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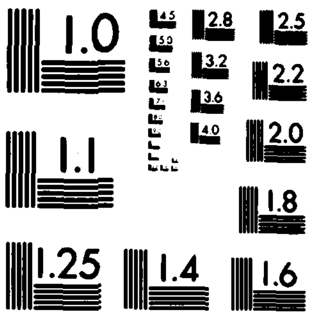

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US Army Corps of Engineers
Nashville District

Water Quality Assessment Dale Hollow Lake and Its Inflows

March 1986

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A survey to determine the quality of the major inflows into Dale Hollow Lake and to evaluate the effect of these inflows on the present and future water quality of the lake. The inflowing streams were to be "screened" under varying hydrological conditions to identify any problem areas.

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Water Quality Assessment
Dale Hollow Lake and Its Inflows

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For the:

Nashville District
U.S. Army Corps of Engineers
Hydrology and Hydraulics Branch
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Contract No. DACW-62-85-M-0757

March 7, 1986

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INTRODUCTION

Dale Hollow Lake presently has very good overall water quality as evidenced by several reports. EPA (1975) classed Dale Hollow Lake as mesotrophic based upon sampling in 1973 and 1974. EPA (1975) also sampled nine tributaries and the municipal waste flows of Albany and Jamestown. Primary productivity was low and growth was limited by phosphorus and not nitrogen.

Ragsdale and Bulow (1975) classified Dale Hollow Lake as oligotrophic based upon sampling in 1971 and 1972. They based this classification on the appearance of numerous oxygen maxima and uniformly high dissolved oxygen values. The oligotrophoc classification was also the conclusion of Gordon (1976) who used the scheme of Dillon (1975) to classify the lake.

Since Dale Hollow Lake is such a high quality resource, it should be protected and its condition mantained if possible. The Nashville District, U.S. Army Corps of Engineers, became corcerned that the current database was inadequate for the streams flowing into the lake and recommended that more information be gained on these inflow streams. Possible threats to the lake include changing land uses such as mining, forestry, agriculture, oil and gas drilling, and urbanization. Thus, a survey of inflow streams and lake water quality was performed during May through November, 1985.

OBJECTIVES/PURPOSE

The purpose of the survey was to determine the quality of the major inflows into Dale Hollow Lake and to evaluate the effect of these inflows on the present and future water quality of the lake. The objective was to determine if the high level of water quality in the lake is threatened or if it can be expected to continue into the future. In essence, the inflowing streams were to be 'screened' in order to identify any problem areas. The potential impacts were to be screened under varying hydrological conditions.

STATIONS AND METHODS

Inflowing Streams

The stations sampled were as follows:

#1	Irons Creek	Mile 4.4
#2	Eagle Creek	Mile 5.3
#3	West Fork Obey River	Mile 7.5
#4	Big Indian Creek	Mile 0.4
#5	East Fork Obey River	Mile 12.6
#6	Franklin Creek	Mile 0.6
#7	Wolf River	Mile 22.7
#8	Spring Creek	Mile 2.7
#9	Little Sulphur Creek	Mile 4.2
#10	Illwill Creek	Mile 9.5
#11	Williams Creek	Mile 2.5
#12	Sulphur Creek	Mile 6.2

All streams were sampled at a flowing location just upstream of the reservoir. Access was generally from roads and bridges permitting all-weather sampling.

Samples for laboratory analysis were collected at each location and held/preserved in such a manner as to insure that no degradation occurred prior to analysis. Each sample was tagged for proper identification and all data sets were taken on the same day. Parameters measured in the laboratory were:

Hardness	Ammonia	Cadmium
Alkalinity	Total Phosphorus	Total Chromium
Acidity	Iron	Copper

Chlorides	Manganese	Nickel
Sulfates	Sodium	Lead
Total Solids	Zinc	Potassium
Dissolved Solids	Aluminum	Kjeldahl Nitrogen
Suspended Solids	Barium	Calcium
Calcium	Magnesium	Nitrate and Nitrite

Parameters measured in the field were:

Temperature	Specific Conductivity
Dissolved Oxygen	Turbidity
pH	Flow

The field parameters of temperature, dissolved oxygen, pH, and specific conductivity were measured with a calibrated Hydrolab Surveyor system, turbidity with a Hach field turbidimeter, and flow with a Marsh-McBirney magnetic current meter. The laboratory analyses were run using currently accepted analytical techniques approved by the Government. Documentation of these techniques is available upon request.

Quality control was assured by proper standardization of all instruments, using duplicate, spiked, and EPA reference samples. The quality control program was documented and the results are available upon request. (Call TTU Water Center, 615-528-3507.)

Surveys were conducted on May 13, June 5, July 16, August 21, September 17, October 7, and November 4, 1985, on the inflow streams. All streams were thus sampled seven times except for Little Sulphur Creek which was not sampled in May.

Lake Surveys

The stations sampled on Dale Hollow Lake were as follows:

Obey River	Mile 32.7
Obey River	Mile 27.2
Wolf River	Mile 8.7
Obey River	Mile 16.7
Obey River	Mile 7.8

All stations were sampled at the deepest point in the cross-section at intervals of 1 to 3 meters in depth. Temperature, dissolved oxygen, specific conductance, pH, oxidation/reduction potential, and depth were measured with a Hydrolab Surveyor system. Turbidity was measured with a Hach field turbidimeter, fluoroescence with a Turner Designs Model 10 fluorometer using a flow-through cell, Secchi depth with a Secchi disk, and the light extinction coefficient with a Whitney submarine photometer. The photometer readings were converted to extinction coefficients using a linear regression technique. A 12-volt pump and 3/4 inch hose was used to pump water to the surface. Quality control consisted of proper calibration of all instruments.

Lake Surveys were conducted on July 10-11, August 23, and October 3, 1985.

DATA PRESENTATION - DALE HOLLOW INFLOWS

The data collected during the inflows are shown by Tables 1 through 4. There are 32 columns of data, 12 stations, and 7 sampling periods which produced 2,656 data points. Obviously, these data cannot be explained without the use of data reduction techniques such as plotting.

The data are first summarized by plotting parameter values for each station as shown by tables which follow. Each parameter will be discussed briefly in the following paragraphs. Not all parameters will be summarized with graphs.

Flow

The objective of assessing water quality at varying hydrological conditions was only partially met even though the span of the surveys was increased by two months in order to increase the measurement of water quality at high flows. It turned out that 1985 was the second driest year on record for Tennessee; therefore, this study was done under low-flow conditions.

Figure 1 is a plot of flow versus station for 1985. Stations 1 through 12 are described under the earlier section on stations. Stations 1,4,6, and 9 all had flows less than 3 cfs during the survey (Irons, Big Indian, Franklin, Little Sulphur Creeks). The stations having the greatest flow variation were 2,3,5, and 7 (Eagle, West Fork Obey, East Fork Obey, and Wolf). The flow in the West Fork Obey was low throughout the survey as Carrithers and Bulow (1973) reported a mean flow at the sampling location of 161 cfs from 1942 to 1968. In a similar fashion, USGS (1985) reported a mean flow of 426 for the East Fork Obey River based upon 42 years of record. All survey flows were below the average at this station. USGS (1982) reported the mean flow of the Wolf River to be 178 cfs. Only one value exceeded the average during these surveys on the Wolf River. USGS (1982) also reported that the principal factor affecting the annual average flow is the size of the drainage basin (i.e. the runoff in cfs/mi^2 is relatively constant) and that actual streamflow varies with time and place.

Thus, flows during this survey were less than average and only a few stations had widely varying flows.

Temperature

No unusual occurances were observed in the inflow temperatures during the survey at any station.

Dissolved Oxygen

DO was uniformly high throughout the survey at all stations except Irons Creek which had a couple of low DO values and Little Sulphur which had one moderate value.

pH

The minimum observed pH was 7.3 and the maximum was 8.7. All pH values were within a satisfactory zone for fish and aquatic life.

Turbidity

Some stations had occasional high turbidity levels which were caused by runoff events. Plots of flow and turbidity did not show good relationships. Plots of temperatures, DO, pH, and turbidity at each station as a function of time are shown by Figures 2 through 13. Figures 14 through 16 show the generally poor relationship between flow and turbidity.

Conductivity

Specific conductivity can show the presence of objectionable quantities of dissolved solids. Figure 17 clearly shows that Stations 4,6,8,9,10,11, and 12 have conductivities above 400 (Big Indian, Franklin, Spring, Little Sulphur, Illwill, Williams, and Sulphur).

Alkalinity

Alkalinity was very low in the East Fork of the Obey River as shown below:

5/13/85	10 mg/l	09/17/85	52 mg/l
6/05/85	20 mg/l	10/07/85	22 mg/l
7/16/85	49 mg/l	11/4/85	42 mg/l
8/21/85	77 mg/l		

All other stations had adequate alkalinity at all times.

Hardness

Hardness was high at Stations 4,6,8,9,10,11, and 12 (Indian, Franklin, Spring, Little Sulphur, Illwill, Williams, and Sulphur) with values over 200 mg/l. Values above 500 mg/l were noted at Stations 10,11, and 12. Figure 18 shows hardness at each station and Figure 19 shows that all hardness is noncarbonate hardness associated with Ca^{++}, Mg^{++}, Fe^{+++}, and Al^{+++} ions. Hardness was also calculated based upon the measured concentrations of Ca^{++} and Mg^{++} giving the results shown by Figure 20. The narrow range of fit to the 45-degree line shows that hardness is mostly caused by Ca^{++} and Mg^{++}.

Chlorides

Figure 21 shows that chlorides are high at Stations 4,8,10, and 11 (Big Indian, Spring, Illwill, and Williams). Chlorides could originate from oil and gas drilling, springs, or industrial sources.

Sulfates

Sulfates greater than 75 mg/l are often associated with sulfur springs, acid mine drainage, and oil and gas drilling. Figure 22 shows that many stations exceed this value. Stations 1,4,5,6,8,10,11, and 12 all had high sulfate values. Some of these streams are known to have sources of acid mine drainage, most notably the East Fork Obey River (Station 5).

Solids

Most solids were dissolved throughout the survey except when high turbidities were present. Few suspended solid levels exceeded 100 mg/l. High levels of chlorides and sulfates and high levels of dissolved solids were complimentary.

Nitrogen

All nitrogen species were low throughout the survey. This generally indicates a lack of municipal pollution in these streams.

Phosphorus

Most total phosphorus levels were quite low throughout the survey. Spring Creek constantly had elevated phosphorus levels and Little Sulphur occasionally had high concentrations.

Iron

Total iron above 500 μg/l can be an indication of acid mine drainage. Stations 2,5, and 9 had more than one value above this level. Of course, spring water also has high iron on occasion. Figure 23 shows the iron values recorded during the survey.

Manganese

Manganese above 500 µg/l can also indicate acid mine drainage or ground water. Figure 24 shows the manganese levels recorded during the survey. No stations were in excess of 500 µg/l but high levels were evident at Stations 1,5,9, and 11.

Aluminum

Aluminum above 300 µg/l can be caused by acid mine drainage. Figure 25 shows that Station 5 was the only station having a value in excess of this. In general, aluminum values declined during the survey period.

Zinc

Most zinc values were below 500 µg/l. Occasional higher values were noted but not repeated. Zinc values also had a tendency to decrease during the survey. Figure 26 shows the zinc concentrations recorded.

Barium

Barium levels were low at all stations with all concentrations less than 77 µg/l.

Calcium and Magnesium

These elements were earlier correlated with measured hardness. The lowest values of calcium occurred in the East Fork Obey River.

Cadmium, Chrome, Copper, Nickel, and Lead

These elements were not detectable during the survey.

Potassium

A few elevated levels of potassium were noted during the survey and are noted as follows:

Station	5/13	6/5	7/16	8/21	9/17	10/7	11/4
9-L. Sulphur	*	1.6	7.9	7.7	10.3	4.5	9.6
10-Illwill	2.6	3.1	3.4	4.3	4.1	3.9	4.6

(Concentrations in mg/l)

Summary

The water quality of the Dale Hollow inflows is discussed by stream in the following paragraphs.

Irons Creek is a small creek having low flows (0.01 to 2.4 cfs). It recorded a couple of low DO values, slightly elevated sulfates, and moderately high manganese. In all, water quality here is good.

Eagle Creek did not show any water quality problems during the survey. It has moderate flow and some turbidity during runoff.

West Fork Obey River is an important, high flow, high quality stream having no apparent problems.

Big Indian Creek is a low flow stream which was noted to have high conductivity, hardness, chlorides and sulfates. A single high zinc value was recorded. This stream had low turbidity, good visual quality, and minnows were always present. Some investigation of its drainage is recommended.

East Fork Obey River is a high flow stream which had problems with low alkalinity, high sulfates, iron, manganese, aluminum, zinc, and calcium. The river is strongly affected by acid mind drainage as reported by Nichols and Bulow (1973). The location of the survey is at a recovery point and bedding sunfish were noted throughout the survey. A grab sample at East Fork Obey River at mile 26.4 (13.8 miles upstream) showed the following characteristics:

Date	EFORM	pH	Cond.	Mn	Fe	Al	SO_4	TDS
12/10/85	26.4	2.8	680	2,852	5,940	14,420	249	442
			µmho/cm	µg/l	µg/l	µg/l	mg/l	mg/l

Obviously, the East Fork Obey River is strongly impacted by acid mine drainage. The lake is spared an impact because of some 6 miles of subterranium drainage between mile 26.4 and about mile 20. A careful analysis of water quality in this stream is in order. All mines are now closed and it would appear that some OSM Abandoned Mine Lands Money should be invested in this drainage.

Franklin Creek is a small stream draining a forested area containing some surface mines on Double Top Mountain. Franklin Creek had high conductivity, hardness, and sulfates during this survey. It was similar to Big Indian Creek except for chlorides.

Wolf River is a high-flow, high-quality tributary of Dale Hollow Lake. No water quality problems were evident.

Spring Creek is a moderate-flow stream with some water quality problems. Its conductivity was high along with hardness, chlorides, sulfates, and phosphorus. A slime growth was evident during the first several surveys which may have indicated some organic contamination.

Little Sulphur Creek is a low-flow stream which was surrounded with oil wells and storage. It showed problems with DO, alkalinity, phosphorus, iron, manganese, and potassium. More than likely, upstream cattle feedlots and pastures are the source of the problem.

Illwill Creek is a moderately flowing stream which showed elevated levels of conductivity, hardness, chlorides, sulfate, and manganese. The source of these contaminants should be investigated.

Williams Creek is a small spring-fed creek of low base flow. The springs feed the creek just above the sampling point and have a sulfur like odor. Some very slight oil residue appears in the creek from adjacent oil fields. As might be expected, Williams has high conductivity, hardness, chlorides, sulfates, and manganese. No real problems are evident, however.

Sulphur Creek is a moderately flowing, high-quality stream with moderate levels of conductivity, hardness, and sulfates. Fish and aquatic life were always present. No problems are evident.

DATA PRESENTATION - DALE HOLLOW LAKE

The data collected on Dale Hollow Lake are presented by Table 5. These data confirm that the lake is a high-quality resource. The water was very clear, few algae were present, turbidity was very low, pH moderate, and conductivity in the low range. Dissolved oxygen was present at all depths except in the Wolf River embayment. Temperature and DO relationships should support the present two-level fishery into the future. No lake-related water quality problems are apparent.

CONCLUSIONS

Dale Hollow Lake is a high quality, nearly oligotrophic lake. Most of its inflowing streams and Rivers are of moderate flow, averaging about 1.5 cfs/mi^2 of drainage. The Irons Creek, Eagle Creek, West Fork Obey River, Wolf River, Williams Creek, and Sulphur Creek inflows appear to be free of problems. The worst potential problem area is the East Fork Obey River which should be the target of an in-depth investigation of its acid mine drainage problem. Lesser investigations are recommended for Big Indian Creek, Franklin Creek, Spring Creek, Little Sulphur Creek, and Illwill Creek to determine the sources of their problems.

ACKNOWLEDGEMENT

The writer acknowledges and appreciates the invaluable support of Ms. Susan Burns, Mr. Jeffry Curtis, and Dr. Brett Botup, who assisted in the survey.

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Table 1. Dale Hollow Inflow Sampling Data, 1985

DALE HOLLOW INFLOW SAMPLING DATA

DATE mm/dd/yr	STATION NAME	FLOW cfs	TEMPERATURE Celcius	D.O. mg/l	CONDUCTIVITY micromho/cm	pH s.u.	TURBIDITY FTU	HARDNESS mg/l	ALKALINITY mg/l	[illegible] mg/l
5/13/85	IRONS CR	0.4	19.4	7.4	365	8.0	0	206	140	0
5/13/85	EAGLE CR	23.6	13.5	10.0	287	8.4	5	158	126	[illegible]
5/13/85	WF OBEY	36.0	19.9	9.4	272	8.4	2	136	93	0
5/13/85	INDIAN	3.1	19.9	10.0	644	8.5	2	206	139	0
5/13/85	EF OBEY	319.0	16.9	9.8	164	7.8	9	75	[illegible]	[illegible]
5/13/85	FRANKLIN	1.4	21.9	8.6	373	8.3	2	216	105	[illegible]
5/13/85	WOLF R	219.0	21.7	9.1	200	8.5	5	104	72	[illegible]
5/13/85	SPRING	20.1	25.0	9.2	442	8.6	4	189	121	0
5/13/85	ILLWILL	2.8	25.5	7.7	425	8.2	4	496	130	0
5/13/85	WILLIAMS	0.8	24.3	7.7	372	8.1	2	196	130	0
5/13/85	SULPHUR	1.7	22.4	8.0	429	8.2	15	246	146	0
5/13/95	L.SULPHUR	*	*	*	*	*	*	*	*	*
6/5/85	IRONS CR	5.4	21.5	5.7	387	7.6	10	249	153	0
6/5/85	EAGLE CR	3.5	21.1	8.2	292	8.0	23	175	127	0
6/5/85	WF OBEY	18.4	23.9	8.1	273	9.0	2	160	97	0
6/5/85	INDIAN	1.2	21.8	8.3	848	8.1	10	262	148	0
6/5/85	EF OBEY	90.0	21.1	8.5	221	7.9	4	120	20	0
6/5/85	FRANKLIN	0.8	23.2	8.1	422	8.0	27	272,276	[illegible]	0
6/5/85	WOLF R	40.0	26.1	8.8	240	8.1	[illegible]	140	89	[illegible]
6/5/85	SPRING	14.9	27.5	9.4	498	8.7	5	229	130	0
6/5/85	L.SULPHUR	<1	19.0	8.1	477	7.9	[illegible]	306	162	[illegible]
6/5/85	ILLWILL	3.6	25.5	8.1	1534	8.1	6	712,710	147	0
6/5/85	WILLIAMS	0.4	27.2	7.7	464	7.6	3	271	141	0
6/5/85	SULPHUR	0.9	26.5	8.5	538	8.1	4	533	151	0
7/16/85	IRONS CR	<1	22.3	3.7	454	7.3	4	263	163	0
7/16/85	EAGLE CR	5.4	22.6	7.6	290	7.7	55	163	127	0
7/16/85	WF OBEY	9.3	24.7	7.2	309	7.8	13	165	104	0
7/16/85	INDIAN	0.7	22.3	7.4	1033	7.7	[illegible]	250	145	0
7/16/85	EF OBEY	132.0	23.6	8.3	272	7.8	5	147	49	0
7/16/85	FRANKLIN	0.2	22.9	8.1	460	7.8	5	284	127	0
7/16/85	WOLF R	16.0	27.6	7.7	308	7.9	9	165,163	106,107	0
7/16/85	SPRING	9.1	26.4	8.8	539	8.3	5	222	134	0
7/16/85	L.SULPHUR	<1	25.4	6.8	349	7.8	51	176	142	0
7/16/85	ILLWILL	1.0	25.4	9.3	1509	8.0	12	695	125	0
7/16/85	WILLIAMS	<1	27.1	7.5	898	7.6	4	398	157	0
7/16/85	SULPHUR	0.2	27.2	9.2	675	8.0	5	315	158	0
8/21/85	IRONS CR	0.6	20.4	7.5	287	7.7	11	224	152	0
8/21/85	EAGLE CR	54.9	17.3	9.2	187	8.0	37	144	114	0
8/21/85	WF OBEY	22.9	21.3	8.4	216	7.9	31	159	108,109	0
8/21/85	INDIAN	1.2	20.3	8.8	536	8.0	[illegible]	229,229	160	0
8/21/85	EF OBEY	392.0	13.7	8.7	167	7.5	51	115	77	0
8/21/85	FRANKLIN	0.5	21.7	8.3	369	7.9	19	293	85	0
9/21/85	WOLF R	67.0	22.4	9.0	153	8.1	5	109	74	0
8/21/85	SPRING	19.7	23.7	9.2	393	8.3	7	226	144	0
8/21/85	L.SULFUR	<1	24.5	6.5	368	7.6	31	209	178	0
8/21/85	ILLWILL	1.4	24.2	8.9	1067	7.9	16	609	142	0
8/21/85	WILLIAMS	0.3	25.2	8.2	393	7.6	3	243	133	0
8/21/85	SULFUR	1.6	22.6	8.7	407	8.0	5	261	175,175	0

Table 1 (continued)

9/17/85	IRONS CR	[illegible]	15.2	6.5	428	7.6	1.3	260	163	[illegible]
9/17/85	EAGLE CR	[illegible]	14.1	10.0	313	8.0	2.8	180	152	[illegible]
9/17/85	WF OBEY	[illegible]	17.2	9.2	221	7.9	1.8	176	[illegible]	[illegible]
9/17/85	INDIAN	[illegible]	15.0	9.9	1297	7.9	1.6	320	154	
9/17/85	EF OBEY	13.3	17.8	9.3	241	7.7	1.3	132,128	52,51	[illegible]
9/17/85	FRANKLIN	0.[illegible]	[illegible]	9.5	492	7.8	2.6	308	131	0
9/17/85	WOLF R	20.[illegible]	20.6	9.4	239	8.1	6.8	122	108	[illegible]
9/17/85	SPRING	5.2	15.9	10.7	602	8.5	4.2	256	157	0
9/17/85	L.SULFUR	<0.1	20.0	8.9	356	7.7	4.4	172	164	0
9/17/85	ILLWILL	0.8	19.5	10.5	2100	7.8	3.8	920	161	0
9/17/85	WILLIAMS	<0.1	13.6	6.3	1073	7.4	2.4	555	173	0
9/17/85	SULFUR	0.1	19.5	8.3	857	7.7	34.5	525	173	[illegible]
10/7/85	IRONS CR	0.1	9.1	9.7	377	8.1	1.4	258	121	0
10/7/85	EAGLE CR	6.9	8.6	11.1	343	8.2	1.5	183	158	0
10/7/85	WF OBEY	14.5	11.6	10.2	305	8.1	1.5	179	123	0
10/7/85	INDIAN	0.6	9.8	10.7	1073	8.1	0.5	325,329	177,177	0
10/7/85	EF OBEY	104.0	12.7	10.0	156	7.4	1.4	125	22	0
10/7/85	FRANKLIN	0.2	11.4	10.5	518	8.0	2.9	313	141	0
10/7/85	WOLF R	37.0	13.6	10.6	250	8.0	5.2	121	86	0
10/7/85	SPRING	5.5	11.5	11.7	572	8.5	2.4	258	166	[illegible]
10/7/85	L.SULFUR	<0.1	15.1	9.2	376	7.9	5.7	183	135	[illegible]
10/7/85	ILLWILL	0.2	13.5	11.7	1950	8.1	[illegible]	938	174	
10/7/85	WILLIAMS	[illegible]	13.4	7.5	665	7.4	2.4	534	151	
10/7/85	SULFUR	0.4	15.4	10.8	656	8.0	5.0	531	177	0
11/4/85	IRONS CR	2.4	11.5	9.6	334	7.9	15.5	230	164	[illegible]
11/4/85	EAGLE CR	11.1	11.4	10.3	346	8.0	1.6	200	178	[illegible]
11/4/85	WF OBEY	13.6	12.3	9.9	358	7.9	[illegible]	194	143	0
11/4/85	INDIAN	2.1	11.3	10.2	1092	7.8	1.2	300	181	0
11/4/85	EF OBEY	44.0	12.5	9.9	241	7.8	1.0	130,130	42,42	0
11/4/85	FRANKLIN	1.4	10.9	10.3	467	7.8	8.3	317	139	[illegible]
11/4/85	WOLF R	78.0	12.1	10.2	309	8.0	4.1	172	130	[illegible]
11/4/85	SPRING	15.7	10.0	10.6	576	8.0	4.8	261	182	0
11/4/85	L.SULFUR	9.2	10.0	9.2	336	7.8	4.3	209	195	[illegible]
11/4/85	ILLWILL	11.9	10.9	10.6	679	8.0	72.0	413	150	[illegible]
11/4/85	WILLIAMS	8.6	11.7	9.9	337	7.6	11.0	234	145	[illegible]
11/4/85	SULFUR	10.1	12.1	10.1	412	7.7	19.[illegible]	289	157	[illegible]

Table 2. Dale Hollow Inflow Sampling Data, 1985

DALE HOLLOW INFLOW SAMPLING DATA

DATE mm/dd/yr	STATION NAME	CHLORIDES mg/l	SULFATES mg/l	TOT. SOLID mg/l	DISS. SOLIDS mg/l	SUSP. SOL. mg/l	NO3 + NO2 mg/l	KJEL N mg/l	AMMONIA ug/l	TOTAL PHOS ug/l
5/13/85	IRONS CR	3.5	55.7	251.3	2.4.5	36.8	0.16	0.41	[illegible]	22
5/13/85	EAGLE CR	8.2	15.5	186.6	151.9	34.7	0.25	1.02	21	47
5/13/85	WF OBEY	6.5	42.3	172.3	163.3	9.0	0.[illegible]	0.40	30	15
5/13/85	INDIAN	113	46	413.1	357.3	55.8	0.25	1.00	36	24
5/13/85	EF OBEY	3.1	55.3	122.8	112	10.8	lt.1	0.19	11	22
5/13/85	FRANKLIN	2.2	96.2	296	264	32.0	lt.1	0.50	69	12
5/13/85	WOLF R	7	25.4	153.6	131.9	21.7	0.[illegible]	0.62	31	26
5/13/85	SPRING	46	52	331	244.2	86.6	0.35	1.52	49	136
5/13/85	ILLWILL	166	350	987.7	953.9	33.8	0.32	2.22	117	79
5/13/85	WILLIAMS	13.5	66.7	266.4	205.1	63.3	lt.1	0.30	11	32
5/13/85	SULPHUR	3.2	[illegible]	347.7	276.1	71.6	lt.1	0.76	lt10	26
5/13/85	L.SULPHUR	*	*	*	*	*	*	*	*	*
6/5/85	IRONS CR	4.2	52.6	293.8	279.7	14.1	lt.1	0.32	[illegible]	22
6/5/85	EAGLE CR	10	42.3	216.3	178.4	37.9	0.79	lt.1	lt10	55
6/5/85	WF OBEY	9.2	40.1	196.6	162.8	33.8	0.21	0.24	98	25
6/5/85	INDIAN	163.4	51	574.9	527.5	47.4	0.67	0.40	38	24
6/5/85	EF OBEY	5.3	80	313.3	135.7	177.6	0.19	0.16	30	21
6/5/85	FRANKLIN	2.4,2.6	115.5	394.1	291.5	102.6	0.55	0.30	49	47
6/5/85	WOLF R	7.9	32.4	170.5	146.9	23.6	0.34	0.23	49	22
6/5/85	SPRING	55.9	49.7	336.5	320.6	15.9	1.46	0.26	24	218,192
6/5/85	L.SULPHUR	7.9	97.9	348.9	325.5	23.4	1.30	0.30	94	35
6/5/85	ILLWILL	200.5	479.7	1221.9	1184.4	47.5	0.92	2.19	45	36
6/5/85	WILLIAMS	19.5	98	332.2	127.9	204.3	lt.1	0.22	lt10	22
6/5/85	SULPHUR	17.1	135.5	411	379.7	31.3	lt.1	0.21	29	[illegible]
7/16/85	IRONS CR	6.5	96.3	350	337.1	13.0	lt.1	1.33	29	42
7/16/85	EAGLE CR	10.7	34.8	256.2	208.4	47.9	0.87	1.05	46	164
7/16/85	WF OBEY	12.3,12.8	49.6	239.6	192.2	47.4	0.43	0.30	26	51
7/16/85	INDIAN	213.4	70.1	695.4	673	22.4	0.20	0.52	[illegible]	22
7/16/85	EF OBEY	1.2	87.7	219.3	209.5	9.8	lt.1	1.14	lt10	22
7/16/85	FRANKLIN	1.3	148.2	362.1	360.3	1.8	0.15	1.99	lt10	51
7/16/85	WOLF R	13.5	48.3,51.5	234	221.9	12.3	0.16	0.88	29,31	33,35
7/16/85	SPRING	64.5	60.5	385.6	368.2	17.5	0.62	0.60	50	277
7/16/85	L.SULPHUR	13.1	31	263.2	250.1	13.1	1.55	0.38	130	112
7/16/85	ILLWILL	185.3	452.8	1251.3	1137.8	63.5	0.57	0.26	[illegible]	46
7/16/85	WILLIAMS	55.1	315.2	729.7	701.8	28.0	lt.1	0.36	19	42
7/16/85	SULPHUR	22.4	258.4,234.	544.6	519.5	25.1	lt.1	0.70	21	42
8/21/85	IRONS CR	3.3	54.4	270.9	250.3	20.6	1.22	0.76	22	53
8/21/85	EAGLE CR	5.0	11.1	211.7	162.5	49.2	1.14	0.24	23	175
8/21/85	WF OBEY	3.[illegible]	41.4	215.8	190.9	24.9	0.65	0.52	33	40
8/21/85	INDIAN	126,139	40.7,41.6	438.7	422.2	16.5	.25,.27	0.65	18,[illegible]	15,[illegible]
8/21/85	EF OBEY	6.5	67.4	199.9	156.7	43.2	0.59	0.42	18	86
8/21/85	FRANKLIN	2.4	156.8	378.5	361.6	16.9	0.39	0.94	16	27
8/21/85	WOLF R	5.2	30.2	149.4	135.2	14.2	0.32	0.93	19	31
8/21/85	SPRING	73.3	51.5	352.1,360.	317.4,328.9	33.1	0.86	0.25	36	112
8/21/85	L.SULFUR	37.7	32.0	333.6	299.8	30.8	1.32	lt.1	372	154
8/21/85	ILLWILL	183.2	400.3	1113.7	993.9	119.8	0.54	0.83	26	37
8/21/85	WILLIAMS	39.3	137.8	373.6	346.5	27.1	0.12	0.50	12	11
8/21/85	SULFUR	22.3	118.0	402.8	383.5	19.3	0.27	0.56	19	27

Table 2 (continued)

9/17/85	IRONS CR	6.0	93.0	428.6	304.1	122.7	0.12	0.25	72	11
9/17/85	EAGLE CR	24.5	58.5	233.6	230.9	2.7	0.44	1.05	68	18
9/17/85	WF OBEY	16.3	60.2	242.3,248.	237.2,249.7	2.2	0.16	0.84	79	11
9/17/85	INDIAN	215.2	100.1,97.7	907.8	810.5	97.3	0.21	0.93	[illegible]	1t10
9/17/85	EF OBEY	6.5,7.1	77.6	190.5	188.5	2.0	.14,.14	0.41	27,35	[illegible],1t10
9/17/85	FRANKLIN	2.2	169.0	421.0	393.4	27.6	0.11	0.85	40	1t10
9/17/85	WOLF R	12.0	76.5	217.5	208.9	8.6	0.19	1t.1	124	18
9/17/85	SPRING	76.1	78.2	439.7	415.8	23.9	0.46	3.76	39	232
9/17/85	L.SULFUR	21.2	17.0	243.0	240.2	2.8	1.50	1t.1	91	30
9/17/85	ILLWILL	304.4	839.0	1883.9	1763.9	120.0	0.16	1t.1	207	11
9/17/85	WILLIAMS	87.0	398.5	935.4	893.2	42.2	1t.1	1.68	140	15
9/17/85	SULFUR	30.0	341.0	809.3	729.1	80.2	0.30	1.88	51	57
10/7/85	IRONS CR	4.5	68.3	284.0	261.3	22.7	0.12	0.75	37	12
10/7/85	EAGLE CR	14.6	32.2	243.0	227.2	15.8	0.50	0.03	80	34
10/7/85	WF OBEY	10.5	49.1	210.2	199.5	10.7	0.34	0.74	154	1t10
10/7/85	INDIAN	198.2	76.3	752.6	667.9	84.7	0.22	0.49	107	1t10,1t10
10/7/85	EF OBEY	4.5,4.5	53.1,52.4	117.7,119.	111.8,107.2	8.2	4.02	2.16	92,101	1t10
10/7/85	FRANKLIN	5.0	169.9	427.7	391.4	36.3	0.24	1.14	97	15
10/7/85	WOLF R	4.5	37.8	159.6	151.9	7.7	0.18	1.56	201	12
10/7/85	SPRING	66.5	91.5	411.0	409.8	1.2	0.86	0.09	274	117
10/7/85	L.SULFUR	18.6	19.7	251.4	241.3	10.1	1.14	0.43	409	69
10/7/85	ILLWILL	274.2	757.6	1620.9	1525.0	95.9	0.16	0.42	156	1t10
10/7/85	WILLIAMS	39.4	205.8	529.8	490.0	39.8	0.10	0.87	204	1t10
10/7/85	SULFUR	13.6	218.5	522.6	486.2	36.4	0.14	0.34	158	12
11/4/85	IRONS CR	3.9	49.2	260.0	239.0	21.0	0.15	0.30	26	29
11/4/85	EAGLE CR	11.6	32.6	240.2	233.9	6.3	0.44	0.29	37	23
11/4/85	WF OBEY	16.8	53.5	252.5,250.	234.8,239.8	14.4	0.29	0.09	48	1t10
11/4/85	INDIAN	159.8	70.9	732.6	676.0	56.6	0.54	0.13	33	1t10
11/4/85	EF OBEY	5.9	76.2	195.2	175.7	19.5	0.20	0.20	43	1t10,1t10
11/4/85	FRANKLIN	1.8	148.8	363.3	357.4	5.9	0.14	0.04	19	1t10
11/4/85	WOLF R	11.1	45.4	215.4	205.3	10.1	0.16	0.21	45	1t10
11/4/85	SPRING	59.3	63.1	410.0	391.0	19.0	1.0,1.1	0.59	43	312
11/4/85	L.SULFUR	24.5,24.0	33.0,33.0	302.3	270.8	31.5	1.60	1.23	235,231	319
11/4/85	ILLWILL	77.3	403.2	555.4	486.5	68.9	0.73	0.89	99	158
11/4/85	WILLIAMS	32.5	100.2	253.7	246.1	7.6	0.15	0.33	25	[illegible]
11/4/85	SULFUR	7.7	116.2	321.0	295.1	25.9	0.27	1t.01	48	16

Table 3. Dale Hollow Inflow Sampling Data, 1985

DALE HOLLOW INFLOW

DATE mo dd/yr	STATION NAME	IRON ug/l	MANGANESE ug/l	SODIUM mg/l	ZINC ug/l	ALUMINUM ug/l	BARIUM ug/l	CALCIUM mg/l
5/13/85	IRONS CR	164	[illegible]	3.6	237	850	33	70.5
5/13/85	EAGLE CR	626	[illegible]	5.7	244	1000	27	[illegible]
5/13/85	WF OBEY	305	34	4.2	109	590	19	42.3
5/13/85	INDIAN	511	88	[illegible]	1682	2740	29	77.6
5/13/85	EF OBEY	424	392	2.2	80	620	25	20.6
5/13/85	FRANKLIN	222	47	1.7	89	310	17	63.7
5/13/85	WOLF R	1085	87	3.9	494	1520	37	39.4
5/13/85	SPRING	818	92	24.8	250	1040	29	60.9
5/13/85	ILLWILL	31	53	84.0	76	1t100	39	128.3
5/13/85	WILLIAMS	456	46	9.6	249	1990	18	60.5
5/13/85	SULPHUR	251	48	6.4	121	590	20	71.2
5/13/85	L.SULPHUR	*	*	*	*	*	*	*
6/5/85	IRONS CR	2202	106	5.0	371	1810	36	74.5
6/5/85	EAGLE CR	542	46	6.4	109	560	26	59.6
6/5/85	WF OBEY	109	13	6.0	62	460	20	42.9
6/5/85	INDIAN	151	15	90.5	59	760	39	[illegible]
6/5/85	EF OBEY	1764	437	3.8	814	3380	31	39.4
6/5/85	FRANKLIN	541	66	2.2	206	470	22	[illegible]
6/5/85	WOLF R	345	36	5.1	188	570	50	39.2
6/5/85	SPRING	56	19	31.4	572	1t100	32	65.1
6/5/85	L.SULPHUR	1153	48	6.3	183	500	34	82.6
6/5/85	ILLWILL	483	55	127.2	169	250	46	179.9
6/5/95	WILLIAMS	130	16	13.1	183	1t100	27	70.4
6/5/85	SULPHUR	238	19	11.1	172	270	27	86.5
7/16/85	IRONS CR	223	277	7.0	167	1t100	45	93.9
7/16/85	EAGLE CR	261	54	7.3	43	210	32	51.7
7/16/85	WF OBEY	103	36	8.7	27	160	27	[illegible]
7/16/85	INDIAN	30	16	126.0	273	1t100	41	80.4
7/16/85	EF OBEY	49	127	5.2	118	210	35	44.5
7/16/85	FRANKLIN	59	16	2.6	129	1t100	26	63.2
7/16/85	WOLF R	115	47	7.7	132	1t100	[illegible]	50.1
7/16/85	SPRING	56	49	39.7	71	1t100	36	[illegible]
7/16/85	L.SULPHUR	306	135	8.1	19	220	51	54.7
7/16/85	ILLWILL	107	35	128.8	31	1t100	43	[illegible]
7/16/85	WILLIAMS	55	320	49.1	38	1t100	69	139.8
7/16/85	SULPHUR	64	23	17.3	143	1t100	32	[illegible]
8/21/85	IRONS CR	37	24	3.9	21	1t100	32	68.2
8/21/85	EAGLE CR	215	52	3.6	22	130	29	[illegible]
8/21/85	WF OBEY	[illegible]	92	5.2	29	240	21	47.5
8/21/85	INDIAN	30	1t1	66.3	18	1t100	27	70.7
8/21/85	EF OBEY	[illegible]	374	4.9	33	330	41	[illegible]
8/21/85	FRANKLIN	79	38	2.2	32	110	20	85.6
8/21/85	WOLF R	149	37	[illegible]	59	1t100	42	34.6
8/21/85	SPRING	125	26	32.5	39	1t100	32	67.2
8/21/85	L.SULFUR	591	186	20.1	78	1t100	59	66.6
8/21/85	ILLWILL	153	37	51.9	65	1t100	40	162.0
8/21/85	WILLIAMS	24	13	18.2	70	1t100	28	73.9
8/21/85	SULFUR	72	25	[illegible]	69	1t100	27	89.9

Table 3 (continued)

9/17/85	IRONS CR	94	81	6.4	221	1t100	41	[illegible]
9/17/85	EAGLE CR	[illegible]	17	8.9	156	1t100	30	[illegible]
9/17/85	WF OBEY	32	23	12.2	161	1t100	26	53.3
9/17/85	INDIAN	8	10	181.3	123	1t100	42	88.9
9/17/85	EF OBEY	39	57	5.4	38	1t100	32	39.8
9/17/85	FRANKLIN	4[illegible]	21	3.0	239	1t100	23	89.4
9/17/85	WOLF R	116	44	8.1	511	1t100	72	51.5
9/17/85	SPRING	59	26	49.8	215	1t100	39	75.4
9/17/85	L.SULFUR	329	162	8.8	241	1t100	58	54.7
9/17/85	[illegible]	71	30	200.8	259	1t108	57	269.6
9/17/85	WILLIAMS	51	181	66.5	1t5	1t100	77	167.3
9/17/85	SULFUR	472	66	27.7	1t5	255	53	148.4
10/7/85	IRONS CR	45	15	4.5	7	1t100	34	66.3
10/7/85	EAGLE CR	42	1t5	9.8	7	1t100	32	56.9
10/7/85	WF OBEY	21	10	7.5	1t5	102	25	49.9
10/7/85	INDIAN		1t5	139.4	1t5	1t100	37	85.7
10/7/85	EF OBEY	64	246	4.0	1t5	1t100	32	22.8
10/7/85	FRANKLIN	37	16	3.0	1t5	1t100	27	91.2
10/7/85	WOLF R	[illegible]	12	5.2	1t5	1t100	47	36.0
10/7/85	SPRING	39	11	38.0	1t5	1t100	39	73.3
10/7/85	L.SULFUR	247	94	8.4	1t5	1t100	53	59.9
10/7/85	[illegible]	38	17	179.2	1t5	1t100	54	241.1
10/7/85	WILLIAMS	37	116	27.8	1t5	1t100	45	106.8
10/7/85	SULFUR	37	24	15.5	1t5	1t100	40	106.6
11/4/85	IRONS CR	107	28	3.3	1t5	102	29	59.7
11/4/85	EAGLE CR	[illegible]	6	8.5	1t5	1t100	28	57.2
11/4/85	WF OBEY	28	12	11.4	1t5	1t100	25	53.3
11/4/85	INDIAN	13	1t5	141.2	1t5	1t100	32	79.3
11/4/85	EF OBEY	21	164	5.7	9	1t100	30	35.7
11/4/85	FRANKLIN	92	16	2.3	1t5	1t100	24	81.6
11/4/85	WOLF R	64	11	7.3	1t5	1t100	56	48.7
11/4/85	SPRING	79	19	42.6	1t5	1t100	35	72.1
11/4/85	L.SULFUR	397	109	10.2	1t5	295	48	60.5
11/4/85	[illegible]	455	55	43.0	1t5	445	32	88.2
11/4/85	WILLIAMS	134	20	8.5	1t5	1t100	20	53.6
11/4/85	SULFUR	181	34	5.8	1t5	136	29	69.7

Table 4. Dale Hollow Inflow Sampling Data, 1985

DALE HOLLOW INFLOW SAMPLING DATA

DATE MM/DD/YY	STATION NAME	MAGNESIUM mg/l	CADMIUM ug/l	CHROMIUM ug/l	COPPER ug/l	NICKEL ug/l	LEAD ug/l	POTASSIUM mg/l
5/13/85	IRONS CR	16.6	lt1	lt5	lt5	lt50	lt100	0.9
5/13/85	EAGLE CR	12.4	lt1	15	lt5	lt50	lt100	0.4
5/13/85	WF OBEY	[illegible]	lt1	lt5	lt5	lt50	lt100	0.2
5/13/85	INDIAN	[illegible]	lt1	lt5	lt5	120	lt100	0.6
5/13/85	EF OBEY	5.6	lt1	lt5	lt5	lt50	lt100	0.3
5/13/85	FRANKLIN	14.3	lt1	lt5	lt5	lt50	lt100	0.4
5/13/85	WOLF R	13.3	lt1	26	lt5	70	lt100	0.4
5/13/85	SPRING	17.6	lt1	24	17	lt50	lt100	1.6
5/13/85	ILLWILL	29.3	lt1	lt5	lt5	lt50	lt100	2.6
5/13/85	WILLIAMS	[illegible]	lt1	lt5	lt5	lt50	lt100	0.7
5/13/85	SULPHUR	18.4	lt1	lt5	lt5	lt50	lt100	0.8
5/13/85	L.SULPHUR	*	*	*	*	*	*	*
6/5/85	IRONS CR	23.3	lt1	35	lt5	60	lt100	2.0
6/5/85	EAGLE CR	7.6	lt1	lt5	26	lt50	lt100	1.2
6/5/85	WF OBEY	9.0	lt1	lt5	lt5	lt50	lt100	0.6
6/5/85	INDIAN	14.7	lt1	lt5	6	lt50	lt100	1.4
6/5/85	EF OBEY	22.4	lt1	18	lt5	140	lt100	1.8
6/5/85	FRANKLIN	15.3	lt1	9	lt5	lt50	lt100	0.9
6/5/85	WOLF R	[illegible]	lt1	7	lt5	lt50	lt100	0.5
6/5/85	SPRING	12.1	lt1	lt5	lt5	lt50	lt100	1.8
6/5/85	L.SULPHUR	18.5	lt1	11	lt5	lt50	lt100	1.6
6/5/85	ILLWILL	40.7	lt1	lt5	lt5	lt50	lt100	3.1
6/5/85	WILLIAMS	15.2	lt1	lt5	lt5	lt50	lt100	0.9
6/5/85	SULPHUR	20.3	lt1	lt5	lt5	lt50	lt100	0.6
7/16/85	IRONS CR	15.0	lt1	lt5	lt5	lt50	lt100	1.8
7/16/85	EAGLE CR	8.6	lt1	lt5	lt5	lt50	lt100	[illegible]
7/16/85	WF OBEY	10.6	lt1	lt5	lt5	lt50	lt100	[illegible]
7/16/85	INDIAN	17.6	lt1	lt5	lt5	lt50	lt100	1.5
7/16/85	EF OBEY	9.1	lt1	lt5	lt5	lt50	lt100	0.9
7/16/85	FRANKLIN	[illegible]	lt1	lt5	lt5	lt50	lt100	1.5
7/16/85	WOLF R	9.9	lt1	lt5	lt5	lt50	lt100	[illegible]
7/16/85	SPRING	[illegible]	lt1	lt5	lt5	lt50	lt100	[illegible]
7/16/85	SULPHUR	9.3	lt1	lt5	lt5	lt50	lt100	3
7/16/85	ILLWILL	[illegible]	lt1	lt5	lt5	lt50	lt100	[illegible]
7/16/85	WILLIAMS	23.3	lt1	lt5	lt5	lt50	lt100	[illegible]
7/16/85	[illegible]	[illegible]	lt1	lt5	lt5	lt50	lt100	1.1
8/21/85	IRONS CR	[illegible]	lt1	lt5	lt5	lt50	lt100	[illegible]
8/21/85	EAGLE CR	9.7	lt1	lt5	lt5	lt50	lt100	[illegible]
8/21/85	WF OBEY	9.5	lt1	lt5	lt5	lt50	lt100	1.6
8/21/85	INDIAN	13.6	lt1	lt5	lt5	lt50	lt100	[illegible]
8/21/85	EF OBEY	6.1	lt1	lt5	lt5	lt50	lt100	1.2
8/21/85	FRANKLIN	[illegible]	lt1	lt5	lt5	lt50	lt100	[illegible]
8/21/85	WOLF R	5.9	lt1	lt5	lt5	lt50	lt100	[illegible]
8/21/85	SPRING	12.5	lt1	lt5	lt5	lt50	lt100	1.6
8/21/85	L.SULFUR	13.6	lt1	lt5	lt5	lt50	lt100	7.7
8/21/85	ILLWILL	36.4	lt1	lt5	lt5	lt50	lt100	4.3
8/21/85	WILLIAMS	15.8	lt1	lt5	lt5	lt50	lt100	1.3
8/21/85	SULFUR	20.6	lt1	lt5	lt5	lt50	lt100	1.0

Table 4 (continued)

9/17/85	IRONS CR	[illegible]	1t5	1t5	1t5	1t50	1t100	[illegible]
9/17/85	EAGLE CR	10.1	1t5	1t5	1t5	1t50	1t100	1.4
9/17/85	WF OBEY	12.[illegible]	1t5	1t5	1t5	1t50	1t100	1.0
9/17/85	INDIAN	36.4	1t5	1t5	1t5	1t50	1t100	[illegible]
9/17/85	EF OBEY	[illegible]	1t5	1t5	1t5	1t50	1t100	1.5
9/17/85	FRANKLIN	21.5	1t5	1t5	1t5	1t50	1t100	1.3
9/17/85	WOLF R	[illegible]	1t5	1t5	1t5	1t50	1t100	1.2
9/17/85	SPRING	17.0	1t5	1t5	1t5	1t50	1t100	2.1
9/17/85	L.SULFUR	[illegible]	1t5	1t5	1t5	1t50	1t100	14.3
9/17/85	ILLWILL	63.0	1t5	1t5	1t5	1t50	1t100	[illegible]
9/17/85	WILLIAMS	[illegible]	1t5	1t5	1t5	1t50	1t100	1.8
9/17/85	SULFUR	33.9	1t5	1t5	1t5	1t50	1t100	[illegible]
10/7/85	IRONS CR	13.4	1t5	1t5	1t5	1t50	1t100	1.8
10/7/85	EAGLE CR	10.3	1t5	1t5	1t5	1t50	1t100	1.6
10/7/85	WF OBEY	10.4	1t5	1t5	1t5	1t50	1t100	1.3
10/7/85	INDIAN	20.2	1t5	1t5	1t5	1t50	1t100	2.0
10/7/85	EF OBEY	5.0	1t5	1t5	1t5	1t50	1t100	[illegible]
10/7/85	FRANKLIN	21.3	1t5	1t5	1t5	1t50	1t100	1.6
10/7/85	WOLF R	7.5	1t5	1t5	1t5	1t50	1t100	1.4
10/7/85	SPRING	15.6	1t5	1t5	1t5	1t50	1t100	[illegible]
10/7/85	L.SULFUR	12.8	1t5	1t5	1t5	1t50	1t100	[illegible]
10/7/85	ILLWILL	57.5	1t5	1t5	1t5	1t50	1t100	[illegible]
10/7/85	WILLIAMS	21.3	1t5	1t5	1t5	1t50	1t100	1.9
10/7/85	SULFUR	25.9	1t5	1t5	1t5	1t50	1t100	1.7
11/4/85	IRONS CR	11.2	1t5	1t5	1t5	1t50	1t100	1.6
11/4/85	EAGLE CR	10.5	1t5	1t5	1t5	1t50	1t100	1.5
11/4/85	WF OBEY	12.0	1t5	1t5	1t5	1t50	1t100	[illegible]
11/4/85	INDIAN	19.0	1t5	1t5	1t5	1t50	1t100	2.4
11/4/85	EF OBEY	8.2	1t5	1t5	1t5	1t50	1t100	1.3
11/4/85	FRANKLIN	13.2	1t5	1t5	1t5	1t50	1t100	2.2
11/4/85	WOLF R	10.2	1t5	1t5	1t5	1t50	1t100	1.1
11/4/85	SPRING	15.4	1t5	1t5	1t5	1t50	1t100	2.5
11/4/85	L.SULFUR	11.3	1t5	1t5	1t5	1t50	1t100	[illegible]
11/4/85	ILLWILL	13.9	1t5	1t5	1t5	1t50	1t100	4.6
11/4/85	WILLIAMS	12.7	1t5	1t5	1t5	1t50	1t100	1.3
11/4/85	SULFUR	16.8	1t5	1t5	1t5	1t50	1t100	1.6

Table 5. Water Quality Data for Dale Hollow Lake, 1985

[illegible] DATE 1985	[illegible] STATION	[illegible] DEPTH meters	DATA TEMP Celsius	1985 D. O. mg/l	COND. mmho/cm	pH	ORP mvolts	TURBIDITY FTU	FLUORESCENCE	[illegible] meter	[illegible]
[illegible]	[illegible] 32.7	[illegible]	28.1	8.1	180	8.2	267	4.7	1.4	2.4	.500
		2	27.6	8.2	16[illegible]	8.1	274	4.4	1.4		
		4	26.8	8.4	162	8.2	276	4.2	1.5		
		6	25.5	7.4	166	7.7	294	4.5	2.0		
		8	22.2	4.1	205	6.9	336	4.5	2		
		10	14.3	4.1	141	7	341	6.4	1.6		
		12	11.9	3.5	134	7.1	342	7	1.5		
		14	11	3.3	131	7.1	341	5.5	1.4		
		16	10.6	3.3	131	7.1	341	5	1.4		
		18	10.5	3.3	130	7.1	342	5.3	1.4		
		19	10.9	3.1	127	7.4	333	5.8	1.4		
JULY 1[illegible]	[illegible] 27.7	0	27.9	8.2	172	8.3	255	5	[illegible]	2.1	[illegible]
		2	27.5	8.3	167	8.3	258	4.5	1.4		
		4	26.5	8.5	165	8.3	258	5	1.5		
		6	25.6	8	160	8.1	272	5.3	1.4		
		8	20.6	6.3	172	7.2	319	7	2.6		
		10	13.6	6.6	147	7.2	324	7.6	2		
		12	11.5	5.4	131	7.2	324	4.5	1.5		
		14	10.7	4.8	133	7.3	327	4.5	1.4		
		16	10.4	4.5	132	[illegible]	320	5.5	1.5		
		18	10.2	4.5	132	7.3	325	4.4	1.7		
		20	10	4.3	131	7.5	323	4.7	1.3		
		22	10	4	133	7.6	321	6	1.2		
		24	10	3.7	130	7.7	318	6.8	1.3		
JULY 10	WRM 3.7	0	28.1	8.7	202	8.5	220	3.7	1.5	2.1	0.589
		2	27.5	9.1	200	8.6	225	3.8	1.4		
		4	27	9.3	193	8.6	223	4.5	1.6		
		6	26.2	9.3	200	8.5	228	4	2.3		
		8	21	0.5	218	7.1	300	4.4	2.7		
		10	15.2	1.6	179	7.3	309	5.5	1.9		
		12	12.1	0.8	163	7.4	308	7	1.5		
		14	11.7	0.2	155	7.6	306	4.5	1.4		
		15	11.7	0.2	160	7.8	304	9.3	1.4		
[illegible]	[illegible]	[illegible]	[illegible]	8.2	176	8.4	208	[illegible]	[illegible]	[illegible]	[illegible]
		2	26.7	8.3	165	8.4	228	3.1	0.6		
		4	[illegible]	9.4	147	9.4	229	[illegible]	0.7		
		7	[illegible]	9.5	150	8.4	230	3.2	1.5		
		10	[illegible]	11.9	134	8.2	246	6.2	2.5		
		13	[illegible]	8.9	130	7.7	293	2.6	1.3		
		16	[illegible]	7.9	129	7.6	297	3.2	1.1		
		19	9.3	7.2	129	7.6	298	2.6	0.3		
		22	9.4	6.5	127	7.6	297	2.5	0.6		
		25	9.1	5.7	124	7.6	295	3.1	0.8		
		28	8.7	5.2	121	7.9	287	4.5	0.7		

Table 5 (continued)

[illegible]		[illegible]	[illegible]	173	8.5	234	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	9.4	165	8.4	235	[illegible]	[illegible]		
	[illegible]	24.2	10.4	162	[illegible]	228	[illegible]	[illegible]		
	8	[illegible]	13	157	[illegible]	222	5.5	[illegible]		
	[illegible]	[illegible]	12.5	151	9.6	234	4	2.5		
	[illegible]	[illegible]	10.4	118	7.7	276	[illegible]	2.4		
	[illegible]	[illegible]	3	115	7.5	287	5	[illegible]		
	16	9.8	8.6	113	7.4	287	2.5	[illegible]		
	21	9.4	8.5	114	7.4	286	2.9	1.2		
	24	8.9	[illegible]	116	7.4	288	[illegible]	1.2		
	27	8.4	7.6	104	7.4	288	[illegible]	[illegible]		
	30	[illegible]	6.8	113	7.4	289	[illegible]	[illegible]		
	[illegible]	[illegible]	6.5	[illegible]	7.4	284	[illegible]	[illegible]		
	[illegible]	[illegible]	6.3	110	7.5	295	[illegible]	[illegible]		
AUGUST [illegible] ORM 32.[illegible]	[illegible]	25.9	7.5	203	7.8	230	[illegible]	[illegible]	[illegible]	[illegible]
	2	25.7	7.5	199	7.7	[illegible]	[illegible]	[illegible]		
	4	25.6	7.4	196	7.6	[illegible]	[illegible]	0.9		
	[illegible]	25	6.9	191	7.4	245	[illegible]	[illegible]		
	[illegible]	[illegible]	5	201	6.9	262	4.4	0.9		
	[illegible]	[illegible]	5.4	184	6.2	271	[illegible]	[illegible]		
	[illegible]	[illegible]	[illegible]	160	[illegible]	274	[illegible]	[illegible]		
	14	[illegible]	[illegible]	154	-	274	[illegible]	[illegible]		
	[illegible]	[illegible]	[illegible]	154	7.1	274	[illegible]	[illegible]		
	19	[illegible]	[illegible]	155	[illegible]	273	[illegible]	0.5		
AUGUST 23 ORM 27.[illegible]	0.5	26.1	7.7	191	8	216	2.1	0.7	3.35	0.402
	1.5	25.8	7.7	188	9	219	2.1	0.6		
	3	25.6	7.7	185	8	217	[illegible]	1		
	5	25.4	7.7	185	8	[illegible]	[illegible]	[illegible]		
	[illegible]	25.2	7.5	180	[illegible]	231	2.2	0.9		
	[illegible]	22.9	2.2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		
	[illegible]	16.2	1.7	[illegible]	[illegible]	[illegible]	[illegible]	0.9		
	[illegible]	12.4	0.9	[illegible]	[illegible]	[illegible]	3	0.9		
	[illegible]	[illegible]	0.9	150	7	277	[illegible]	[illegible]		
	[illegible]	[illegible]	0.9	[illegible]	7	277	[illegible]	[illegible]		
	[illegible]	[illegible]	1.1	146	7.1	275	[illegible]	[illegible]		
	[illegible]	[illegible]	1.2	140	7.2	273	[illegible]	[illegible]		
	[illegible]	[illegible]	1.2	137	7.3	270	[illegible]	[illegible]		
[illegible]	[illegible]	[illegible]	7.5	220	8.1	175	[illegible]	[illegible]	[illegible]	[illegible]
	2	[illegible]	7.6	222	8.1	174	[illegible]	[illegible]		
	[illegible]	[illegible]	[illegible]	222	8.1	168	2.2	[illegible]		
	[illegible]	[illegible]	7.3	220	7.9	[illegible]	[illegible]	1.4		
	[illegible]	24.2	2	246	7	152	[illegible]	[illegible]		
		[illegible]	0	231	6.9	2	5.6	[illegible]		
	12	13.9	0	185	[illegible]	-48	[illegible]	2		
	[illegible]	[illegible]	[illegible]	[illegible]	7.2	-10	[illegible]	1.9		
	[illegible]	12.1		176	7.3	-15	[illegible]	[illegible]		

Table 5 (continued)

[illegible]	[illegible]	26.7	8.1	155	9.2	204	1	[illegible]	[illegible]	[illegible]
	[illegible]	25.7	8.2	182	9.2	204	1.2	1.4		
	[illegible]	25.2	8.2	175	8.2	204	1.4	[illegible]		
	8	25	8	174	8.1	211	.5	[illegible]		
	11	[illegible]	9.2	170	7.4	254	[illegible]	4		
	[illegible]	12.2	6.4	157	7.2	269	[illegible]	[illegible]		
	[illegible]	10.8	4.9	150	7.2	268	[illegible]	1.4		
	20	10.1	4.1	145	7.2	265	[illegible]	[illegible]		
	23	10	3.2	136	7.2	264	[illegible]	[illegible]		
	26	9.6	2.8	131	7.3	262	1.2	[illegible]		
	29	[illegible]	2.5	123	7.4	259	[illegible]	[illegible]		
	32	[illegible]	2.4	120	7.9	254	1.1	[illegible]		
AUGUST 25 [illegible]	0	26.9	9	181	8.1	212	1.5	1	[illegible]	[illegible]
	3	25.8	8.1	178	8.1	213	1.4	[illegible]		
	6	25.4	8.2	170	8.1	216	1.4	[illegible]		
	[illegible]	24.1	7.1	173	7.4	247	3.4	1.7		
	12	15.4	9	160	7.4	262	[illegible]	[illegible]		
	15	11.7	7.9	150	7.3	270	1.5	1.4		
	18	10.7	7.1	140	7.3	270	1.3	[illegible]		
	21	10.1	6.6	139	7.3	270	1.3	1.3		
	24	9.6	5.7	126	7.2	269	[illegible]	[illegible]		
	27	9.2	4.8	126	7.2	269	2	[illegible]		
	30	[illegible]	4.2	116	7.3	267	2.4	[illegible]		
	33	9.5	3.6	117	7.4	263	[illegible]	[illegible]		
	36	8.2	3.5	105	7.5	262	2.2	1		
	39	8.4	3.2	102	[illegible]	261	2.9	0.8		
OCTOBER 3 [illegible]	[illegible]	20.9	7.1	191	7.4	272	[illegible]	0.65	3.05	[illegible]
	2	20.6	7.1	182	7.4	271	[illegible]	[illegible]		
	4	20.3	7.1	180	7.4	268	[illegible]	0.65		
	6	20.8	7.1	182	[illegible]	264	[illegible]	0.65		
	8	20.3	7.1	180	7.4	259	3.2	0.65		
	9	20.7	7.1	180	7.3	250	3	0.65		
	[illegible]	20.6	7.1	182	7.3	235	2.9	0.65		
	12	20.1	3.6	185	6.8	218	4.4	0.48		
	14	16	0.1	187	6.8	156	4	0.65		
	16	12.7	0	176	7	126	4.2	0.7		
OCTOBER 3 [illegible]	[illegible]	20.7	7.52	166	7.5	278	2.5	[illegible]	[illegible]	[illegible]
	3	20.6	7.52	165	7.5	277	[illegible]	[illegible]		
	[illegible]	20.6	7.55	165	7.5	273	[illegible]	[illegible]		
	[illegible]	20.5	7.52	166	7.5	271	[illegible]			
	[illegible]	20.4	7.51	168	7.5	266	[illegible]	[illegible]		
	[illegible]	20.2	7.57	163	7.4	259	[illegible]	0.8		
	[illegible]	15.1	0	165	6.7	286	4.4	0.35		
	[illegible]	[illegible]	[illegible]	152	6.8	288	[illegible]	0.7		
	17	12	0	156	6.9	290	2.4	0.75		
	19	11.5	0	155	6.9	291	2.35	0.7		
	21	11.4	0	150	6.9	293	2.4	0.7		
	23	11.4	0	150	7	294	2.5	0.85		

Table 5 (continued)

[illegible]	[illegible]	20.3	7	215	7.8	195	8.6	1.5	[illegible]	[illegible]
	[illegible]	20.5	7	205	7.5	193	8.4	[illegible]		
	[illegible]	20.5	7	198	7.5	189	[illegible]	1.6		
	7	20.4	7	200	7.5	185	8.3	1.6		
	9	20.3	7	198	7.5	175	7.8	1.65		
	11	19.7	6.2	215	7.3	159	5.65	1.65		
	13	14.2	0	178	6.9	-82	6.5	4.3		
	15	12.8	0	182	6.9	-86	6.1	3		
	17	12.1	0	180	7.9	-56	4.3	2.4		
OCTOBER 5 ORM 16.7	0	20.4	8.2	146	7.8	218	1.5	0.65	*	0.305
	3	20.3	8.3	133	7.8	220	1.5	0.7		
	6	20.2	8.2	132	7.9	219	1.5	0.65		
	10	20	8.3	135	7.7	221	1.4	0.6		
	14	18	8.4	116	7	250	2.2	0.65		
	17	11.5	3.4	110	6.9	250	1.6	0.5		
	20	10.8	2.7	107	6.9	246	1.6	0.4		
	23	10.2	1.7	115	6.9	241	3.8	0.35		
	26	9.0	0.9	88	6.9	241	4	0.30		
	29	9.4	0.7	92	6.9	142	[illegible]	0.2		
	33	9.1	0.3	83	7	249	4.4	0.4		
OCTOBER 9 ORM 7.6	1	21	8.3	157	7.8	227	1.8	0.8	5.49	0.299
	3	21.9	8.3	136	7.8	227	1.7	0.8		
	6	20.9	8.3	132	7.8	228	2	0.7		
	9	20.7	8.3	132	7.7	229	1.95	0.6		
	12	20.5	8.2	132	7.7	235	1.7	0.5		
	15	13.9	6.8	129	7.1	268	2.2	0.5		
	18	11.4	6	124	7.1	269	1.5	0.4		
	22	10.4	4.8	124	7.1	267	1.3	0.35		
	26	9.9	3.9	120	7.1	265	2.4	0.3		
	30	9.4	2.9	110	7.1	264	2.9	0.3		
	34	8.8	2	120	7.1	264	3.1	0.3		

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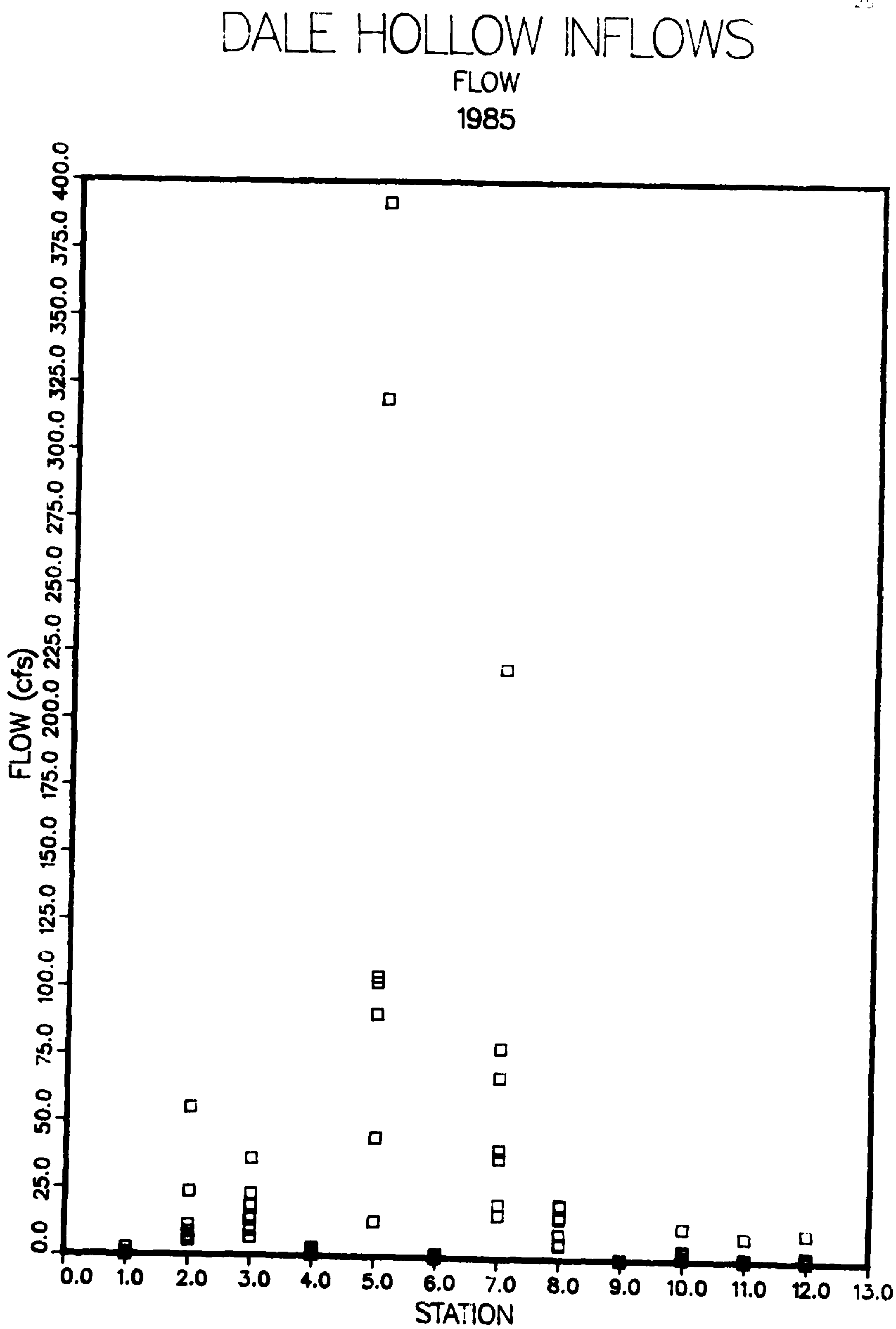

Figure 1. Dale Hollow Inflow Rates During 1985

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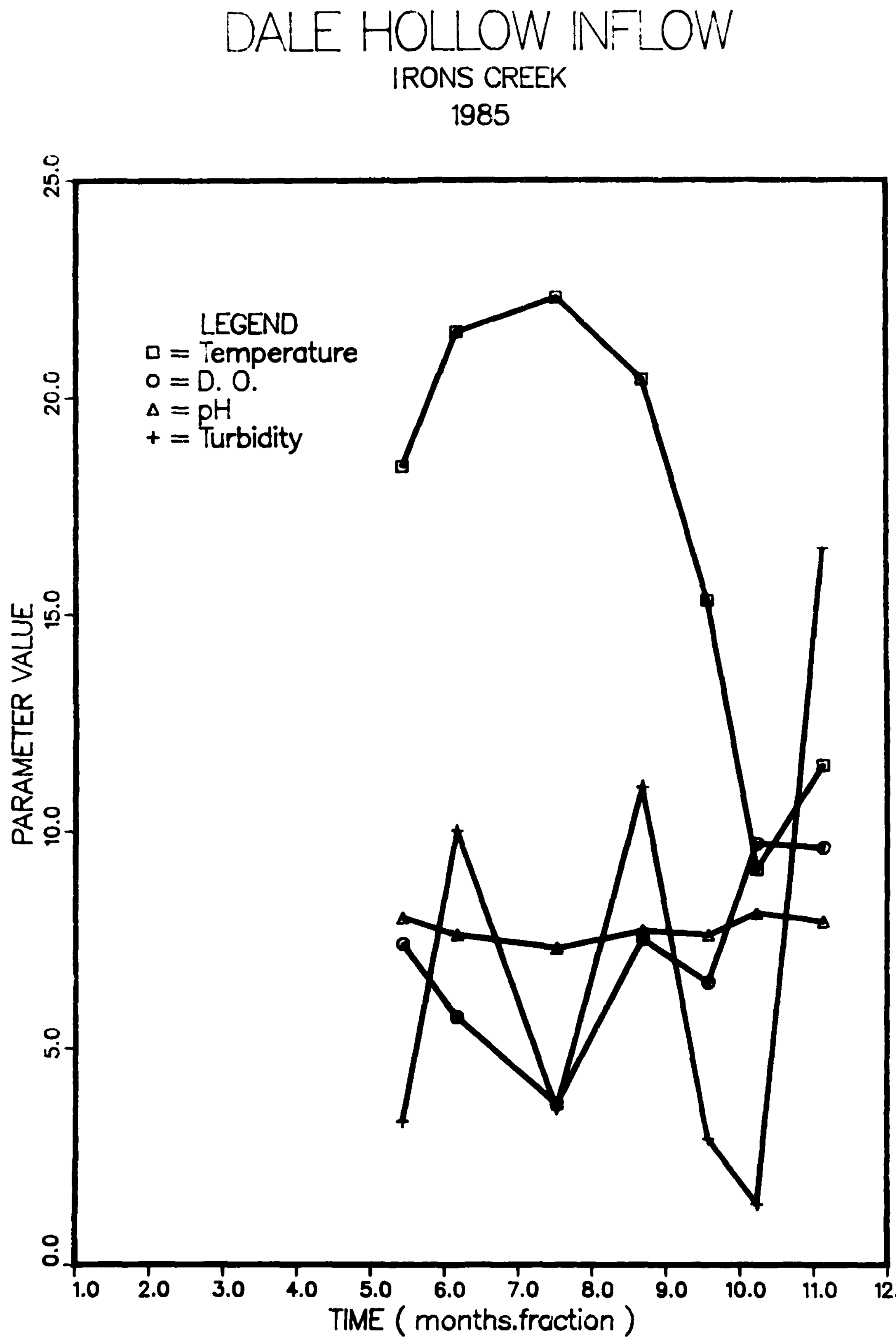

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Figure 2. Water Quality Irons Creek, 1985

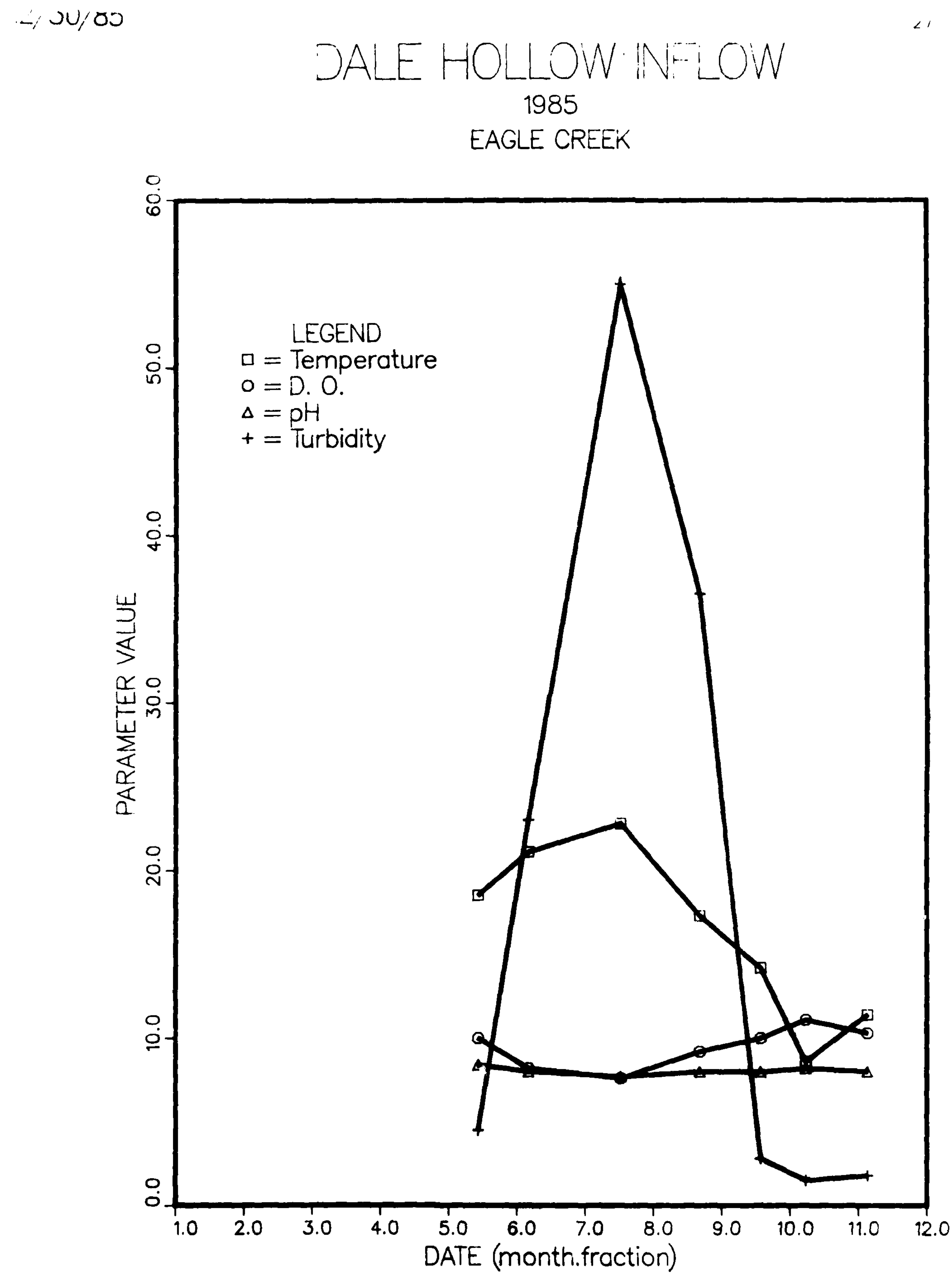

Figure 3. Water Quality in Eagle Creek, 1985

12/31/85

DALE HOLLOW INFLOW

W. F. OBEY RIVER

1985

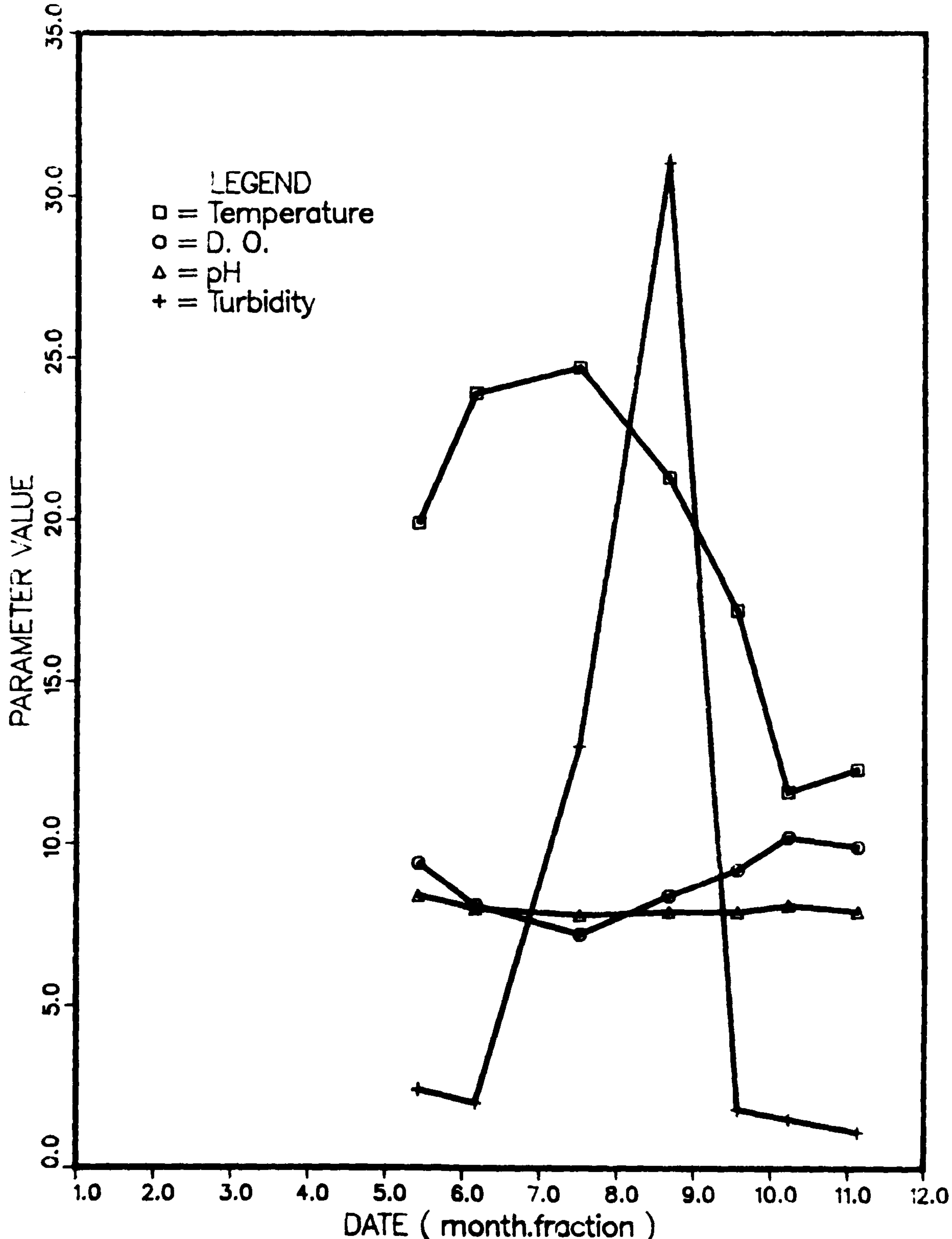

Figure 4. Water Quality in the West Fork Obey River, 1985

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1_ 30 85

DALE HOLLOW INFLOW

INDIAN CREEK

1985

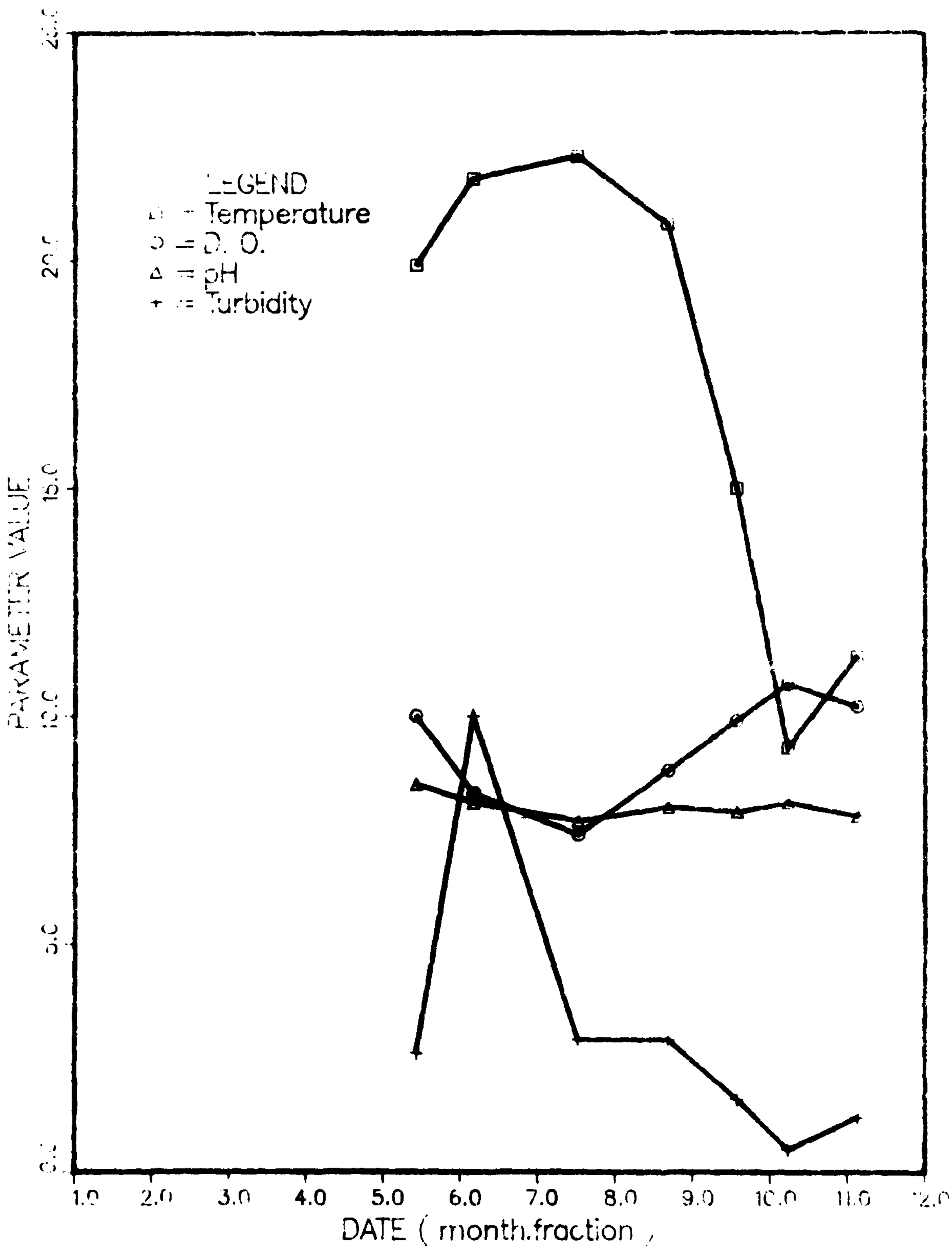

Figure [illegible]. Water Quality in Big Indian Creek,

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5/85

DALE HOLLOW INFLOW

E. F. OBEY RIVER

1985

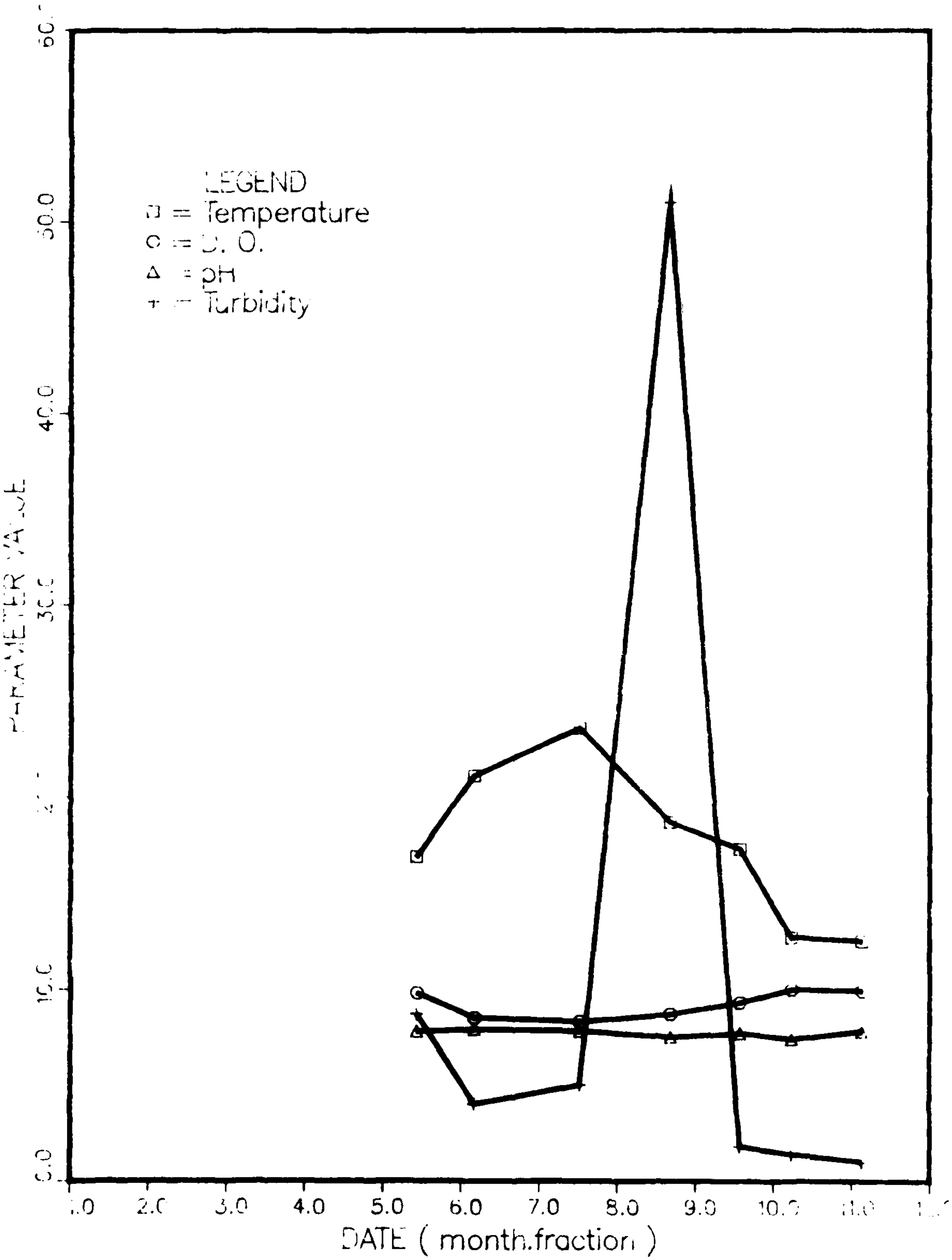

Figure 6. Water Quality in the East Fork Obey River, 1985

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DALE HOLLOW INFLOW
FRANKLIN CREEK
1985

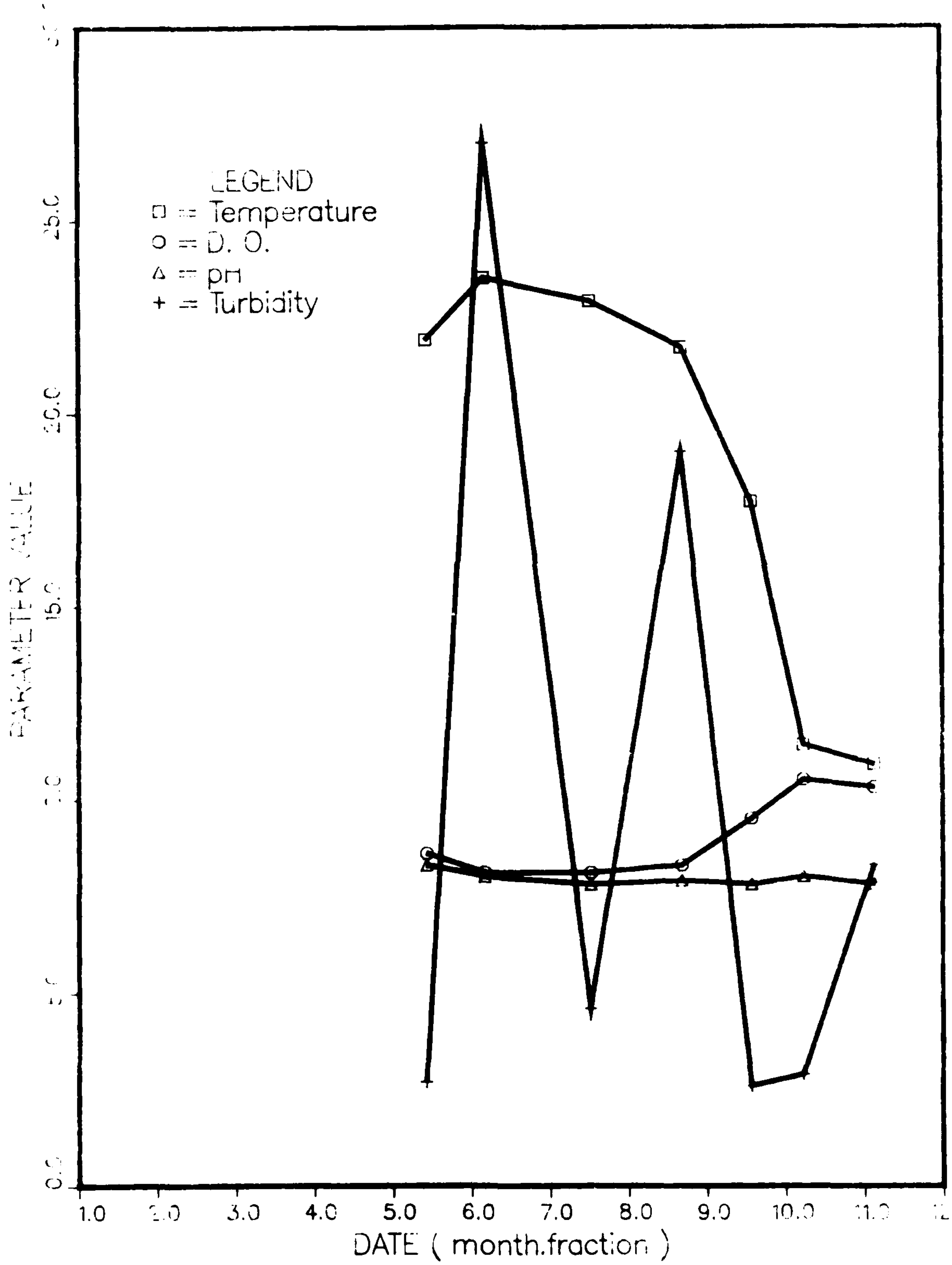

Figure 7. Water Quality in Franklin Creek, 198

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12/31/85

DALE HOLLOW INFLOW

WOLF RIVER

1985

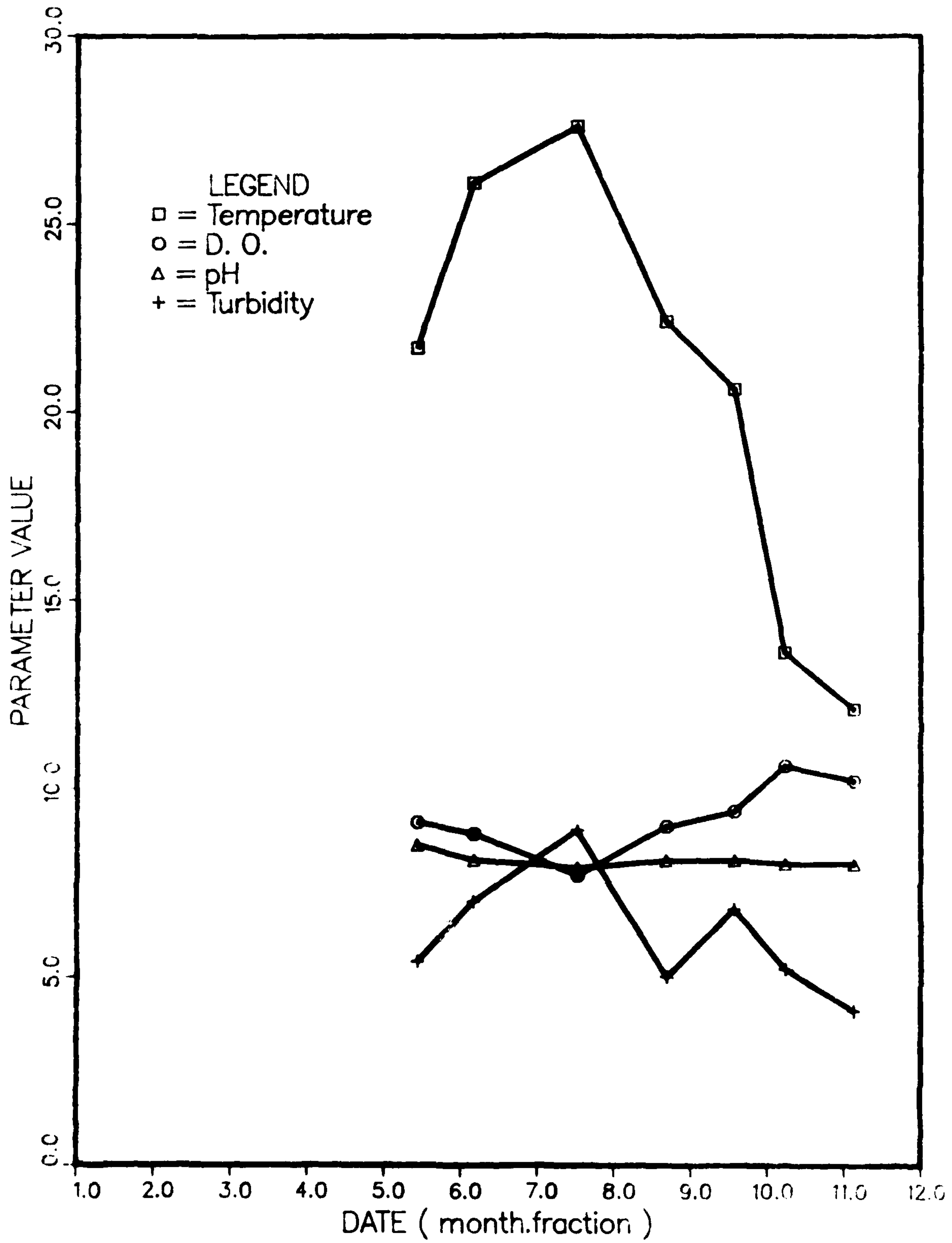

Figure [illegible]. Water Quality in the Wolf River, 198[illegible]

J A GORDON

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DALE HOLLOW INFLOW

SPRING CREEK

1985

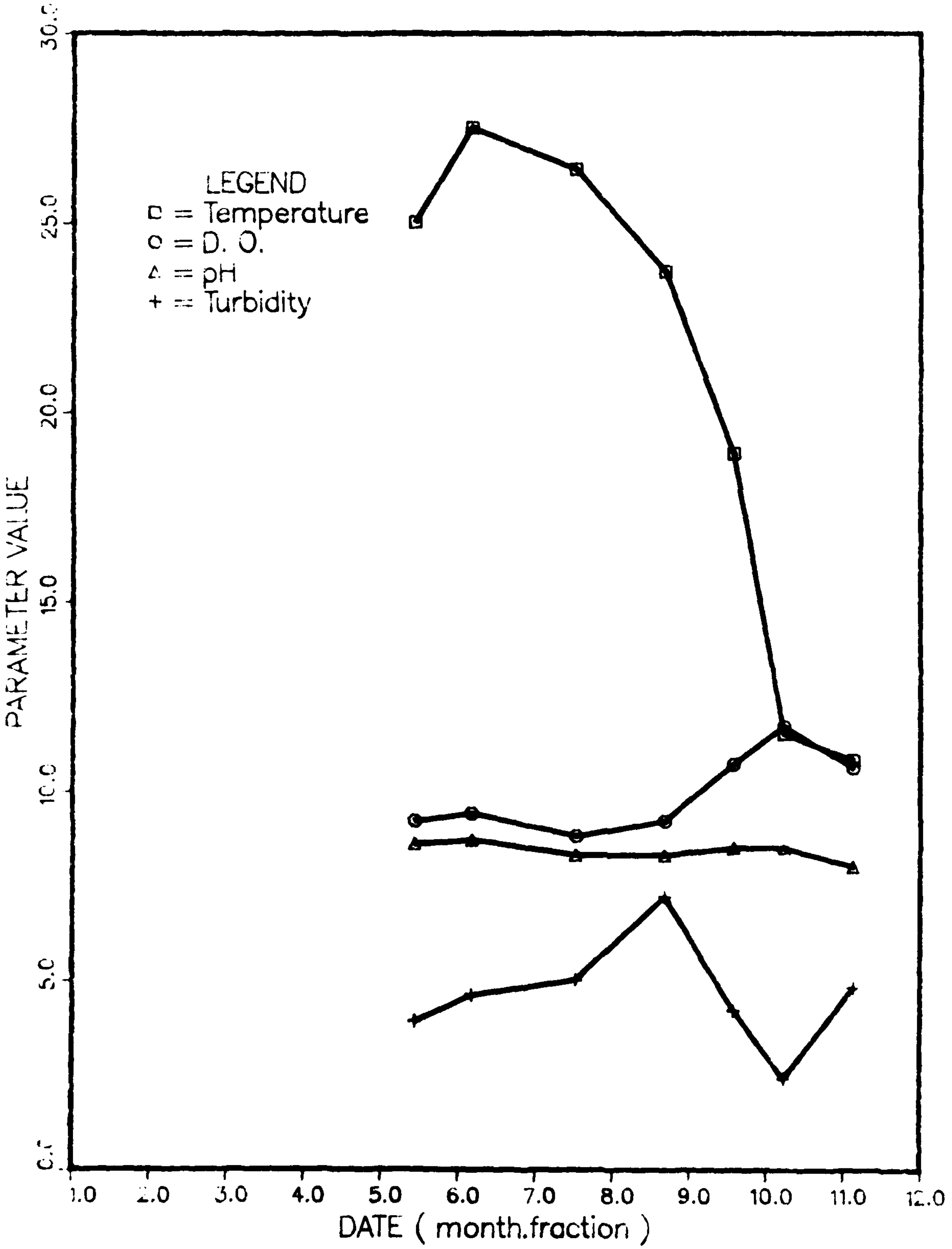

Figure 9. Water Quality in Spring Creek, 1985

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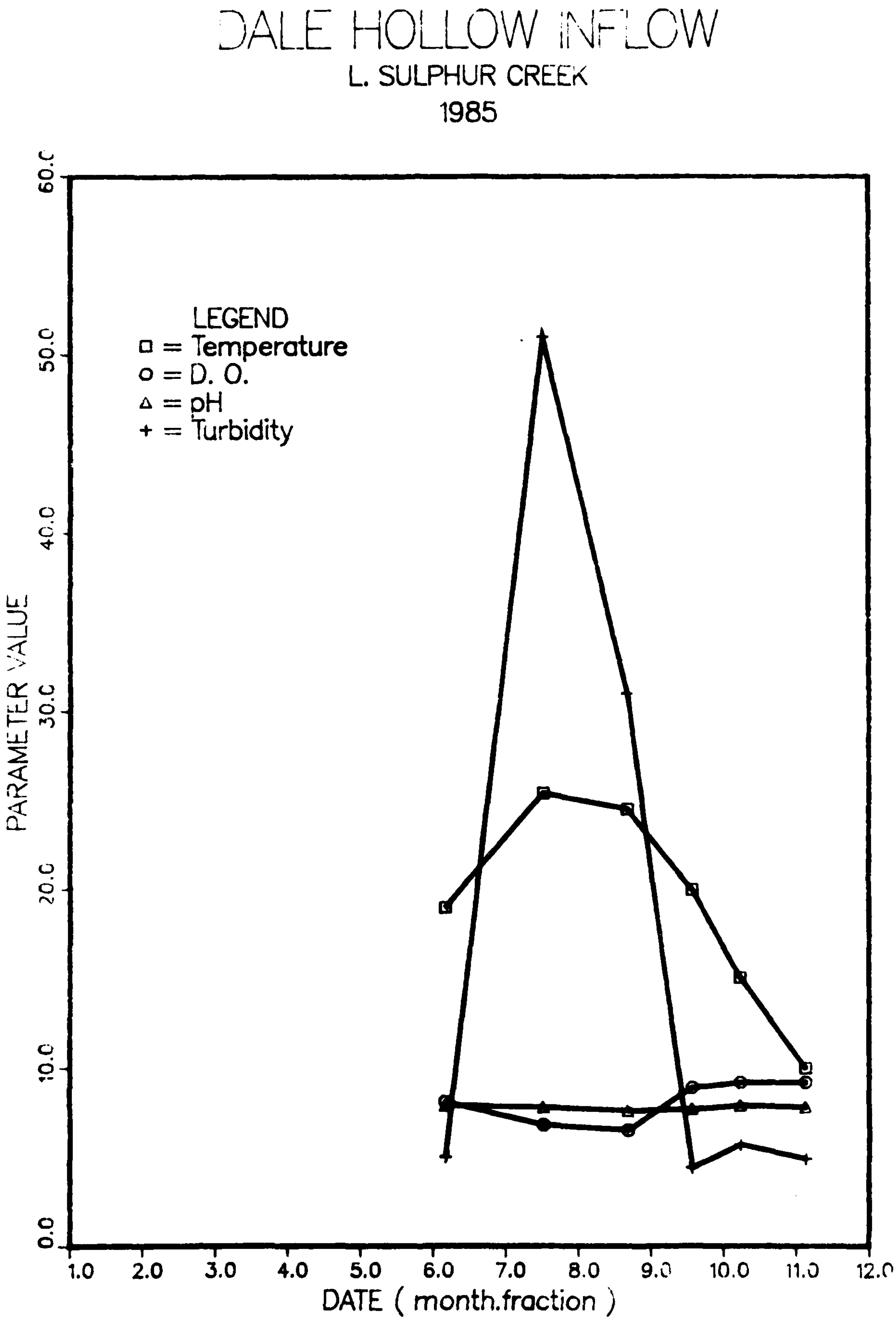

Figure 10. Water Quality in Little Sulphur Creek, 1985

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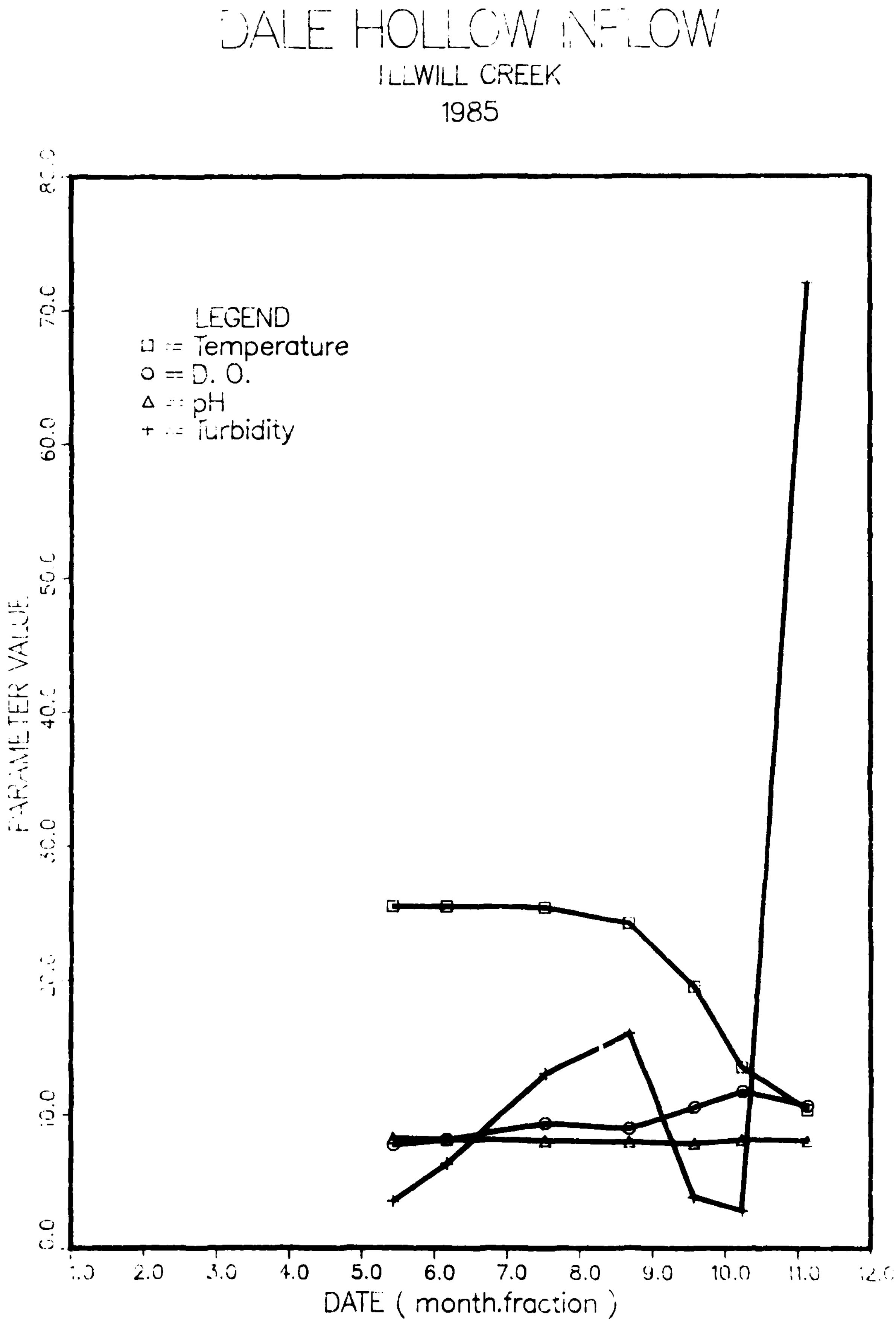

Figure 11. Water Quality in Illwill Creek, 1985

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12/31/85

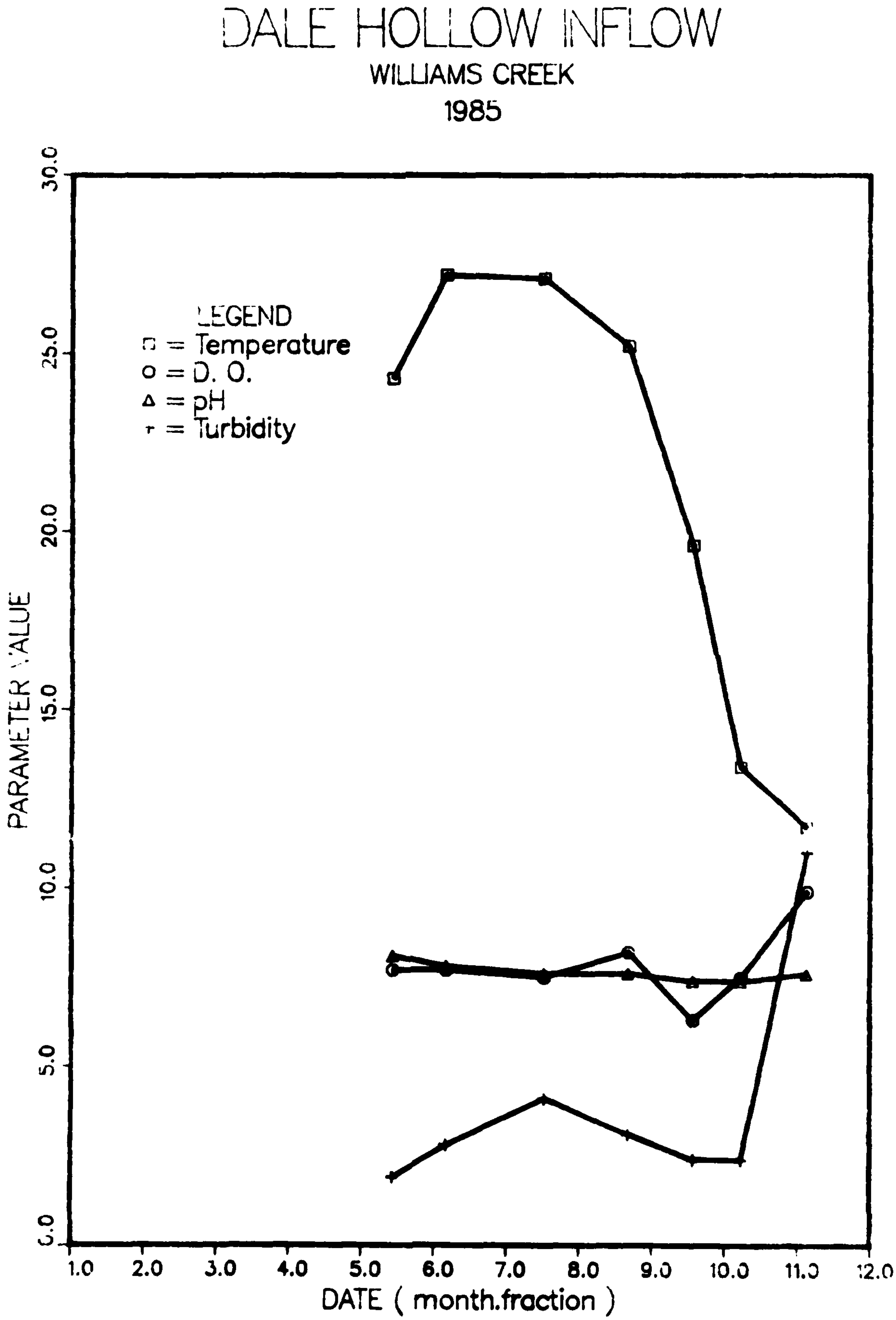

Figure 12. Water Quality in Williams Creek, 1985

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12/31/85

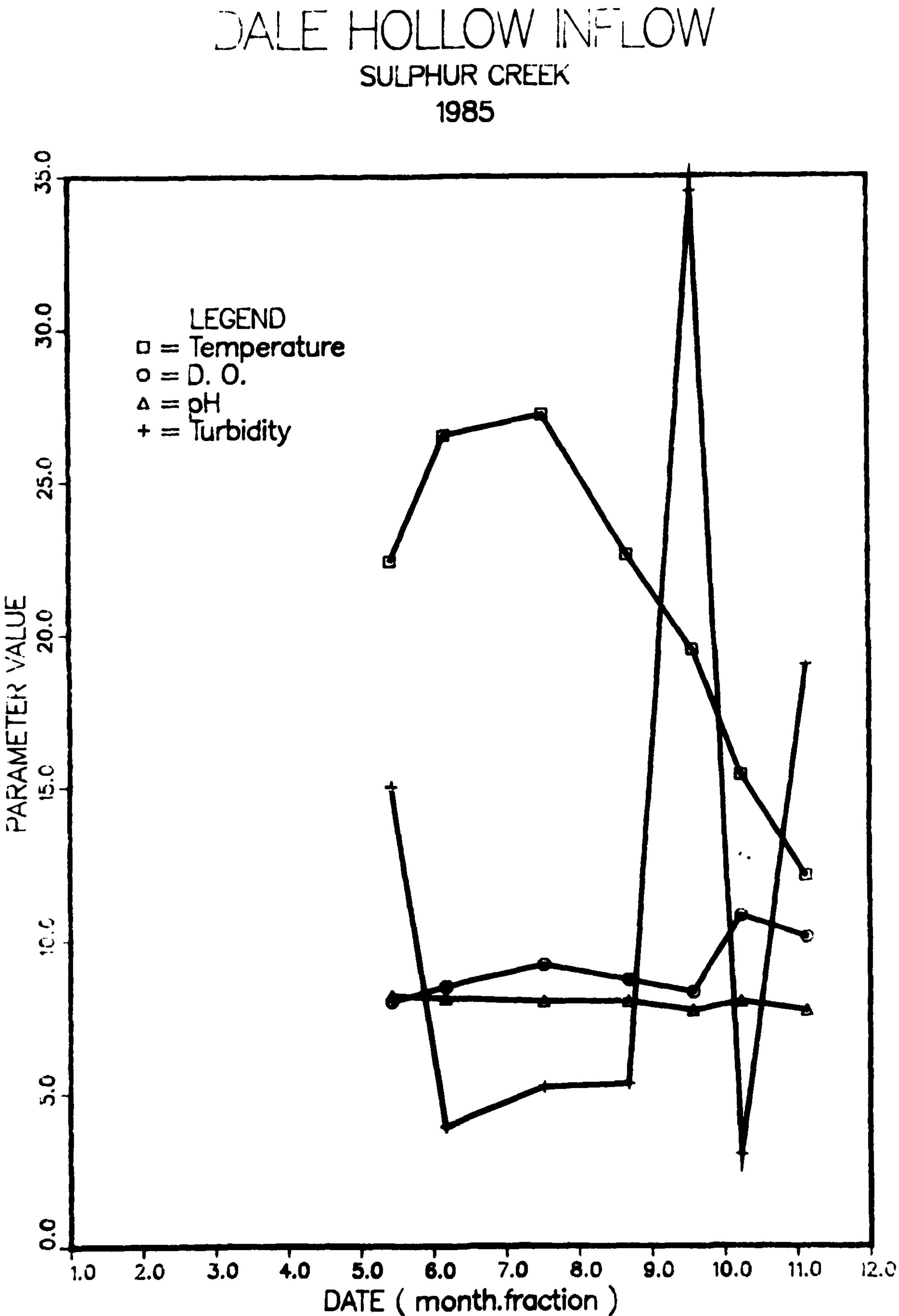

Figure 13. Water Quality in Sulphur Creek, 198

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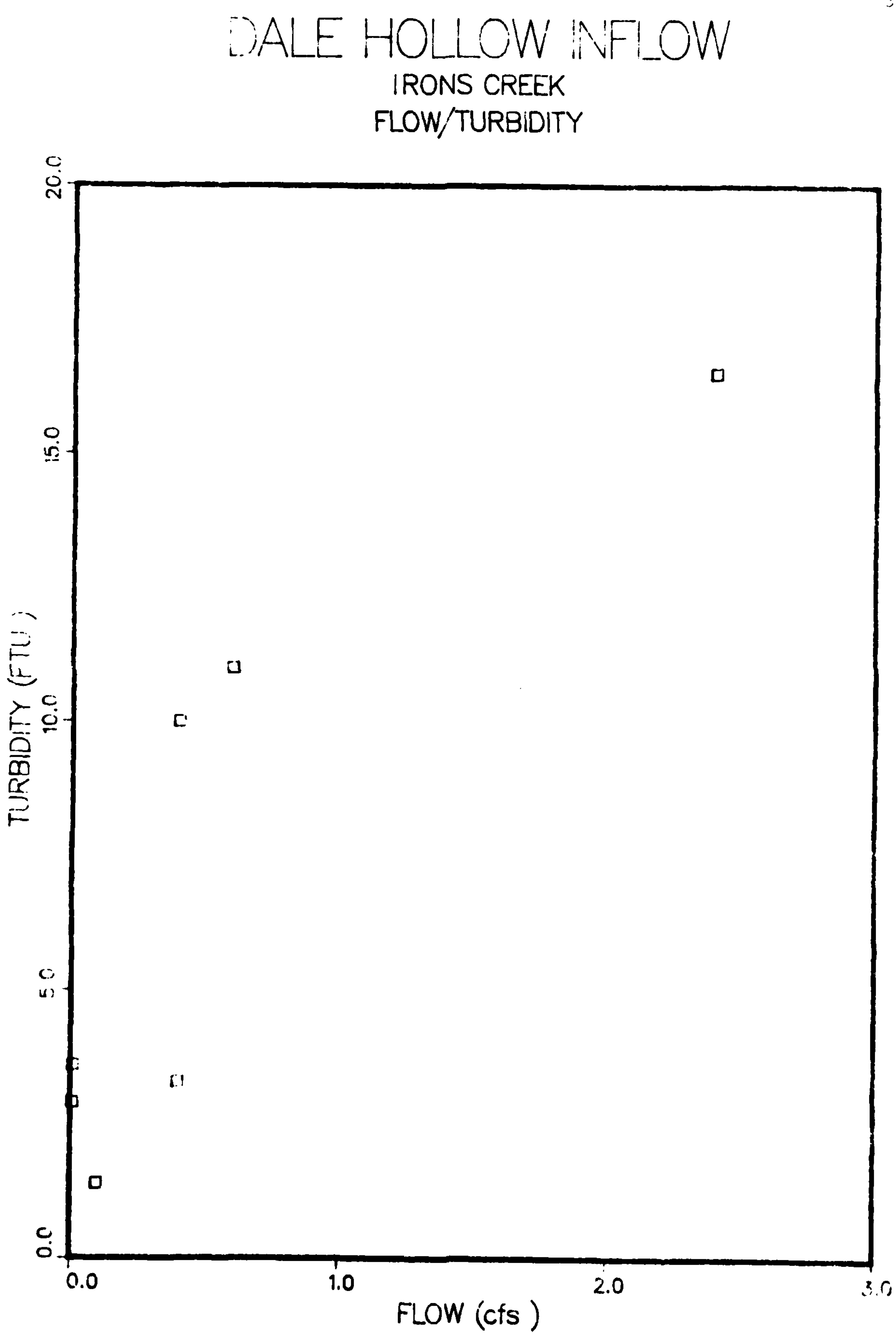

Figure 14. Flow vs. Turbidity in Irons Creek

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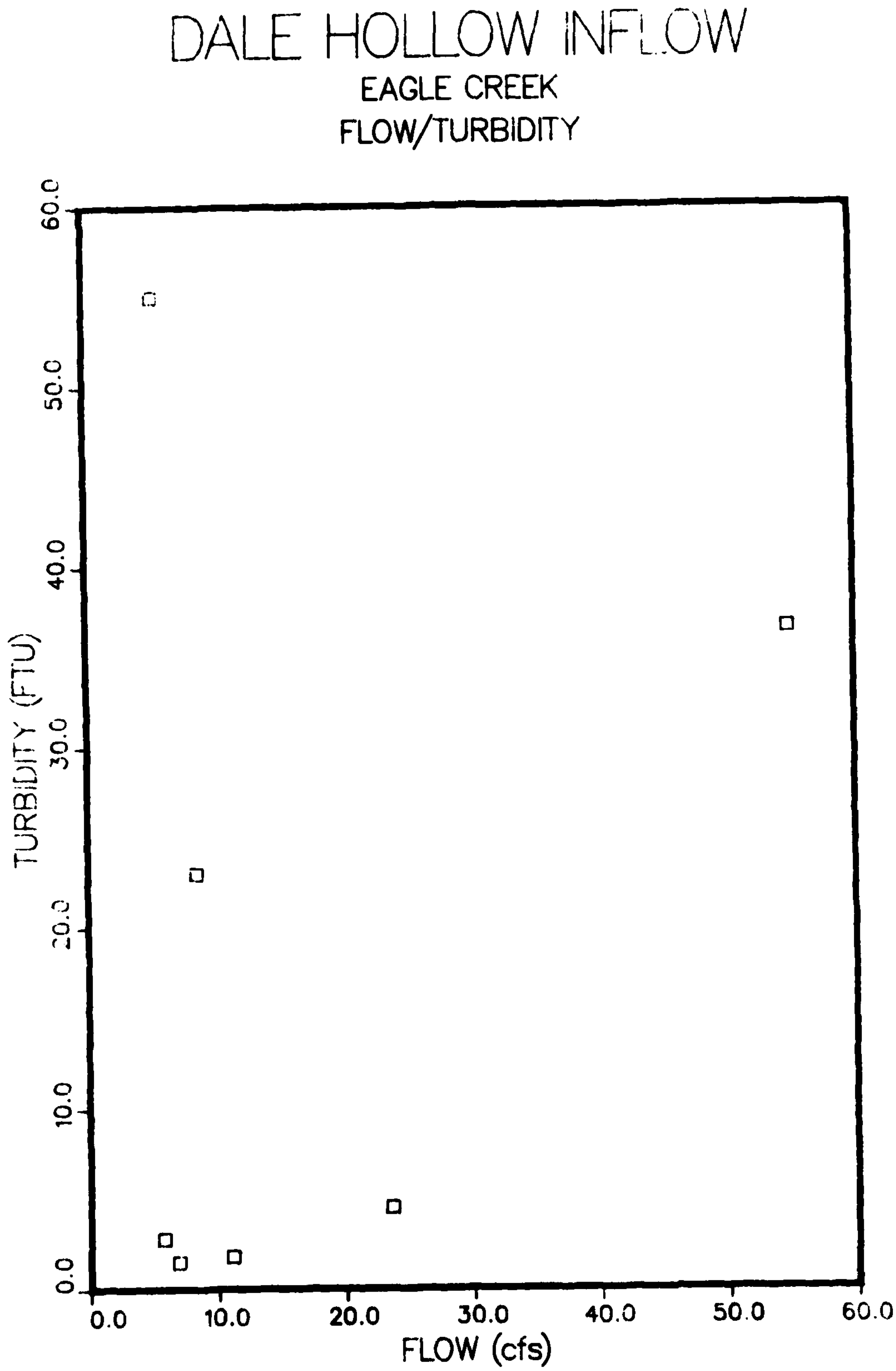

Figure 15. Flow vs. Turbidity in Eagle Creek

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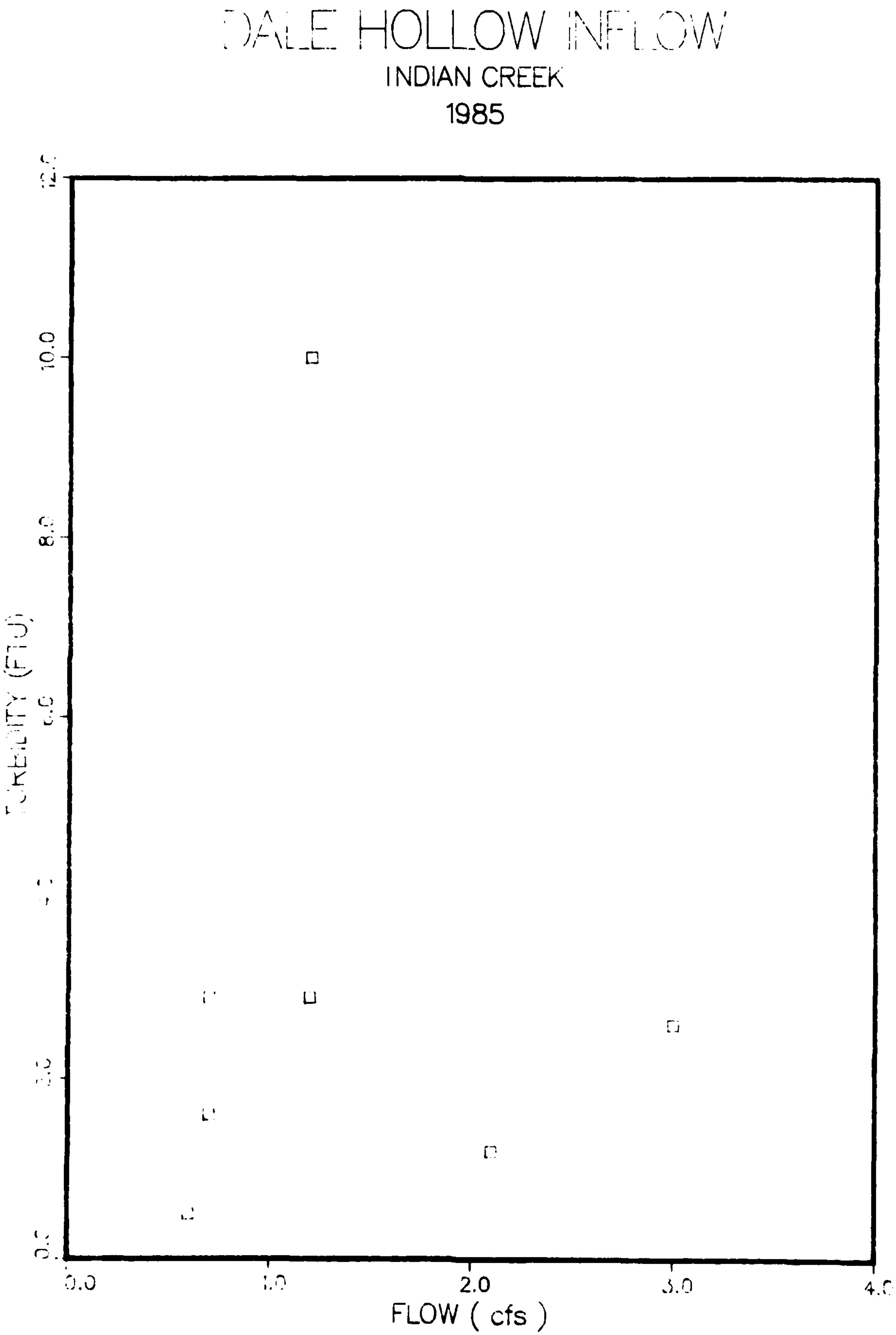

Figure 16. Flow vs. Turbidity in Indian Creek

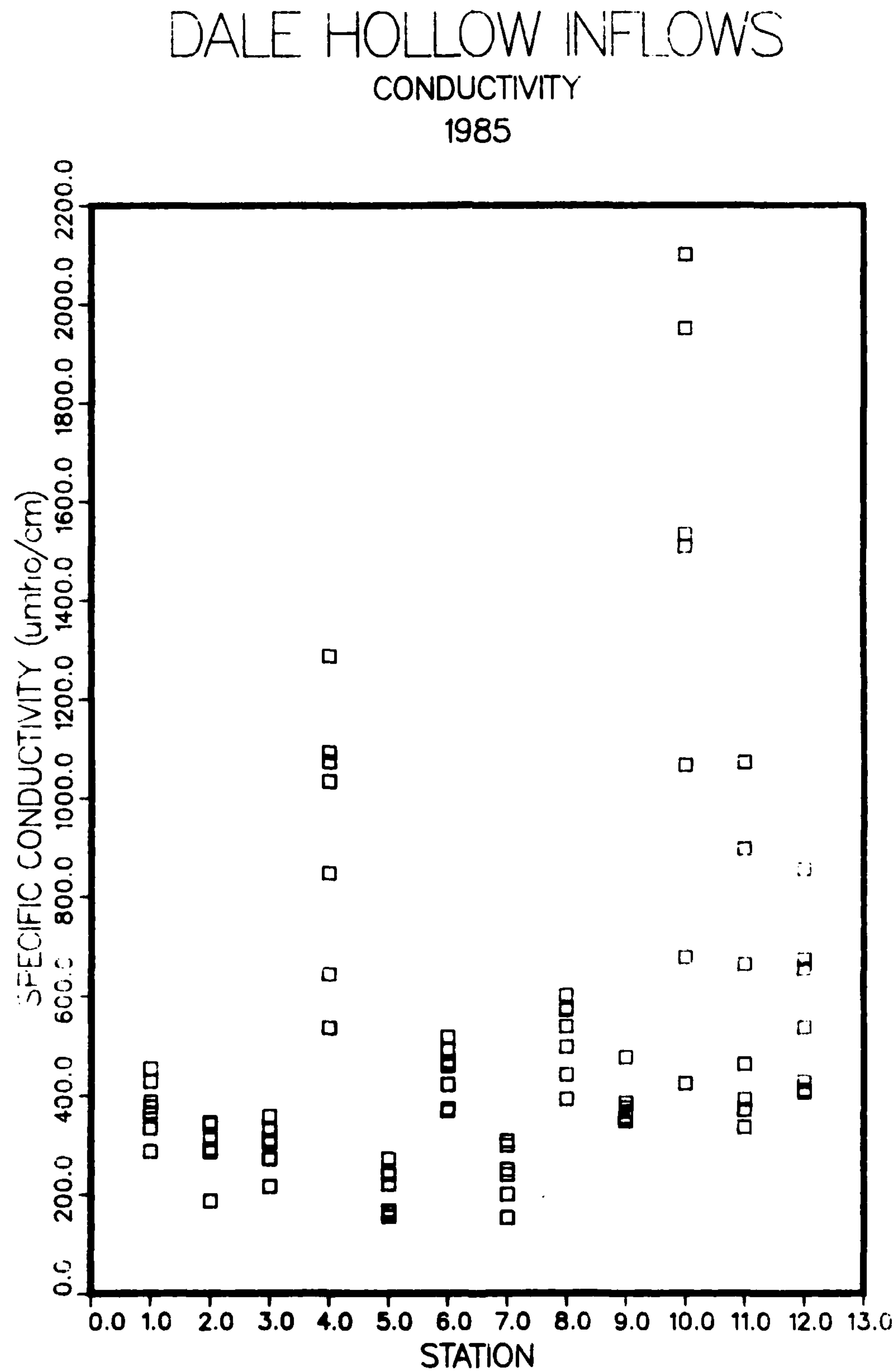

Figure 17. Conductivity of Dale Hollow Inflows, 1985

?/2/86

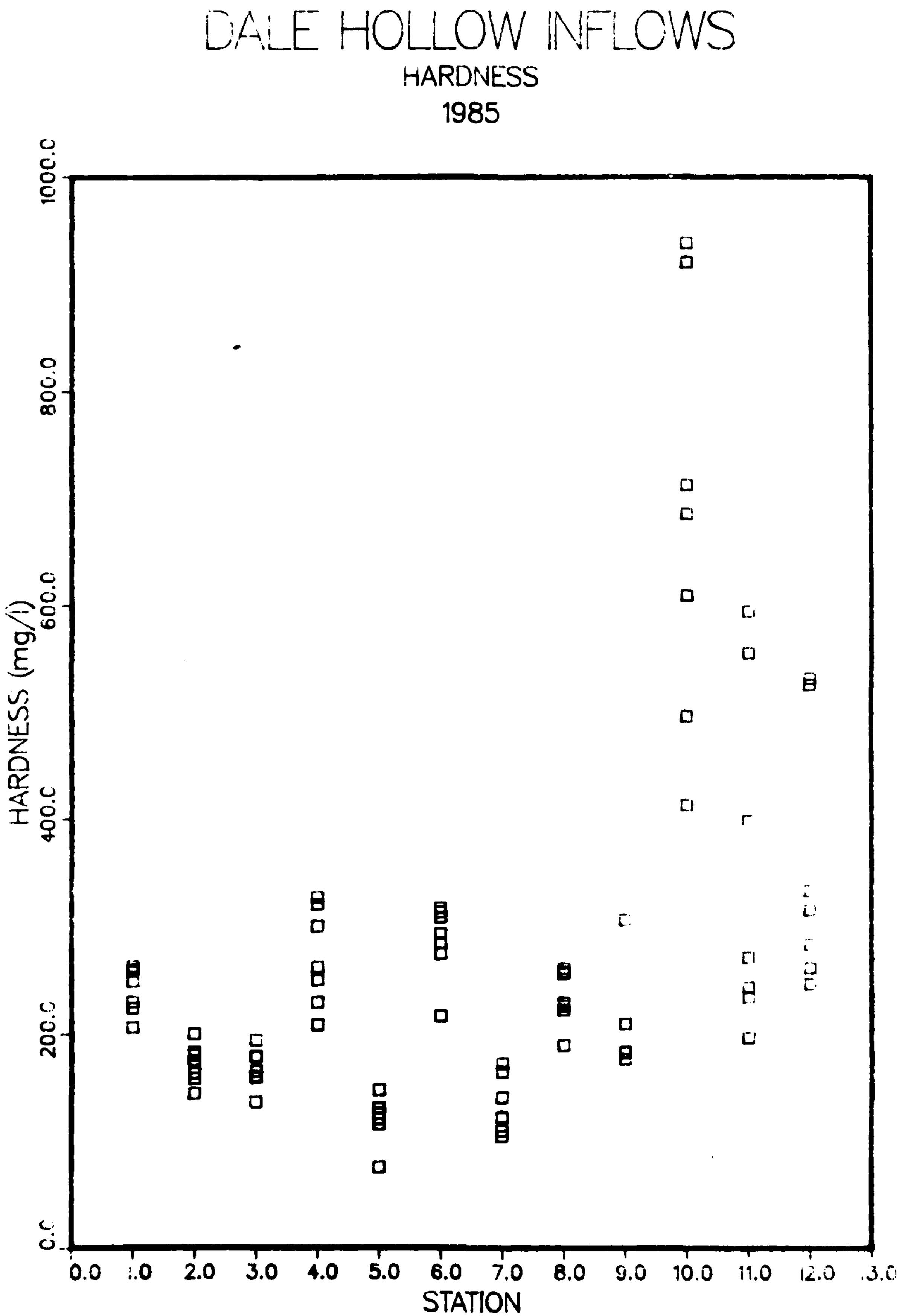

Figure 18. **Hardness in Dale Hollow Inflows, 1985**

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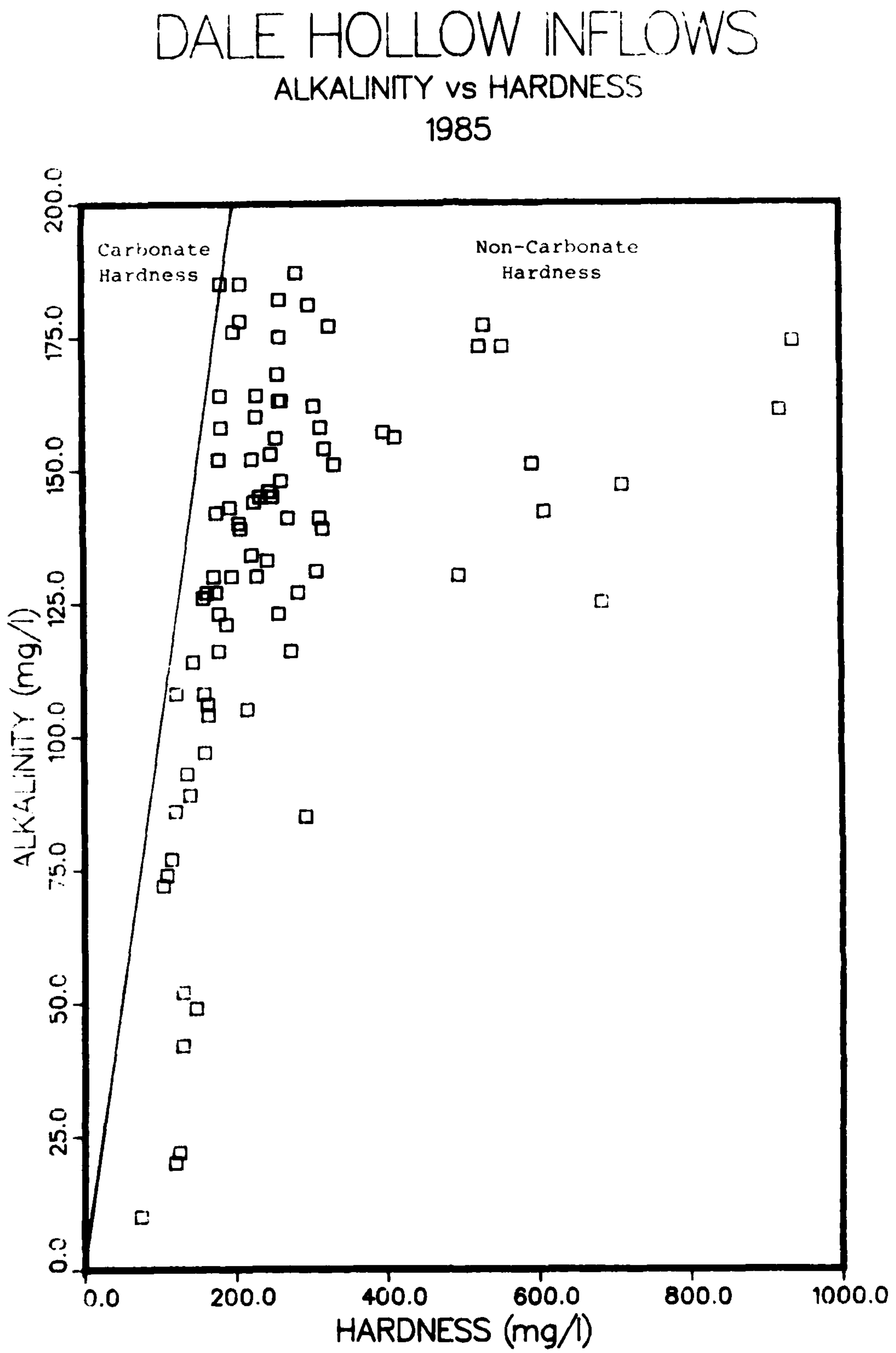

Figure 19. Hardness vs. Alkalinity for Dale Hollow Inflows

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86

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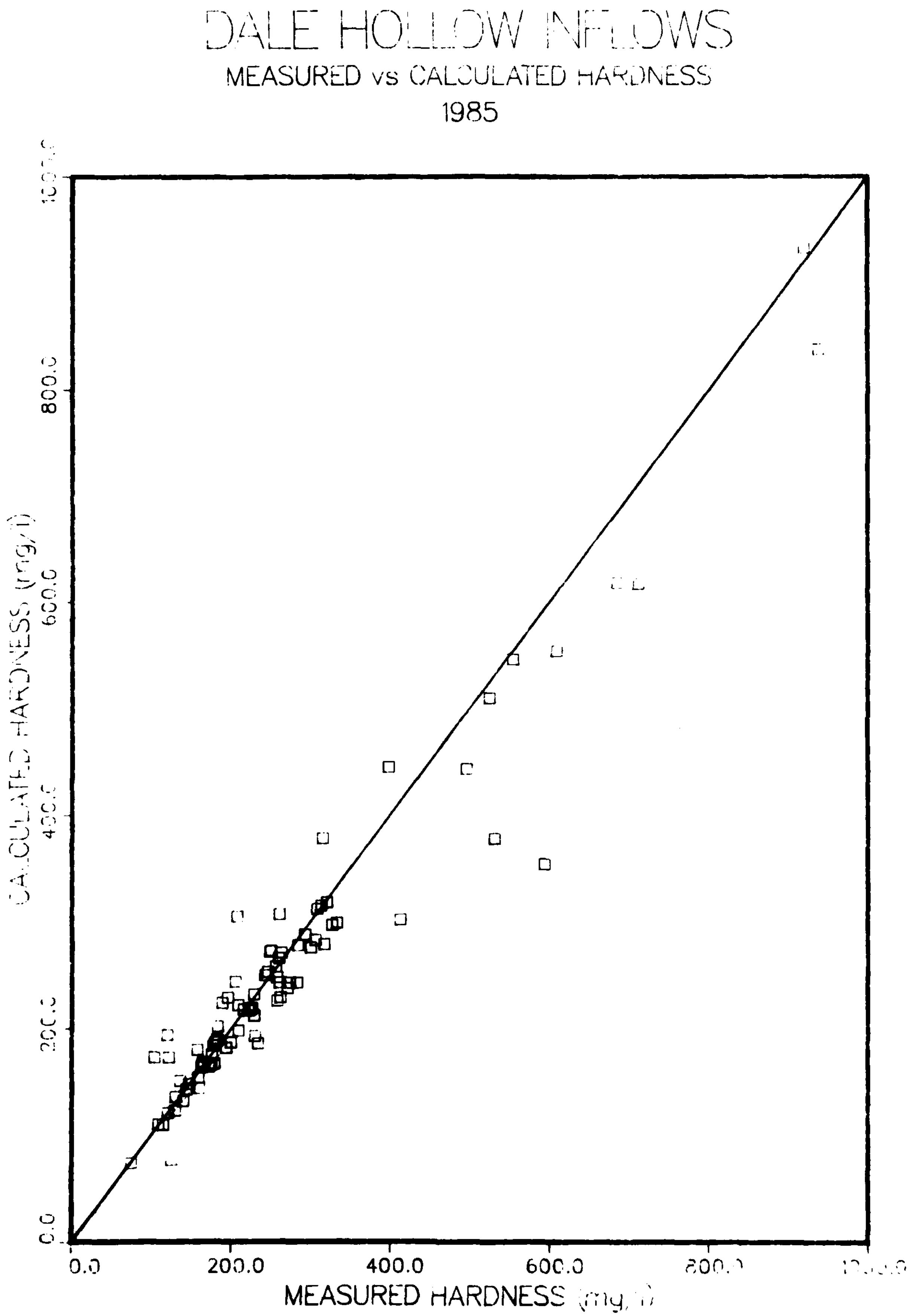

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Figure 20. Calculated vs. Measured Hardness for Dale Hollow I...
(Based Upon measured Ca and Mg)

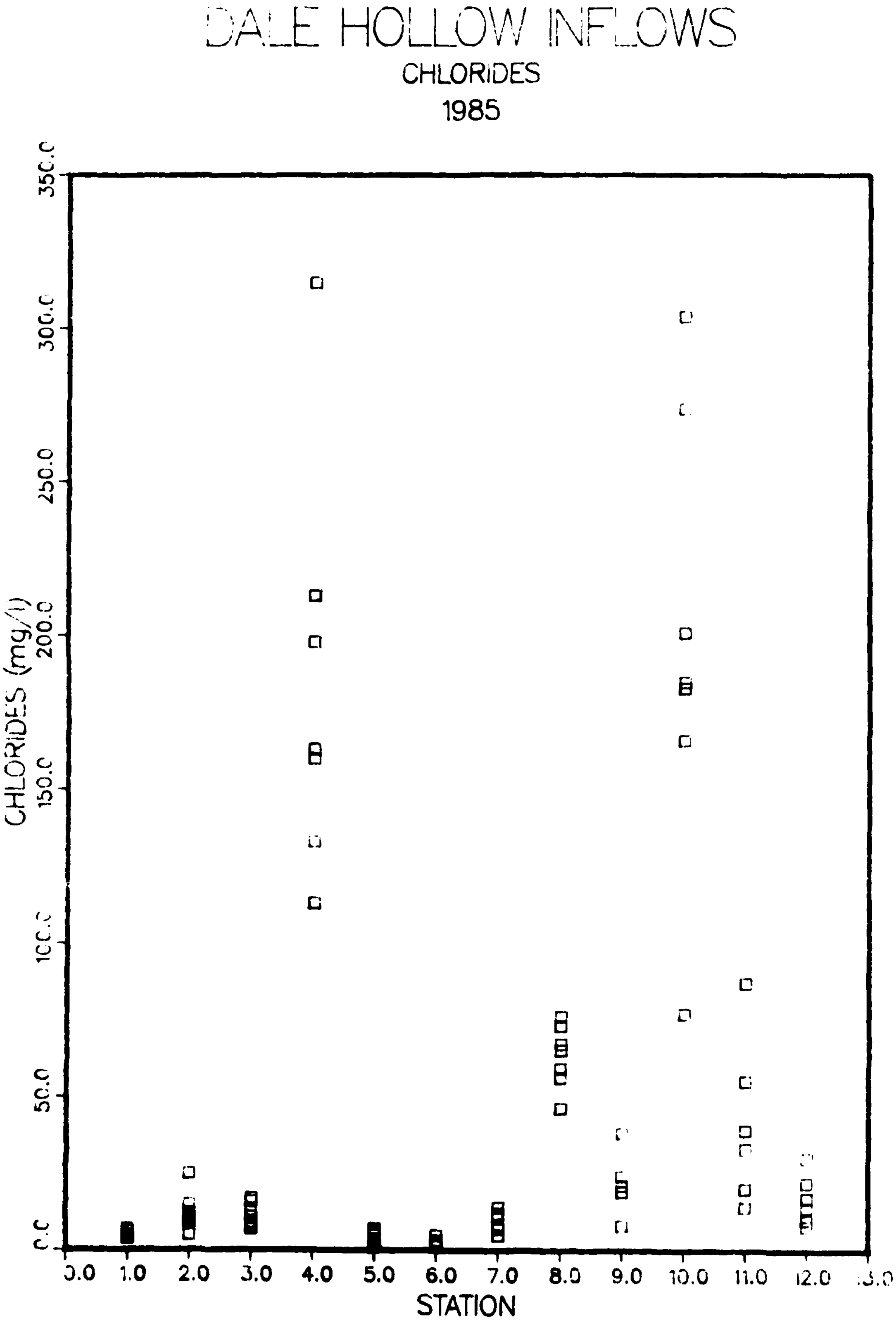

Figure 21. Chlorides in Dale Hollow Inflows, 198:

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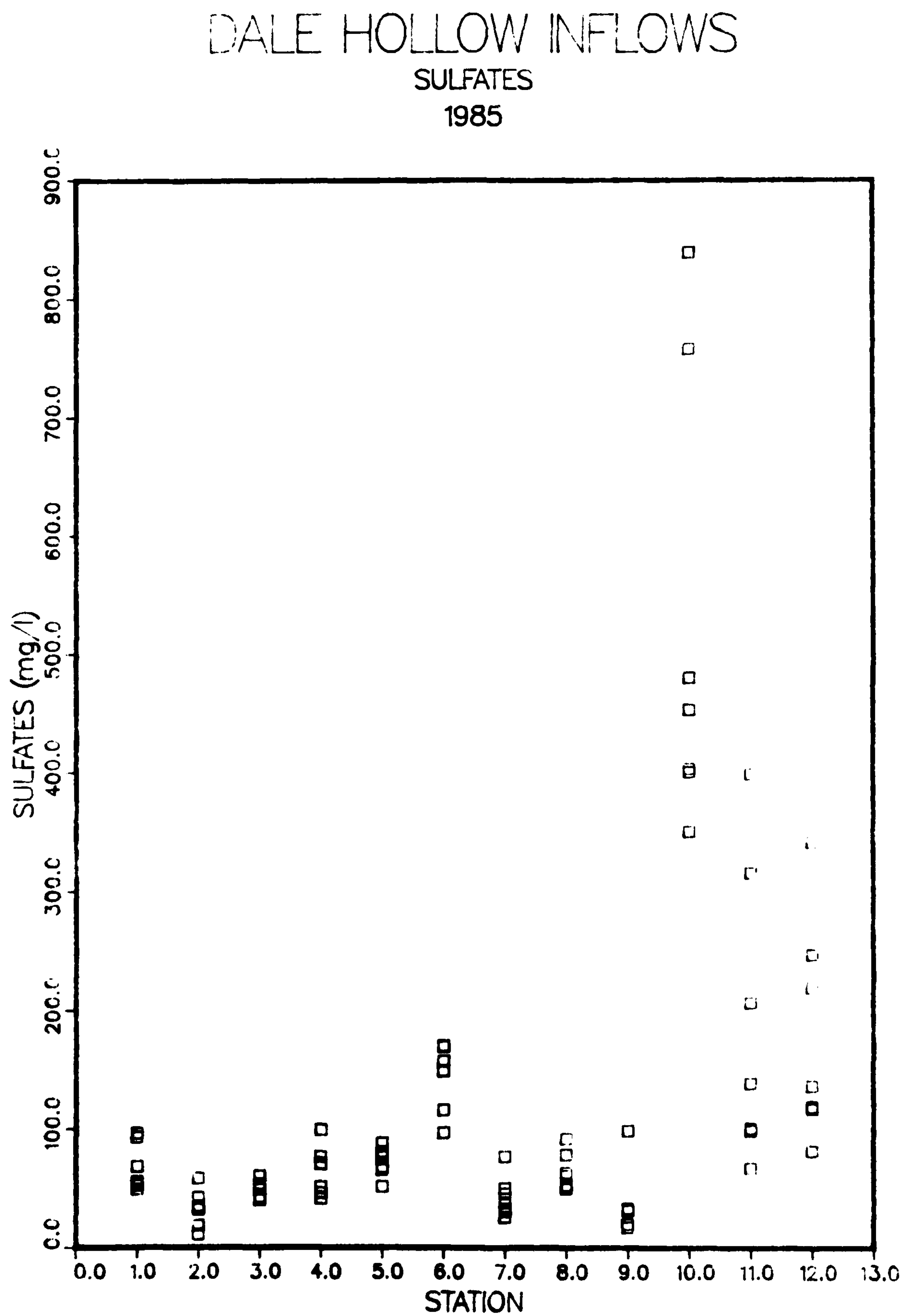

Figure 22. Sulfates in Dale Hollow Inflows, 198?

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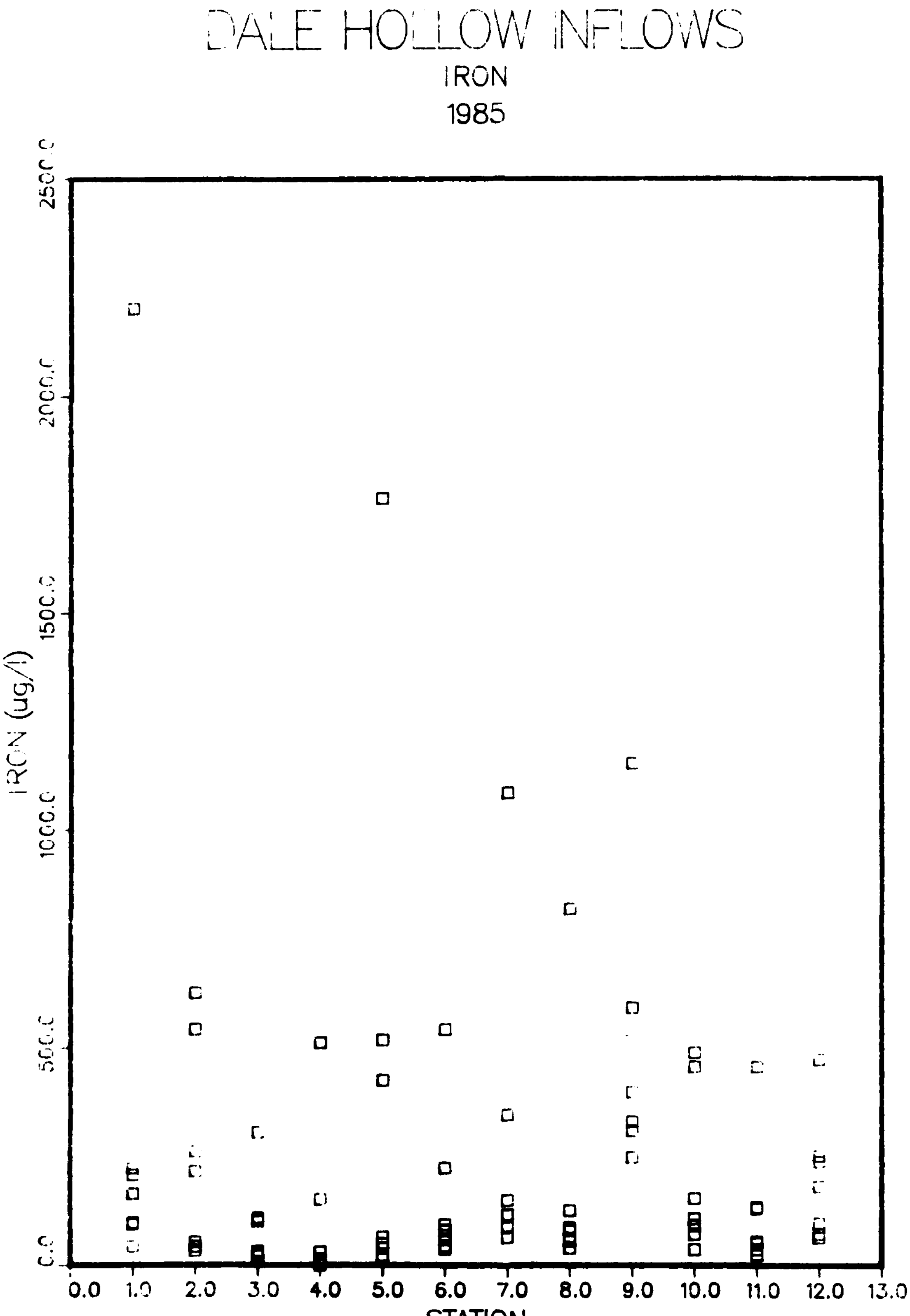

Figure 23. Iron in Dale Hollow Inflows, 1985

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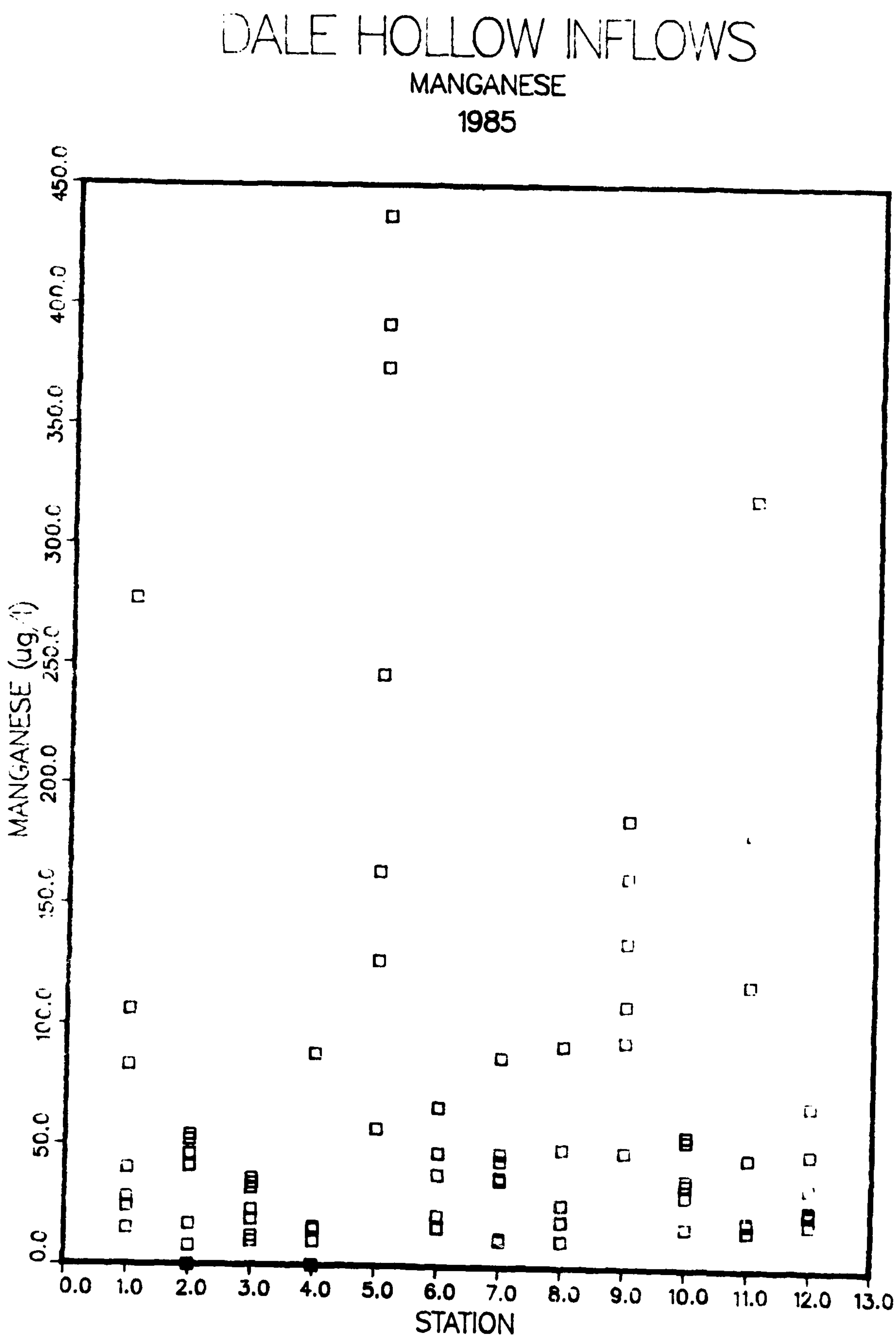

Figure 24. Manganese in Dale Hollow Inflows, 1985

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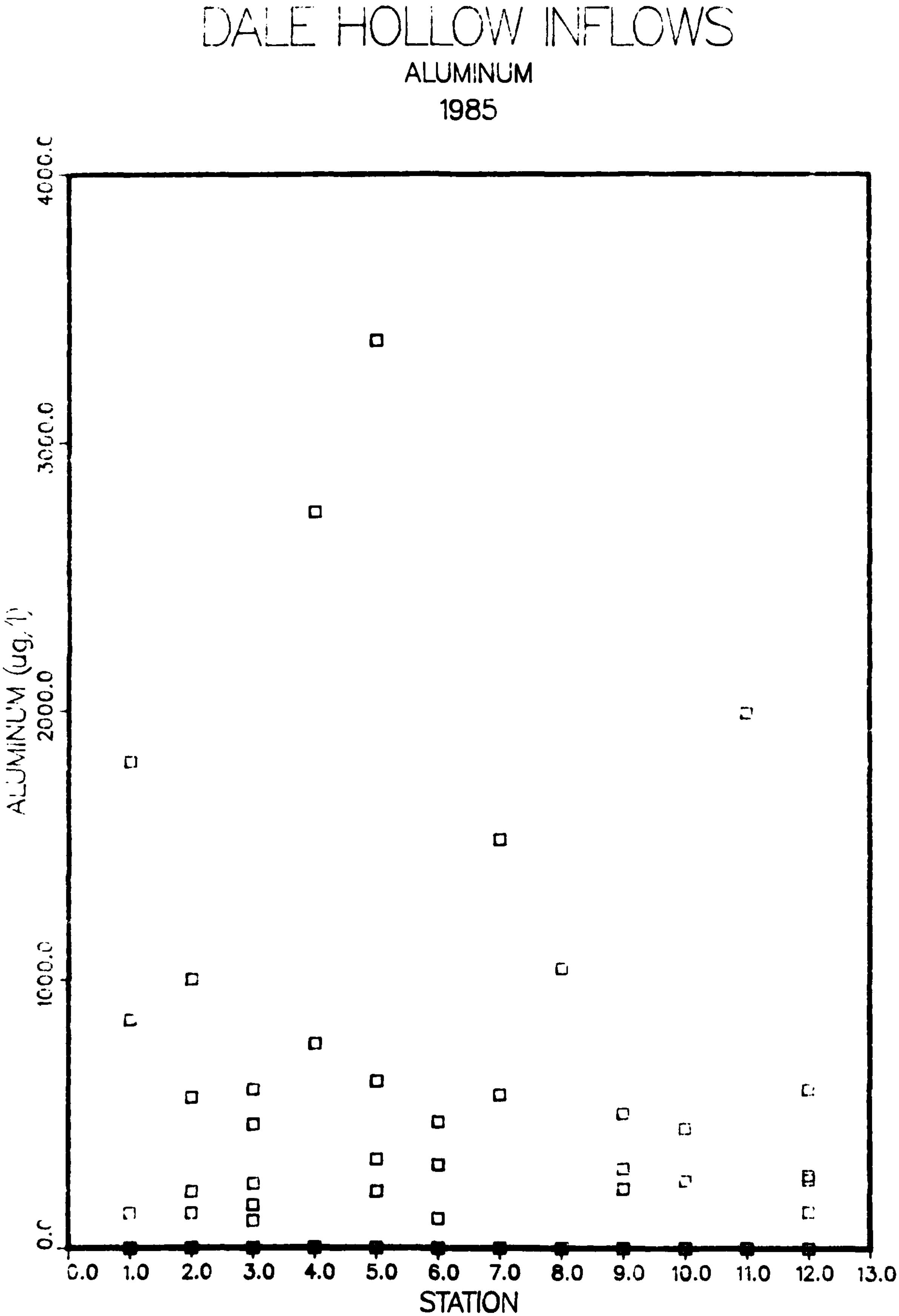

Figure 25. Aluminum in Dale Hollow Inflows, 1985

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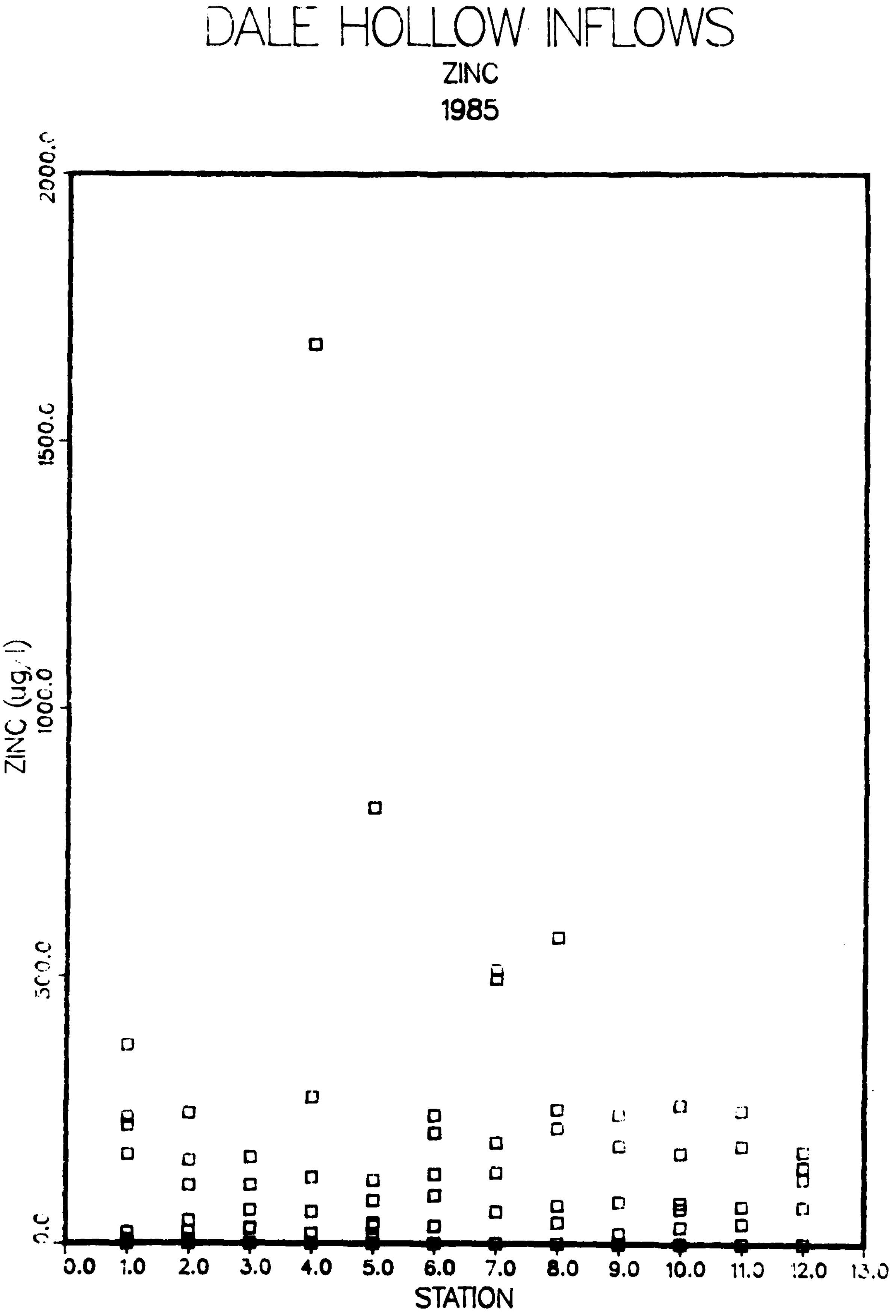
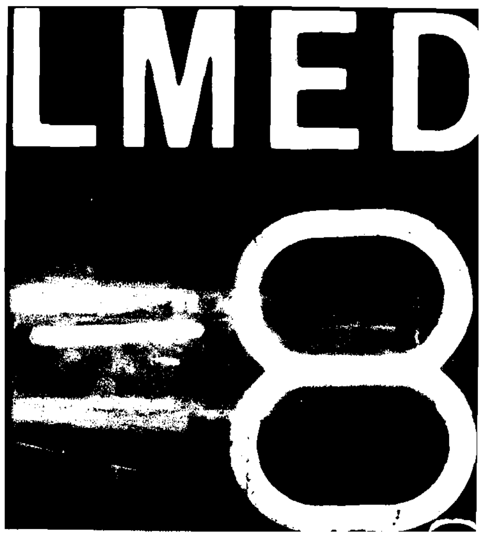


Figure 26. Zinc in Dale Hollow Inflows, 198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