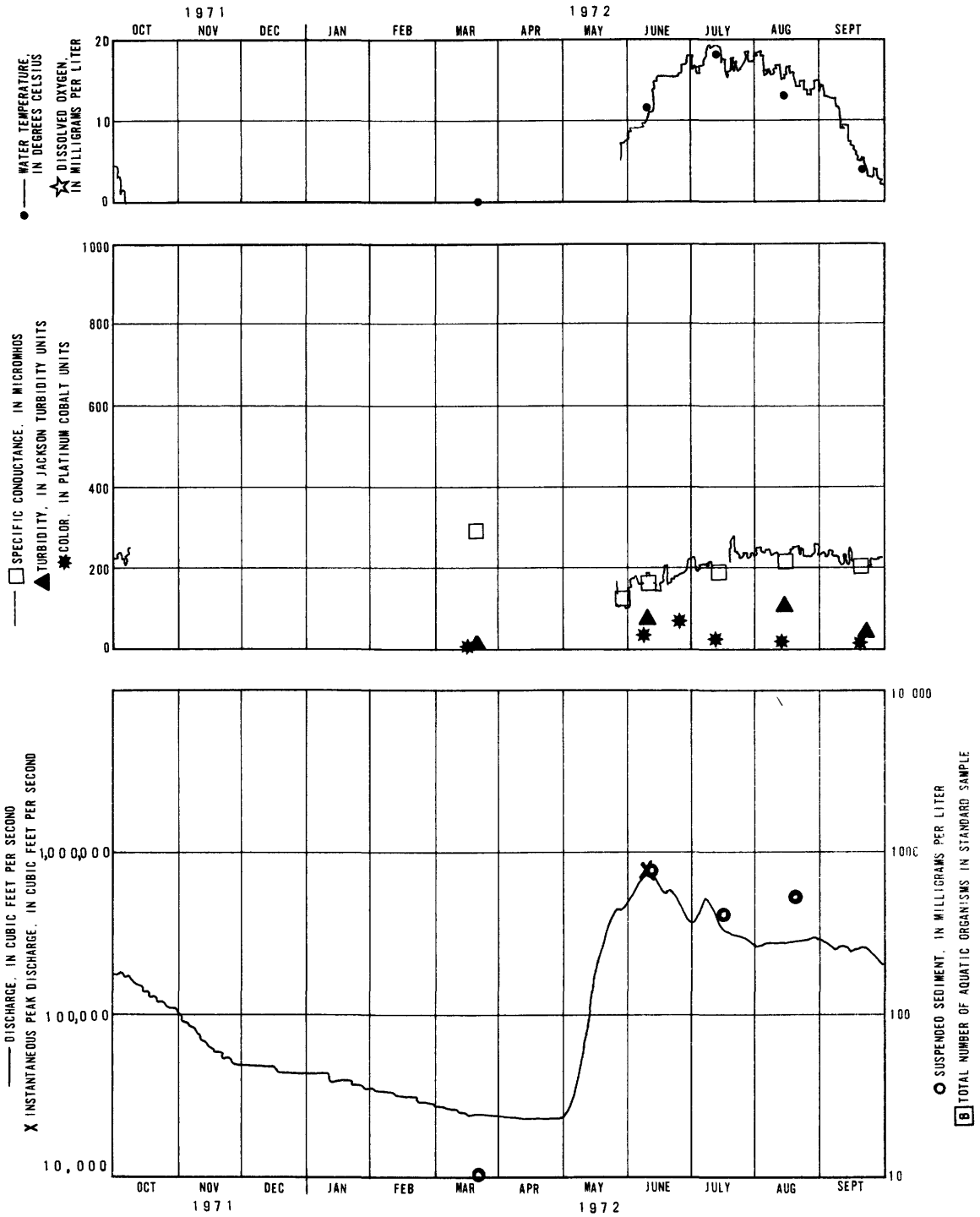

Figure 7.-- Yukon River at Ruby--Continued.

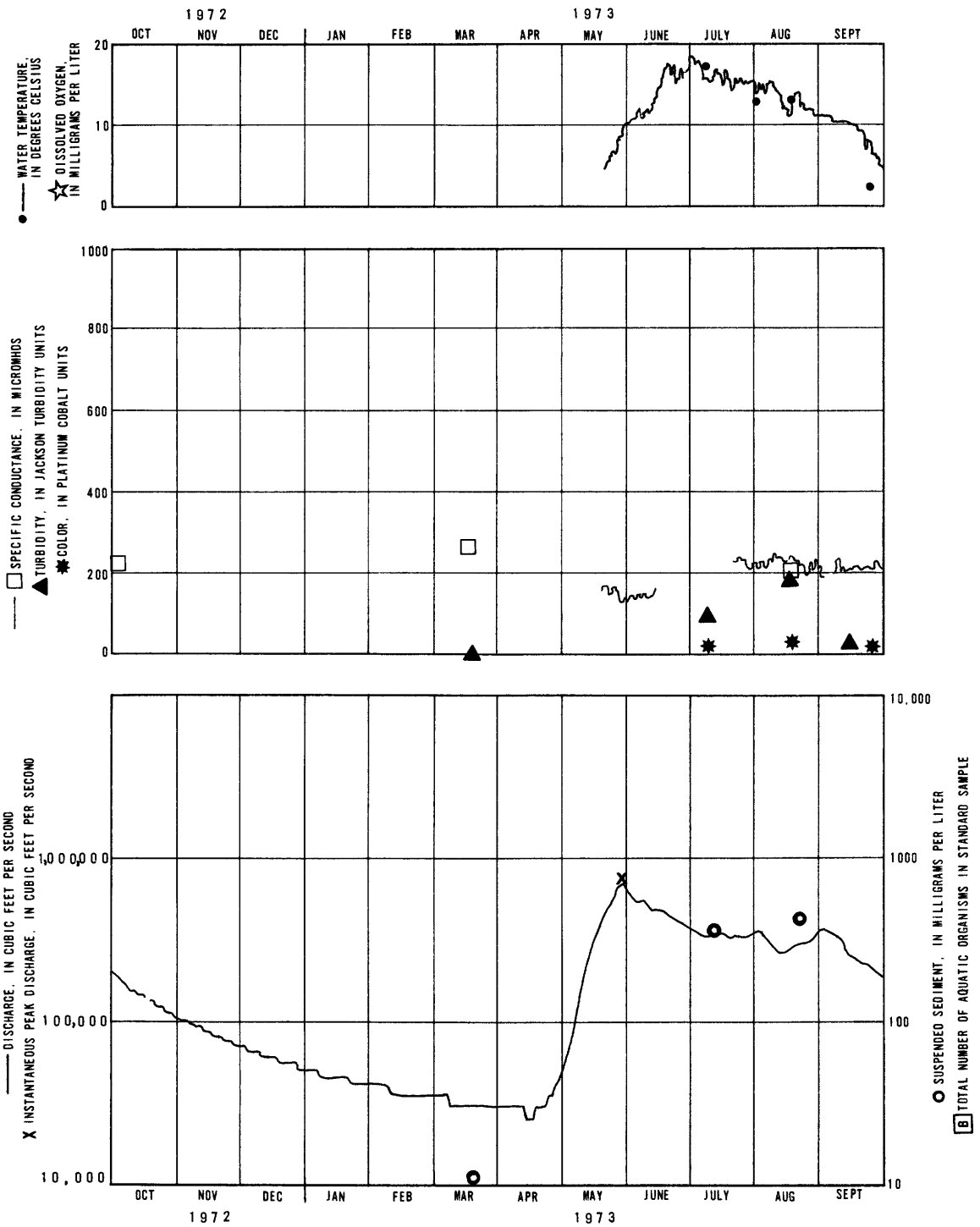

Figure 7.-- Yukon River at Ruby--Continued.

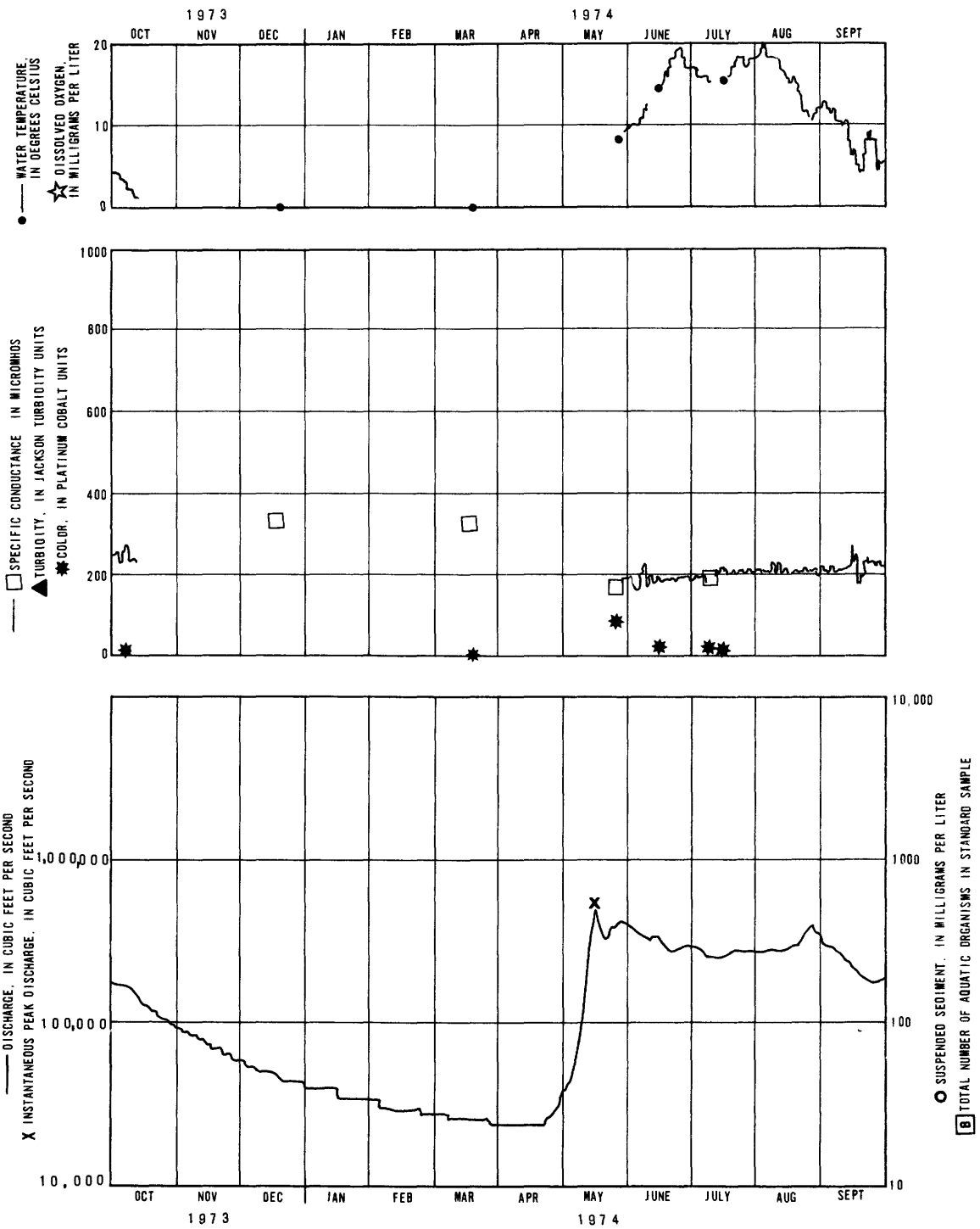

Figure 7.-- Yukon River at Ruby--Continued.

Hess Creek near Livengood

Location.--Lat 65°39'55", long 149°05'47", in NW¼ sec.30, T.10 N., R.7 W., near midspan on downstream side of bridge at mile 22 on TAPS haul road, 1.0 mi downstream from Mastodon Creek, 4.0 mi upstream from Richardson Creek, and 18.6 mi northwest of Livengood.

Period of Record.--June 1970 to current year.

Purpose.--To document streamflow conditions along the trans-Alaska pipeline and to provide a hydrologic sample from a representative basin in the region for planning and design information.

Drainage Basin.--Drainage area is 662 mi^2. The basin is in low mountains, in the Continental climatic zone, within the discontinuous permafrost zone, and is mostly forested. Permafrost, ground ice, and stream overflow and hillside icings are cold region features of this basin. The basin has some inactive placer mines and contains a small reservoir formed by a permafrost dam, which probably has no significant regulatory effect on streamflow at the gaging station.

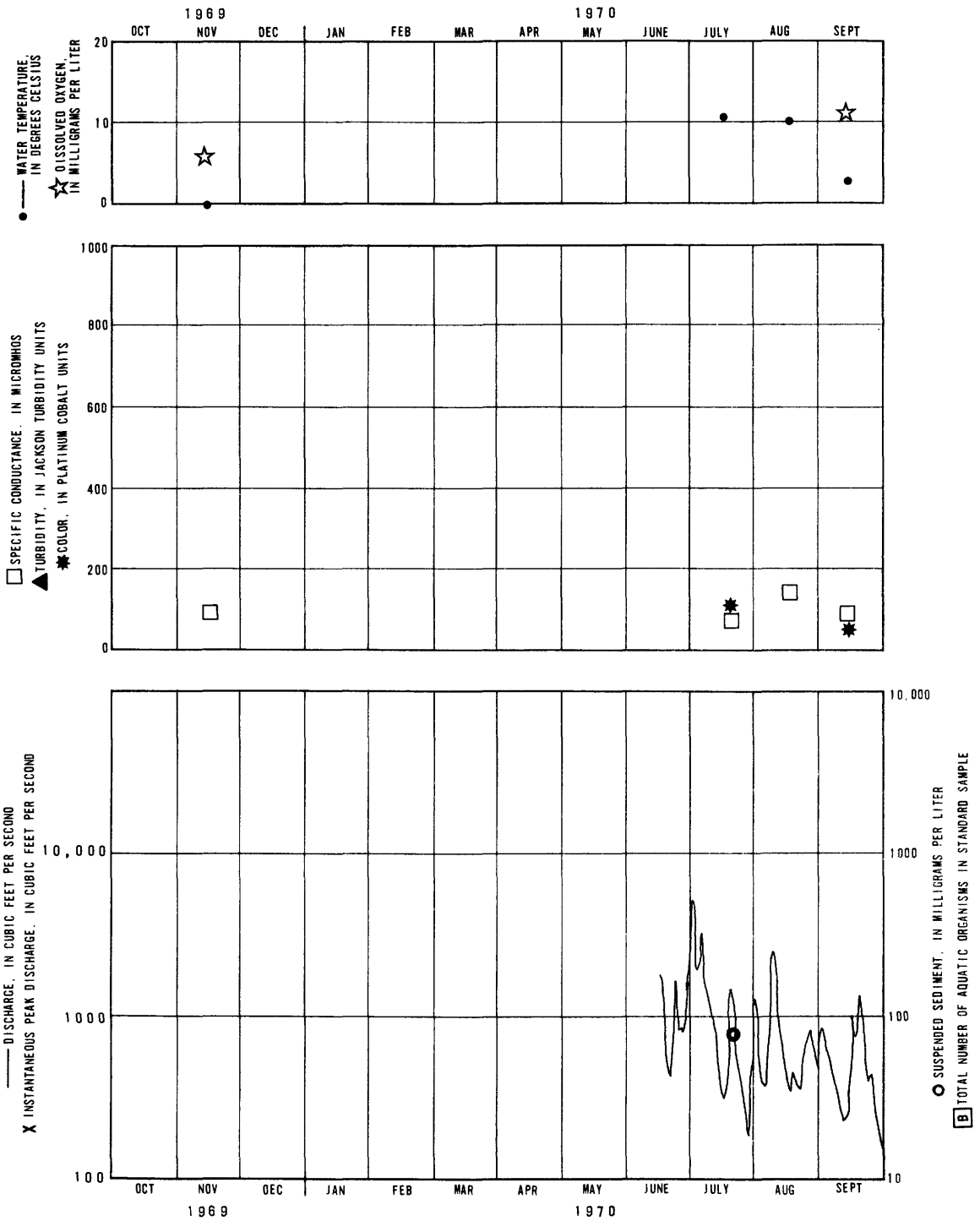

Figure 8.-- Hess Creek near Livengood.

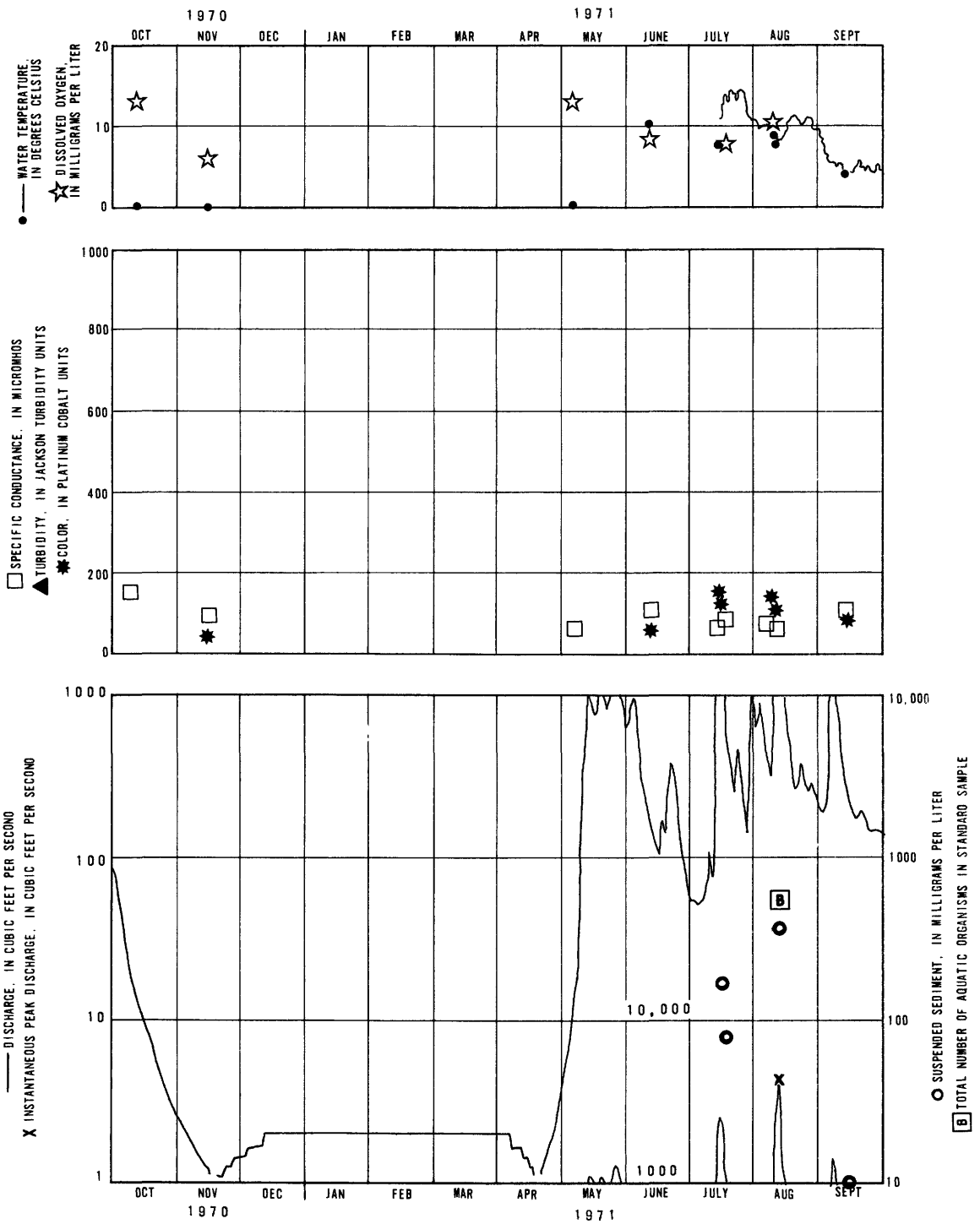

Figure 8.-- Hess Creek near Livengood--Continued.

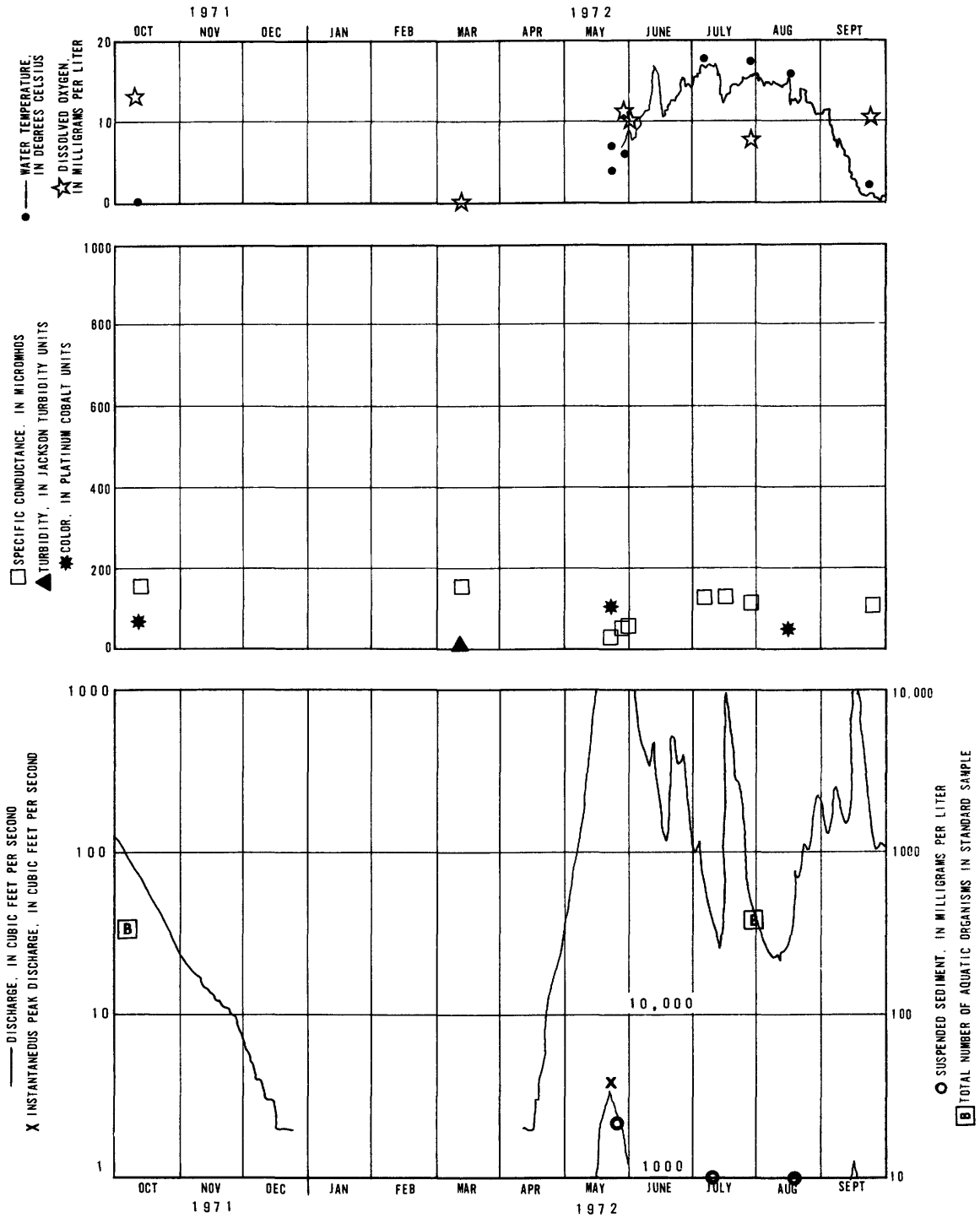

Figure 8.-- Hess Creek near Livengood--Continued.

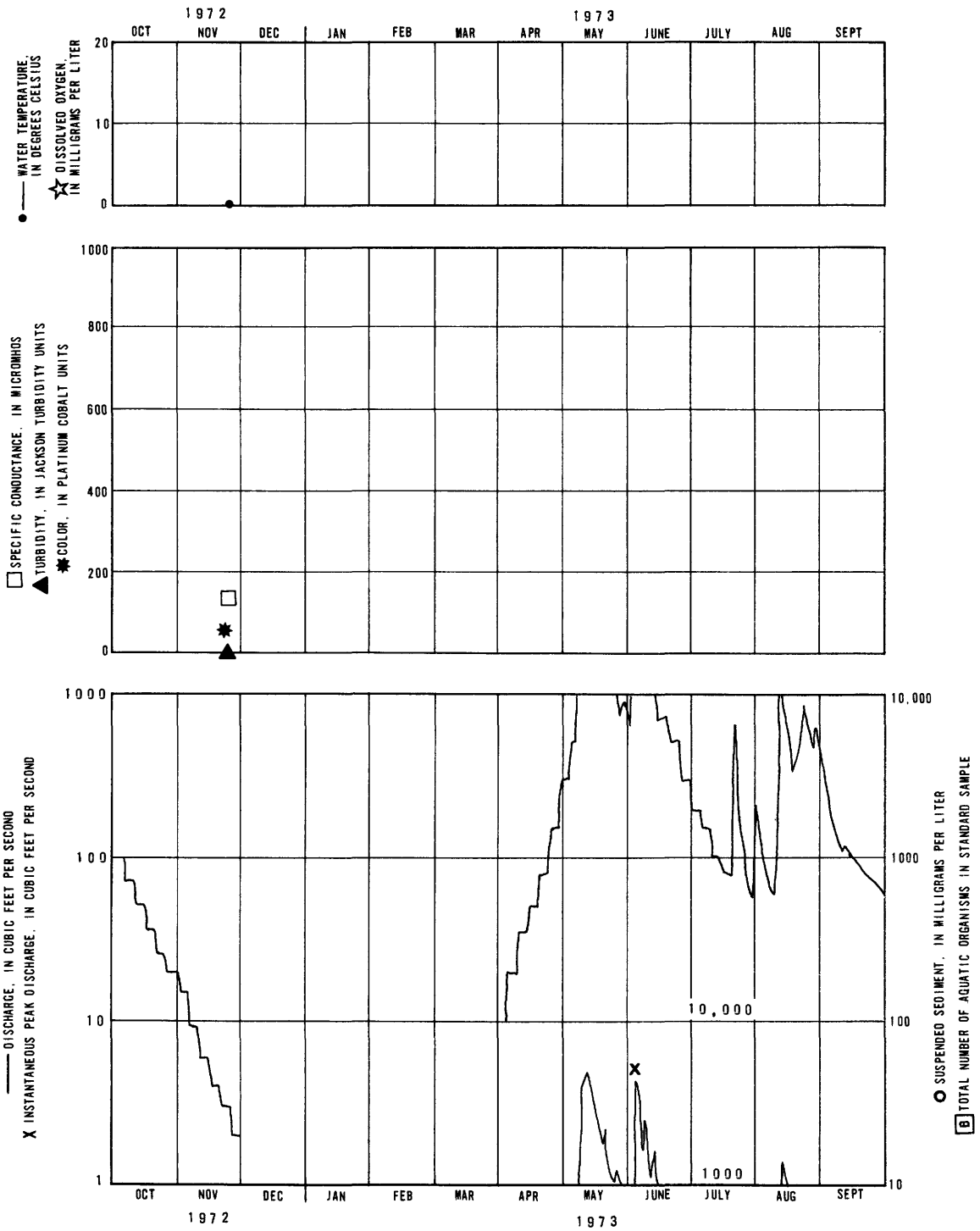

Figure 8.-- Hess Creek near Livengood--Continued.

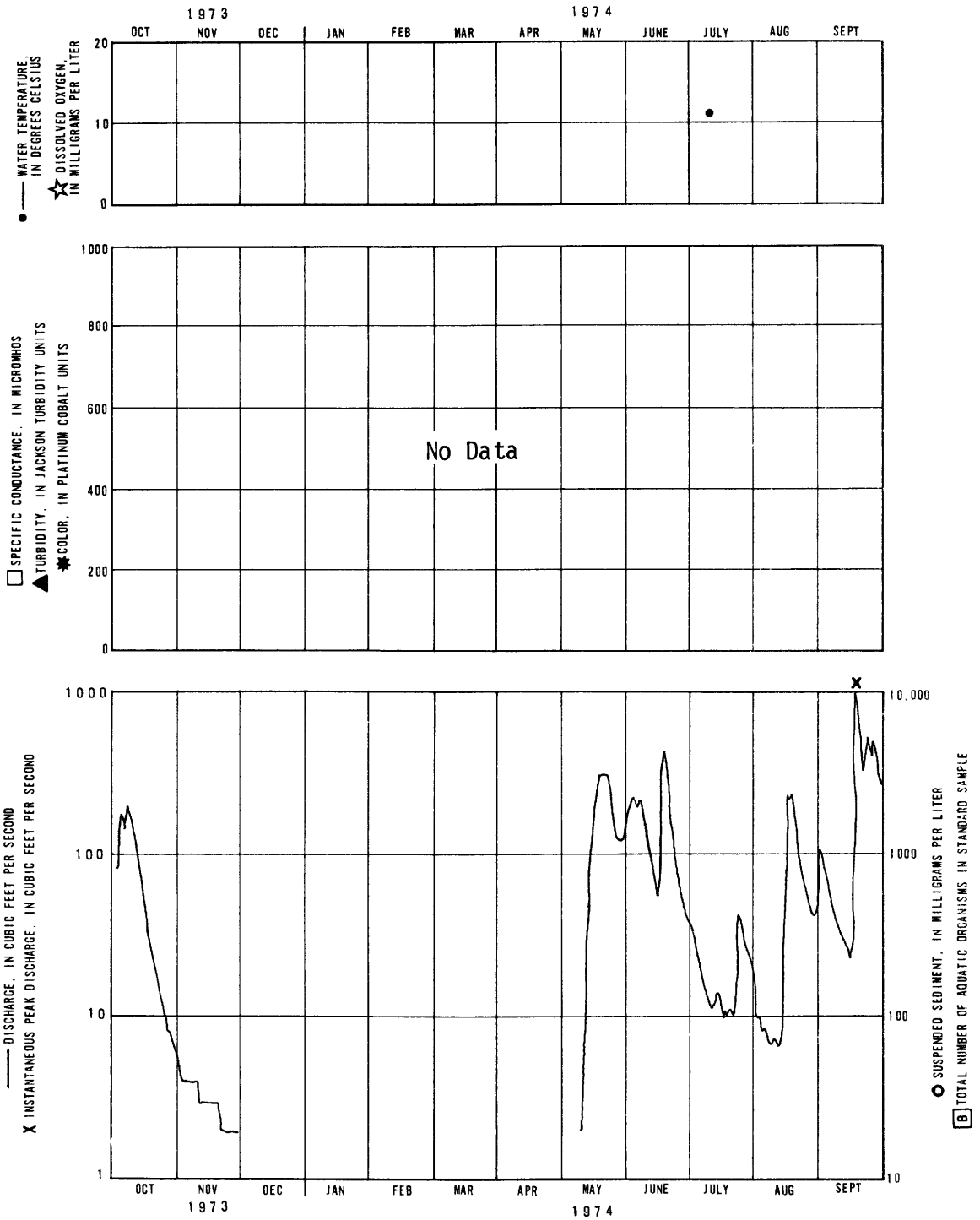

Figure 8.-- Hess Creek near Livengood--Continued.

Caribou Creek near Chatanika

Location.--Lat 65°09'00", long 147°33'05", in NW¼ sec.28, T.4 N., R.1 E., Fairbanks North Star Borough on left bank 2.0 mi upstream from mouth, 3.5 mi northwest of Chatanika, and 21.6 mi north of Fairbanks.

Period of Record.--October 1969 to current year.

Purpose.--To provide key records for the Caribou-Poker Creek experimental watershed funded by the Interagency Technical Committee for Alaska. It is also a benchmark station which is hydrologically representative of long-term trends on small streams draining taiga in the central Alaska region.

Drainage Basin.--Drainage area is 9.19 mi^2. The basin is in low mountains, within the Continental climatic zone, and in the discontinuous permafrost zone. It is mostly forested. The basin, although not crossed by the trans-Alaska pipeline, is probably representative of many small basins which are. Permafrost, ground ice, and stream overflow and hillside icings are features of this basin. The basin has not been significantly disturbed by man.

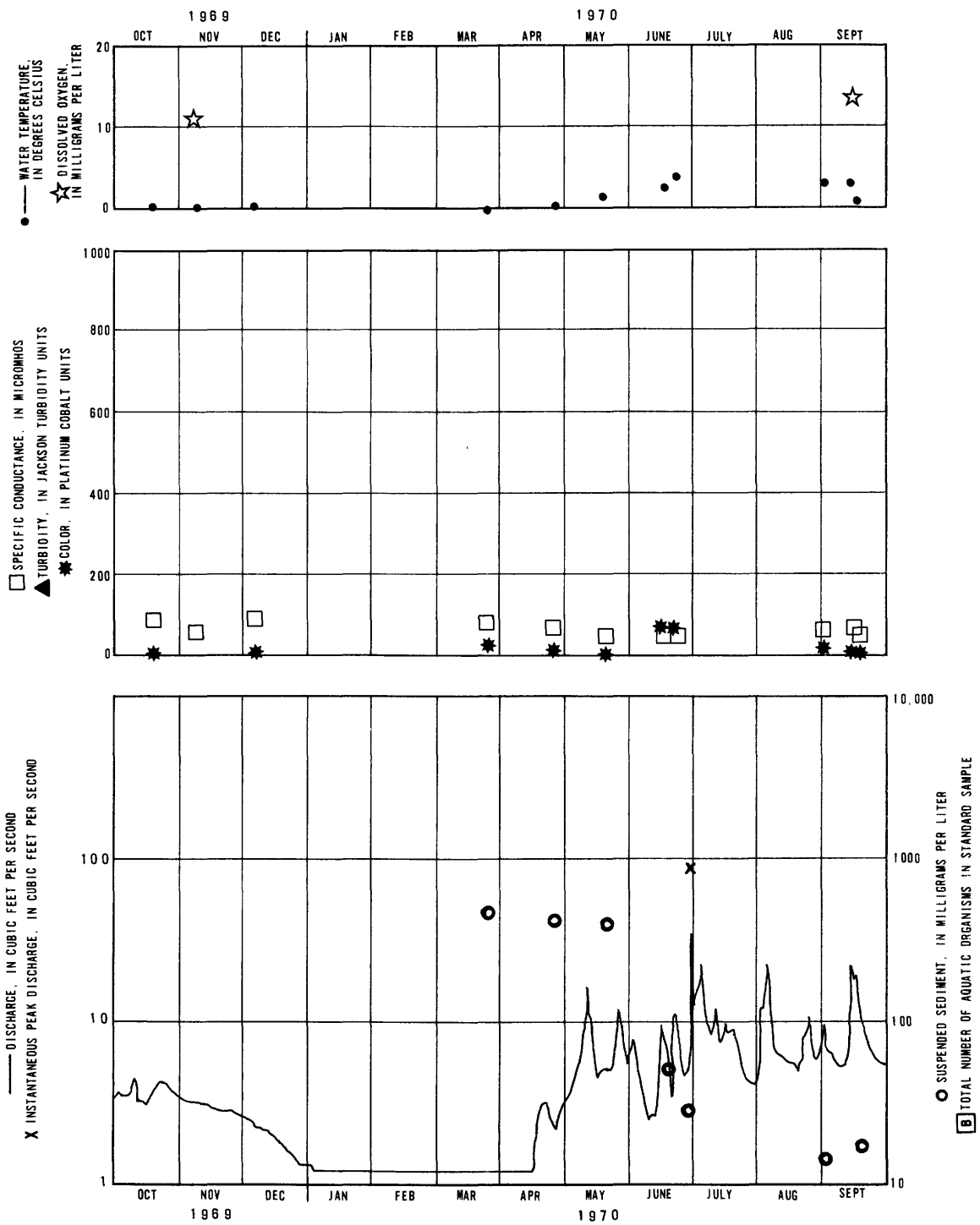

Figure 9.-- Caribou Creek near Chatanika.

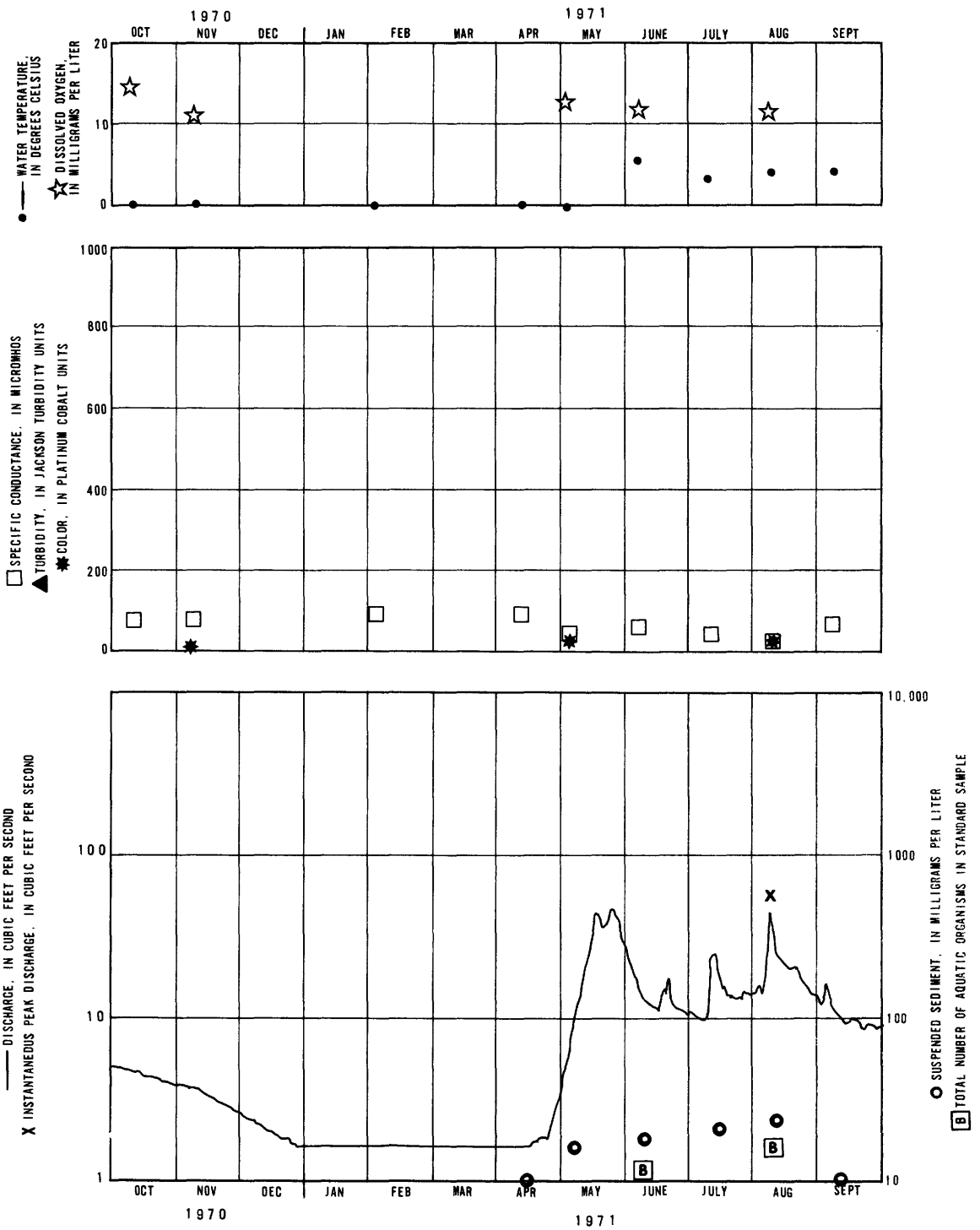

Figure 9.-- Caribou Creek near Chatanika--Continued.

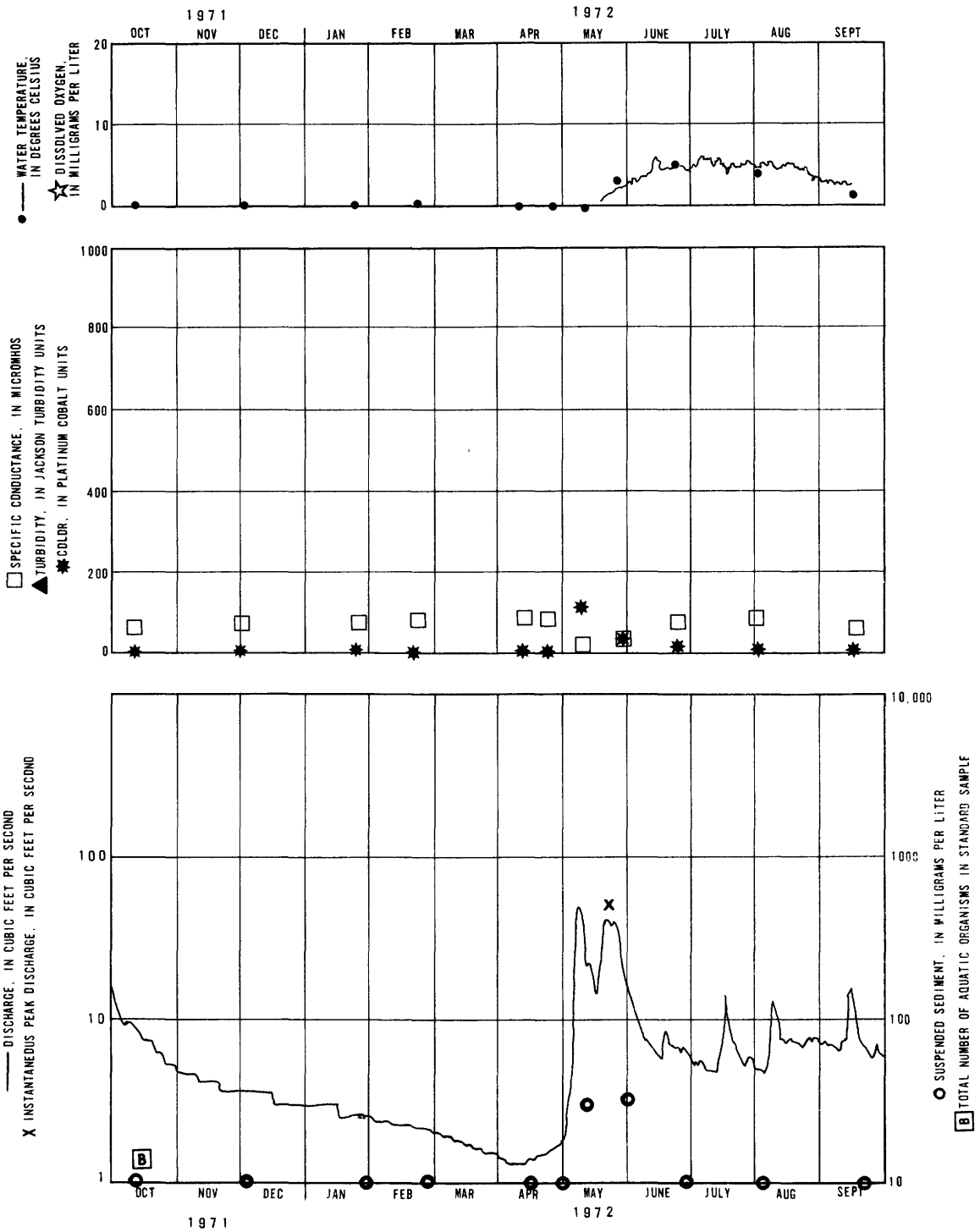

Figure 9.-- Caribou Creek near Chatanika--Continued.

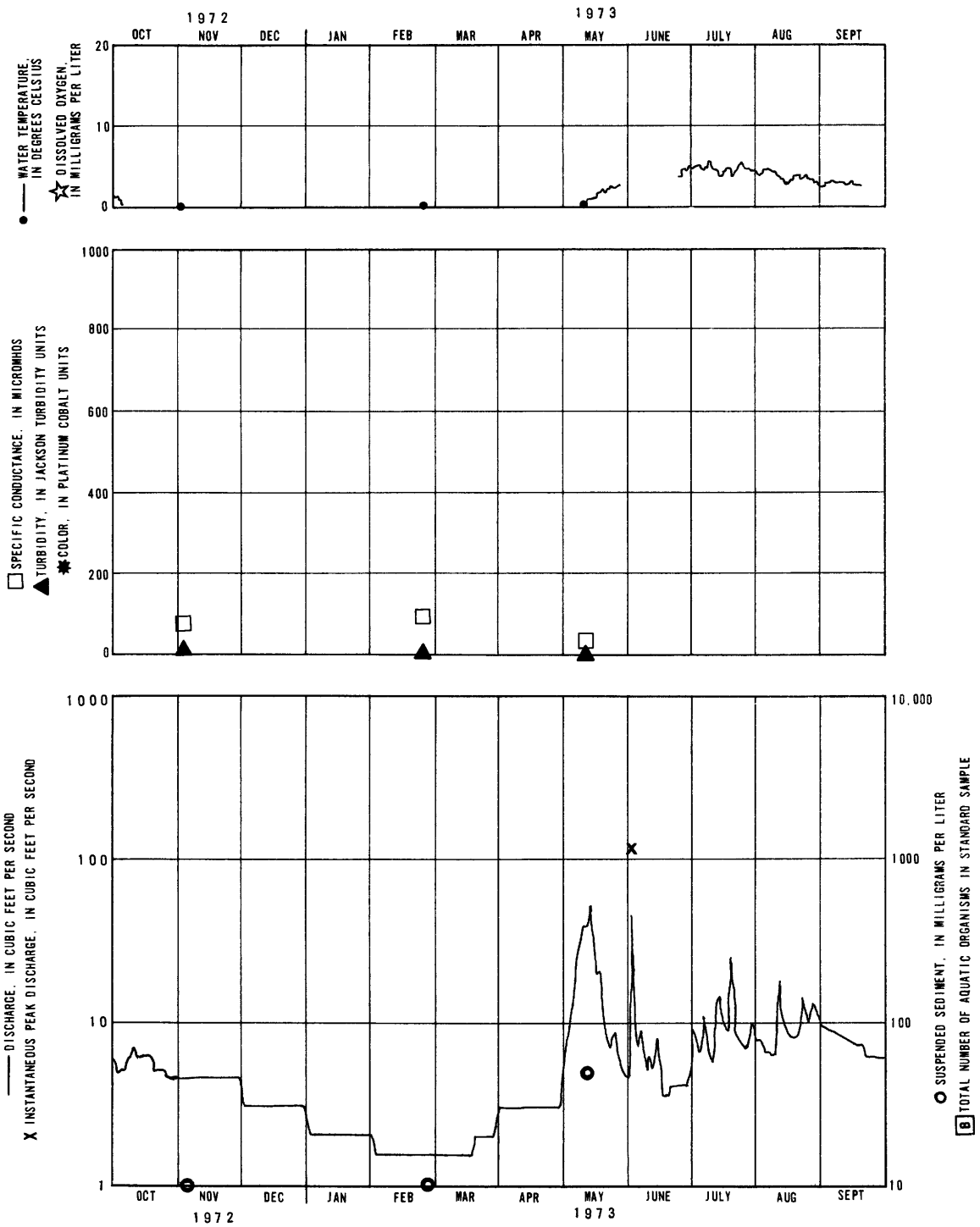

Figure 9.-- Caribou Creek near Chatanika--Continued.

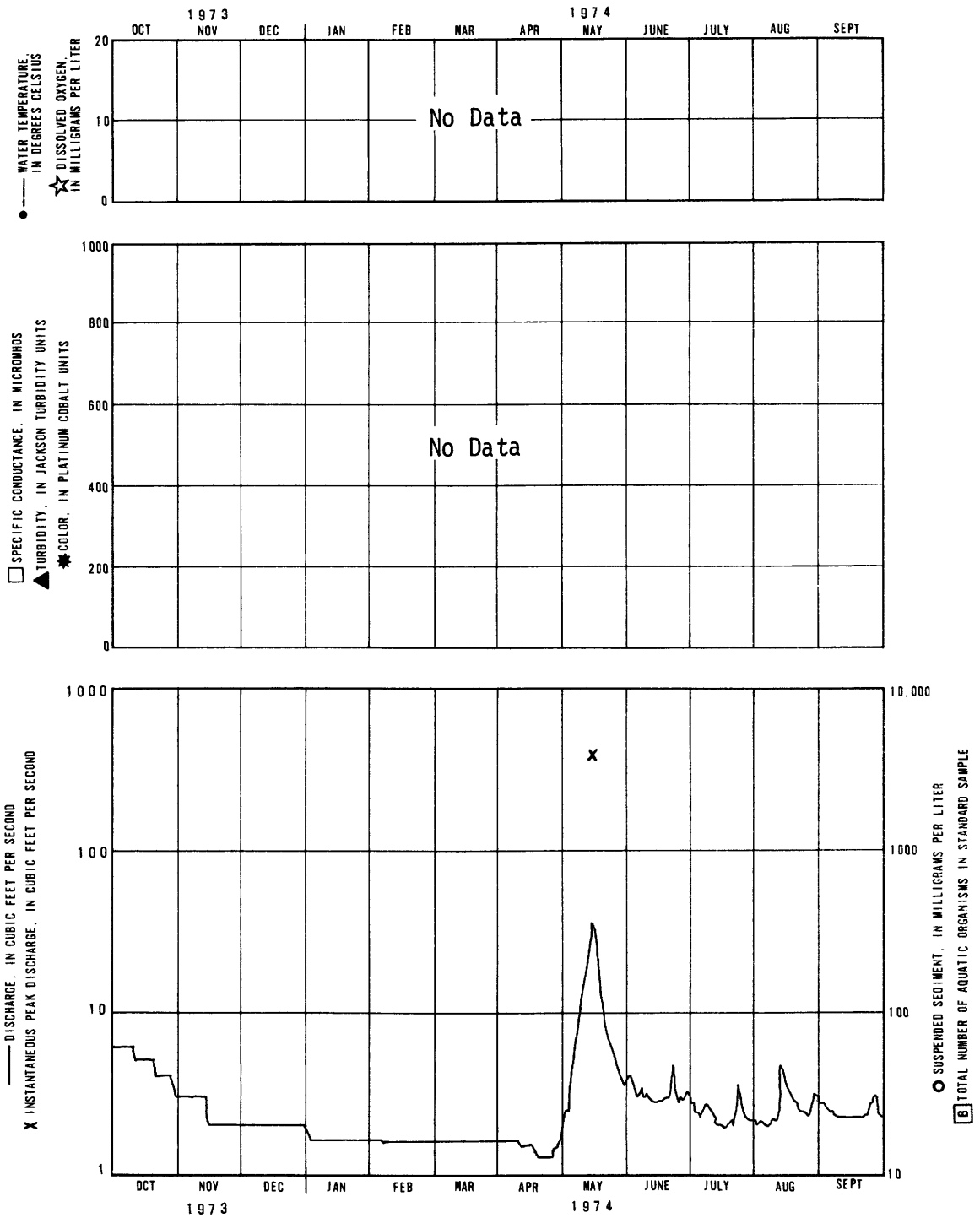

Figure 9.-- Caribou Creek near Chatanika--Continued.

Chena River at Fairbanks

Location.--Lat 64°50'45", long 147°42'04", in NW¼ sec.11, T.1 S., R.1 W., Fairbanks North Star Borough, on right bank 800 ft upstream from bridge on Steese Highway (U.S. Highway 97) in Fairbanks, 0.3 mi upstream from Noyes Slough, 11 mi upstream from mouth, and 11 mi downstream from Chena Slough.

Period of Record.--July 1947 to September 1948 (no winter records), October 1948 to current year.

Purpose.--To provide data for flood and river stage-discharge forecasting, to document hydrologic conditions along the trans-Alaska pipeline and to define streamflow characteristics on this principal stream.

Drainage Basin.--Drainage area is approximately 1,980 mi^2. The basin is in low mountains, in the Continental climatic zone, in the discontinuous permafrost zone, and is forested. Permafrost, ground ice, and stream overflow and hillside icings are cold region features of this basin. The basin is crossed by the trans-Alaska pipeline. Placer mining took place in some drainages in the basin. A flood control diversion reservoir is being constructed about 10 mi upstream from Fairbanks to prevent damage from a flood like the extreme flood of August 1967. The gaging station is located near the center of Fairbanks, and water quality may be affected by some local runoff from urban development. Most of the basin, however, is unaffected by man.

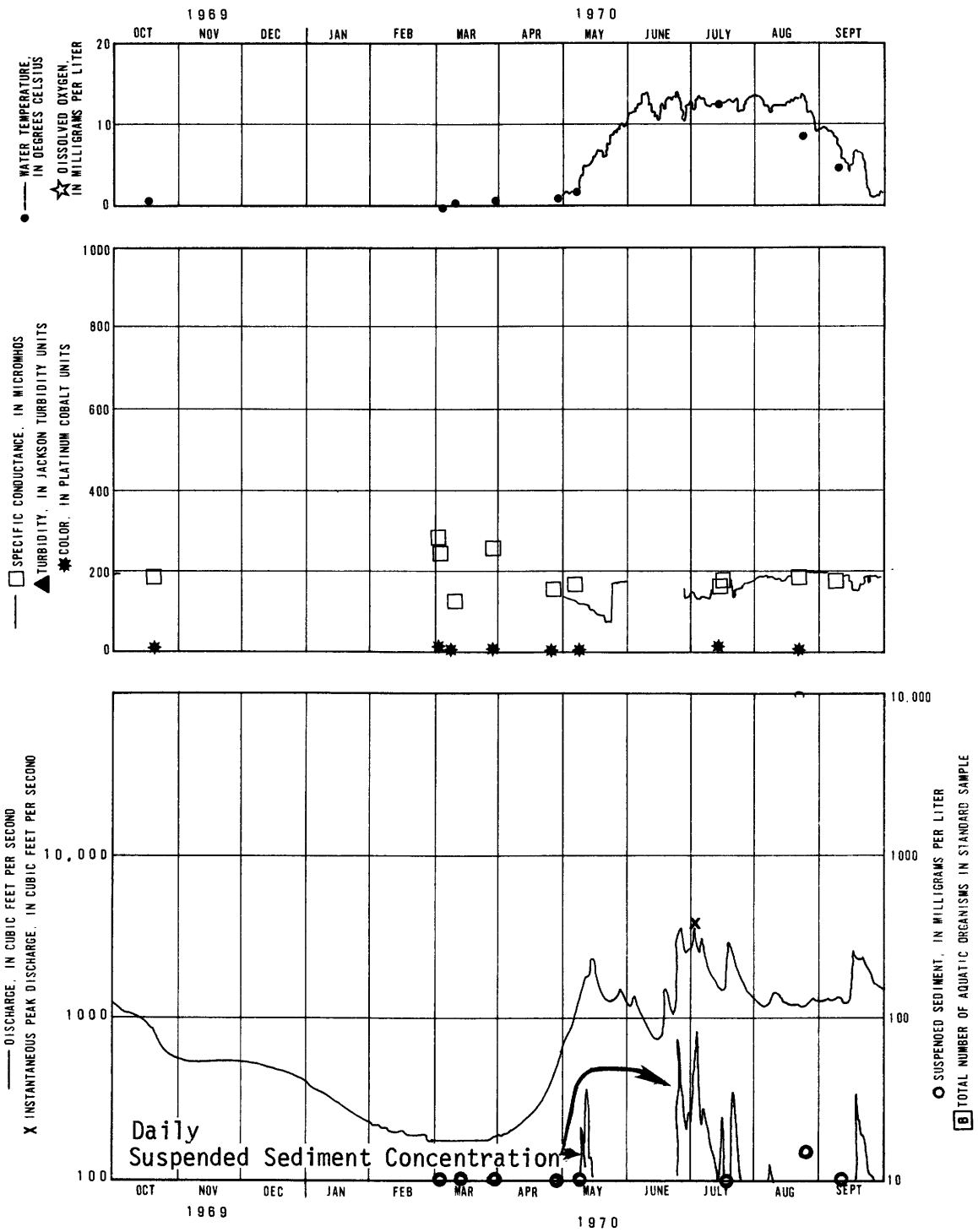

Figure 10.-- Chena River at Fairbanks.

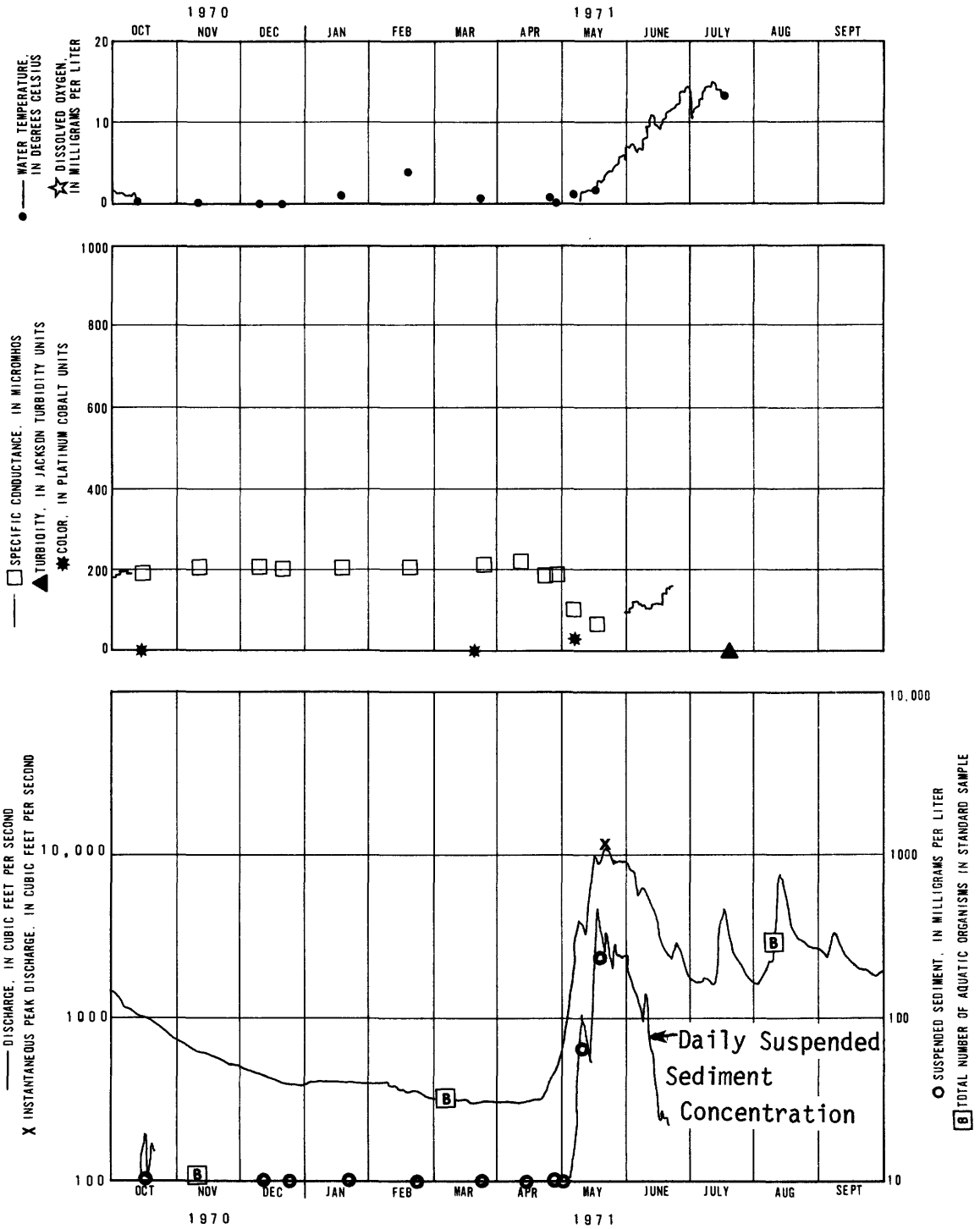

Figure 10.-- Chena River at Fairbanks--Continued.

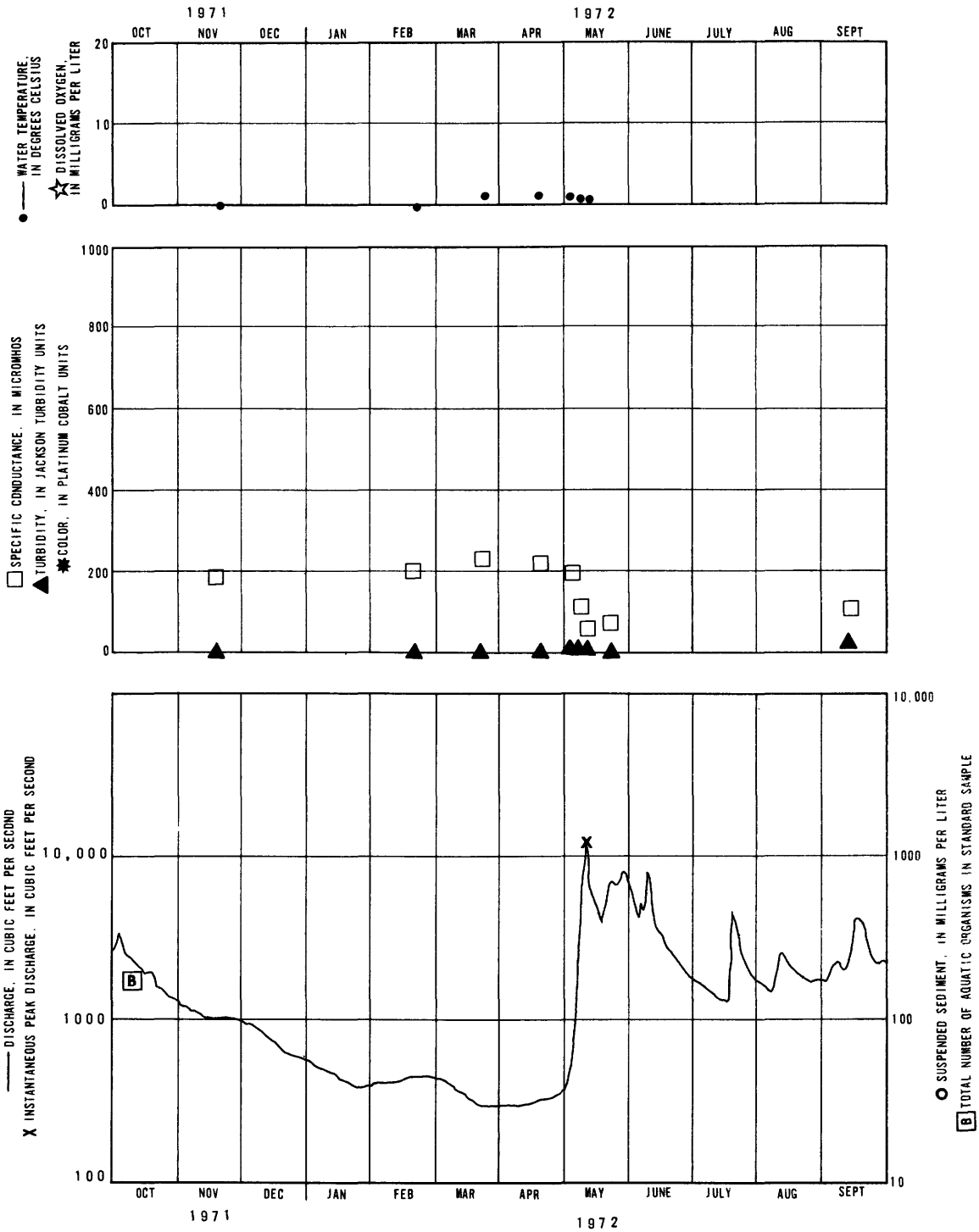

Figure 10.-- Chena River at Fairbanks--Continued.

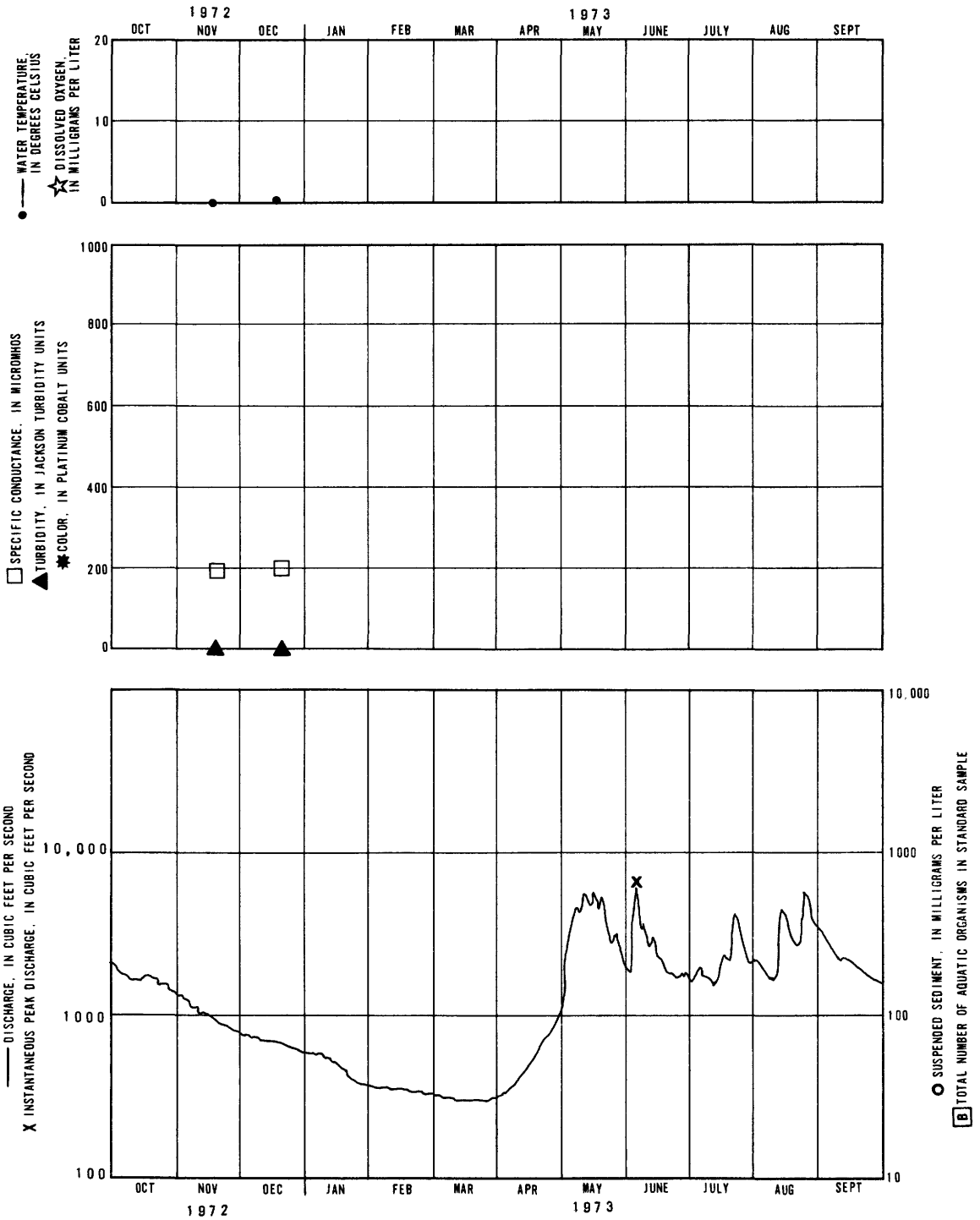

Figure 10.-- Chena River at Fairbanks--Continued.

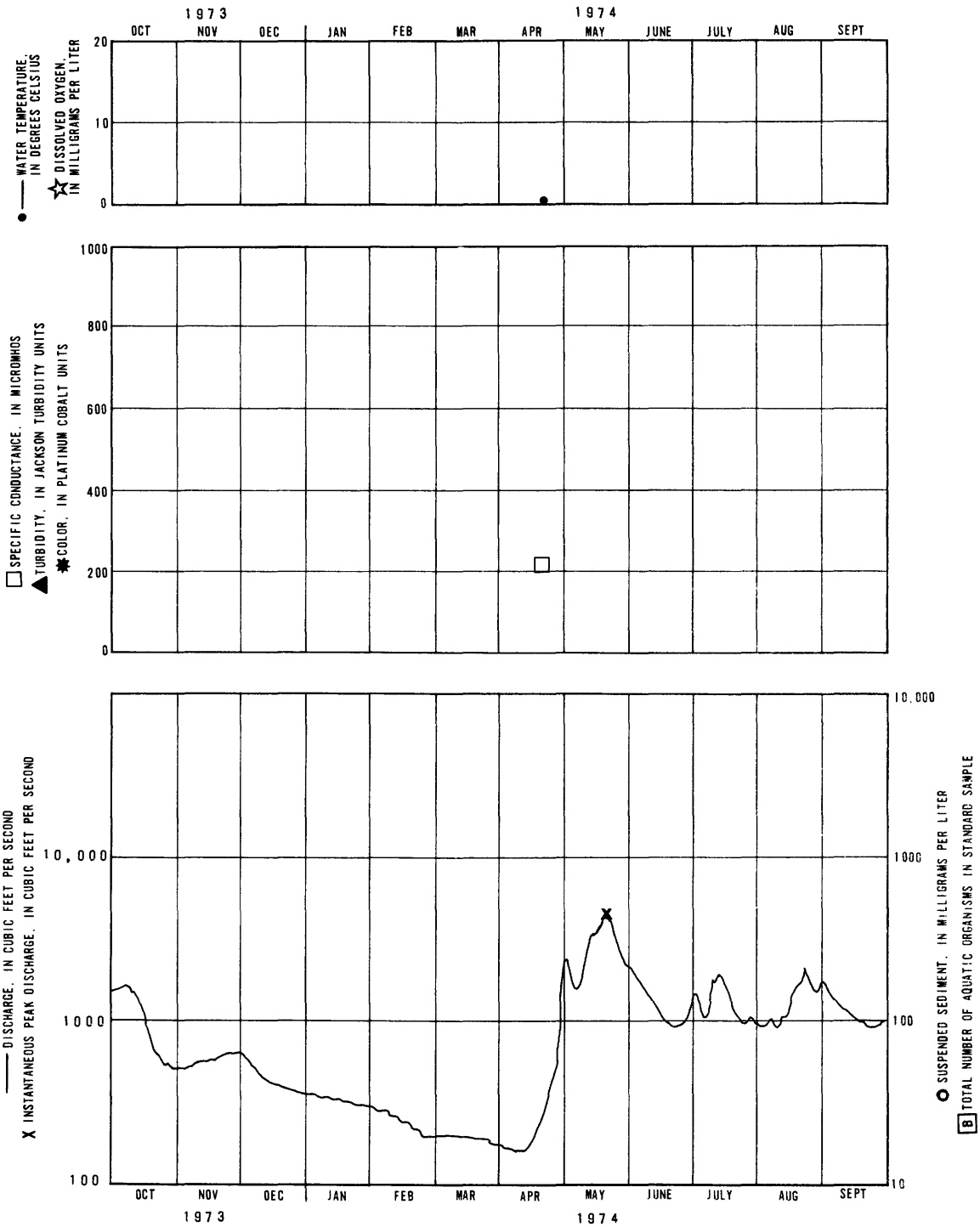

Figure 10.-- Chena River at Fairbanks--Continued.

Salcha River near Salchaket

Location.--Lat 64°28'22", long 146°55'26", in NE¼ sec.22, T.5 S., R.4 E., Fairbanks North Star Borough, on right bank 0.2 mi upstream from bridge on Richardson Highway, 0.5 mi east of Aurora Lodge, 2 mi upstream from mouth, and 6 mi southeast of Salchaket.

Period of Record.--July 1909 to August 1910, published as "at mouth" (no winter records), October 1948 to current year.

Purpose.--To provide data for flood and river stage-discharge forecasting, to document hydrologic conditions along the trans-Alaska pipeline, and to define streamflow characteristics on this principal stream.

Drainage Basin.--Drainage area is approximately 2,170 mi^2. The basin is in low mountains, in the Continental climatic zone, in the discontinuous permafrost zone, and is forested. Permafrost, ground ice, stream overflow and hillside icings are cold region features of this basin. The basin is crossed by the trans-Alaska pipeline. Placer mining was active along some streams in the basin. Many cabins are scattered along the major stream; otherwise, the basin is uninhabited wilderness.

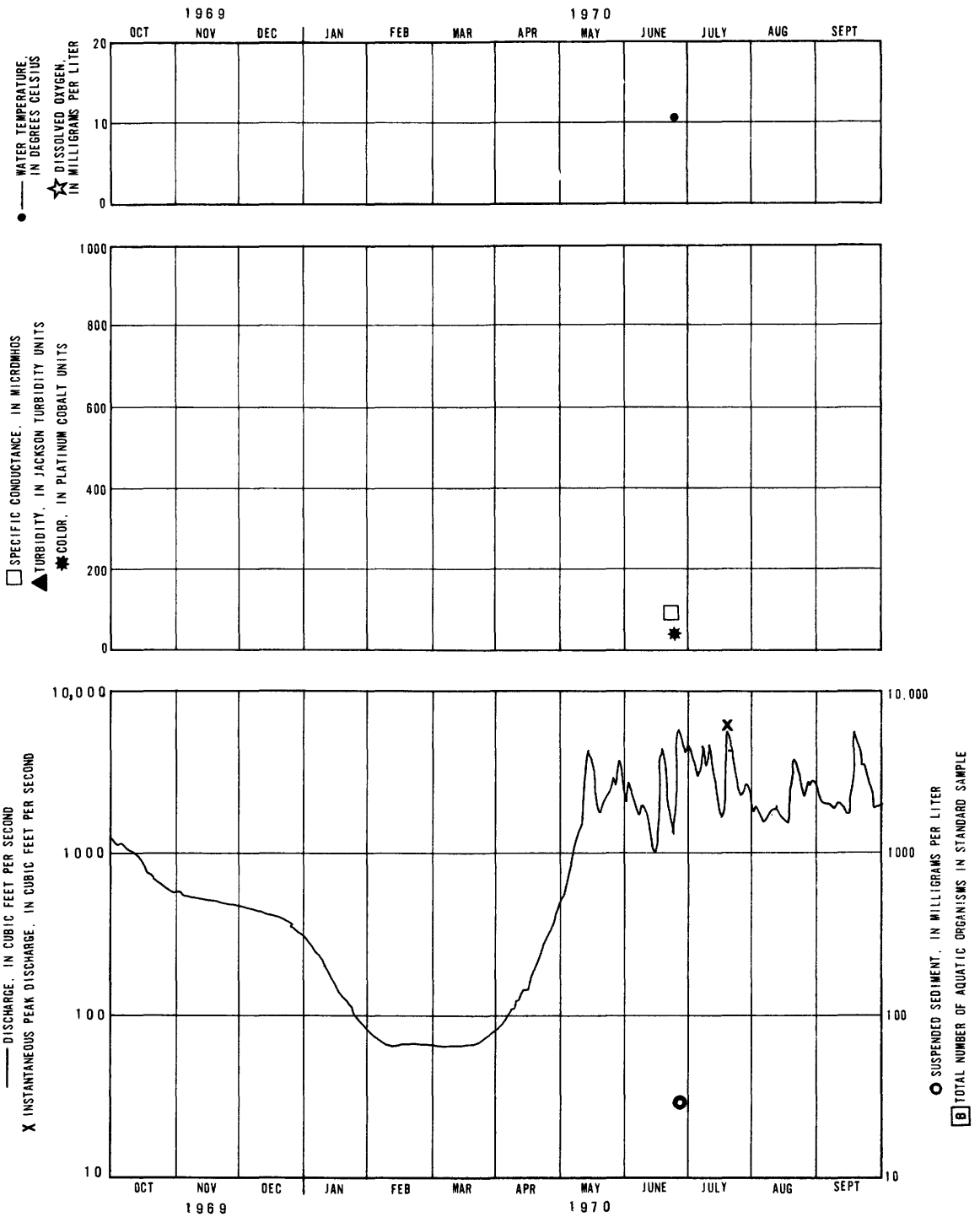

Figure 11.-- Salcha River near Salchaket.

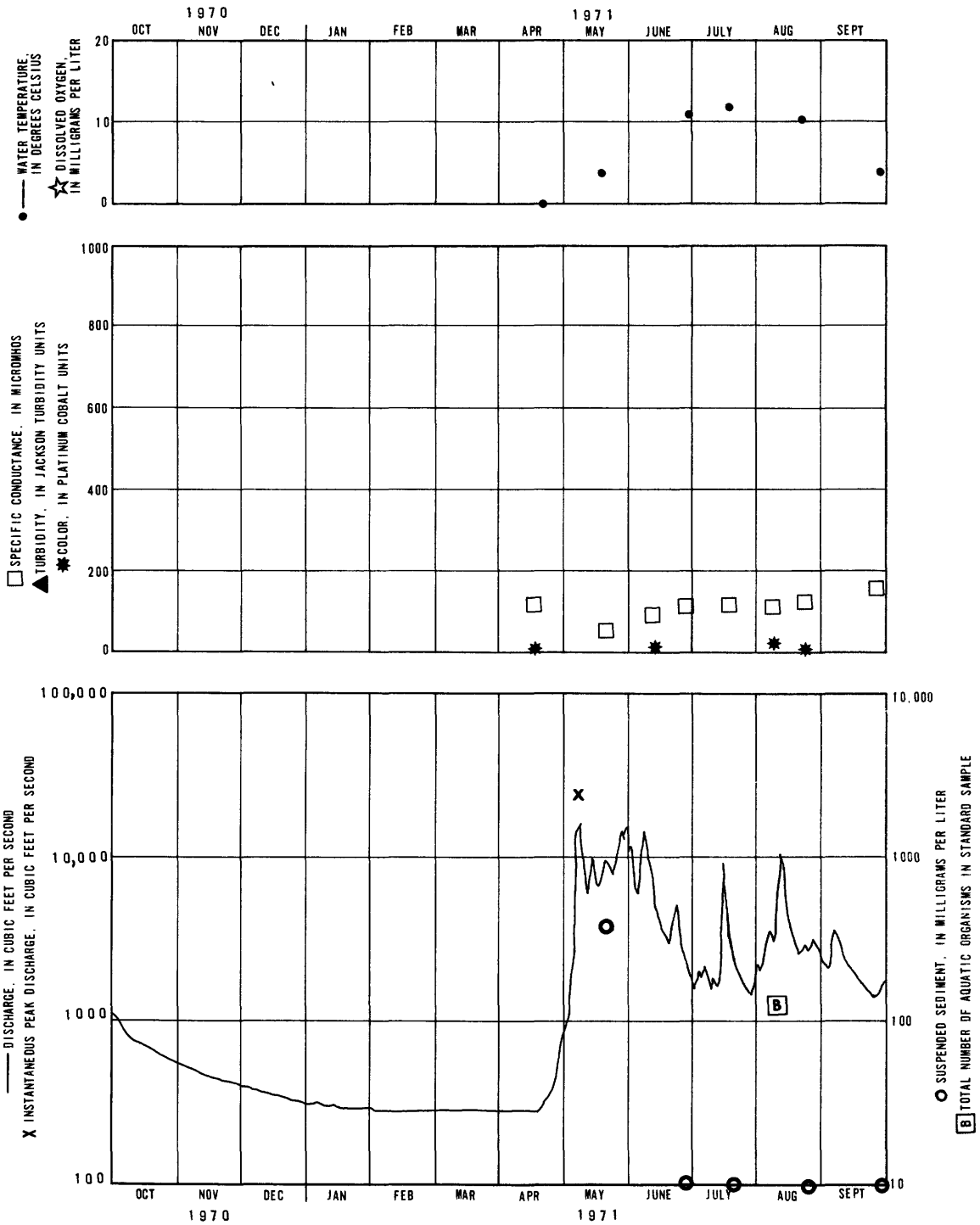

Figure 11.-- Salcha River near Salchaket--Continued.

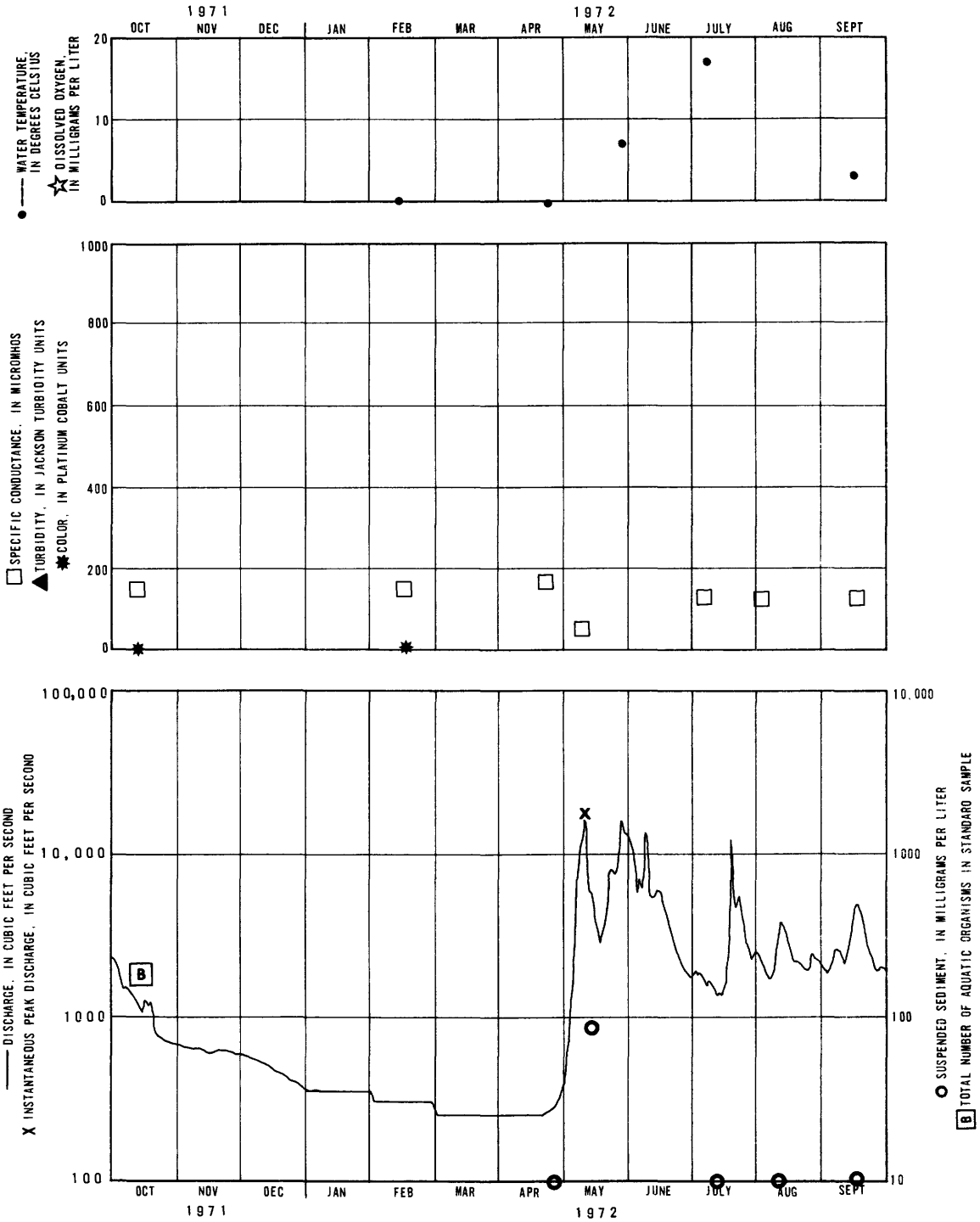

Figure 11.-- Salcha River near Salchaket--Continued.

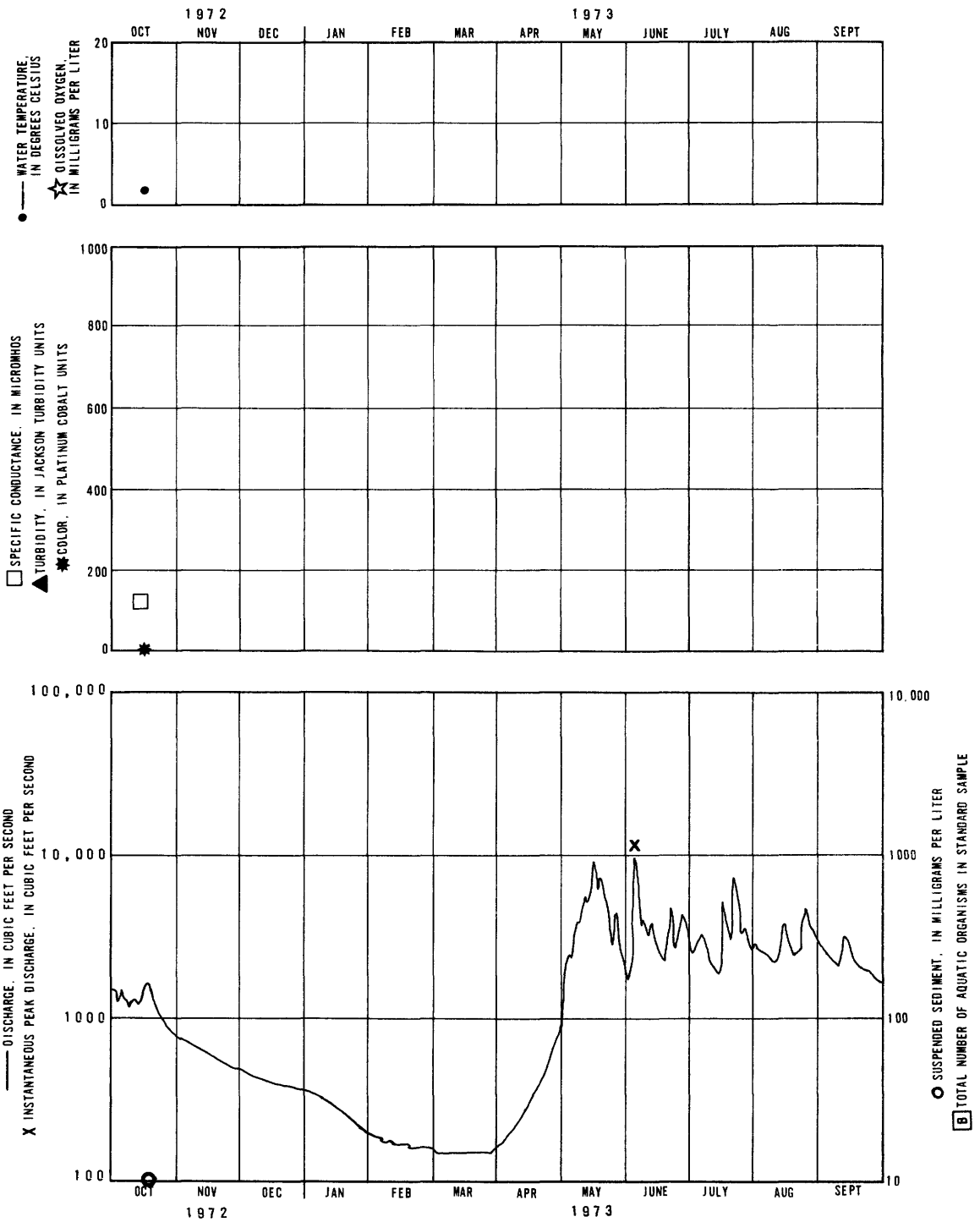

Figure 11.-- Salcha River near Salchaket--Continued.

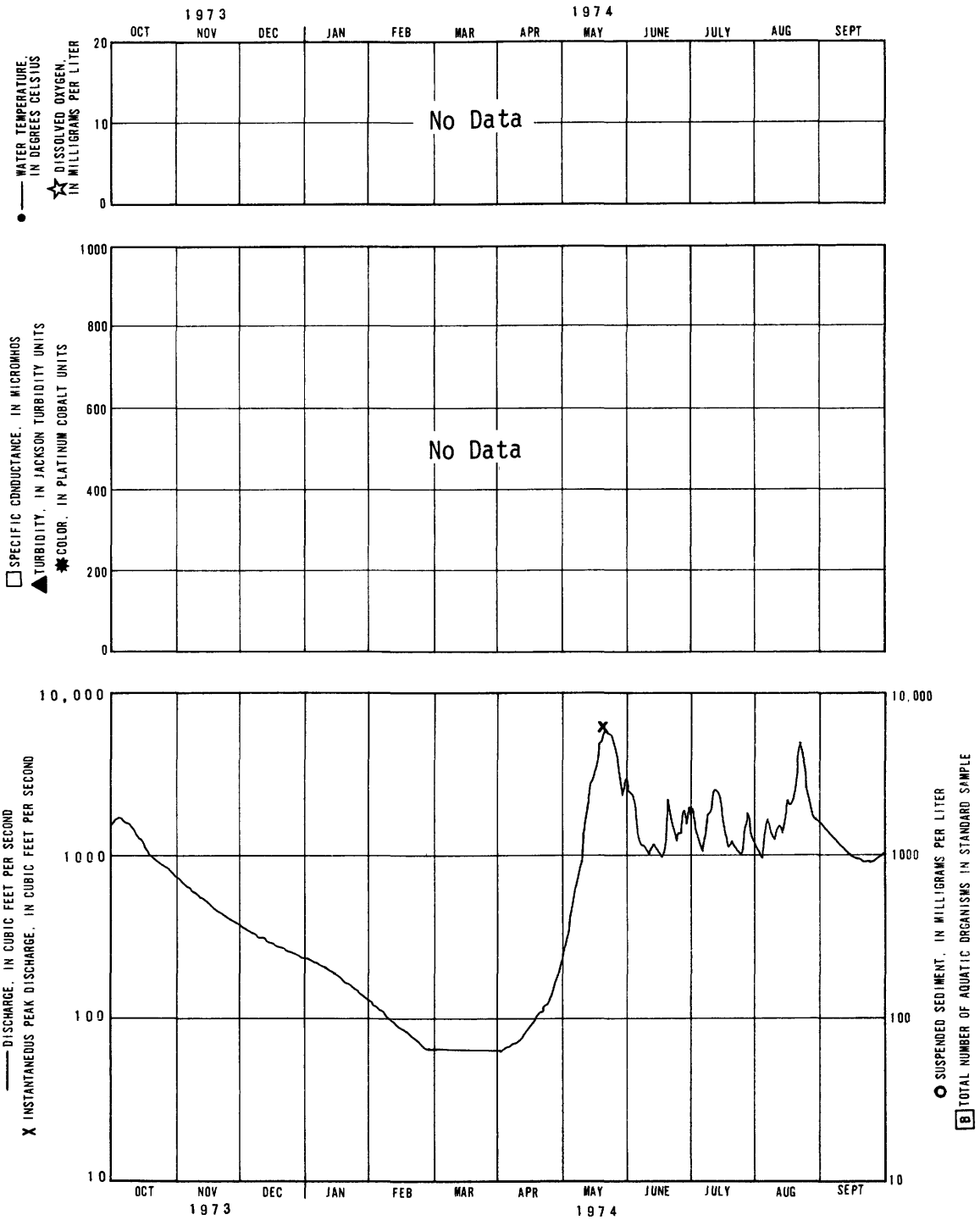

Figure 11.-- Salcha River near Salchaket--Continued.

Tanana River at Nenana

Location.--Lat 64°33'55", long 149°05'30", in SE¼ sec.14, T.4 S., R.8 W., on left bank on east end of Alaska Railroad dock in Nenana, and 0.3 mi upstream from Nenana River.

Period of Record.--May 1962 to current year.

Purpose.--To provide data for flood and river stage-discharge forecasting, to document hydrologic conditions along the trans-Alaska pipeline, and to define streamflow characteristics of this principal stream.

Drainage Basin.--Drainage area is approximately 25,600 mi^2.

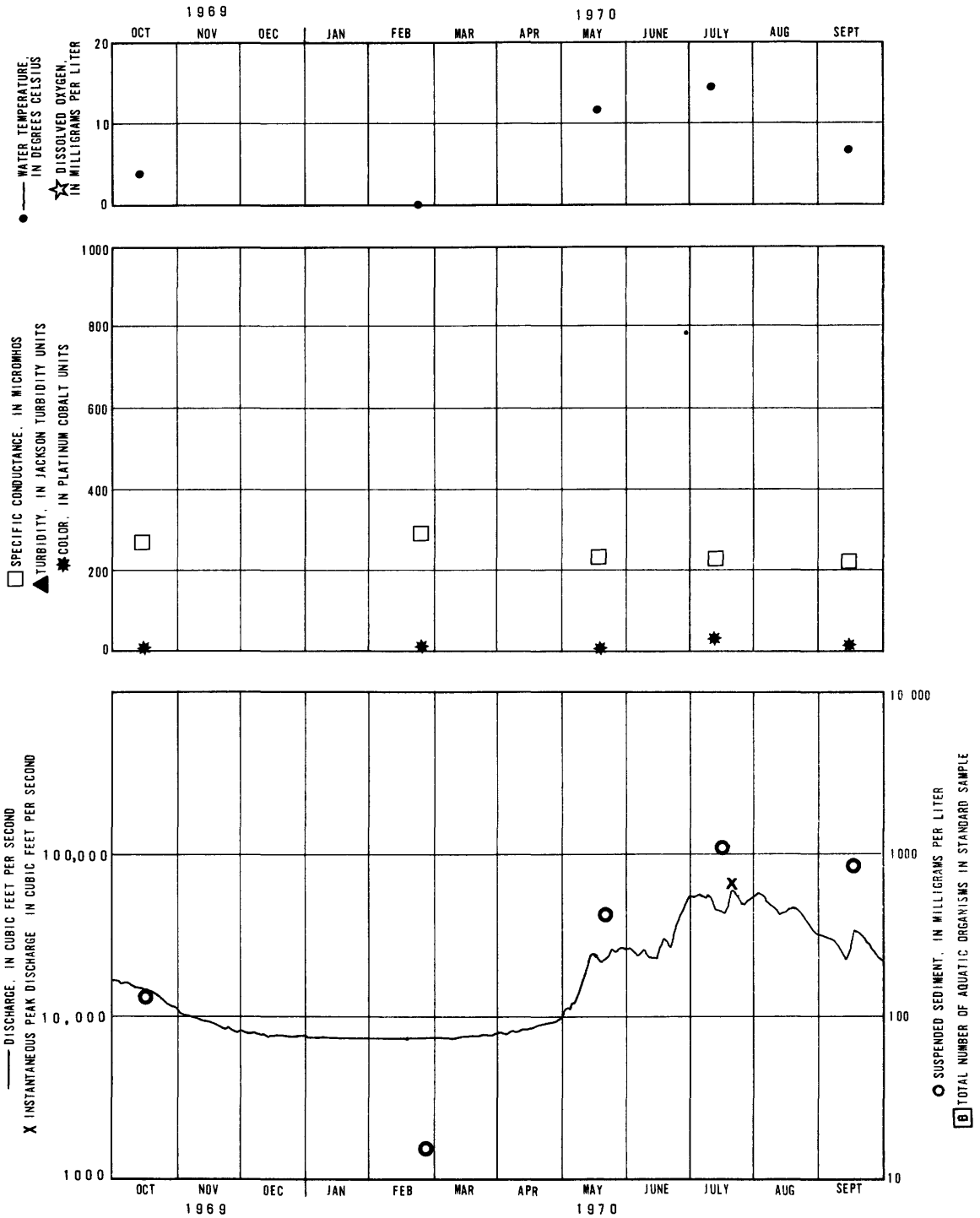

Figure 12.-- Tanana River at Nenana.

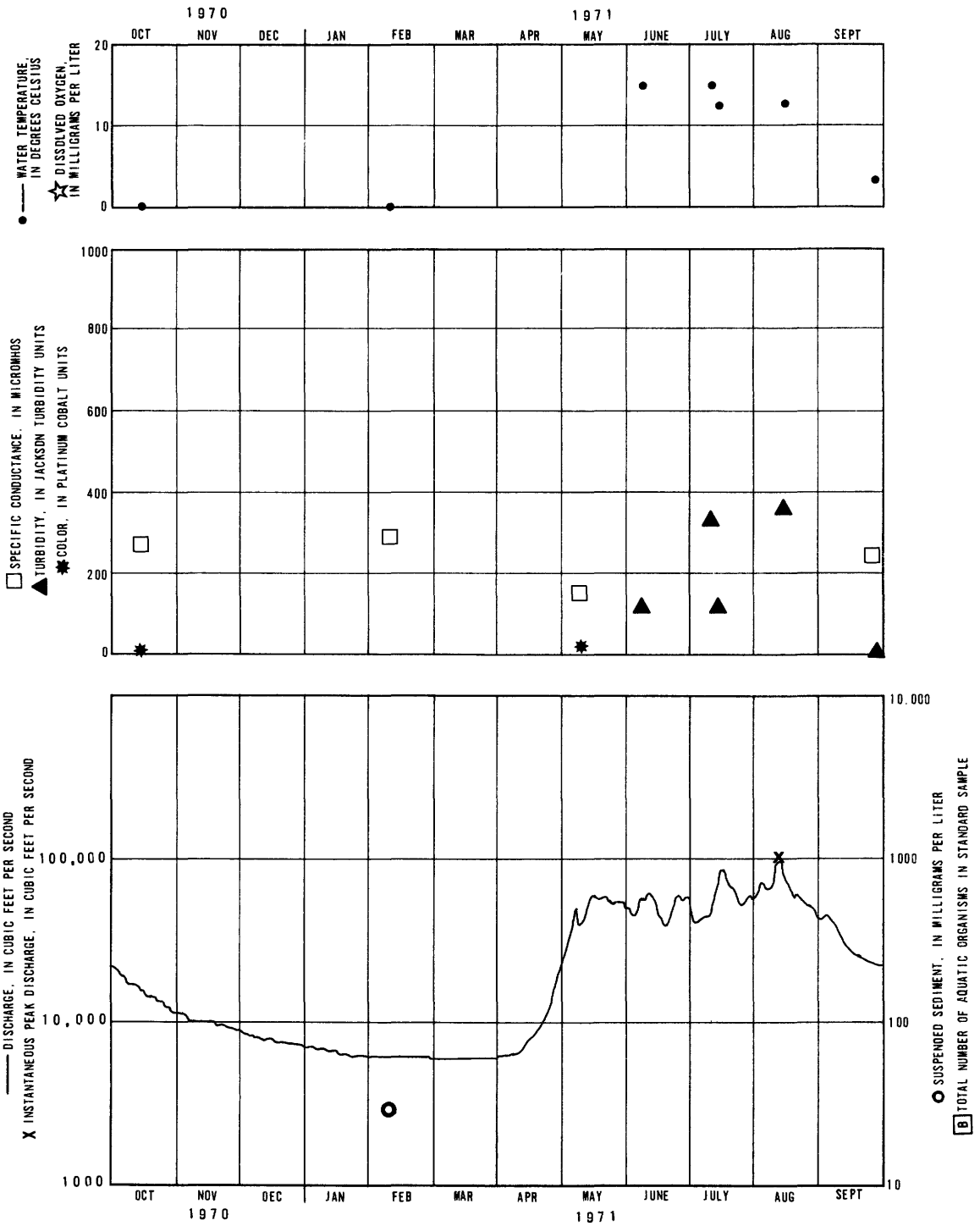

Figure 12.-- Tanana River at Nenana--Continued.

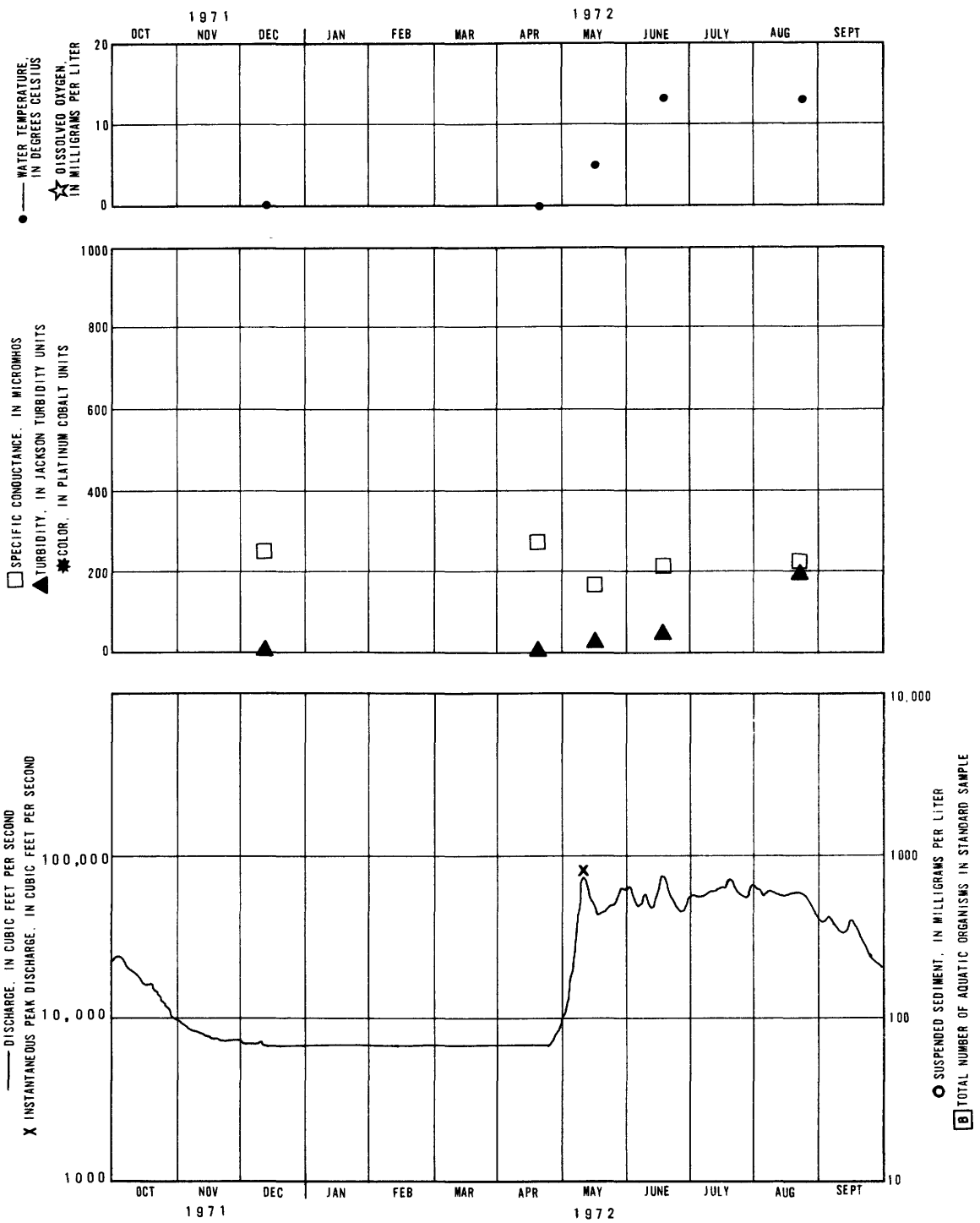

Figure 12.-- Tanana River at Nenana--Continued.

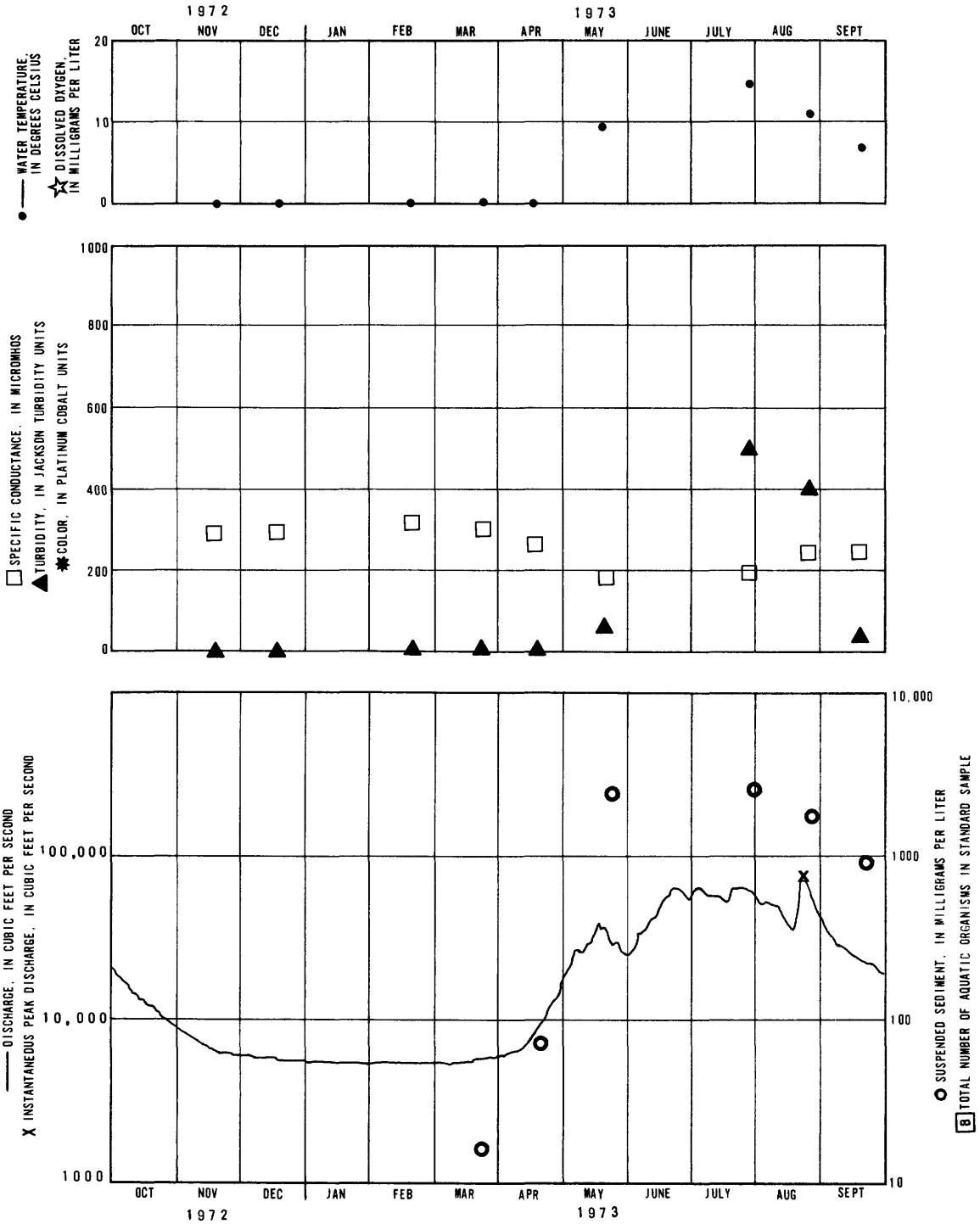

Figure 12.-- Tanana River at Nenana--Continued.

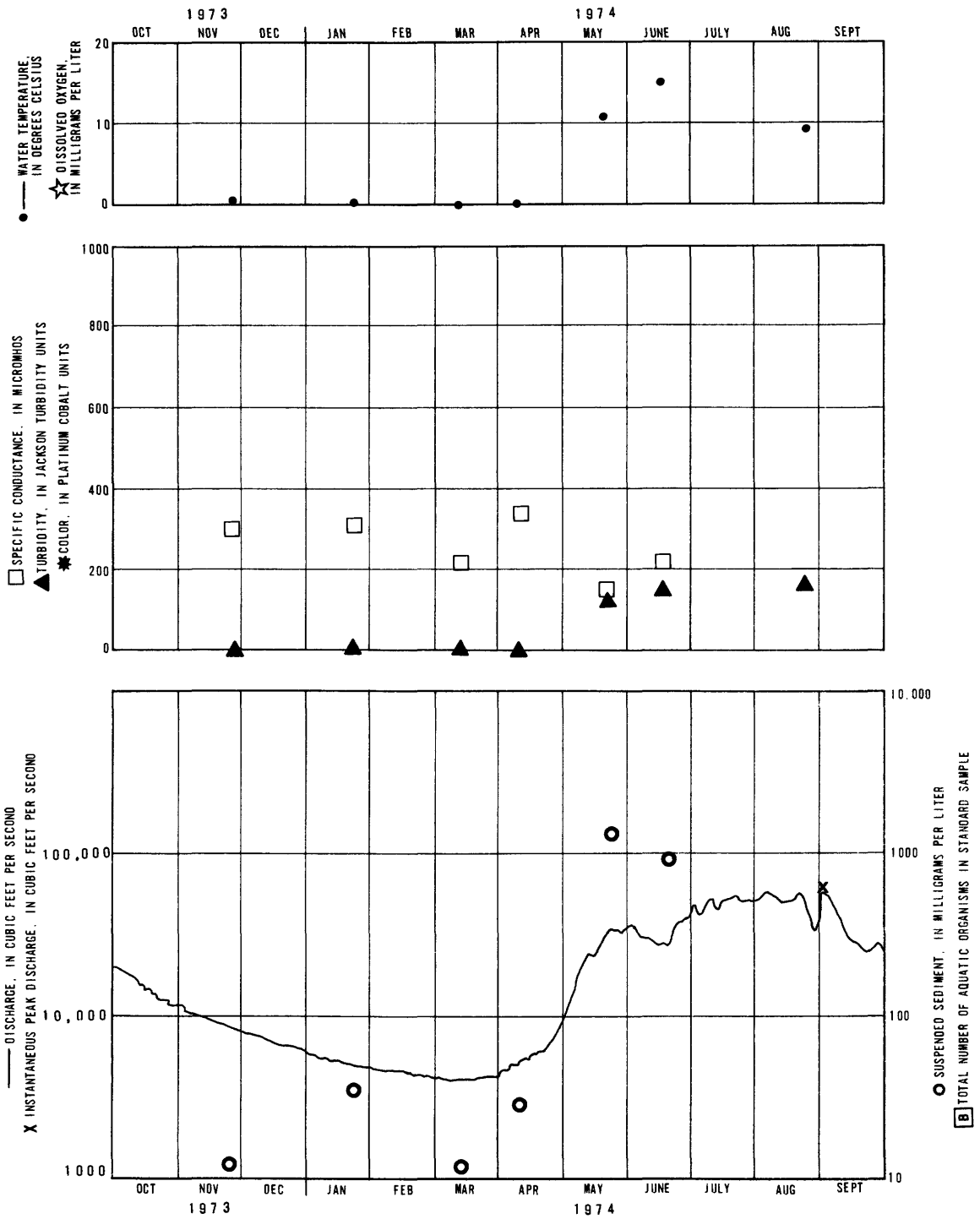

Figure 12.-- Tanana River at Nenana--Continued.

Phelan Creek near Paxson

Location.--Lat 63°14'27", long 145°28'03", in SW¼ sec.28, T.19 S., R.12 E., on left bank approximately 1 mi downstream from terminus of Gulkana Glacier, and 14.5 mi north of Paxson.

Period of Record.--October 1966 to current year.

Purpose.--To document hydrologic conditions and to provide a hydrologic sample from a regionally representative basin. Also, this gaging station is a research station to help determine glacier mass dynamics.

Drainage Basin.--Drainage area is 12.2 mi^2. The basin is in high mountains, in the Continental climatic zone, and within the discontinuous permafrost zone. It is unforested. Permafrost, ground ice, stream overflow and hillside icings are cold region features of this basin.

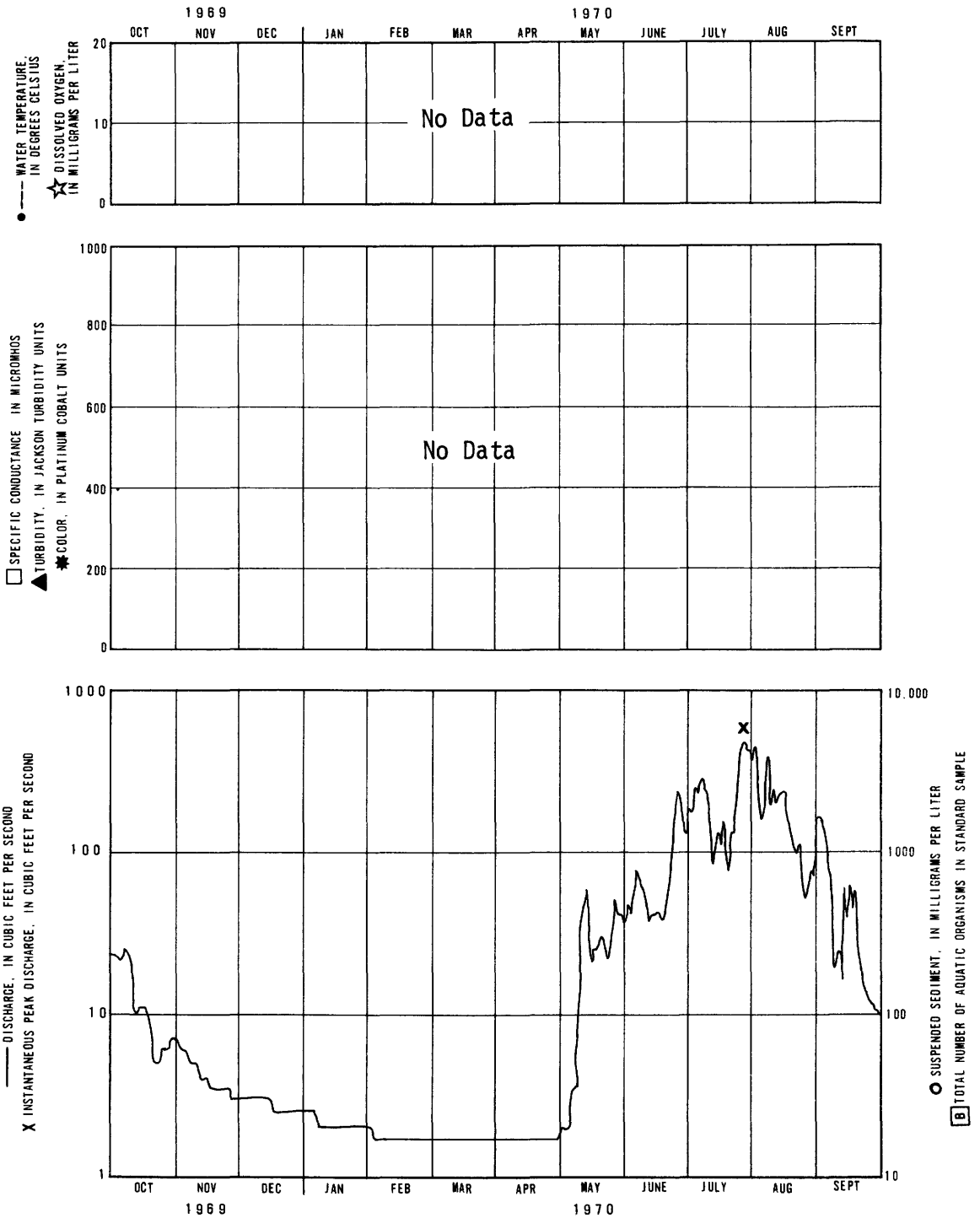

Figure 13.-- Phelan Creek near Paxson.

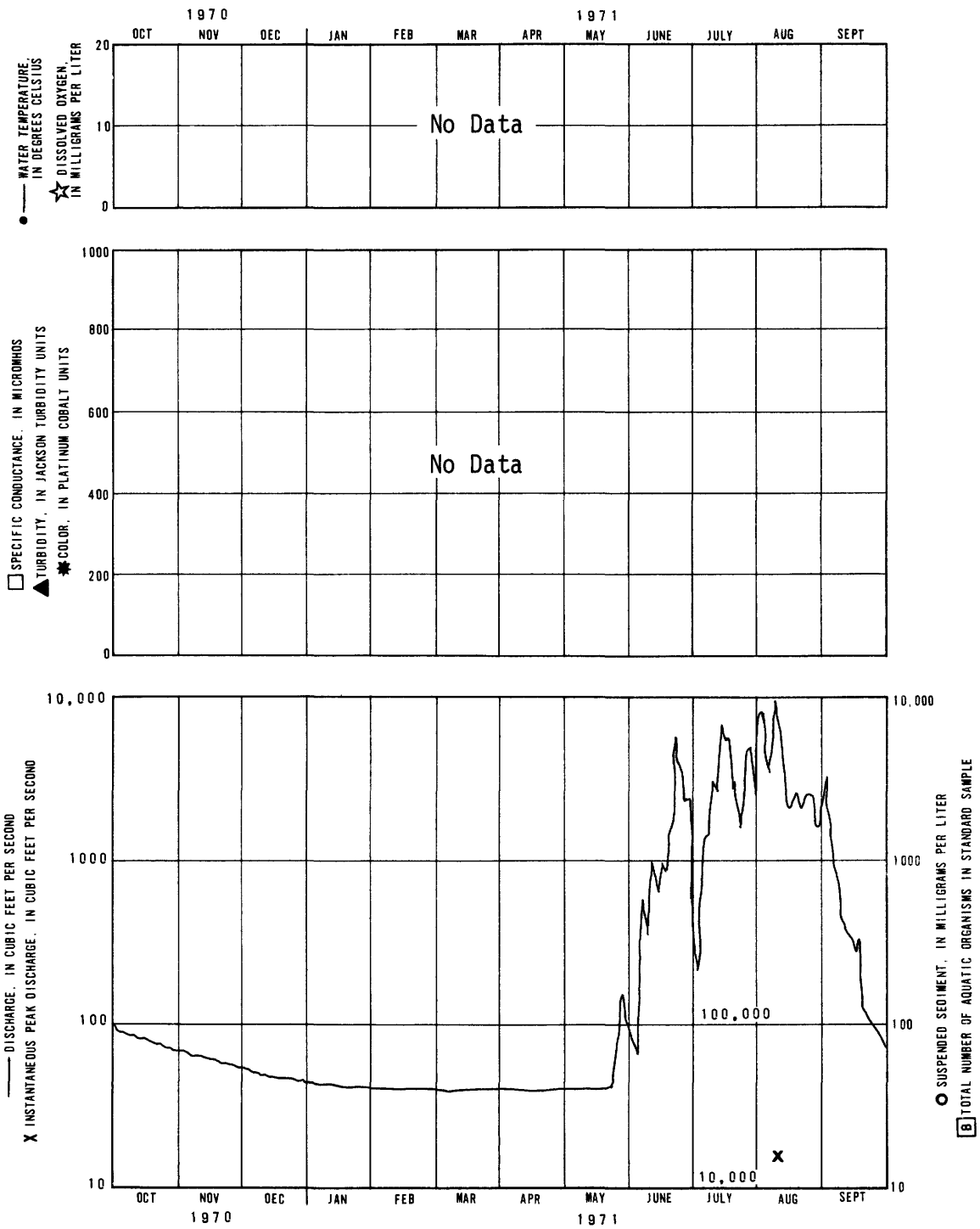

Figure 13.-- Phelan Creek near Paxson--Continued.

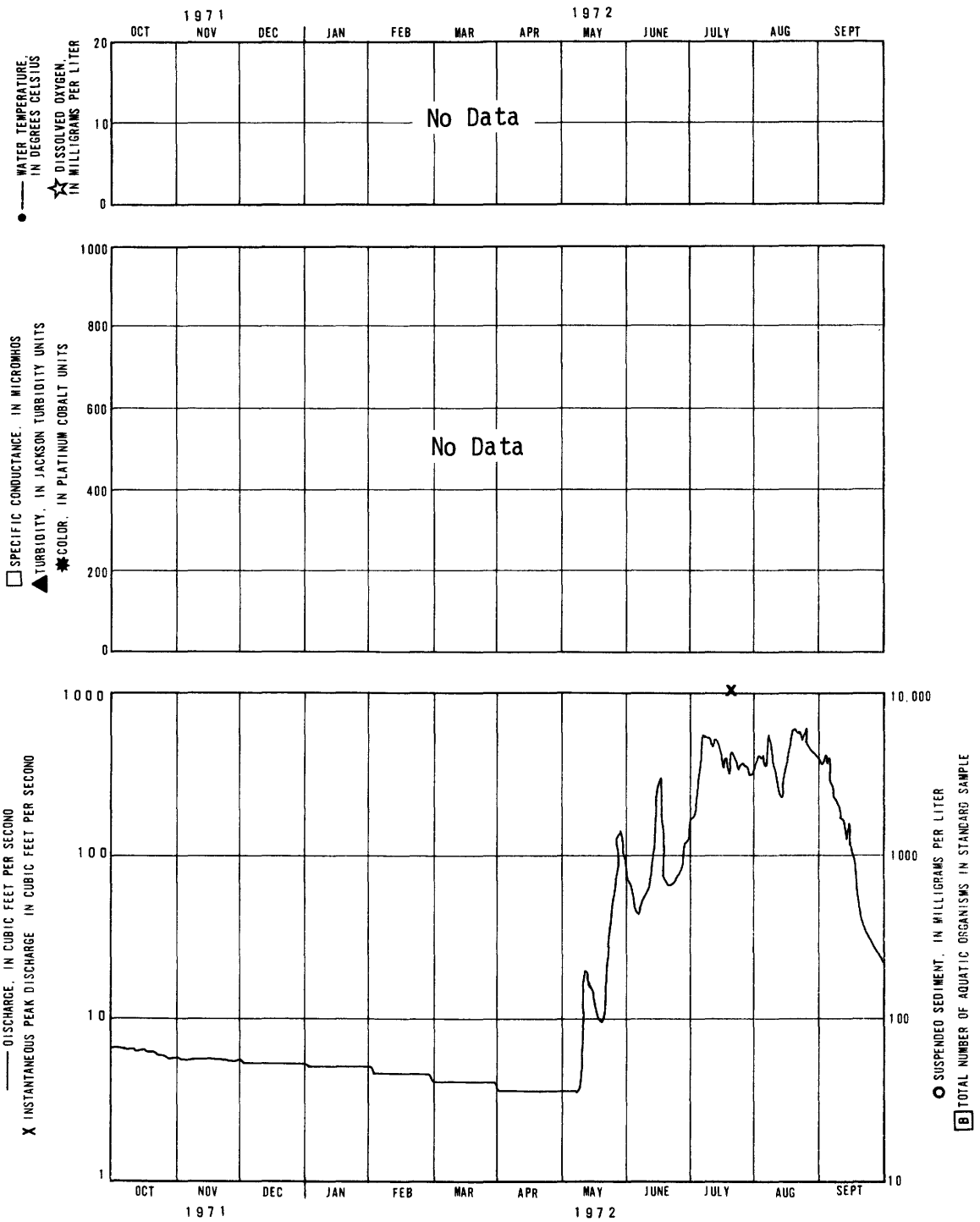

Figure 13.-- Phelan Creek near Paxson--Continued.

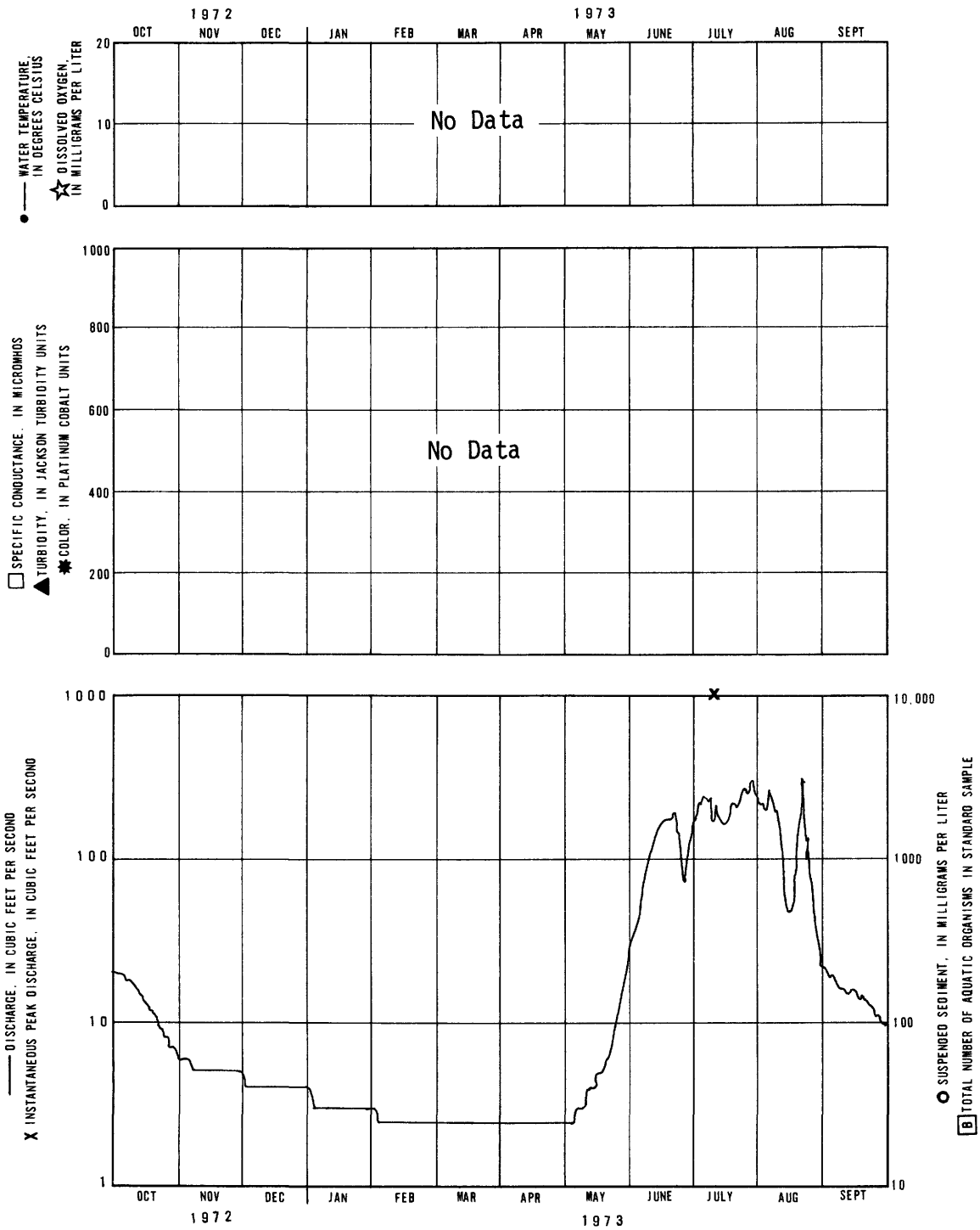

Figure 13.-- Phelan Creek near Paxson--Continued.

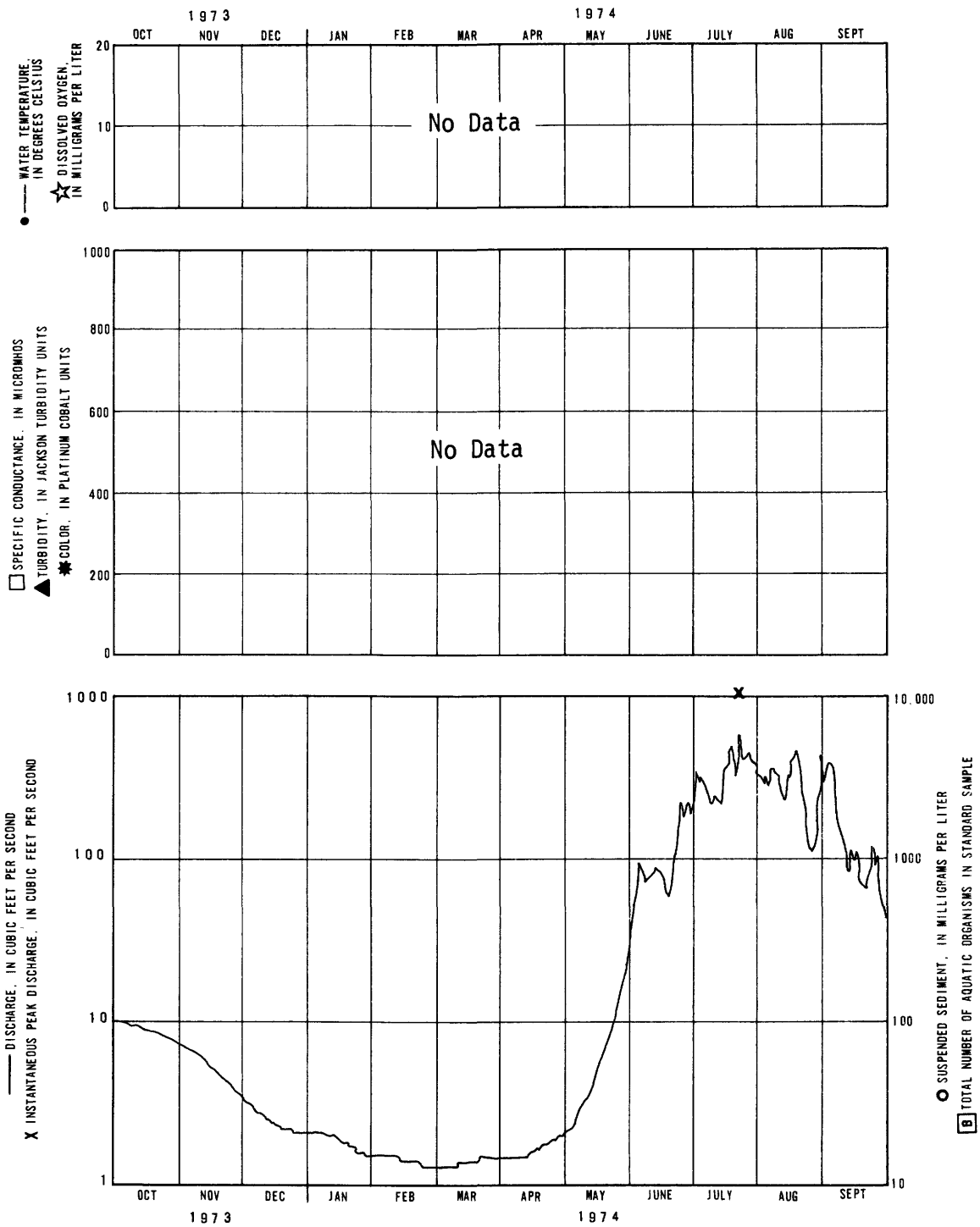

Figure 13.-- Phelan Creek near Paxson--Continued.

Gulkana River at Sourdough

Location.--Lat 62°31'15", long 145°31'51", in NE¼ sec.35, T.19 N., R.2 W., on left bank 0.3 mi downstream from Sourdough Creek, and 0.8 mi southwest of Sourdough.

Period of Record.--October 1972 to current year.

Purpose.--Current records to document streamflow conditions along the trans-Alaska pipeline and to define streamflow characteristics on this principal stream.

Drainage basin.--Drainage area is 1,170 mi^2. The basin is in low mountains, in the Continental climatic zone, within the discontinuous permafrost zone, and is mostly forested. Permafrost, ground ice, stream overflow and hillside icings are cold region features of this basin, which contains some natural lakes. The trans-Alaska pipeline and the Richardson Highway cross the basin.

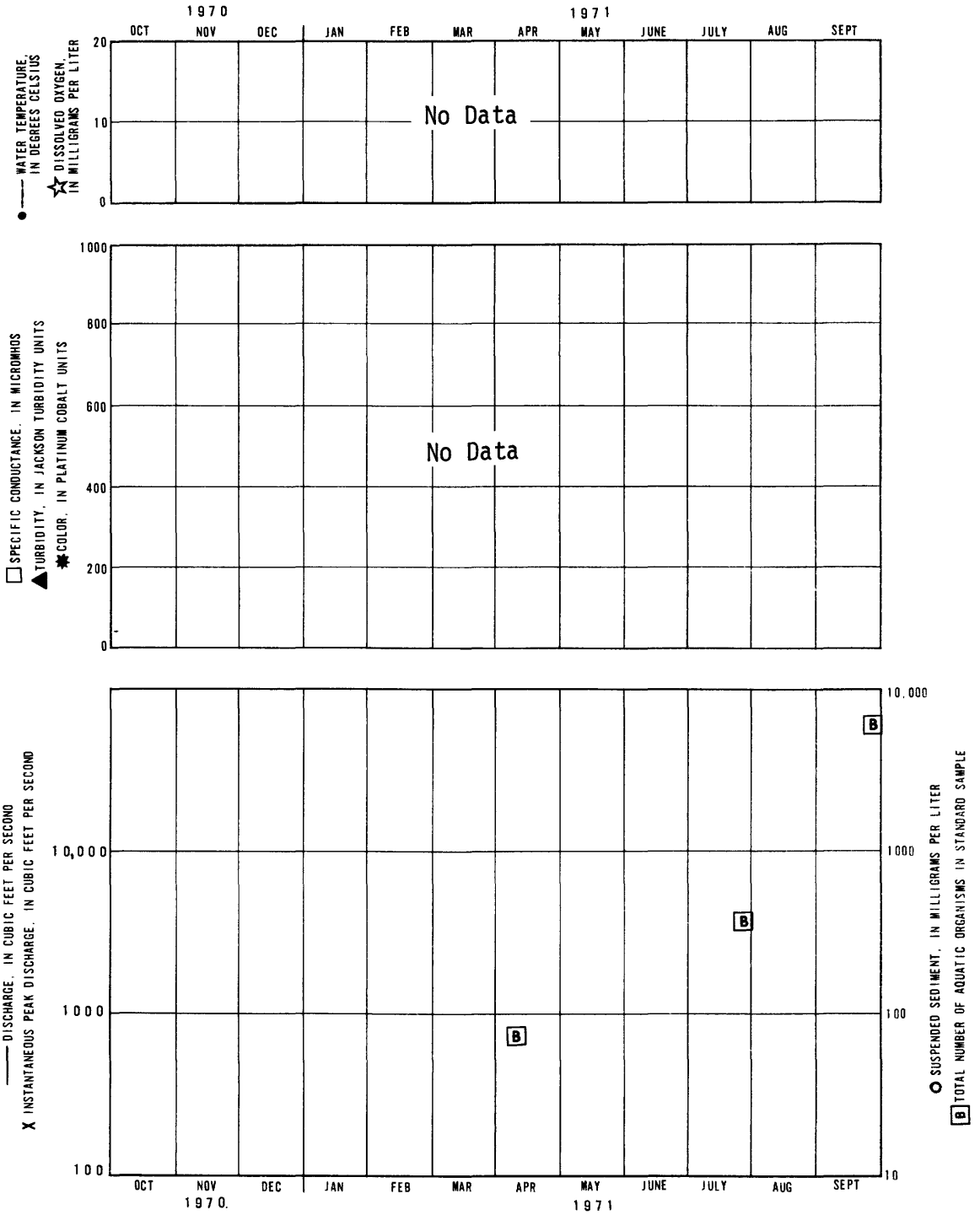

Figure 14.-- Gulkana River at Sourdough.

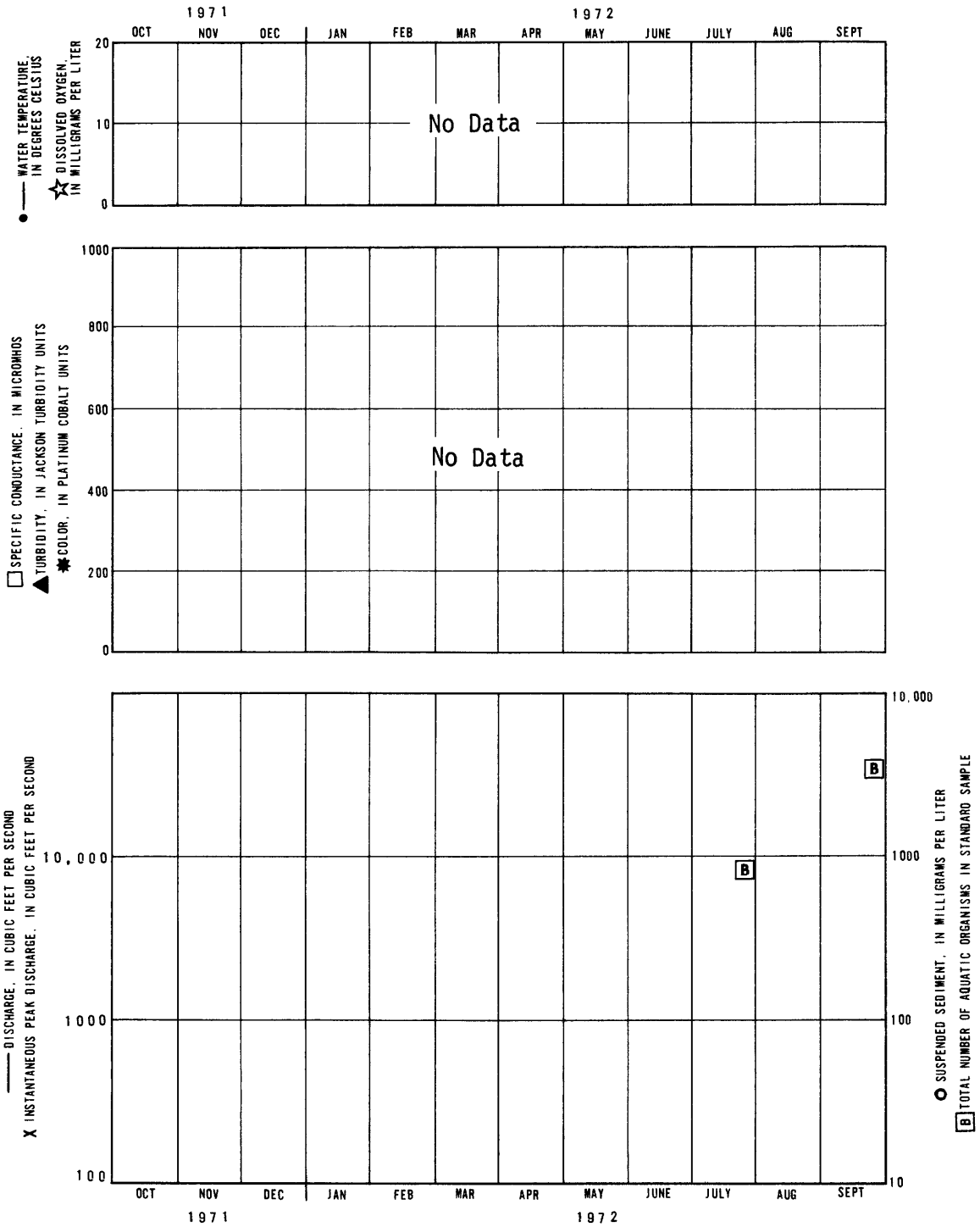

Figure 14.-- Gulkana River at Sourdough--Continued.

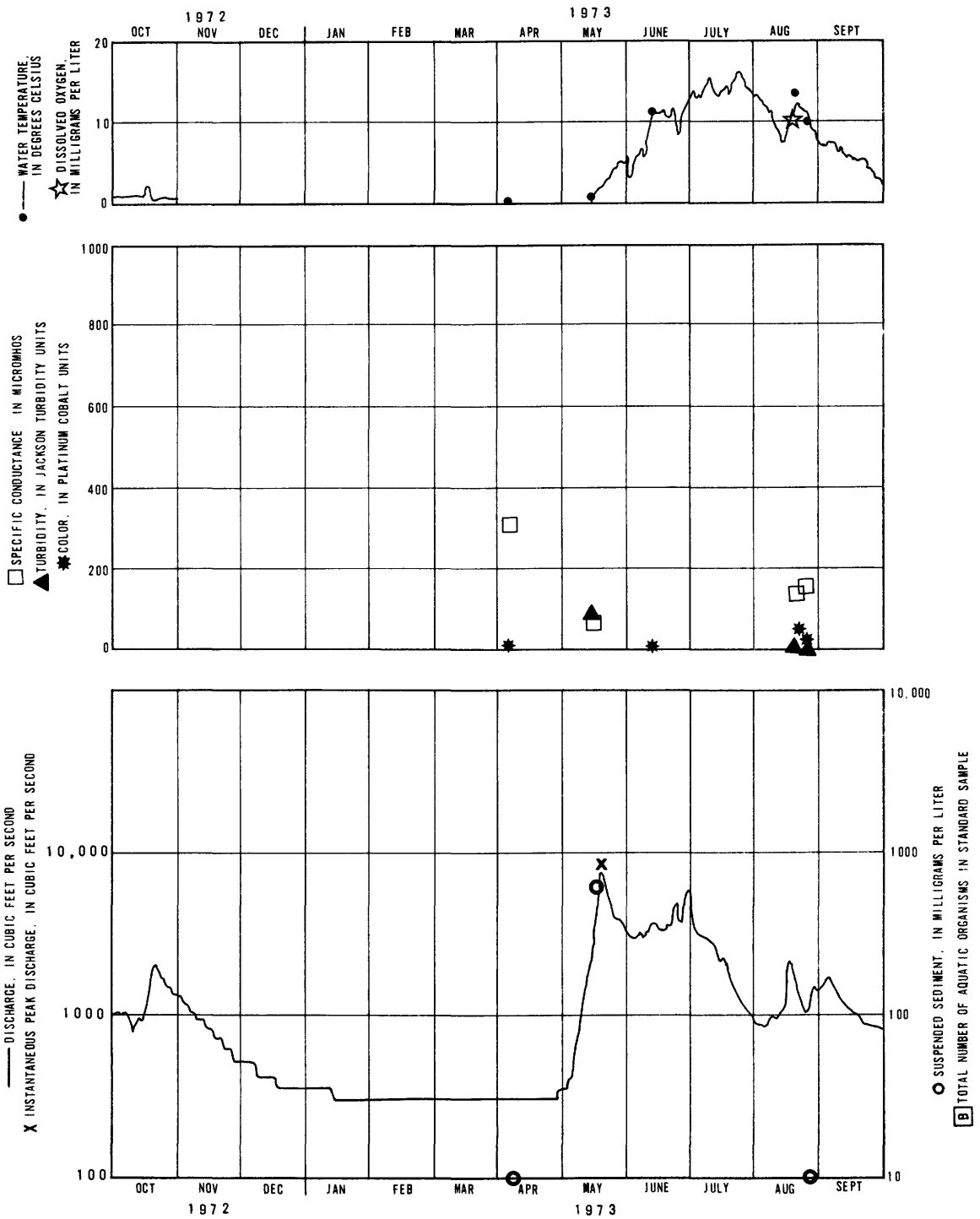

Figure 14.-- Gulkana River at Sourdough--Continued.

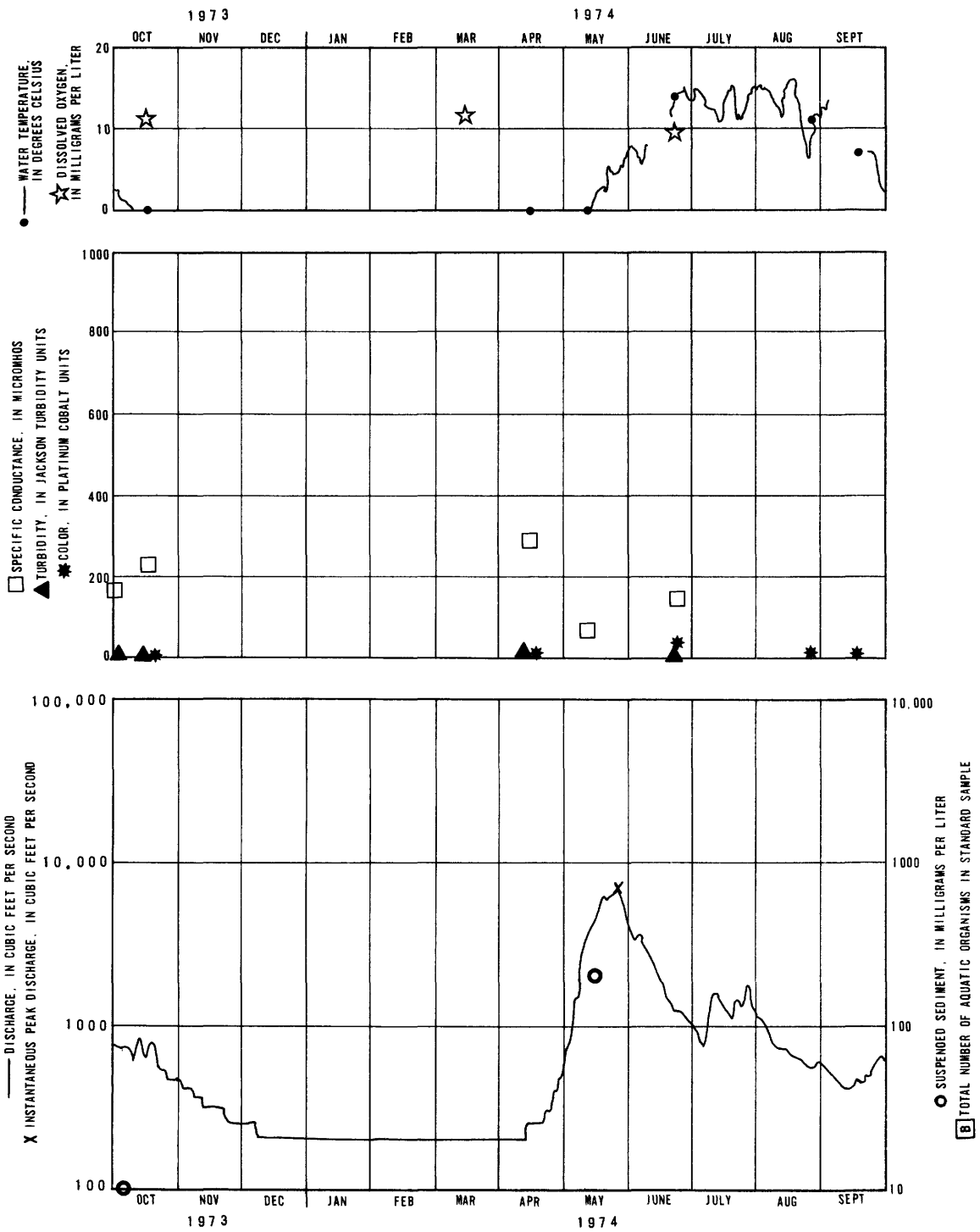

Figure 14.-- Gulkana River at Sourdough--Continued.

Gakona River at Gakona

Location.--Lat 62°18'06", long 145°18'20", near center of span on downstream side of bridge on Glenn Highway at Gakona, 500 ft upstream from mouth, and 1.9 mi northeast of junction of Richardson and Glenn Highways.

Period of Record.--August to September 1948, October 1948 to September 1970. Miscellaneous data 1971-74.

Purpose.--To provide a hydrologic sample from a representative basin in the region.

Drainage Basin.--Drainage area is approximately 620 mi^2. About one-third of the basin is high mountains, one-third low mountains, and one-third lowlands. The basin is in the Continental climatic zone, in the discontinuous permafrost zone, and is mostly forested. Permafrost, ground ice, stream overflow and hillside icings are cold region features of this basin. The basin is uninhabited wilderness except near Gakona. Glaciers cover some of the basin headwater area.

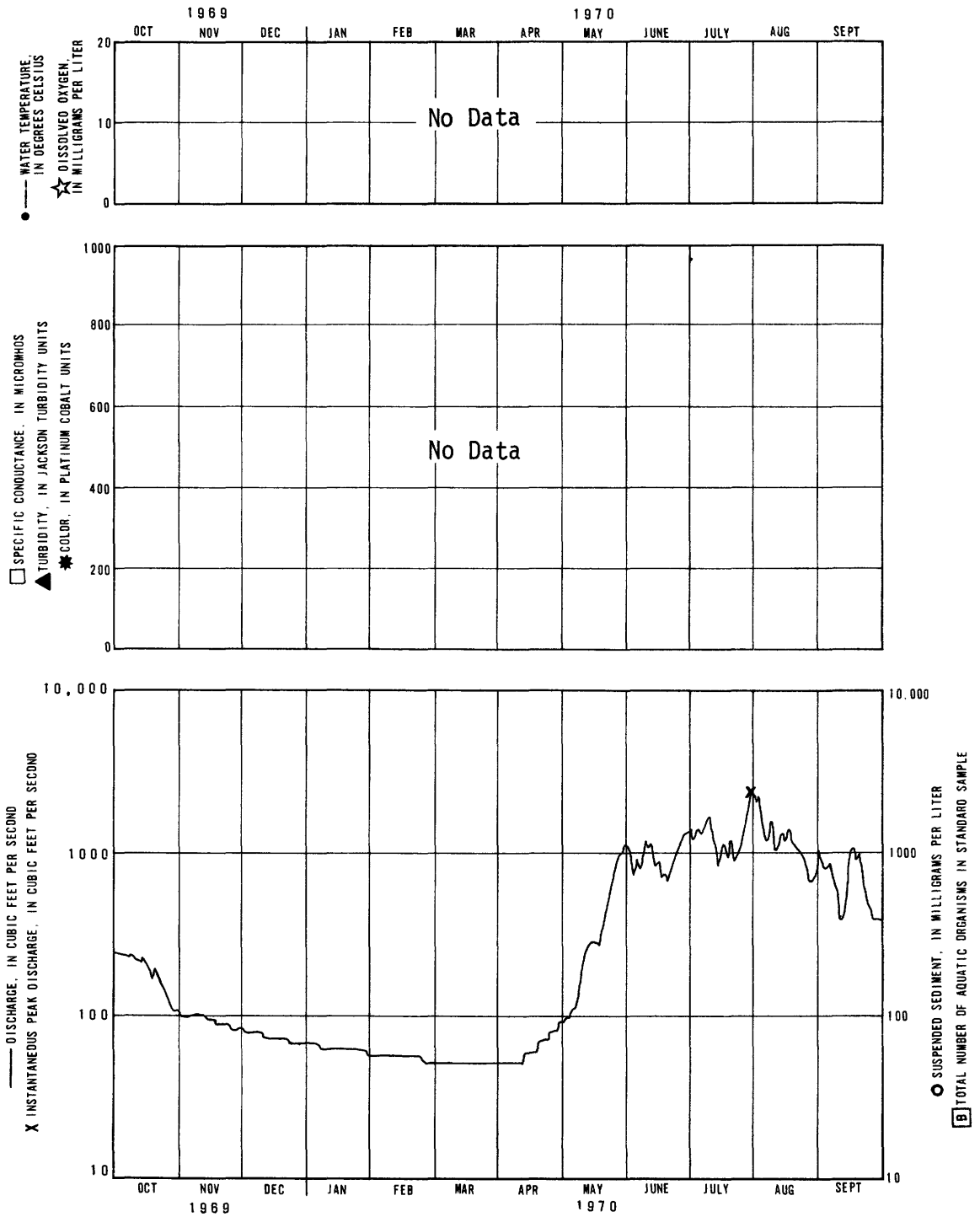

Figure 15.-- Gakona River at Gakona.

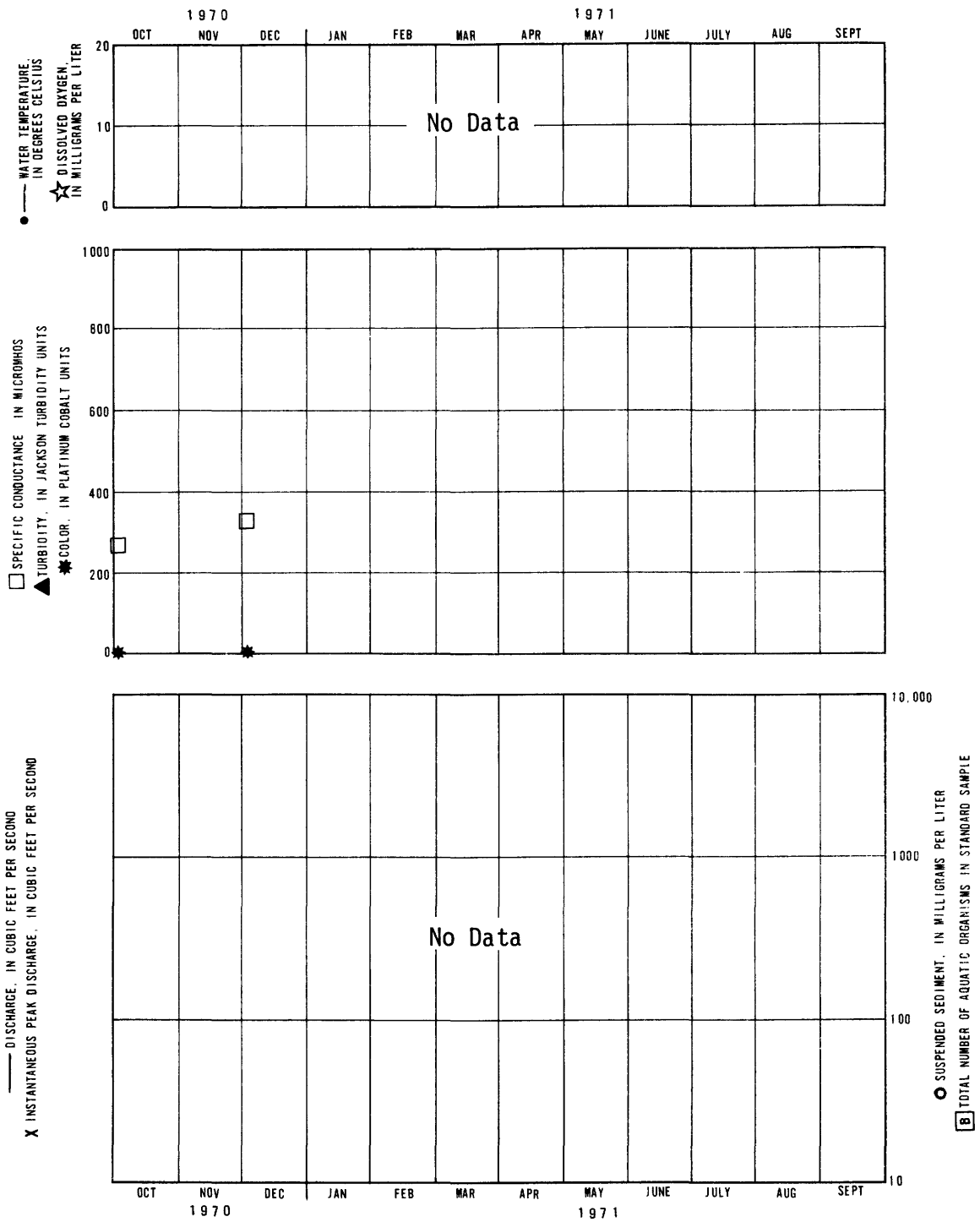

Figure 15.-- Gakona River at Gakona--Continued.

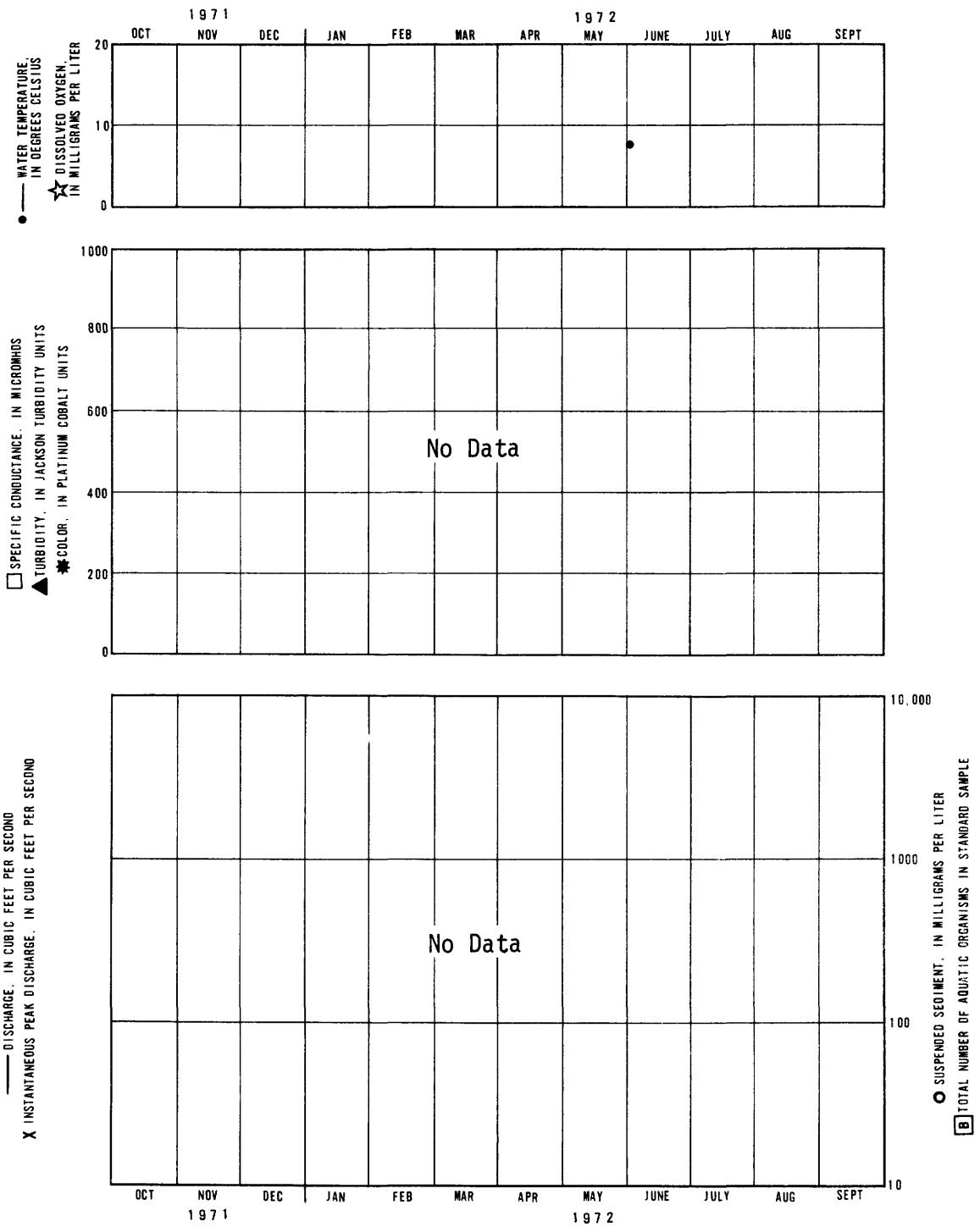

Figure 15.-- Gakona River at Gakona--Continued.

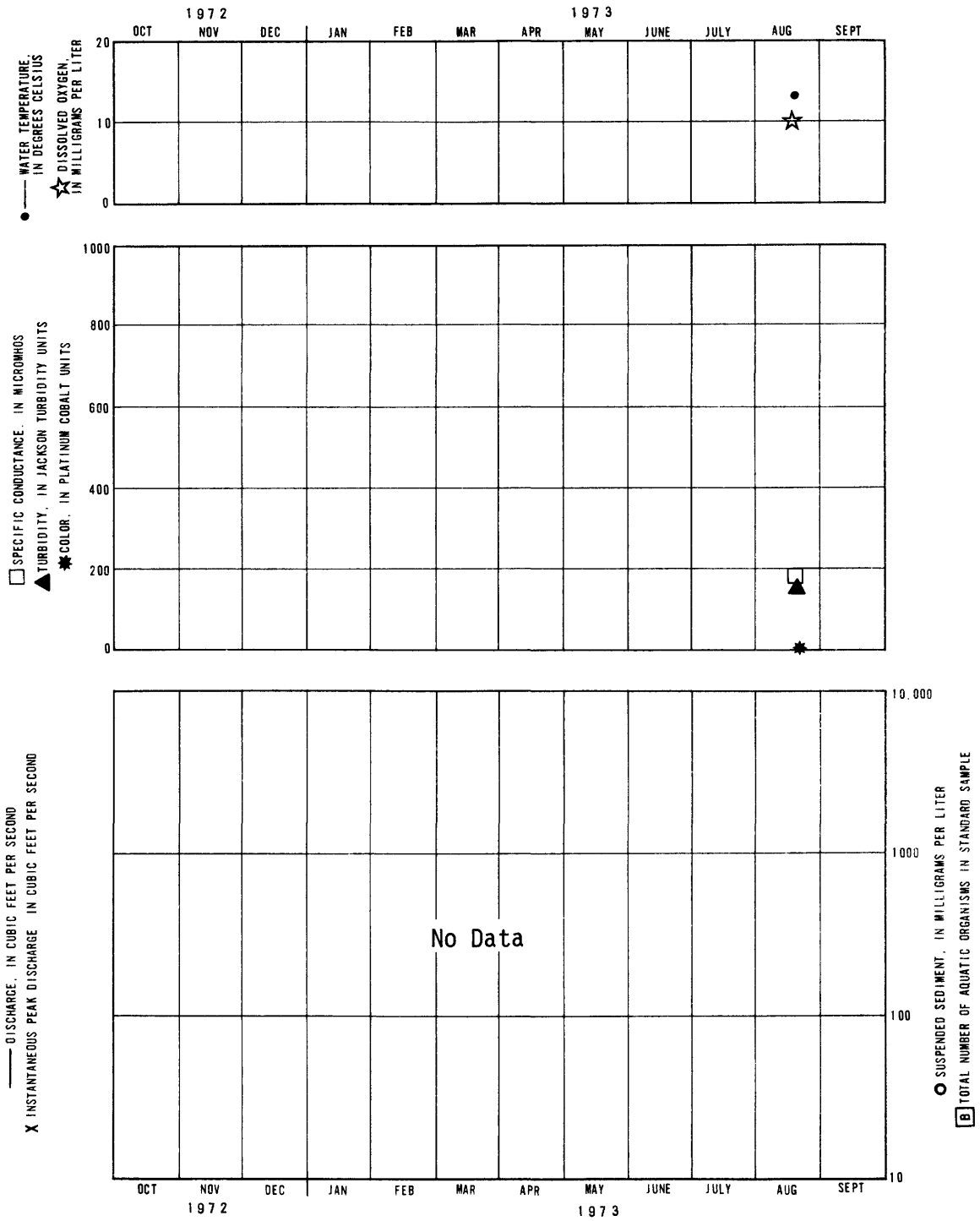

Figure 15.-- Gakona River at Gakona--Continued.

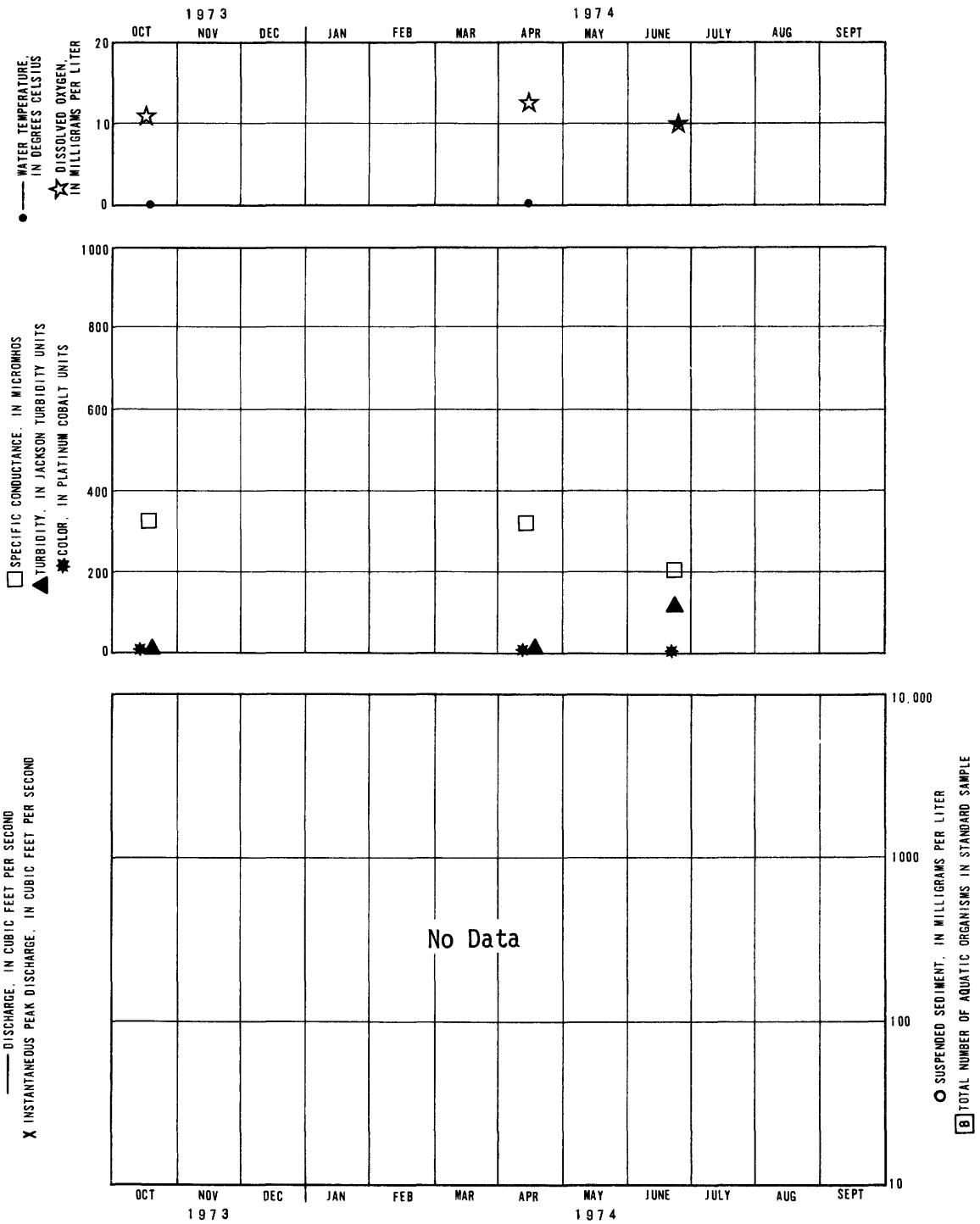

Figure 15.-- Gakona River at Gakona--Continued.

Tazlina River near Glennallen

Location.--Lat 62°03'20", long 145°25'34", in W½ sec.9, T.3 N., R.1 W., near center of span on downstream side of bridge on Richardson Highway, 2 mi upstream from mouth, 4 mi downstream from Moose Creek, and 5 mi southeast of Glennallen.

Period of Record.--August 1949 to September 1950, October 1951 to September 1972. Miscellaneous data 1973-74.

Purpose.--To define streamflow characteristics on this principal stream.

Drainage Basin.--Drainage area is approximately 2,670 mi^2. The basin is partly in high mountains, partly in low mountains, and partly in lowlands. It is in the Continental and Transition climatic zones, in the discontinuous permafrost zone, and is mostly forested. Glaciers cover some of the high mountain drainage. The several large lakes in the basin provide traps for coarse sediment. Some glacier-dammed lakes in the basin are also subject to outburst flooding. The basin is uninhabited wilderness, although two highways and the trans-Alaska pipeline cross it.

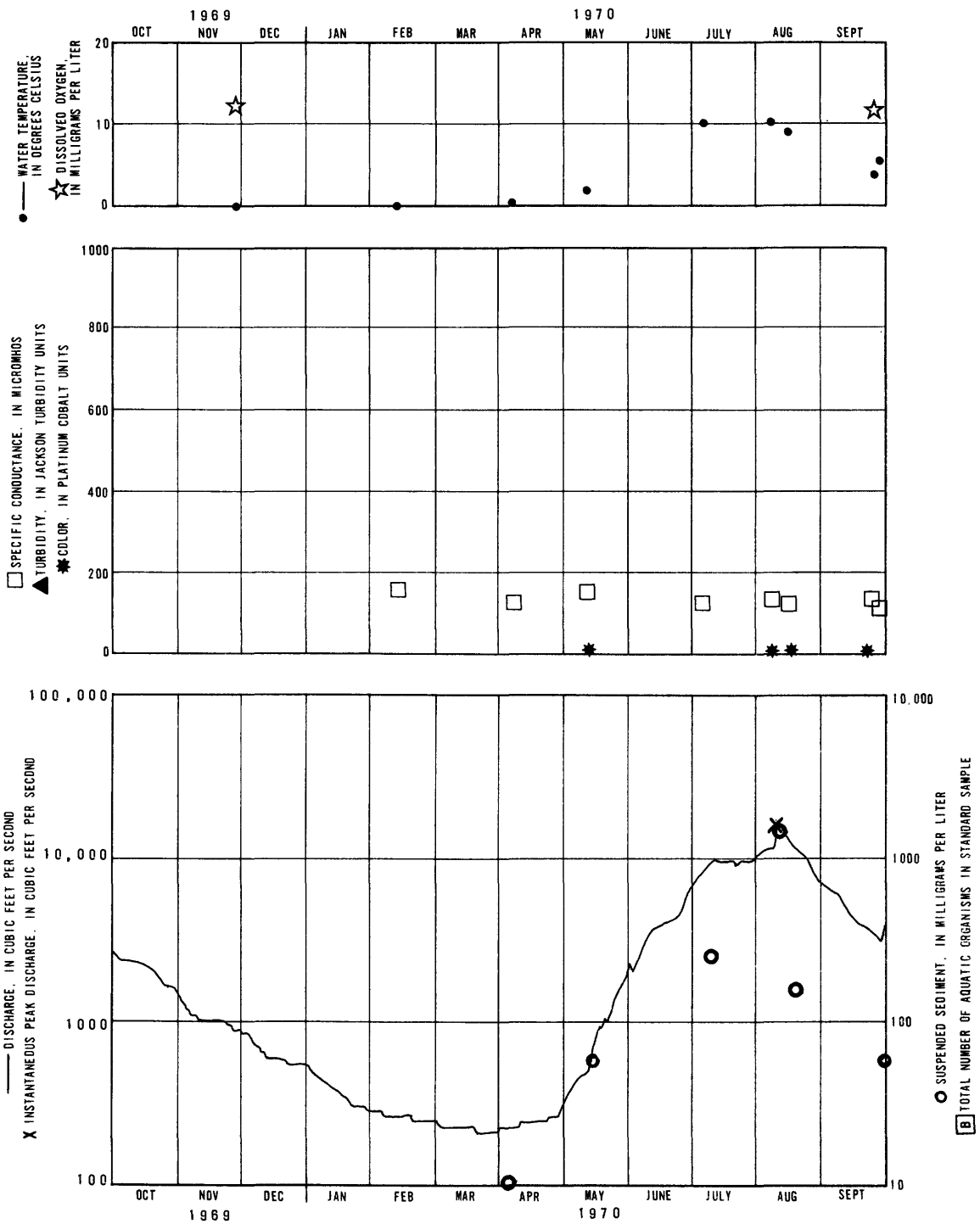

Figure 16.-- Tazlina River near Glennallen.

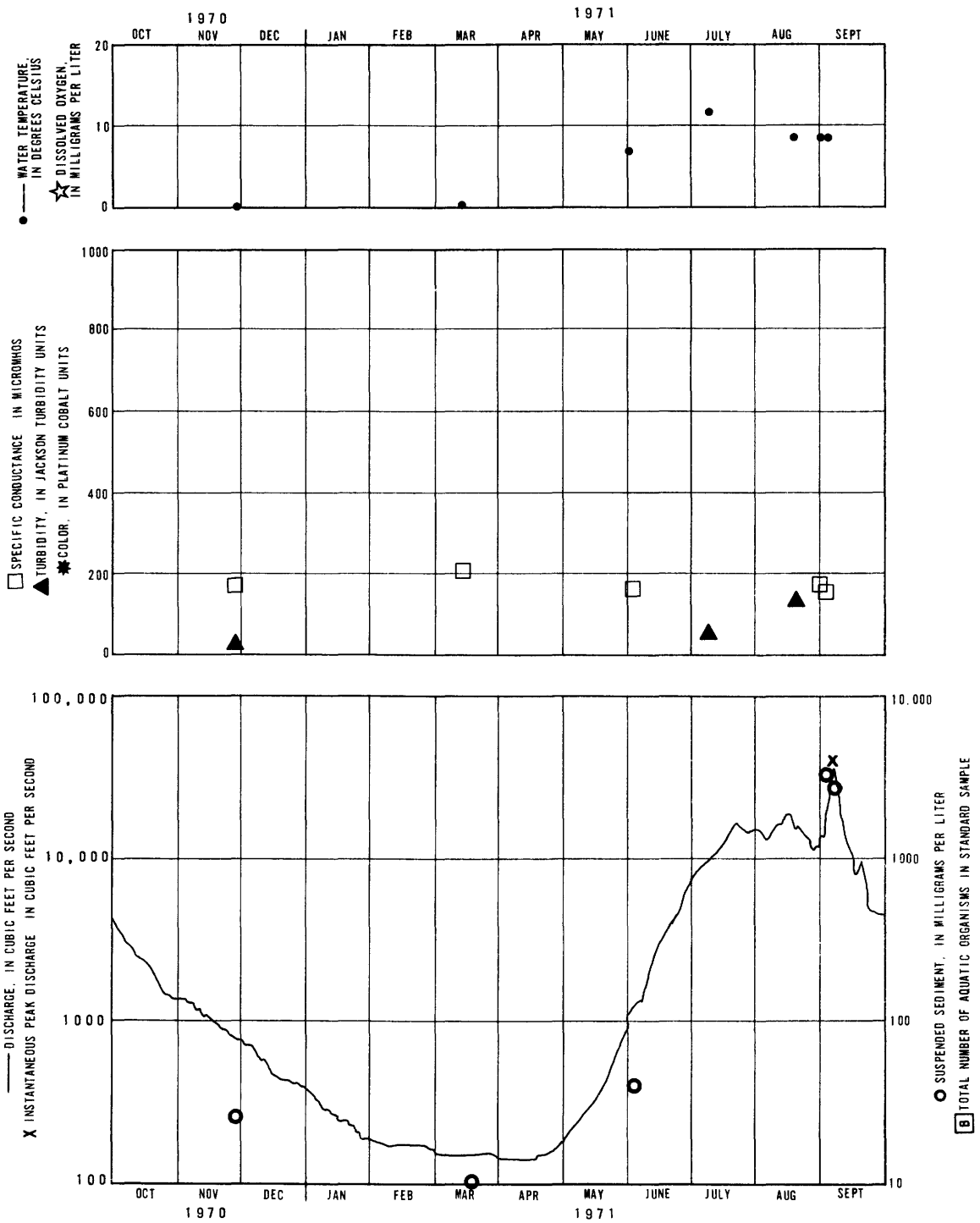

Figure 16.-- Tazlina River near Glennallen--Continued.

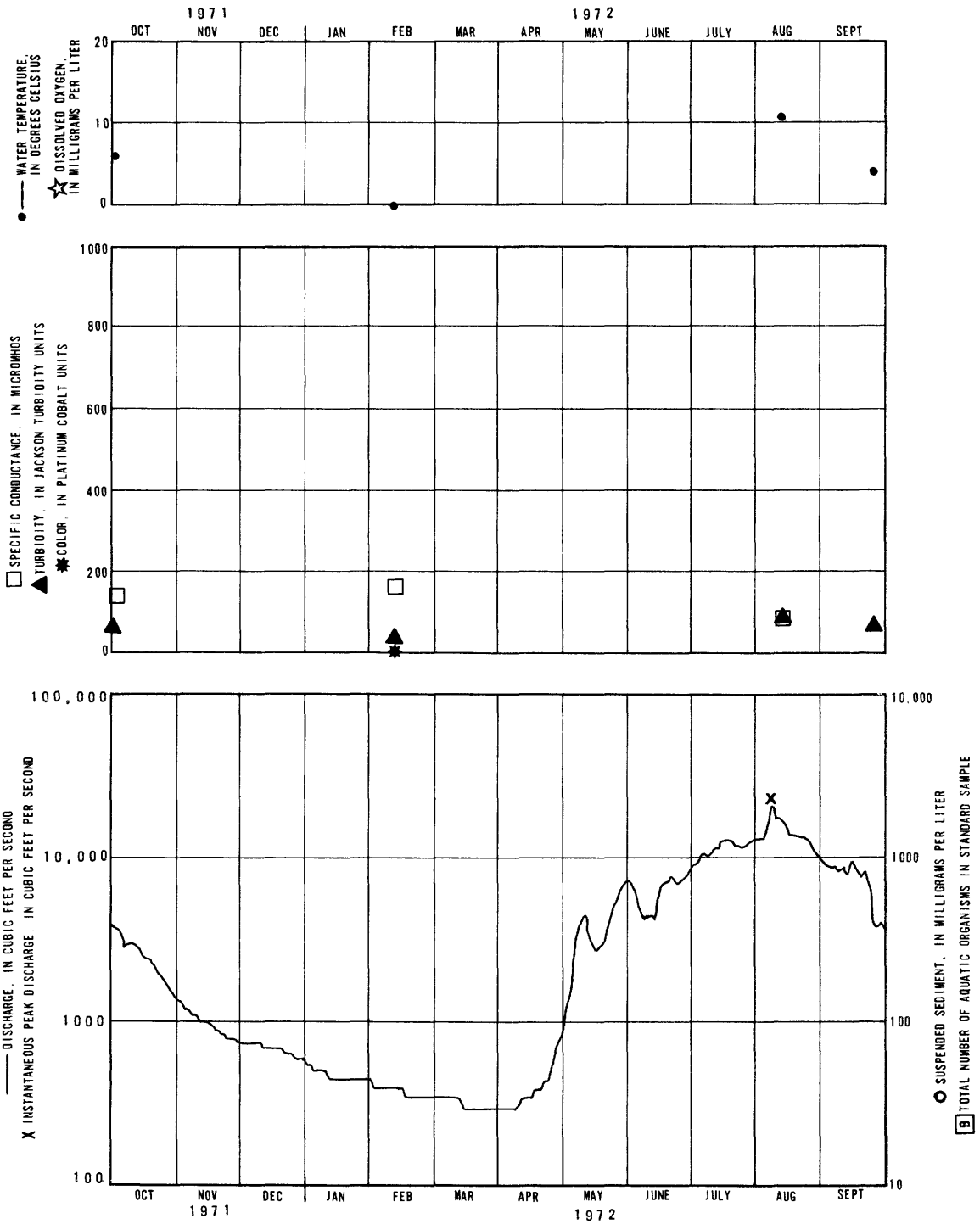

Figure 16.-- Tazlina River near Glennallen--Continued.

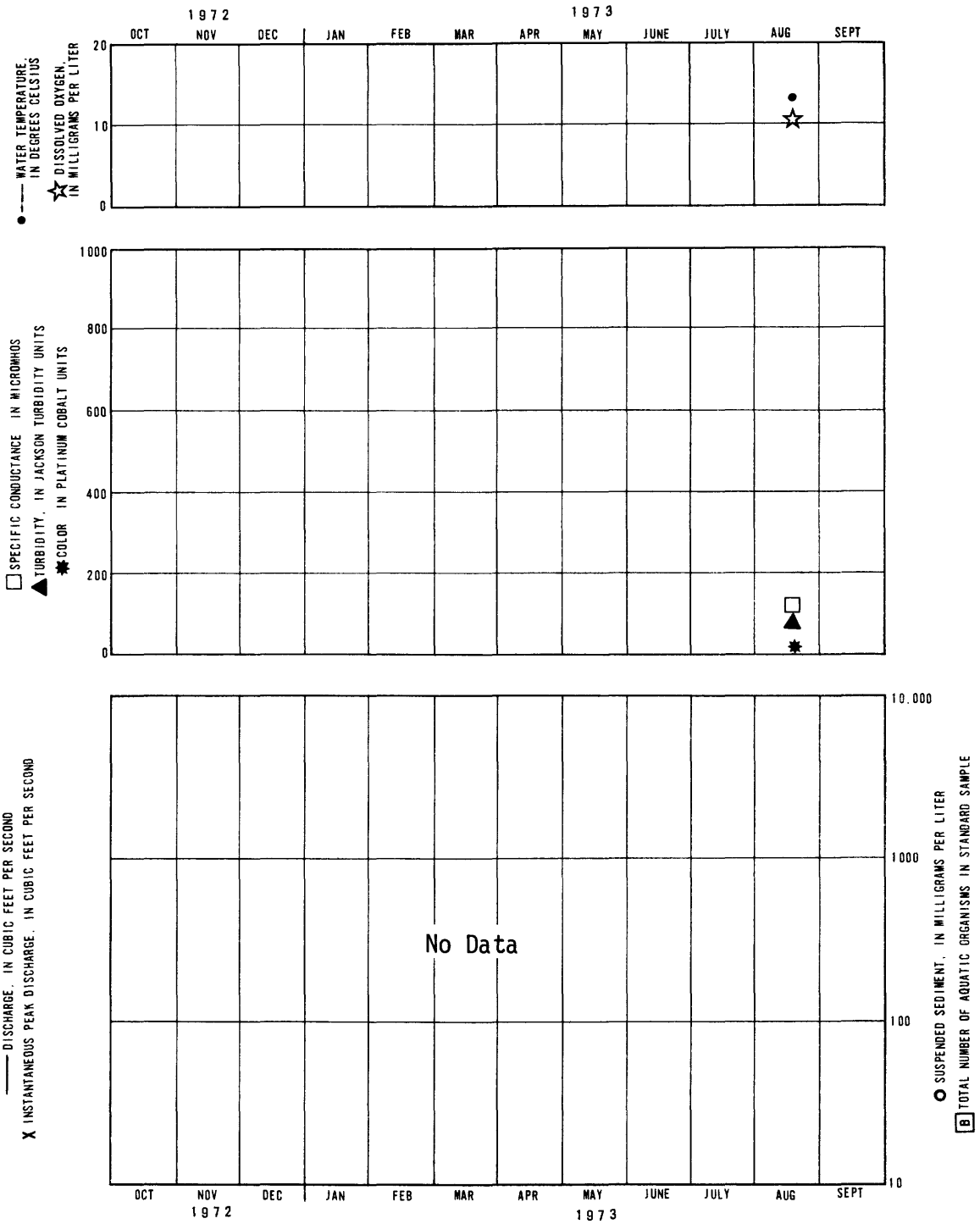

Figure 16.-- Tazlina River near Glennallen--Continued.

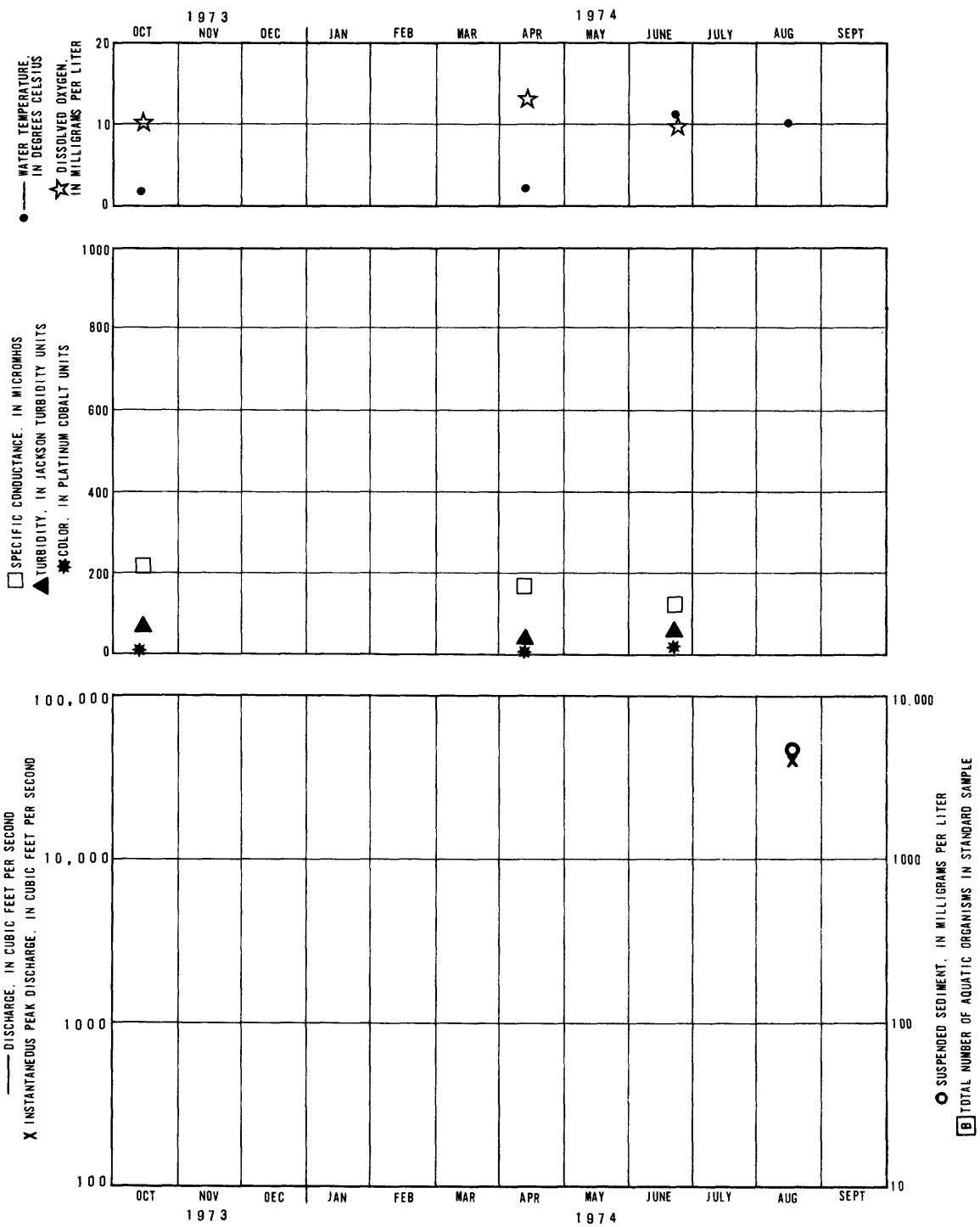

Figure 16.-- Tazlina River near Glennallen--Continued.

Klutina River at Copper Center

Location.--Lat 61°57'10", long 145°18'20", in SW¼ sec.18, T.2 N., R.1 E., near left bank on downstream side of bridge on Richardson Highway, 0.7 mi south of Copper Center, three-quarters of a mile upstream from mouth, and 24 mi downstream from Klutina Lake.

Period of Record.--May to August 1908 (gage heights only), June to October 1913, August 1949 to September 1966. Miscellaneous data available 1970, 72-73.

Purpose.--To document streamflow conditions along the trans-Alaska pipeline.

Drainage Basin.--Drainage area is approximately 880 mi^2. The basin is in high mountains, in the Continental and Transition climatic zones, in the discontinuous permafrost zone, and is forested. Permafrost, ground ice, and stream overflow and hillside icings are cold region features of this basin. Large glaciers cover some of the basin's high parts. A lake catches coarse sediment from the glacial drainage and provides some natural flow regulation. Stream overflow icings at the gaging station vary greatly in size from winter to winter. Some have spread over the flood plain and caused damage to the community.

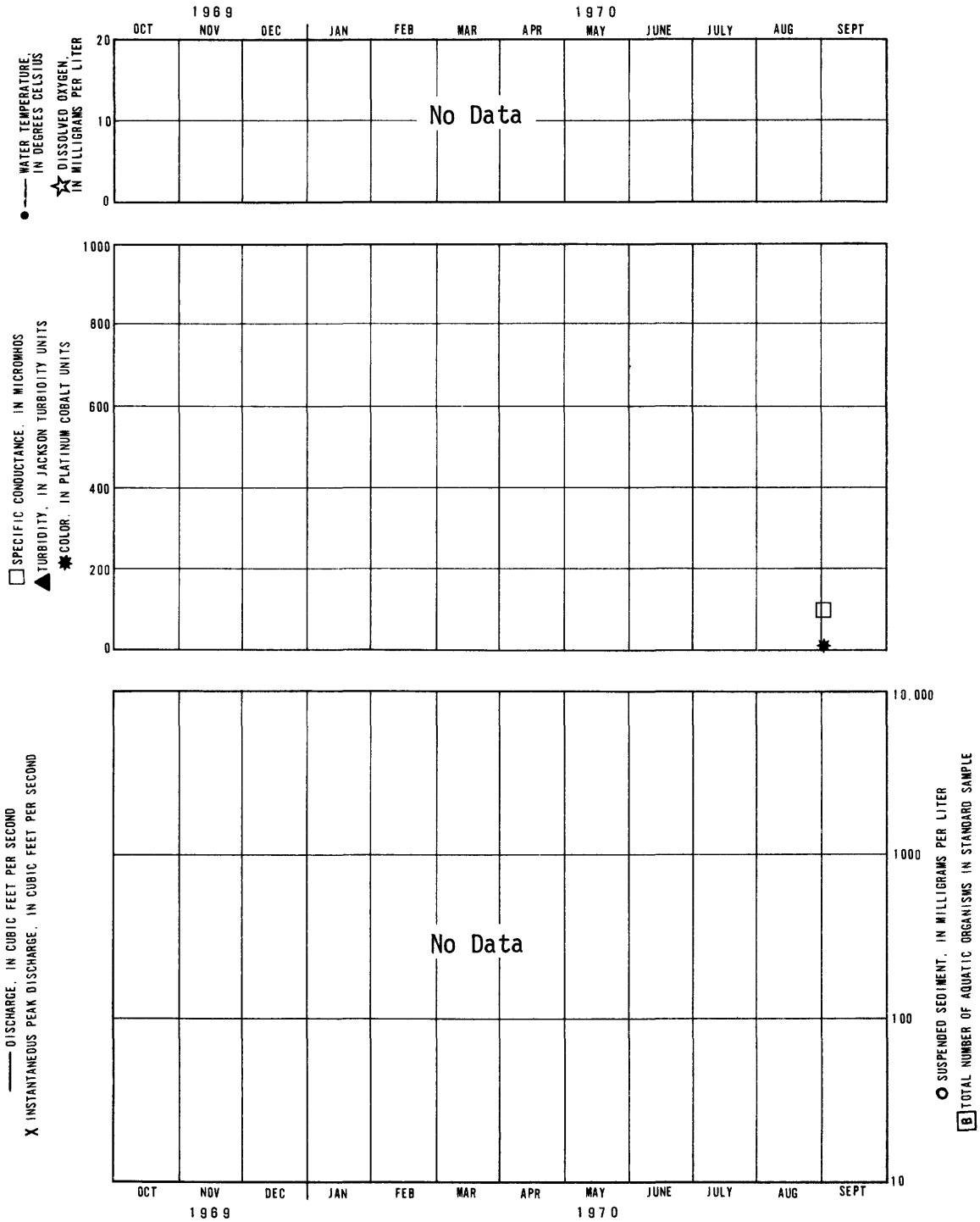

Figure 17.-- Klutina River at Copper Center.

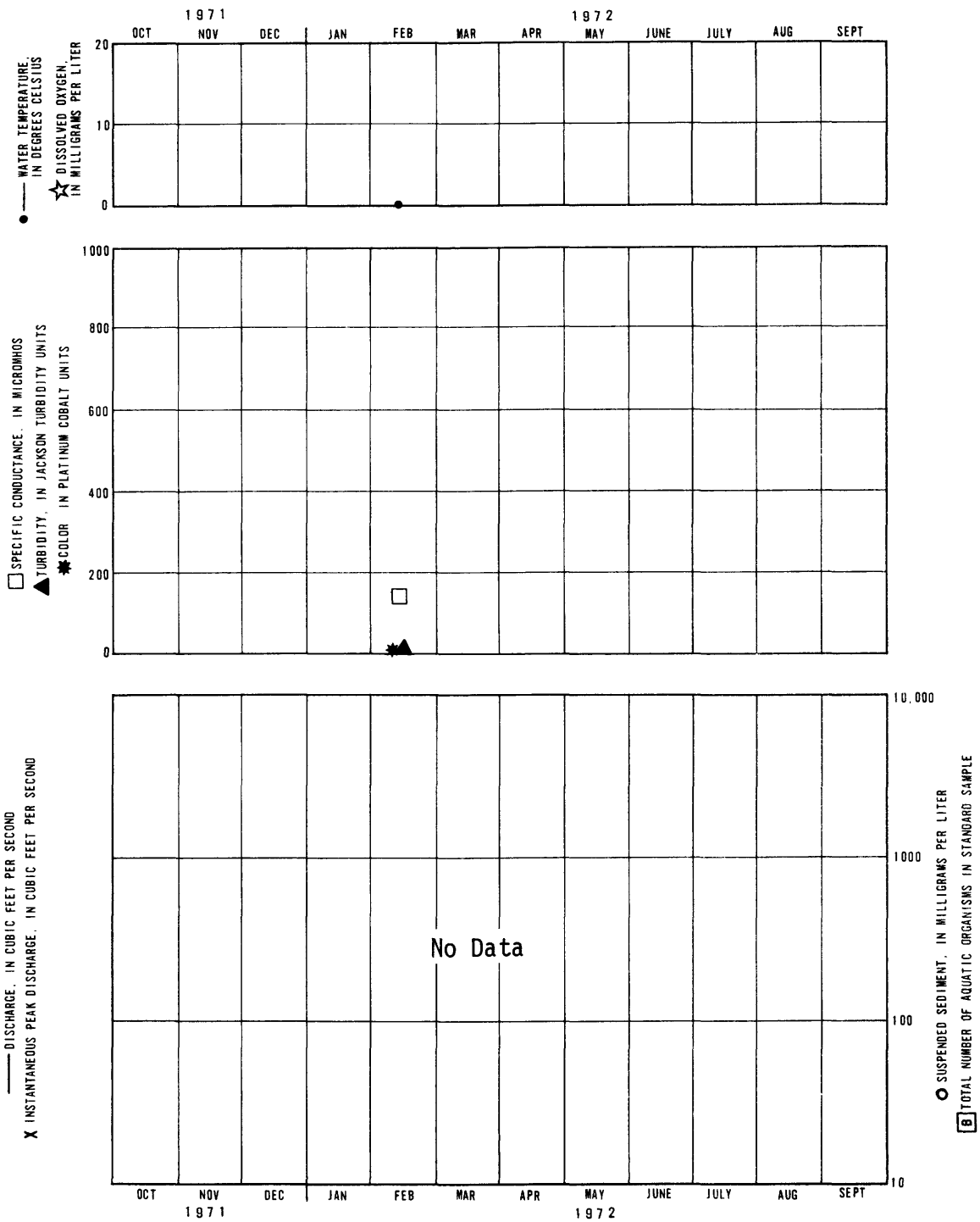

Figure 17.-- Klutina River at Copper Center--Continued.

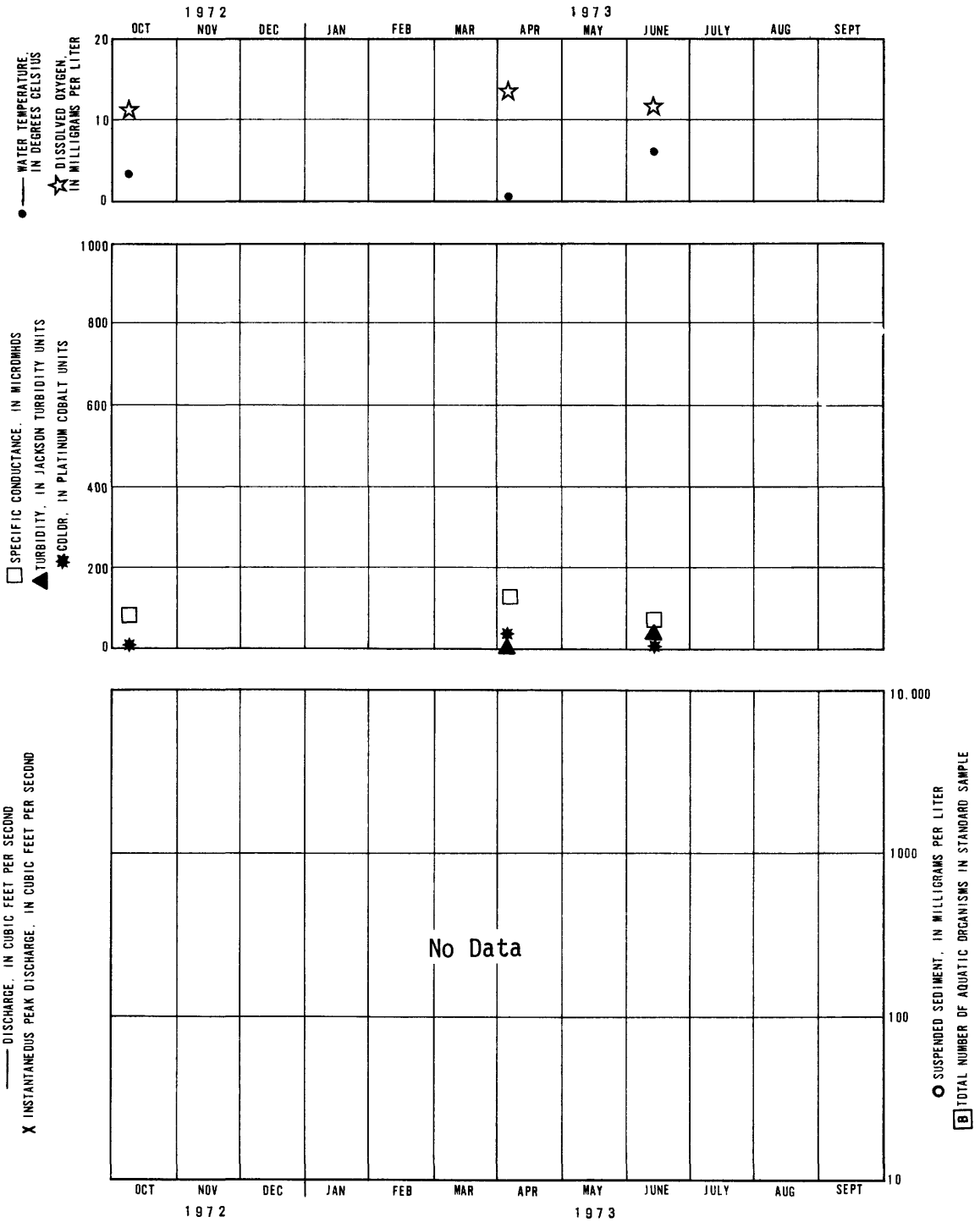

Figure 17.-- Klutina River at Copper Center--Continued.

Squirrel Creek at Tonsina

Location.--Lat 61°40'05", long 145°10'26", in NW¼ sec.26, T.2 S., R.1 E., on left downstream wingwall of bridge at mile 79.5 on Richardson Highway, 0.3 mi northeast of Tonsina River bridge, and 0.3 mi upstream from mouth.

Period of Record.--July 1965 to current year.

Purpose.--To document streamflow conditions along the trans-Alaska pipeline and to provide a hydrologic sample from a representative basin in the region.

Drainage Basin.--Drainage area is 70.5 mi^2. The basin is in high mountains in the Continental climatic zone, in the discontinuous permafrost zone, and is mostly forested. Permafrost, ground ice, and stream overflow and hillside icings are cold region features of this basin. The basin is crossed by the trans-Alaska pipeline but is otherwise undisturbed wilderness.

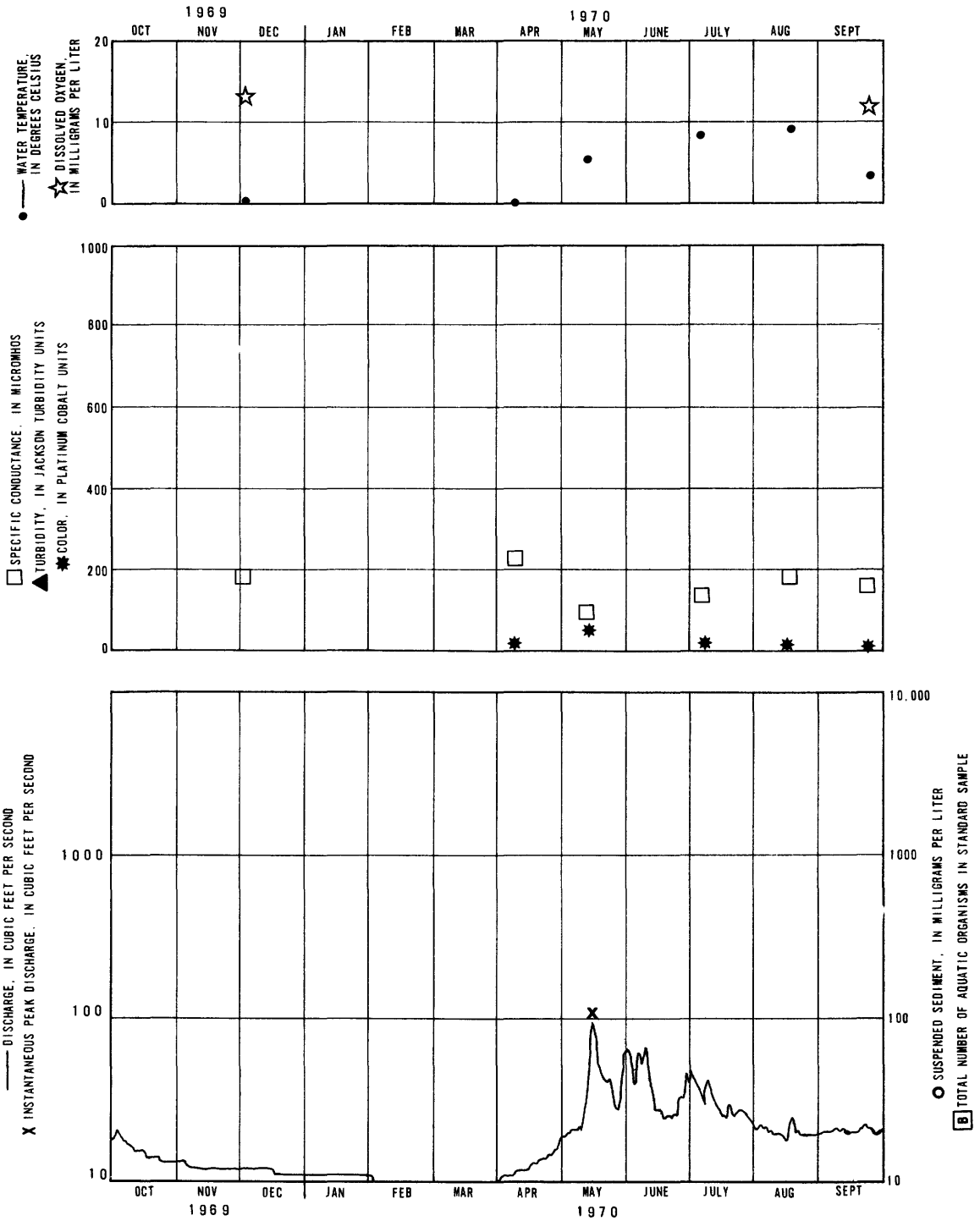

Figure 18.-- Squirrel Creek at Tonsina.

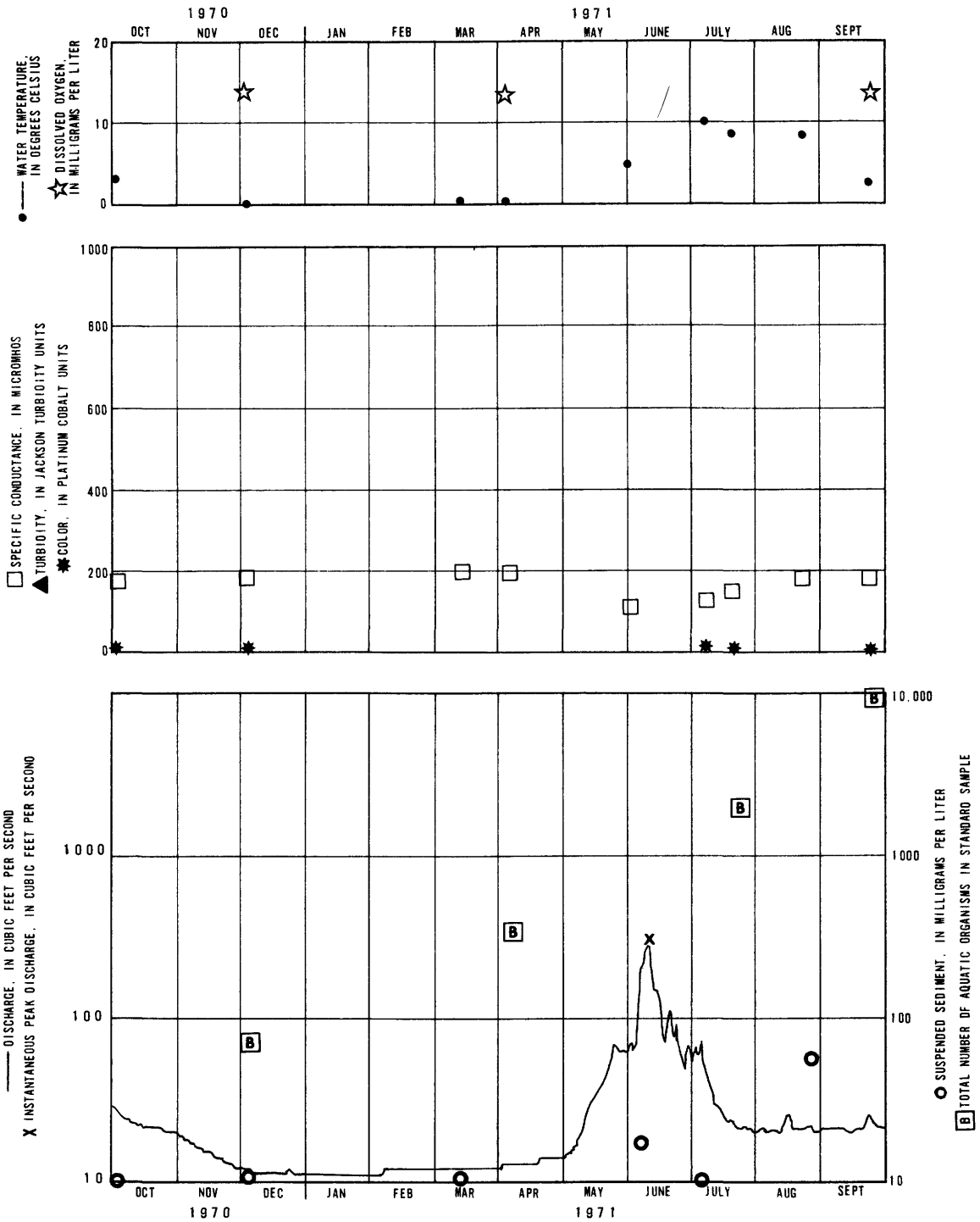

Figure 18.-- Squirrel Creek at Tonsina--Continued.

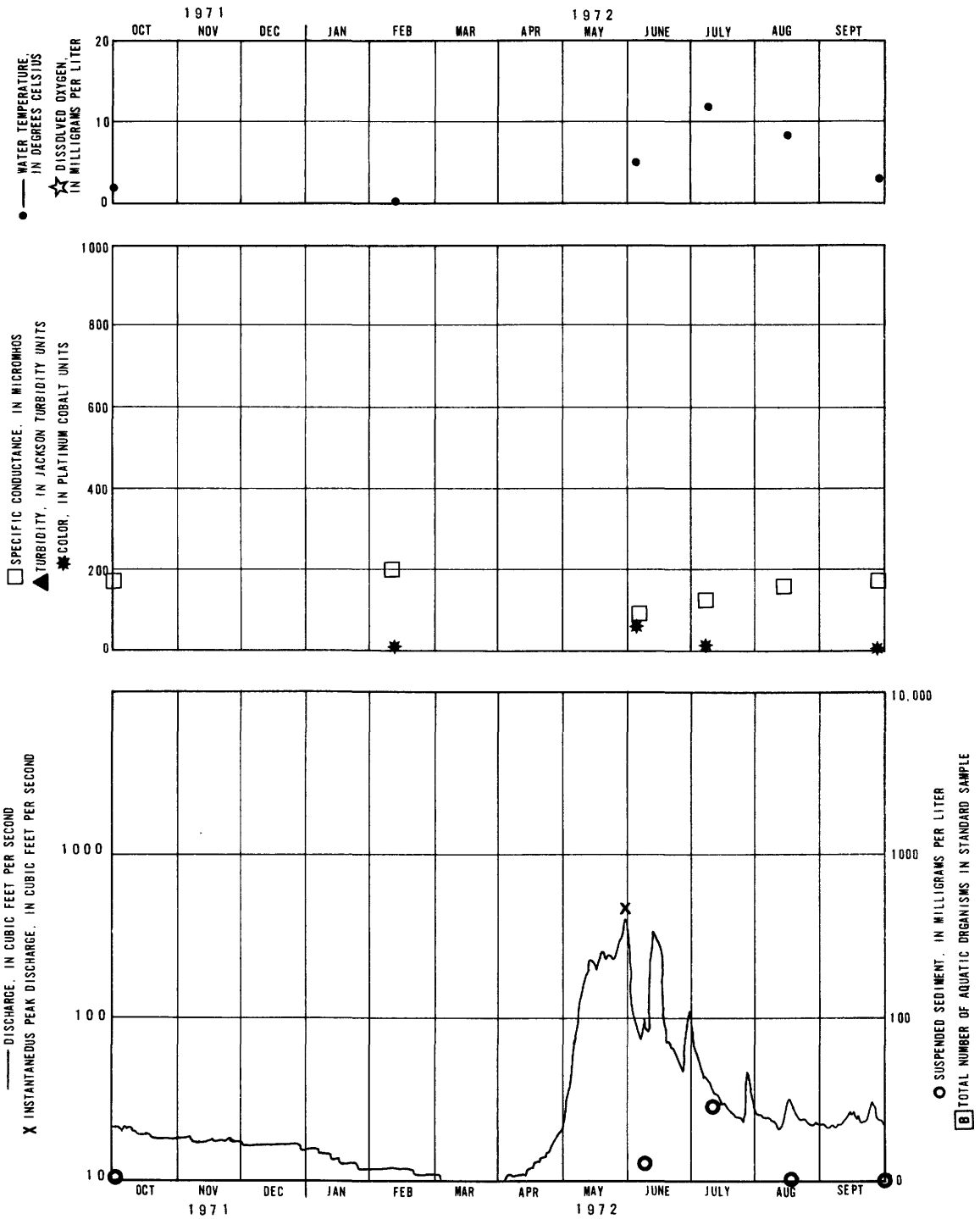

Figure 18.-- Squirrel Creek at Tonsina--Continued.

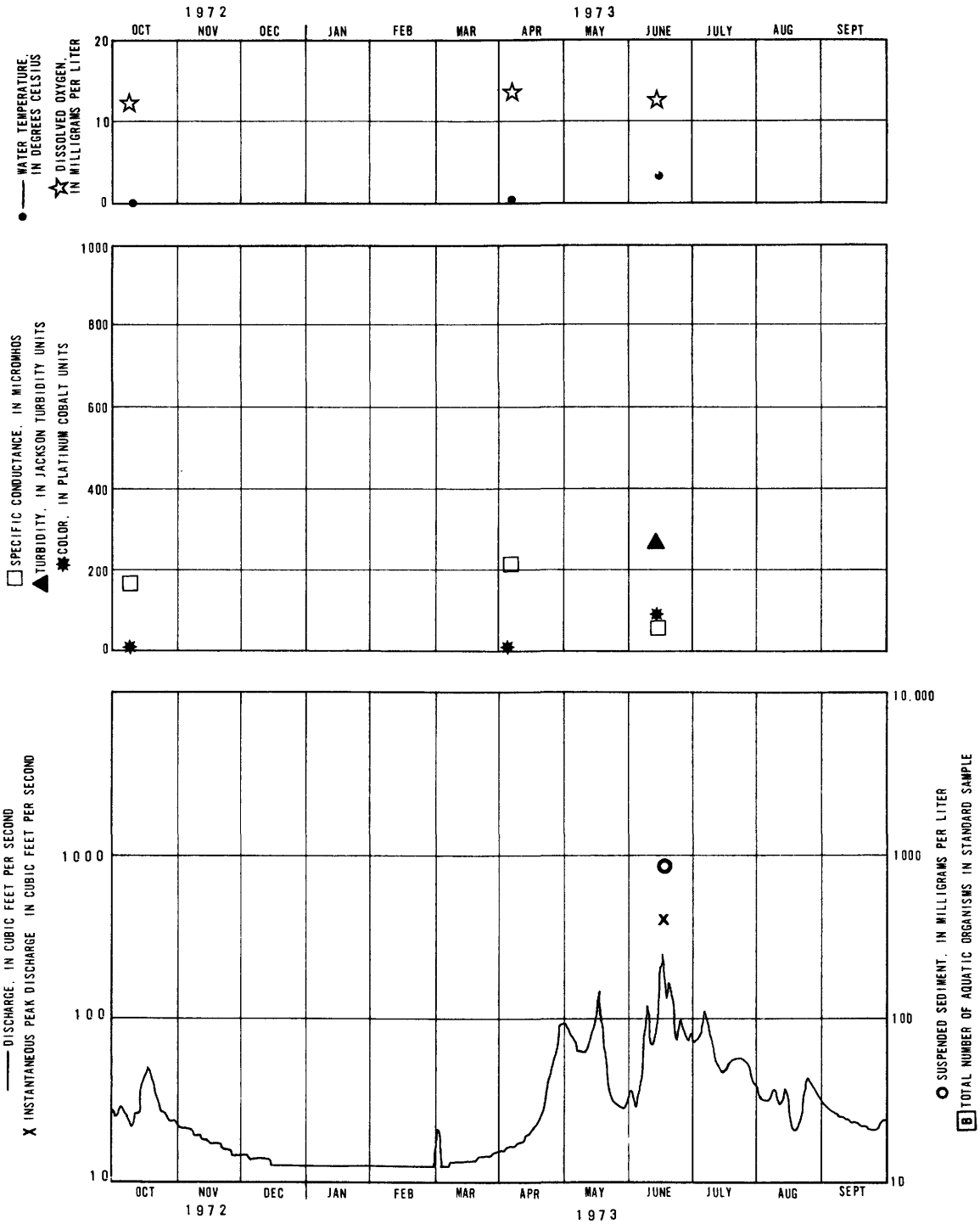

Figure 18.-- Squirrel Creek at Tonsina--Continued.

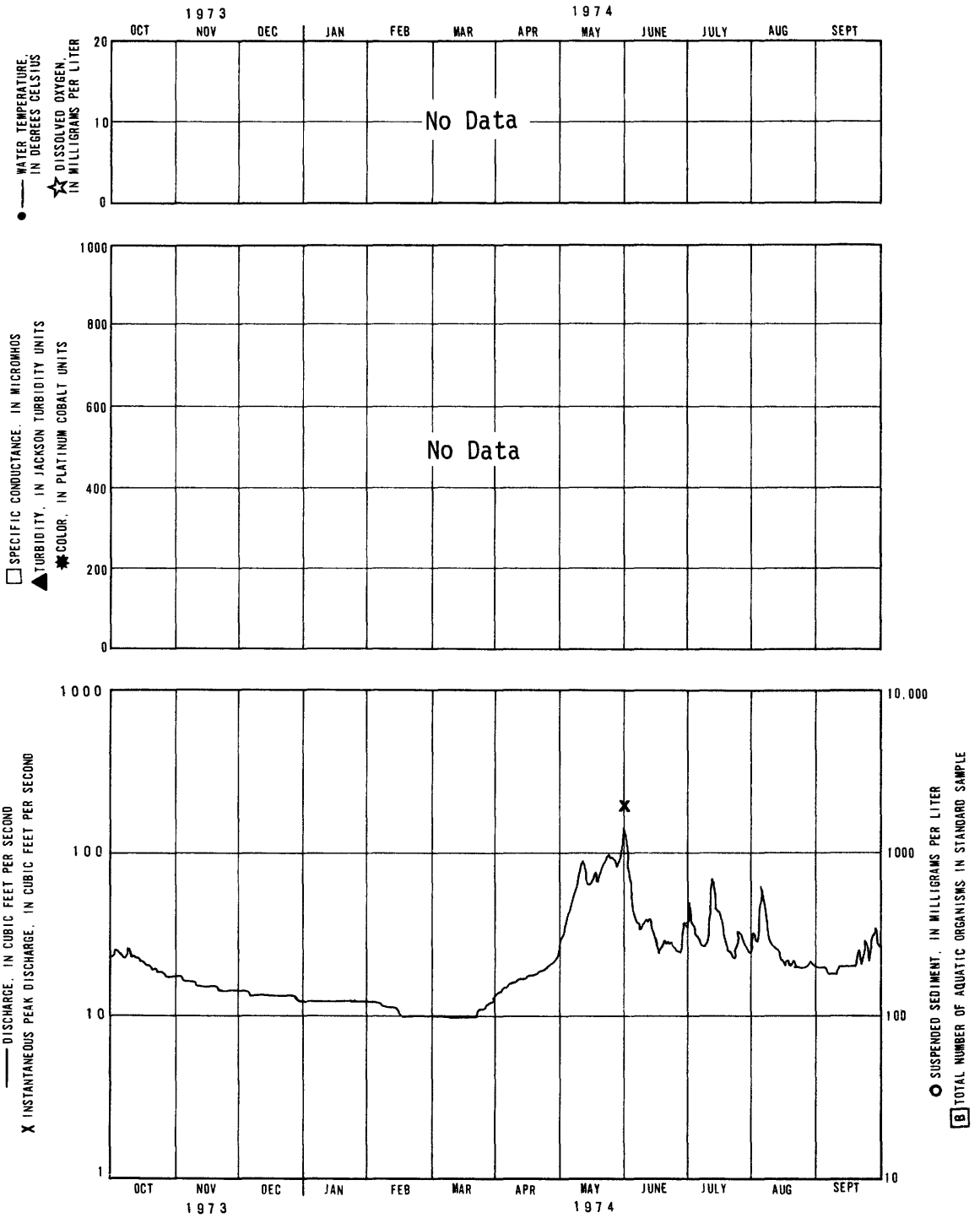

Figure 18.-- Squirrel Creek at Tonsina--Continued.

Tonsina River at Tonsina

Location.--Lat 61°39'41", long 145°11'02", in SW¼ SW¼ sec.26, T.2 S., R.1 E., on right bank 0.2 mi upstream from Richardson Highway crossing at Tonsina, 0.6 mi upstream from Bernard Creek, and 0.8 mi upstream from Squirrel Creek. (Prior to April 17, 1974, 0.2 mi downstream on downstream side of Richardson Highway bridge.)

Period of Record.--May 1950 to December 1954, January to September 1955 (fragmentary), October 1955 to current year.

Purpose.--To document streamflow conditions along the trans-Alaska pipeline and to define streamflow characteristics at this site for a hydrologic sample from the region.

Drainage Basin.--Drainage area is approximately 420 mi^2. The basin is in high mountains, in the Continental and Transition climatic zones, in the discontinuous permafrost zone, and is forested. Permafrost, ground ice, and stream overflow and hillside icings are cold region features of this basin. Glaciers cover some of the high mountain drainage. A large lake traps the coarser sediment in the glacier drainage and provides some natural flow regulation. The basin is undisturbed wilderness.

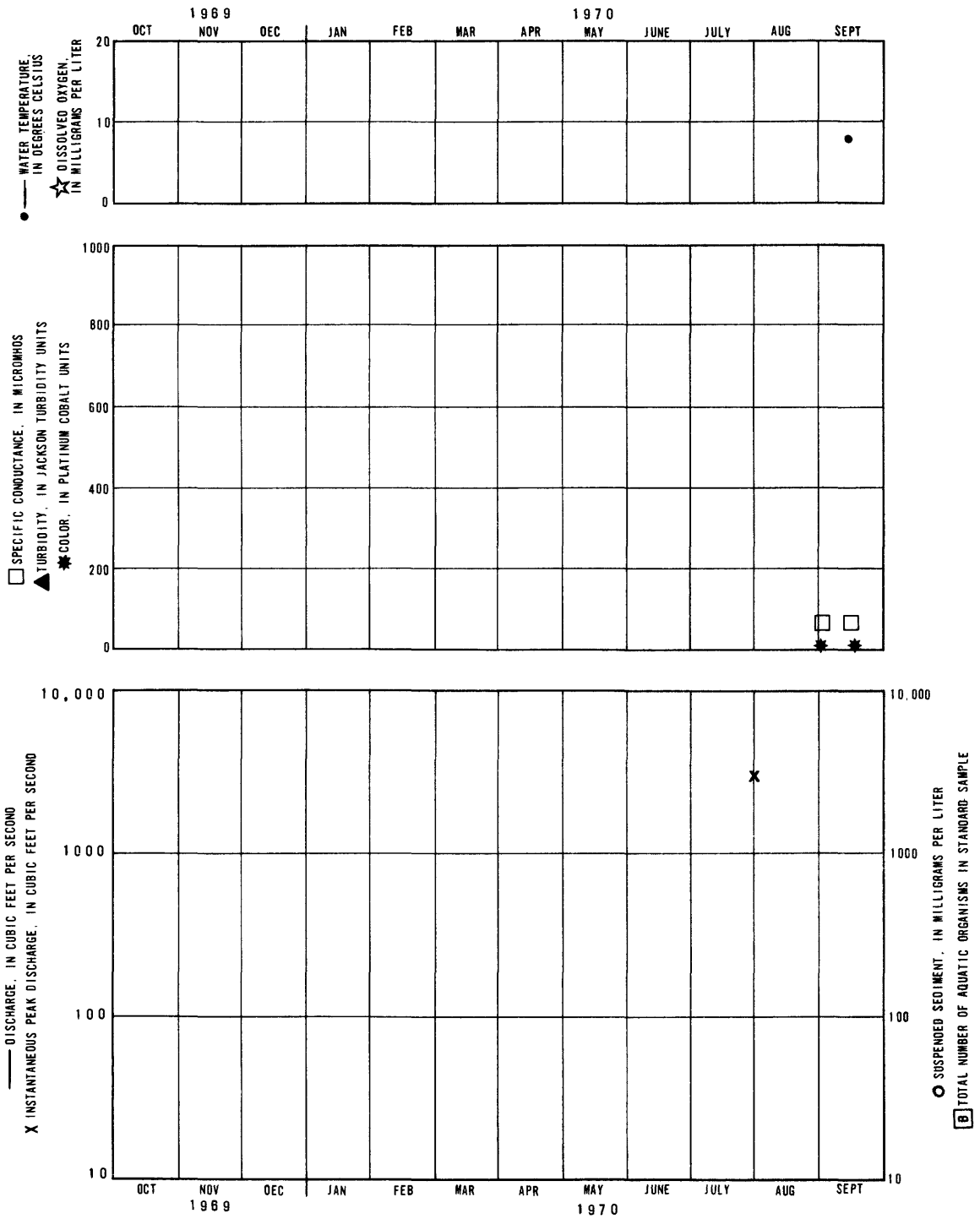

Figure 19.-- Tonsina River at Tonsina.

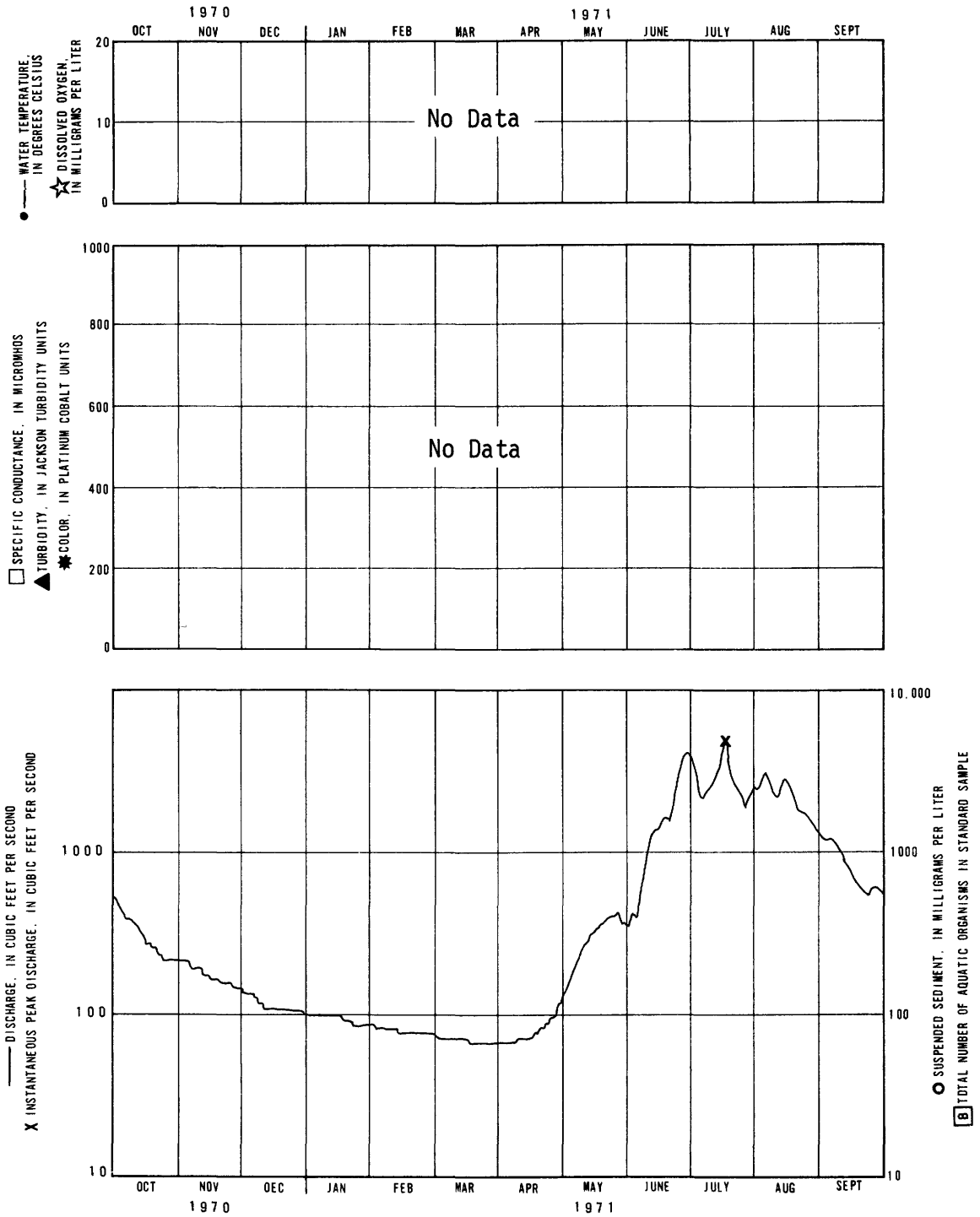

Figure 19.-- Tonsina River at Tonsina--Continued.

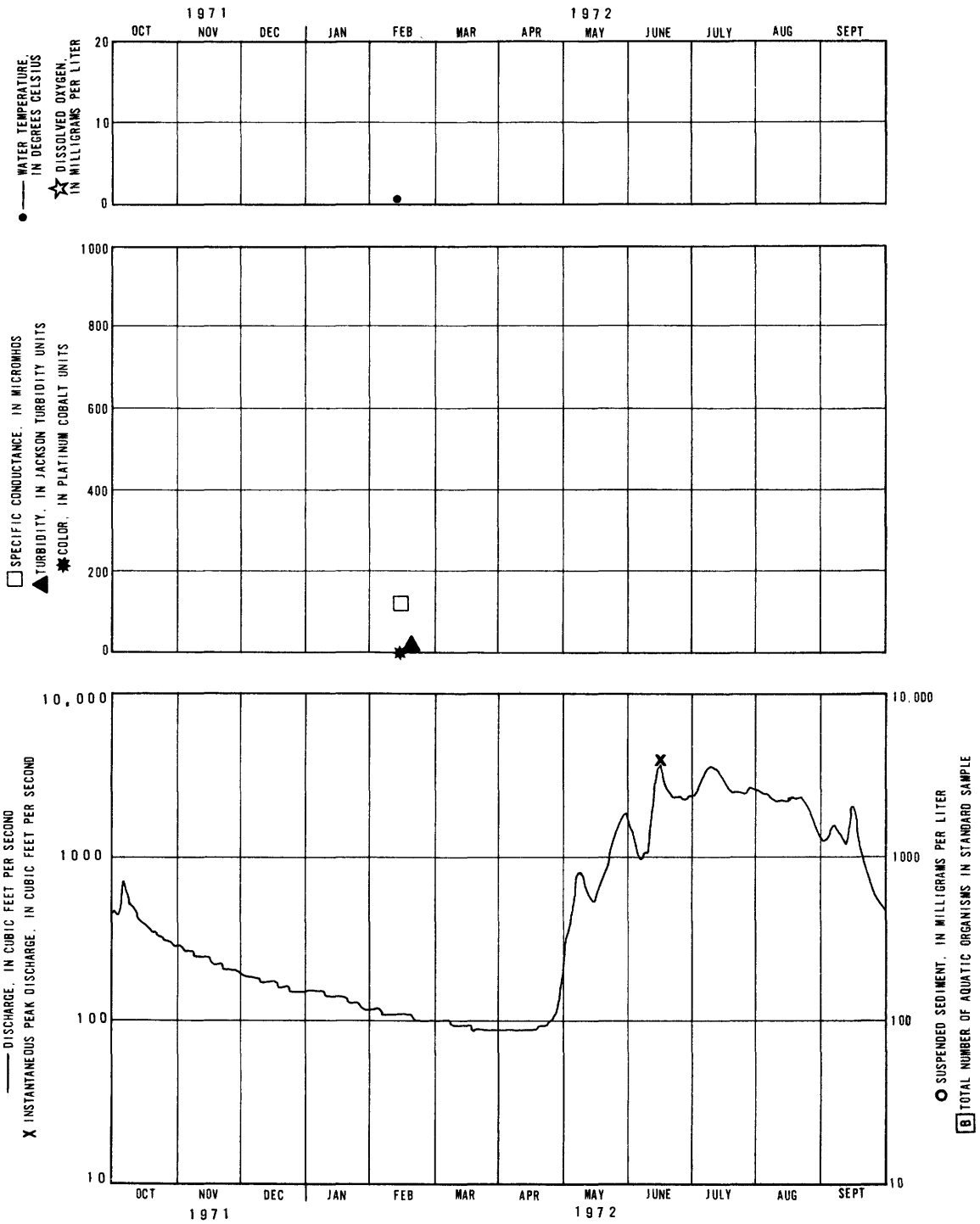

Figure 19.-- Tonsina River at Tonsina--Continued.

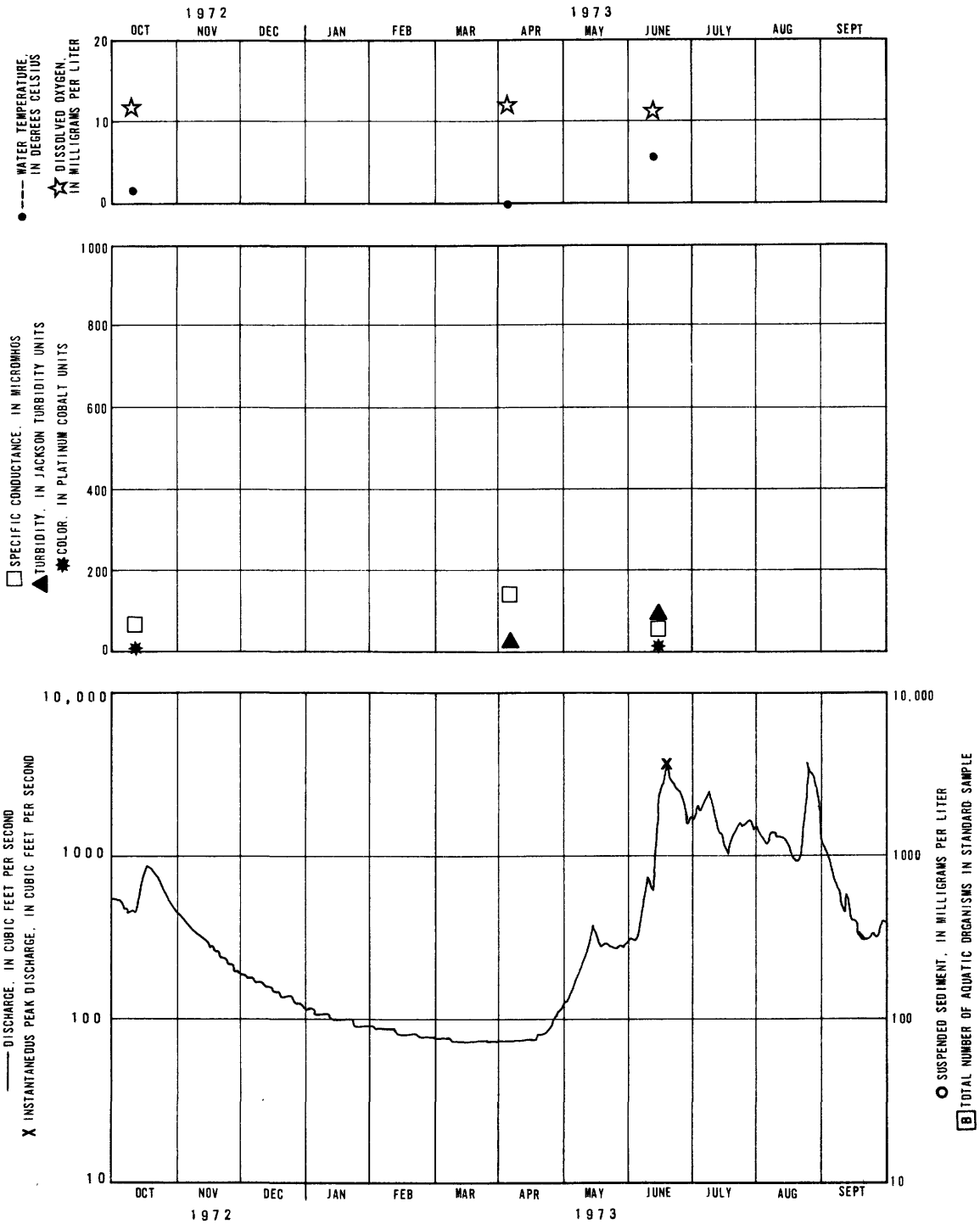

Figure 19.-- Tonsina River at Tonsina--Continued.

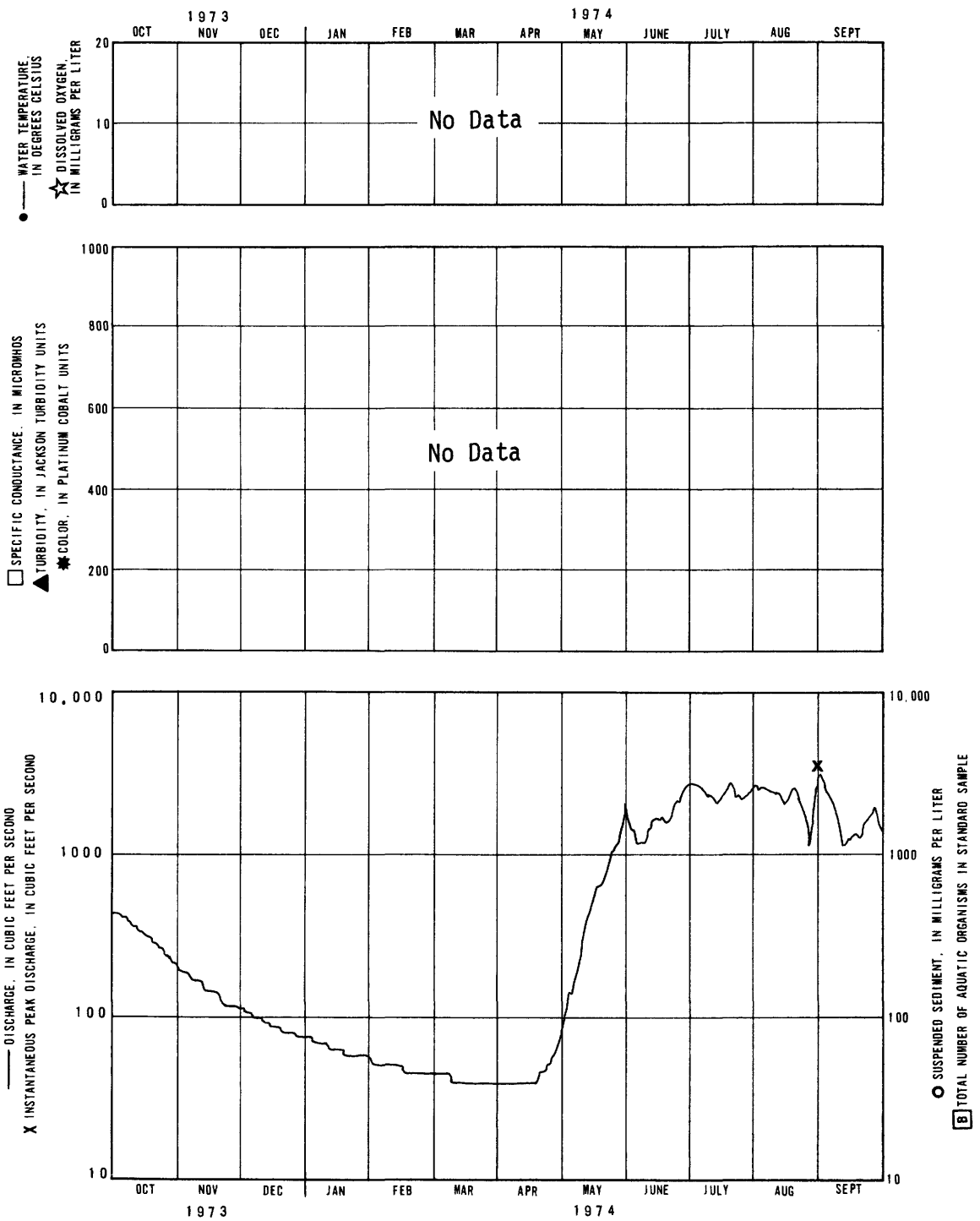

Figure 19.-- Tonsina River at Tonsina--Continued.

Little Tonsina River near Tonsina

Location.--Lat 61°28'49", long 145°09'05", in NW¼ sec.36, T.4 S., R.1 E., on right bank 50 ft downstream from Richardson Highway crossing, and 15.4 mi south of Tonsina.

Period of Record.--September 1972 to current year.

Purpose.--To document streamflow conditions along the trans-Alaska pipeline and to provide hydrologic samples from a representative basin in the region for defining streamflow characteristics.

Drainage Basin.--Drainage area is 22.7 mi^2. The basin is in high mountains in the Continental climatic zone, in the discontinuous permafrost zone, and is forested. Permafrost, ground ice, stream overflow and hillside icings are cold region features of this basin. The trans-Alaska pipeline and Richardson Highway cross the basin. Most of the basin is wilderness, but houses have been built along the stream valley and there is a pump station for TAPS.

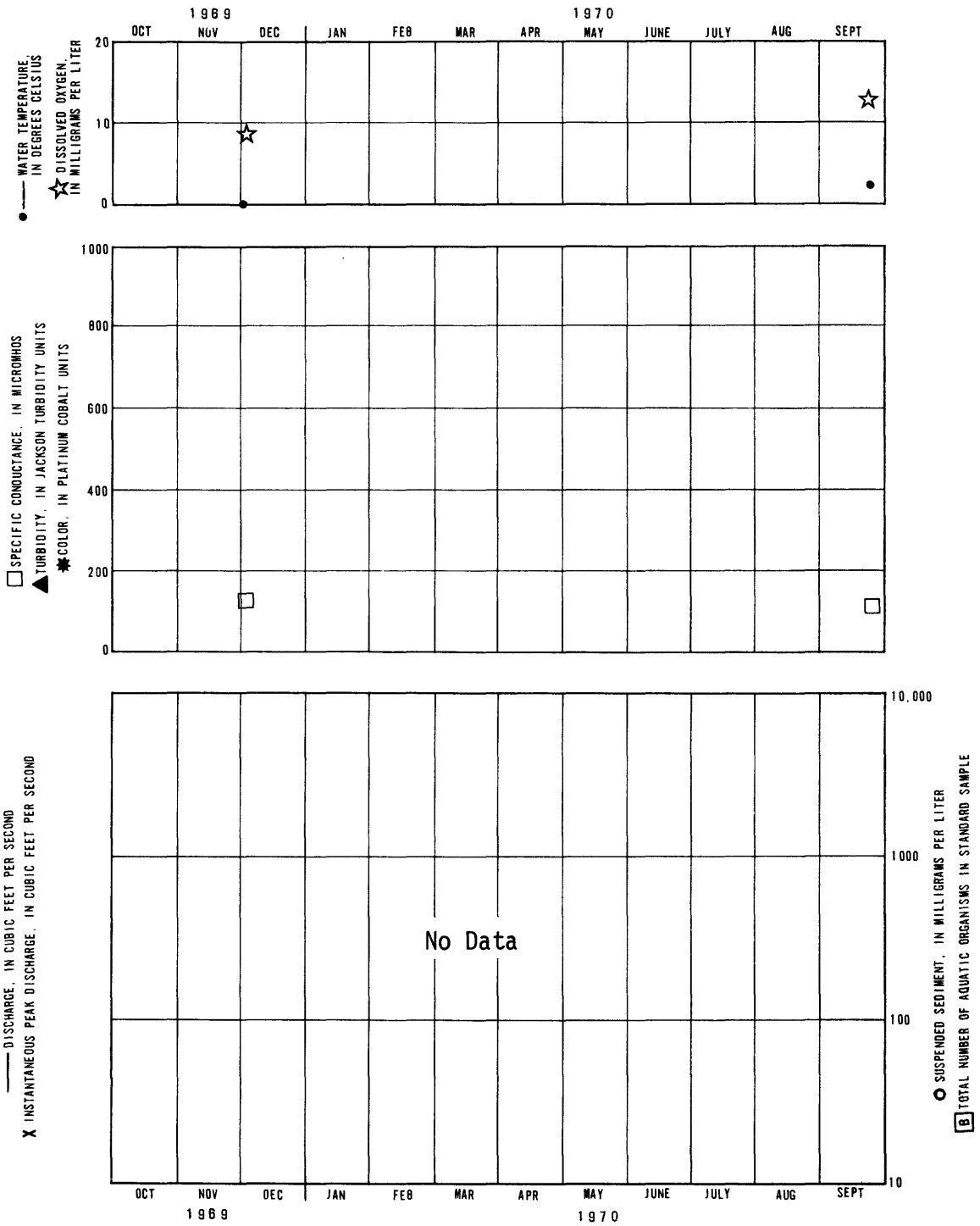

Figure 20.-- Little Tonsina River near Tonsina.

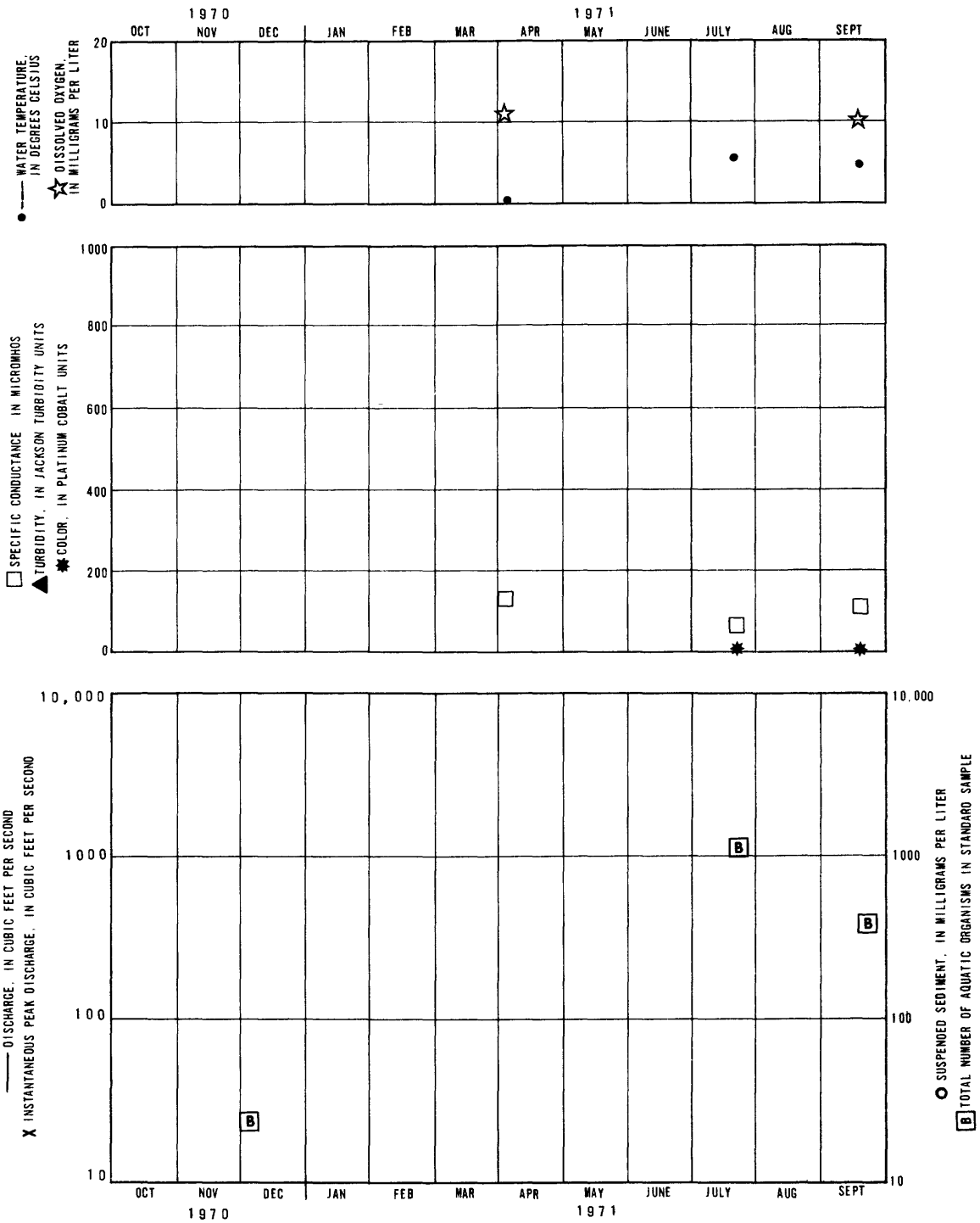

Figure 20.-- Little Tonsina River near Tonsina--Continued.

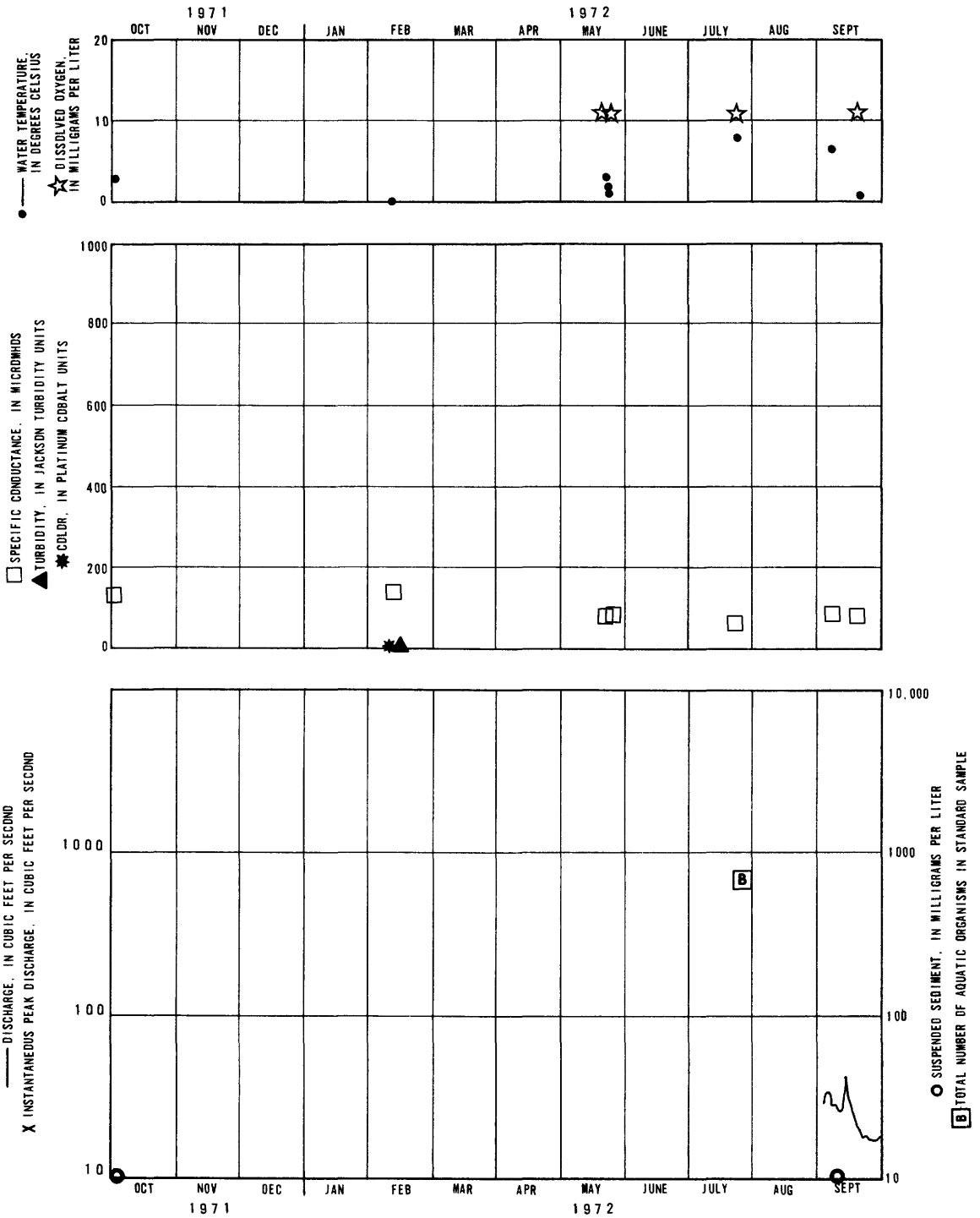

Figure 20.-- Little Tonsina River near Tonsina--Continued.

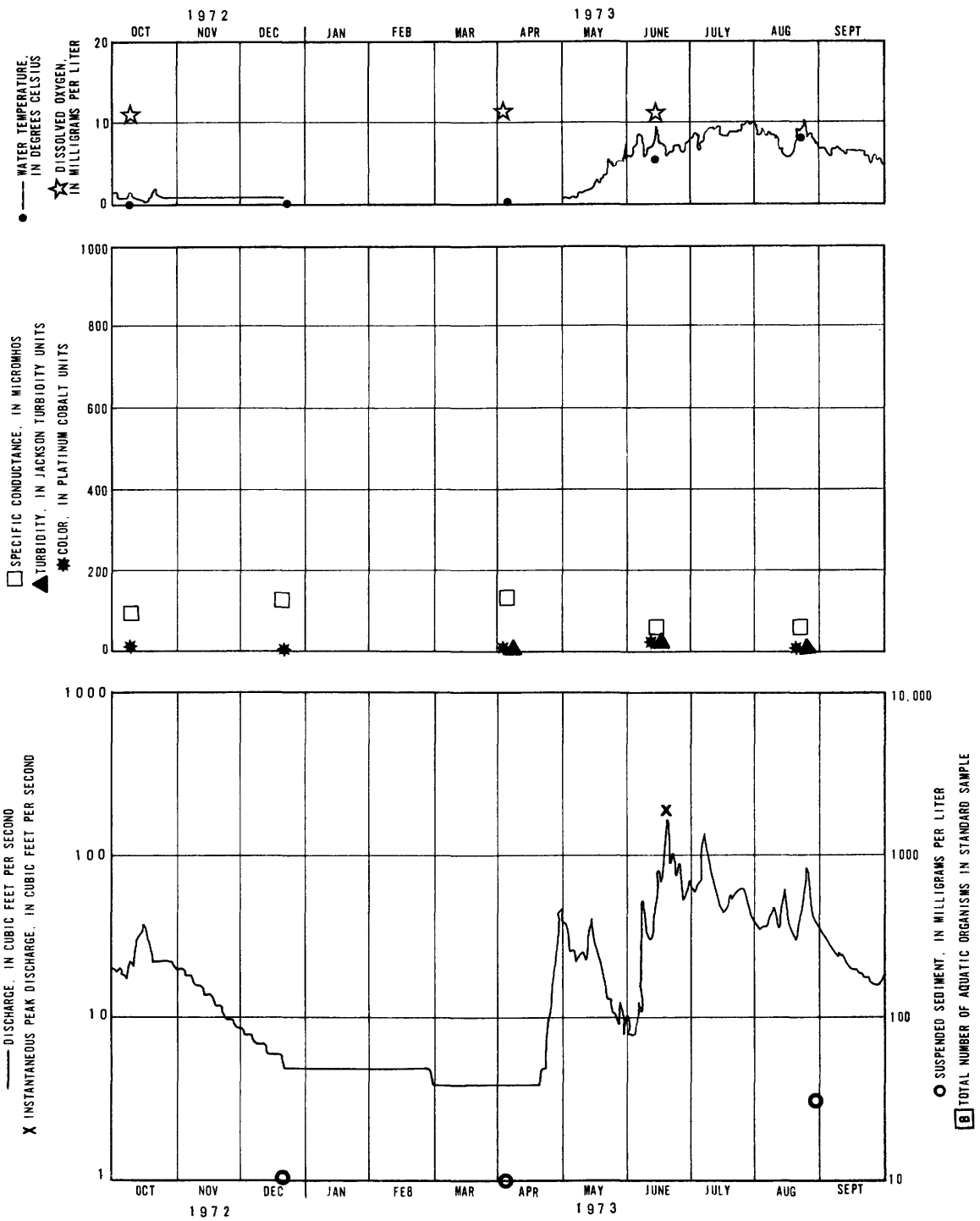

Figure 20.-- Little Tonsina River near Tonsina--Continued.

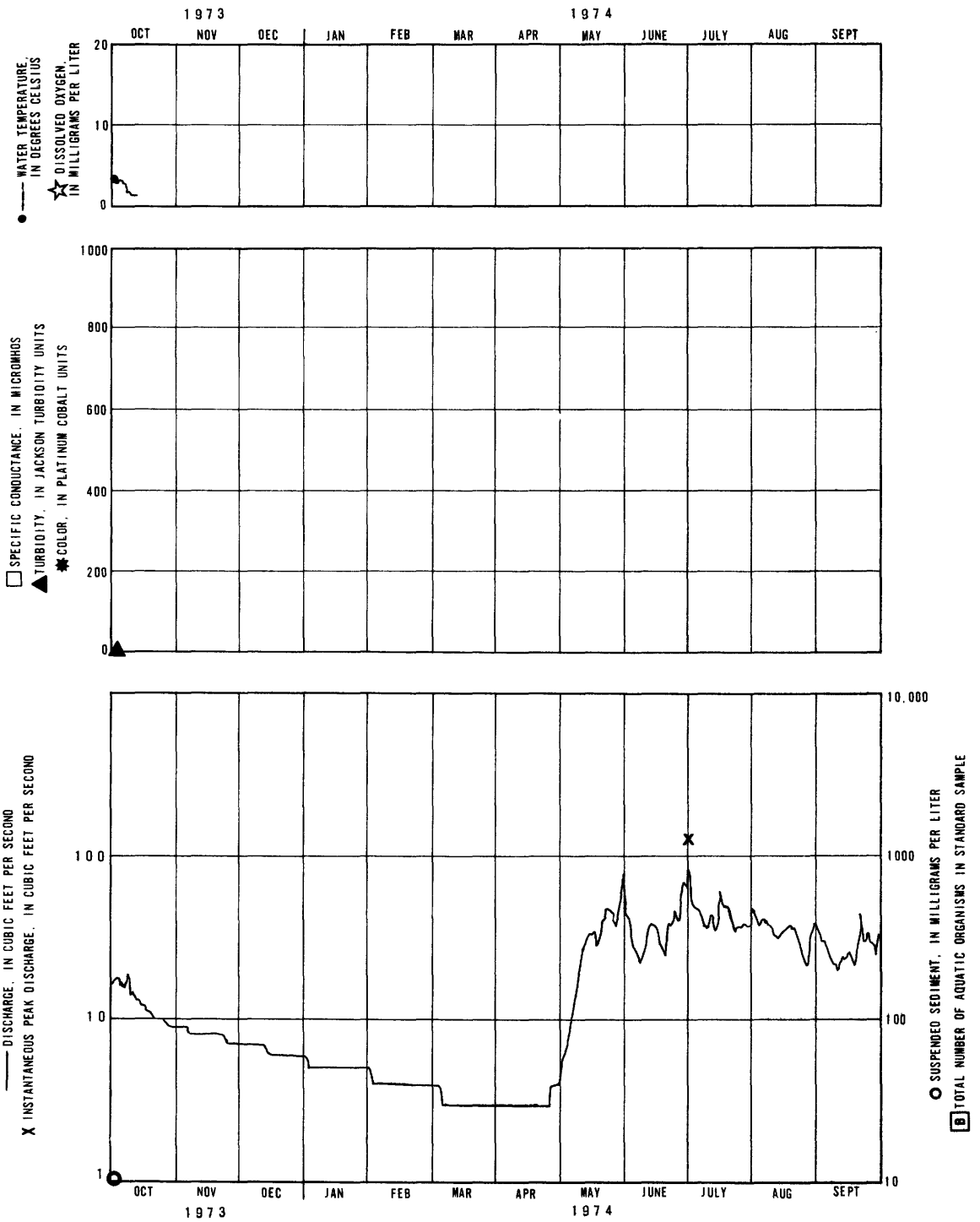

Figure 20.-- Little Tonsina River near Tonsina--Continued.

Copper River near Chitina

Location.--Lat 61°27'56", long 144°27'21", in SW¼ NE¼ sec.2, T.5 S., R.5 E., on right bank at head of Woods Canyon, 0.5 mi downstream from Taral Creek and abandoned Indian village of Taral, 2.2 mi upstream from Tenas Creek and 3.5 mi south of Chitina.

Period of Record.--July to September 1950, May to November 1952, October 1955 to current year.

Purpose.--To document hydrologic conditions and to define streamflow characteristics for this principle stream.

Drainage Basin.--Drainage area is approximately 20,600 mi^2. Glaciers cover approximately 17 percent of the basin.

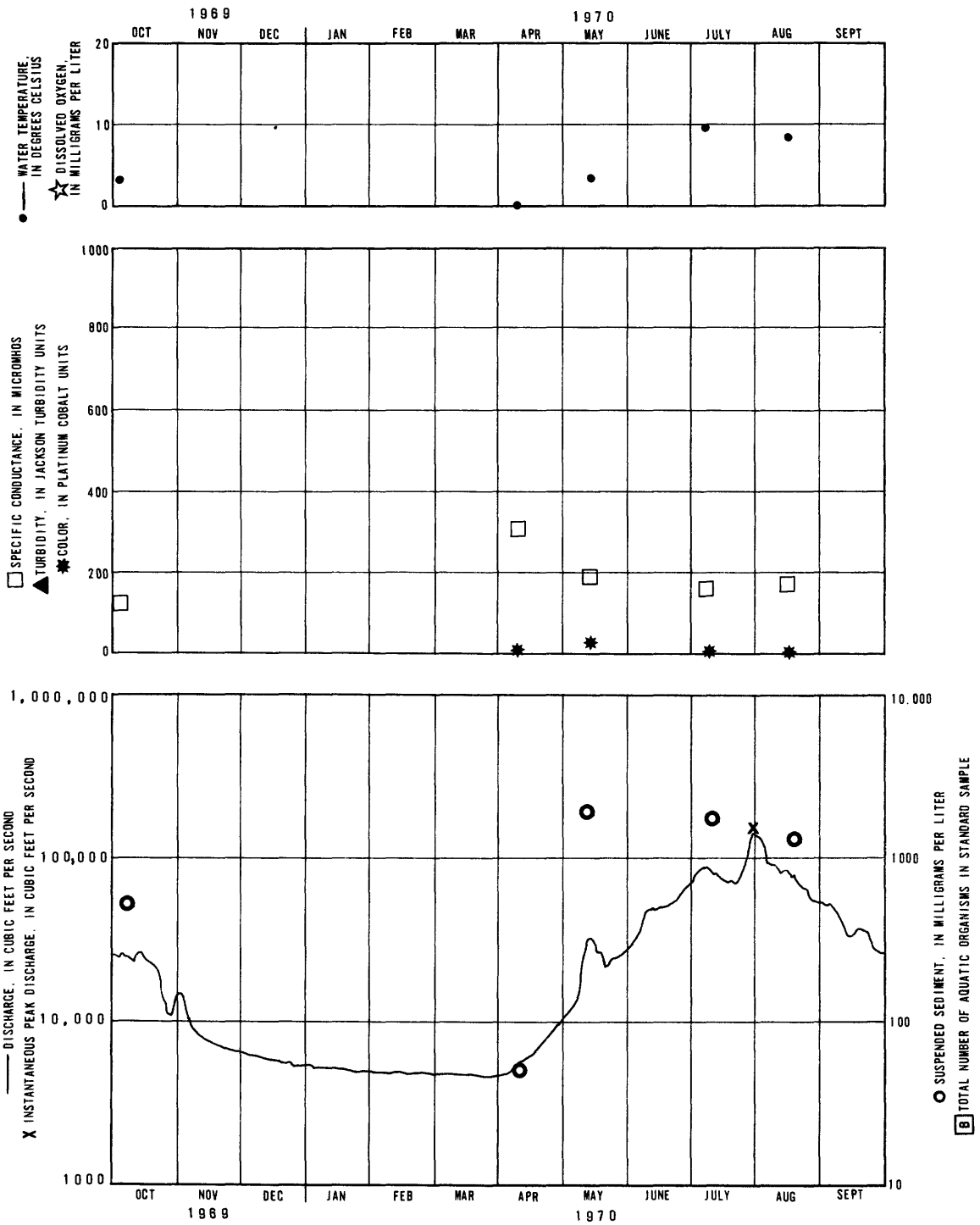

Figure 21.-- Copper River near Chitina.

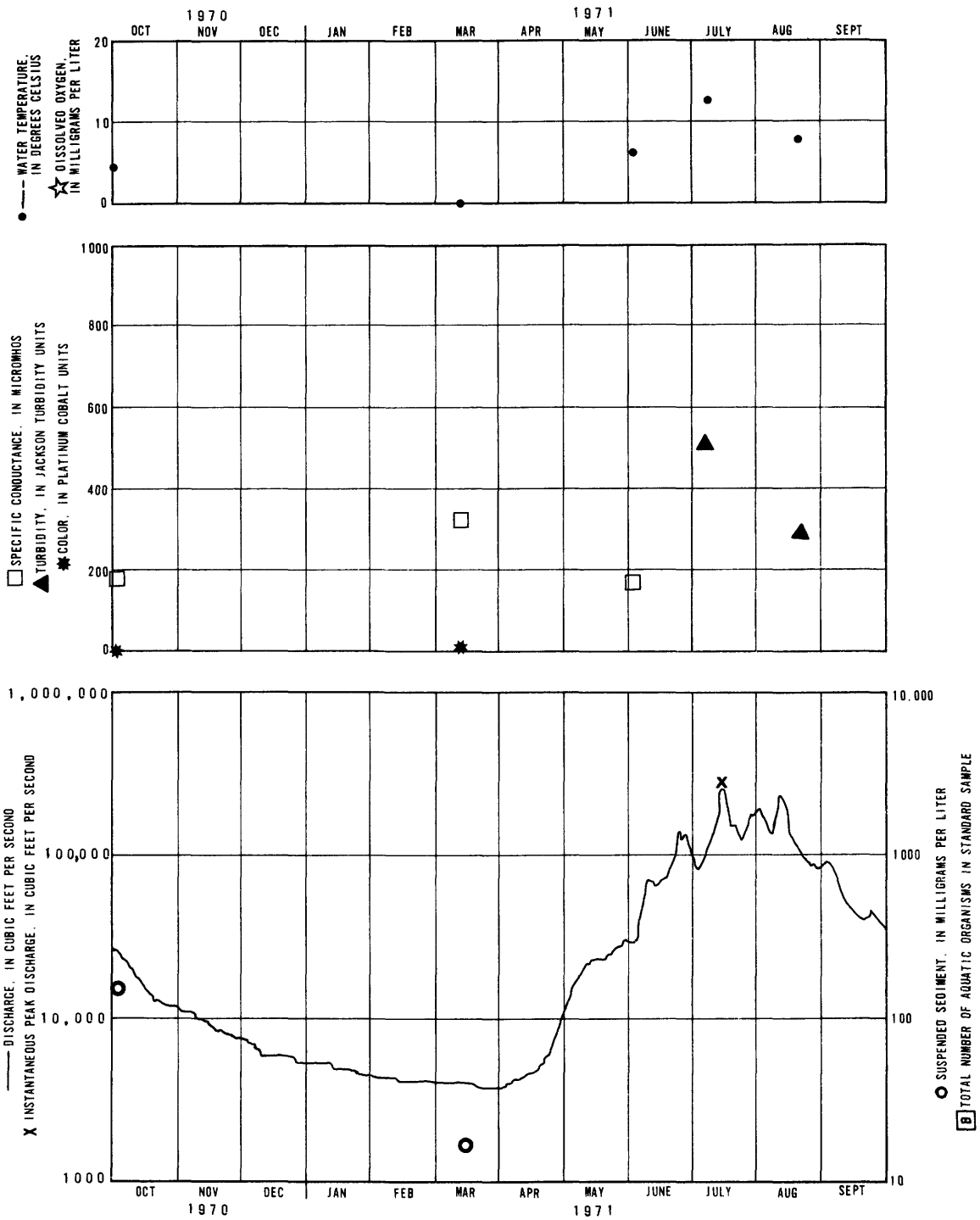

Figure 21.-- Copper River near Chitina--Continued.

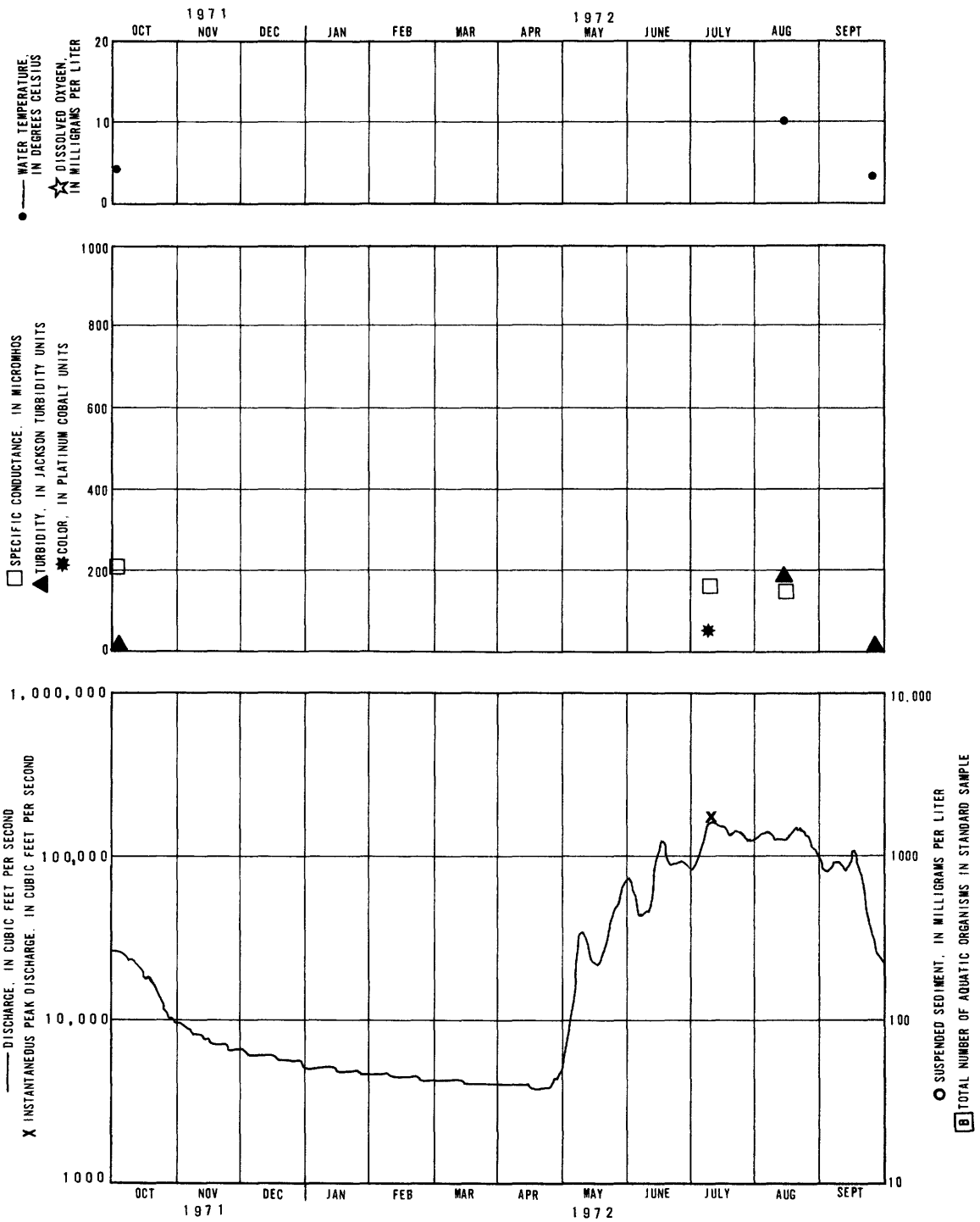

Figure 21.-- Copper River near Chitina--Continued.

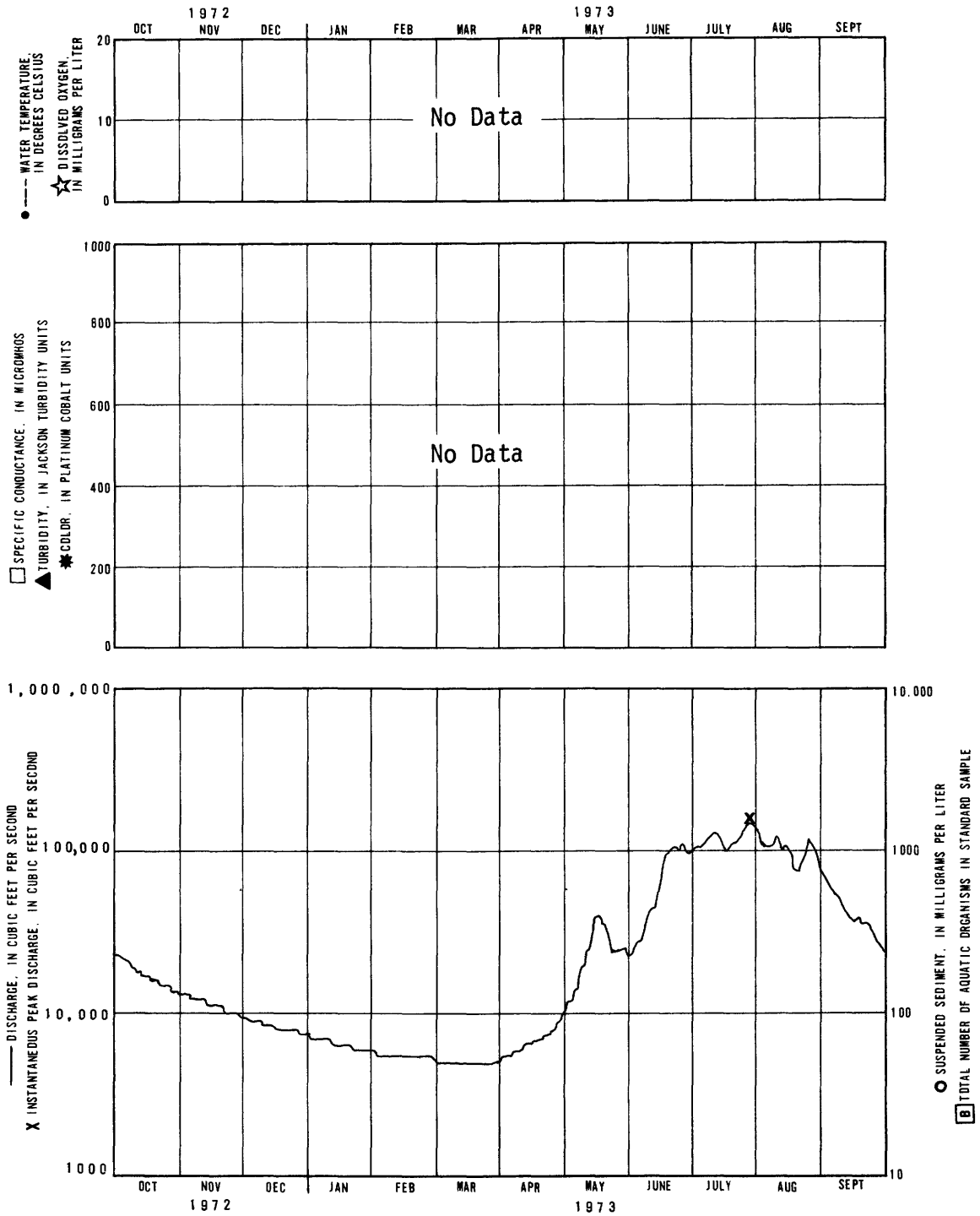

Figure 21.-- Copper River near Chitina--Continued.

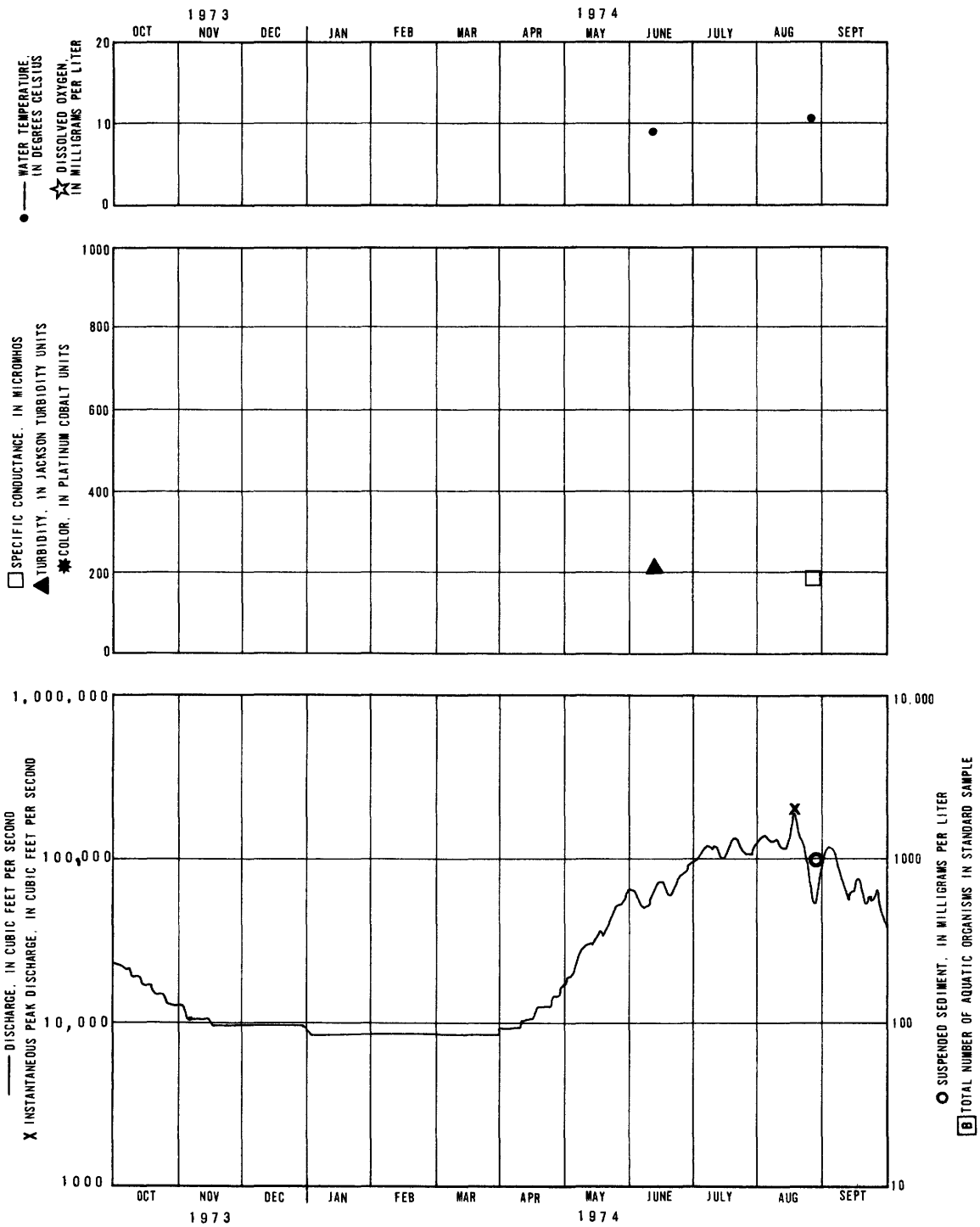

Figure 21.-- Copper River near Chitina--Continued.

Lowe River near Valdez

Location.--Lat 61°05'49", long 145°51'31", in SW¼ sec.12, T.9 S., R.4 W., on pier on Richardson Highway bridge, 22 mi east of Valdez.

Period of Record.--August 1971 to current year.

Purpose.--To document streamflow conditions along the trans-Alaska pipeline and to provide a hydrologic sample from a representative basin to define streamflow characteristics in the region.

Drainage Basin.--Drainage area is 201 mi^2. The basin is in high mountains of the Maritime and Continental climatic zones. Part of the basin is in the discontinuous permafrost zone. The area is partly forested and contains glaciers. Glacier-dammed lakes in the basin have caused outburst floods in the Lowe River. The trans-Alaska pipeline and the Richardson Highway cross the basin, which is mostly wilderness.

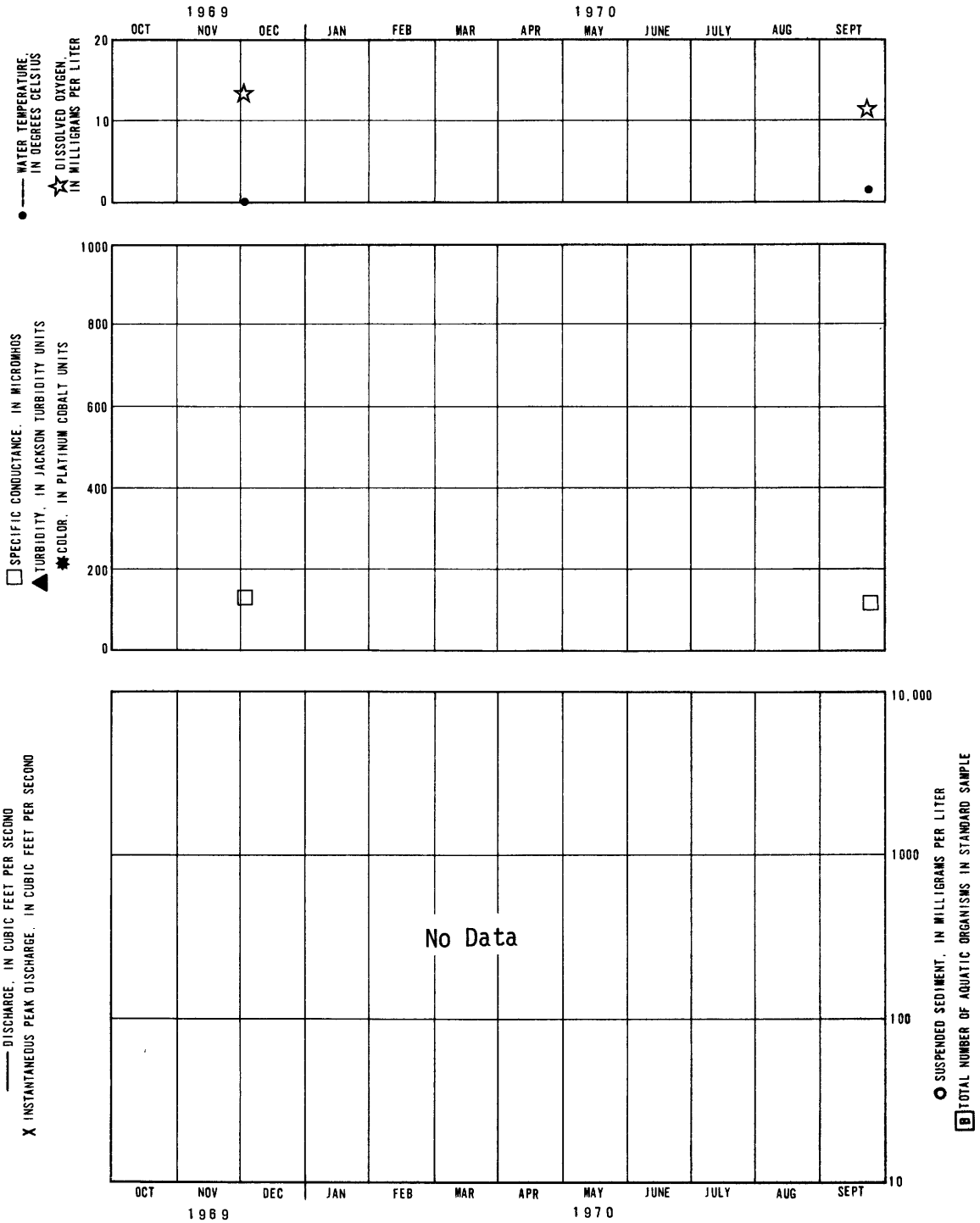

Figure 22.-- Lowe River near Valdez.

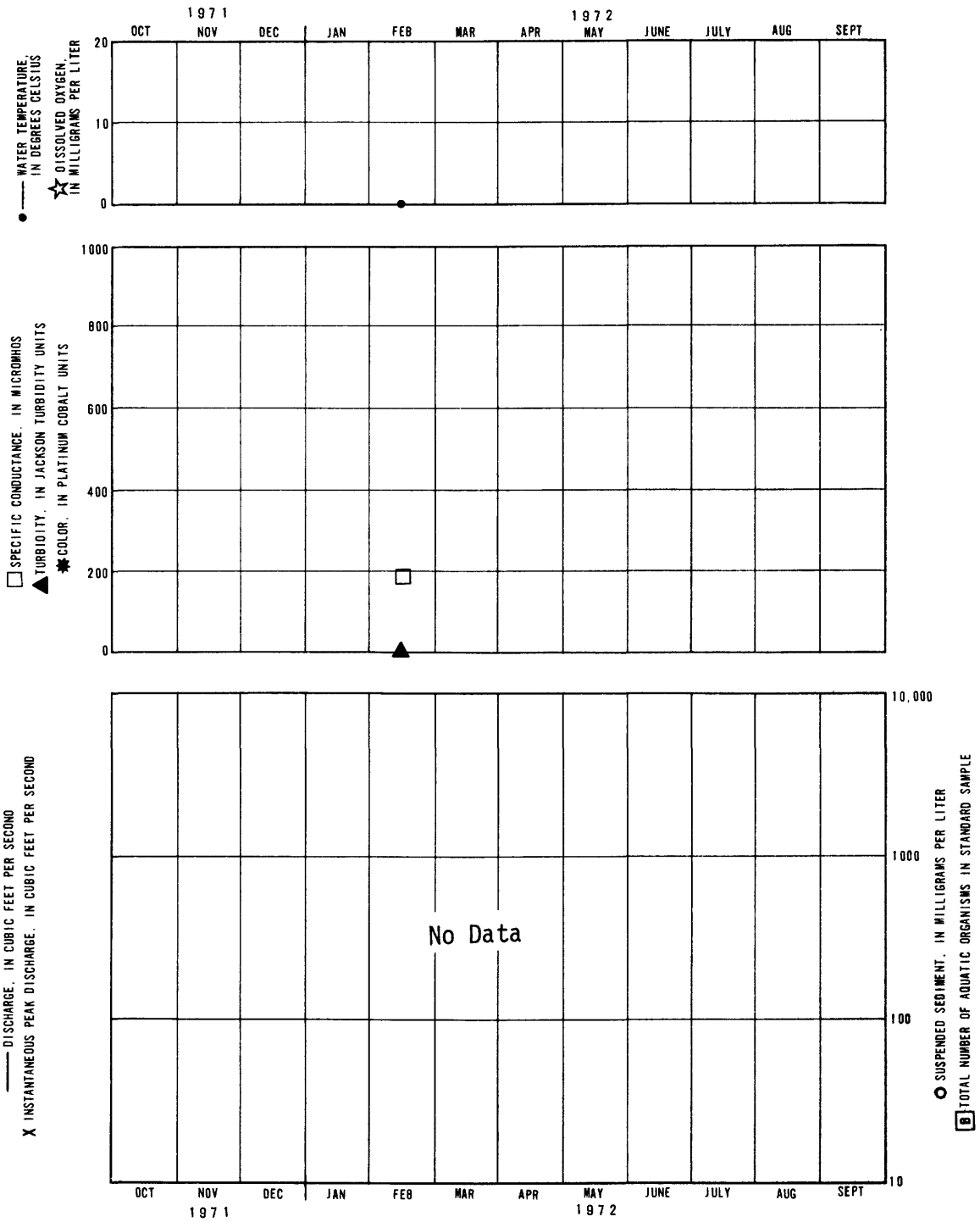

Figure 22.-- Lowe River near Valdez--Continued.

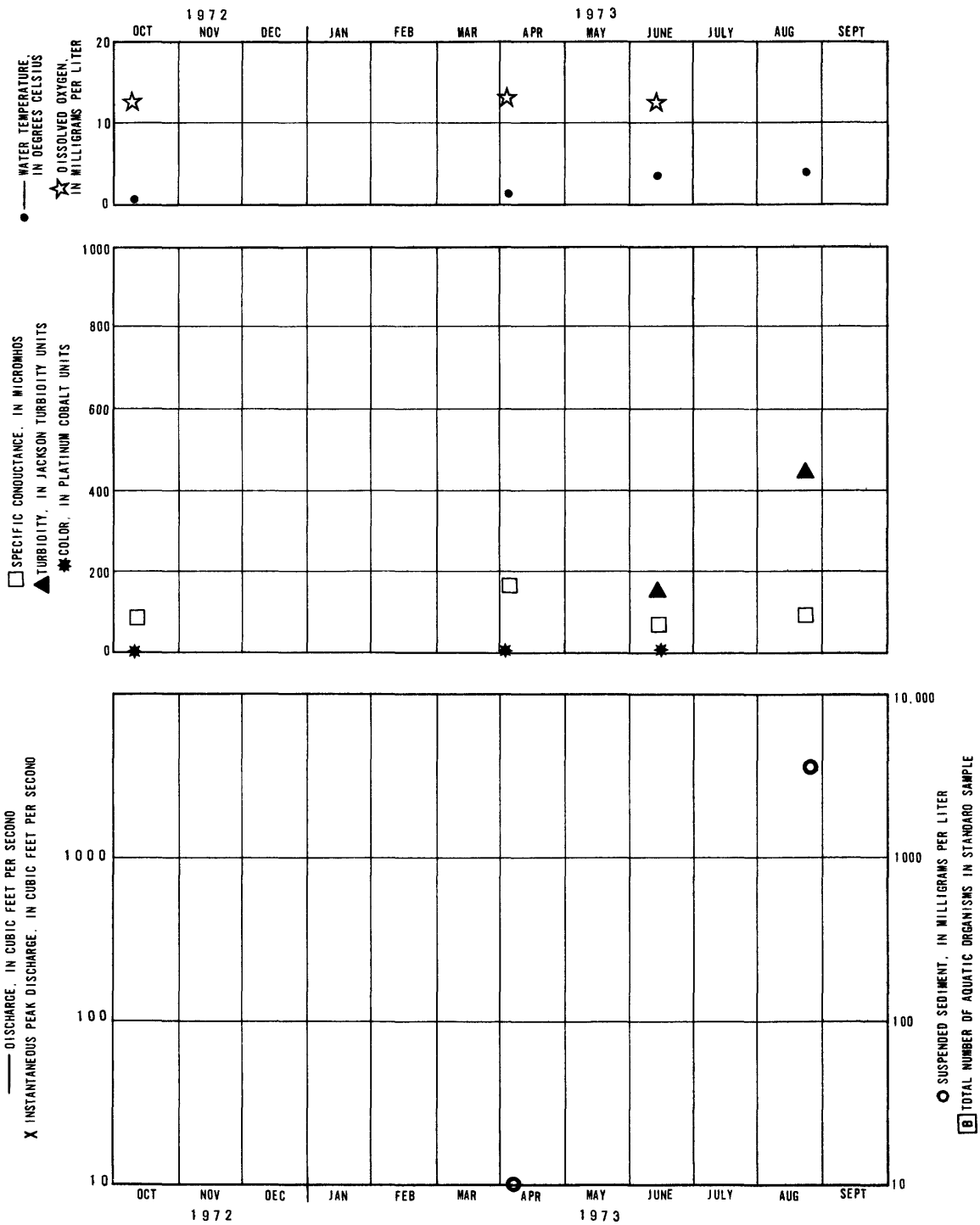

Figure 22.-- Lowe River near Valdez--Continued.

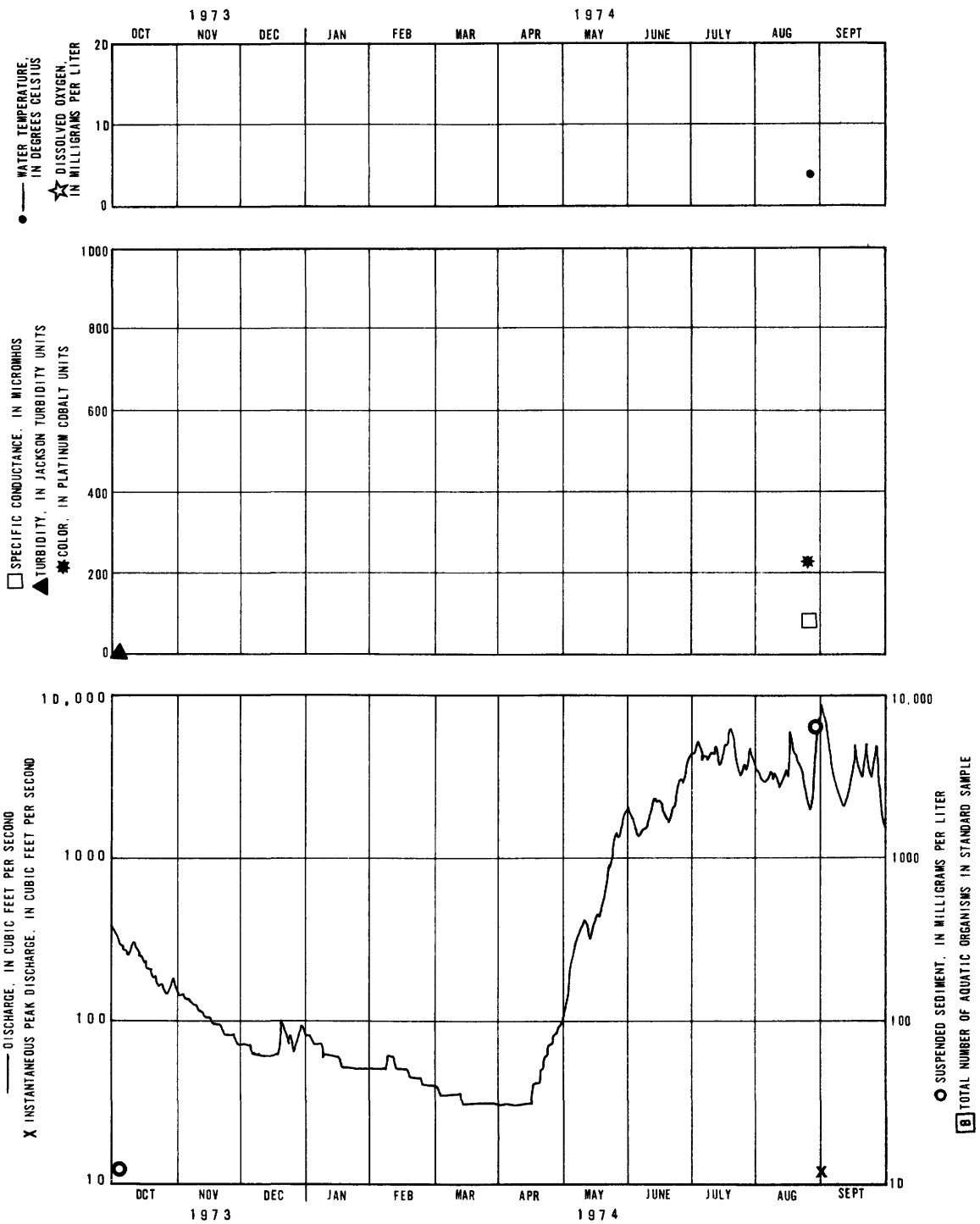

Figure 22.-- Lowe River near Valdez--Continued.

Solomon Gulch near Valdez

Location.--Lat 61°05', long 146°19', on right bank at tidewater, 6.5 mi downstream from small lake and 3 mi southwest of Valdez.

Period of Record.--July to December 1948, October 1949 to September 1956. Miscellaneous data available 1971-73.

Drainage Basin.--Drainage area is 19 mi^2. The basin is in high mountains, in the Maritime climatic zone, partly forested and uninhabited. The basin includes a small lake as well as glaciers.

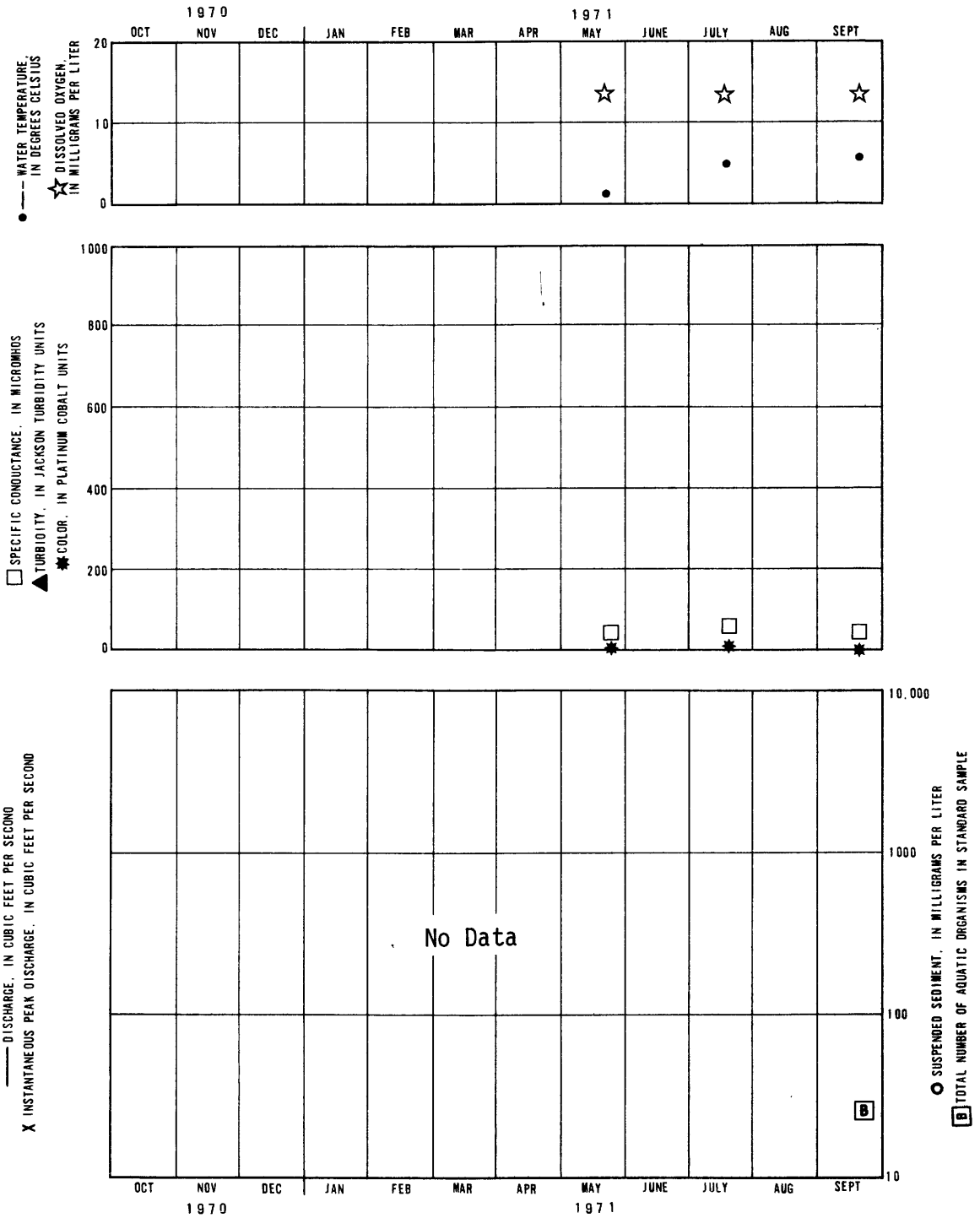

Figure 23.-- Solomon Gulch near Valdez.

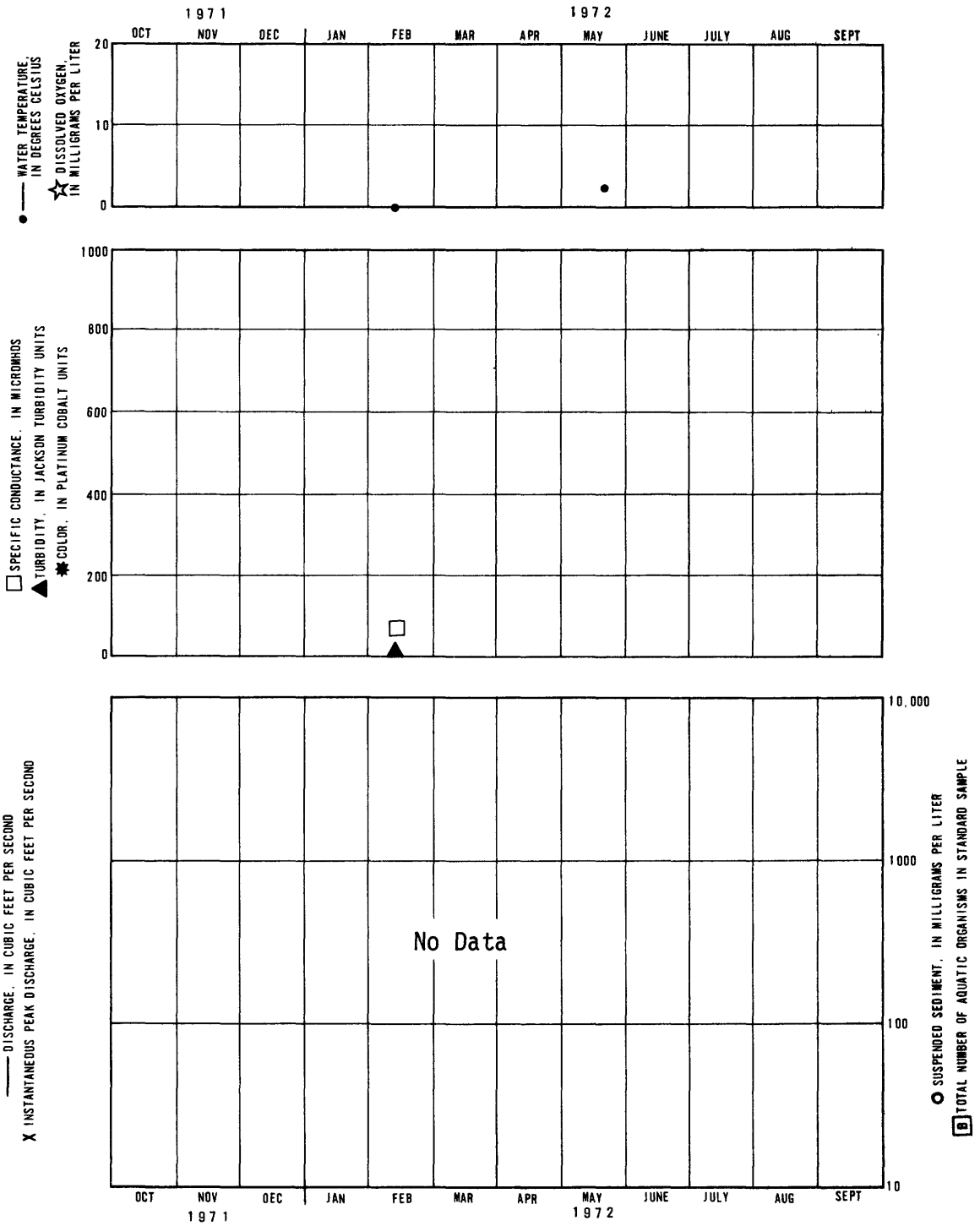

Figure 23.-- Solomon Gulch near Valdez--Continued.