

PERFORMANCE REPORT

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FEDERAL AID IN FISHERIES RESTORATION ACT

TEXAS

Federal Aid Project F-4-R-20

Region 2-A Fisheries Studies

Objective B-37: Fishery Management Recommendations

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## ABSTRACT

Quarterly surveys were conducted on Lakes Benbrook, Diversion, Garza Little Elm, and Hubbard Creek during this segment. Walleye evaluations were also made on Lakes Diversion and Garza-Little Elm.

Rough fish species, primarily smallmouth buffalo, river carpsucker, and gizzard shad, were predominant in all lakes except Hubbard Creek. White bass, white crappie, and channel catfish were the prevalent game fishes collected in all lakes. Six walleye were collected from Garza-Little Elm and four from Lake Diversion.

Stocking of four to six inch fingerling largemouth bass is recommended for Lake Benbrook. Walleye stockings should be continued on Garza-Little Elm Reservoir and discontinued on Lake Diversion in 1974.

PERFORMANCE REPORT

State: Texas Project Number: F-4-R-20

Project Title: Region 2-A Fisheries Studies

Project Section: Research and Surveys

Study Title: Fishery Management Recommendations

Contract Period: From January 1, 1973 To December 31, 1973

Program Narrative Objective Number: B-37

Objective: To determine the need for changes in fish harvest regulations, stocking population control, vegetation control, and contract fishing in Region 2-A waters.

I. Segment Objective

To determine the need for changes in fish harvest regulations, stocking, population control, vegetation control, and contract fishing in Region 2-A waters.

II. Summary of Progress

Proposed changes in fishing regulations for the Possum Kingdom Regulatory District were presented at public hearings in each county under Regulatory Authority in Region 2-A. The results of these hearings were presented to the Commissioners of the Texas Parks and Wildlife Department for consideration. The changes made in the fishing laws which affected Region 2-A are as follows:

Section 7.02 (c) iii The eight inch size limit on rainbow and brown trout was removed. The bag limit remained five in the aggregate with no possession limit.

Management surveys on Lakes Benbrook, Diversion, Garza-Little Elm, and Hubbard Creek were conducted quarterly during this segment. Walleye evaluations were also made on a quarterly basis on Lakes Diversion and Garza-Little Elm. From 5 to 15 gill nets, depending on reservoir size, were set overnight on each survey. Frame nets were added to survey methods on lakes being surveyed for walleye. Seine and water samples were also taken.

Fish collections were made primarily with standard experimental gill nets and minnow seines. Selection of stations for sampling were made as randomly as possible. Sites representing various habitat types were chosen. Experimental gill nets were 150 feet long, 6 feet deep, and had varying mesh sizes, in 25 foot sections, from 1 to 3½ inches. A representative sample of all fishes collected in gill nets were weighed and measured with the remainder being counted and bulk weighed. The same procedures were used for fishes caught in frame nets. Seining collections were made with a 20-foot common seine with 3/16-inch square mesh. Two 50 foot drags were made at each station. Fishes from both drags at each station were combined, sorted as to species, and counted.

Water quality information was taken in conjunction with each netting trip. Two stations, at the dam and near the upper end, were sampled on each lake. Samples were taken at 10 foot intervals from the surface to the bottom. Water analyses for temperature, dissolved oxygen, pH, specific conductivity, and turbidity were made using the following meters: oxygen and temperature-YSI dissolved oxygen meter; specific conductivity- YSI S-C-T meter; pH-IBC trophy pH meter. Turbidity was determined by means of a Hach colorimeter. Analyses for total alkalinity and hardness were made according to standard methods (A.P.H.A., 1971).

Observations were made on each survey to determine if aquatic vegetation was present in such quantities as to hamper access or fishability of fishing areas. Vegetation was not considered a problem on any of the reservoirs surveyed this segment.

Assistance was given hatchery personnel with stocking walleye fry and fingerlings in Lakes Diversion, Eagle Mountain, Garza-Little Elm, and Possum Kingdom. Fishes were tempered and released in open water areas.

Table 1 is a checklist of all fishes taken in the netting and seining collections in Region 2-A waters this segment. Common and scientific names are based on American Fisheries Society, Special Publication No. 6, A List of Common and Scientific Names of Fishes from the United States and Canada (Third Edition, 1970). Only common names are used in this report.

#### Lake Benbrook

Lake Benbrook, impounded in 1952, is a 3,770 surface acre lake located on the Clear Fork of the Trinity River drainage in Tarrant County. At normal pool level the mean depth is 23.4 feet with a maximum depth of 75 feet. Controlled by the Corps of Engineers, the lake is used for flood control, municipal water supply, and recreation. Most of the 40 miles of shoreline is accessible and provides maximum usage by fishermen, especially in the spring and summer months.

Five gill nets were set overnight on each survey (Figure 2). Rough fishes were the predominant species caught by number (57.74%) and by weight (80.93%) with spotted sucker, river carpsucker, and gizzard shad prevailing (Table 3). This was the trend until the last survey (Figure 1). In November, numbers and weights of game fishes increased. White bass, bluegill, and white crappie were caught in good numbers. Game or rough fishes were not predominant at any one station, except for station No. 1 where a much larger percentage of rough fishes were usually caught. A point noted on netting data was that smallmouth buffalo and gar were not caught. This is quite different from other Region 2-A lakes.

Seining collections were made during each survey at five stations. Seining efforts produced large numbers of forage with 13 species being collected (Table 2). Mississippi silverside, blacktail shiner, bullhead minnow, and red shiner were caught in largest quantities. There was a noted scarcity of young-of-the-year game fishes in seine collections.

Water samples were taken during each survey (Table 4). Water temperature, dissolved oxygen, and pH profiles in the June and September sampling indicated the lake stratifies to some degree.

### Lake Diversion

Impounded in 1924, Lake Diversion is a 3,419 surface acre lake on the Wichita River drainage in Archer County. It is rather shallow with a mean depth of 12 feet and maximum depth of 35 feet with poor access to its 28 miles of shoreline. Controlled by the Wichita County Water Improvement District No. 2, and the City of Wichita Falls, the lake serves primarily as a source for irrigation water for Wichita County farmers and ranchers and as a water supply for area municipalities with some recreational uses.

Six gill nets were set overnight on each survey (Figure 3). Rough fish species were predominant on all surveys by number (75.55%) and by weight (87.98%) (Table 5). This trend can be easily seen on Figure 1. Fishes most abundant were gizzard shad, smallmouth buffalo, and river carp-sucker. Three walleye, the largest weighing 2 pounds 12 ounces, were recovered in gill nets.

Frame nets were set on the last three surveys of the year to collect walleye. One walleye weighing .75 pounds was recovered. Game fish greatly outnumbered (91.73%) rough fish caught in the frame nets (Table 6).

Seine collections were attempted at 10 stations on each survey. Due to large fluctuation in water level, stumps, and large rocks, seining was nearly impossible. In the samples that were collected, a total of 19 species were represented (Table 2). Very low numbers of all species were collected. No walleye were recovered in night seining.

Water samples were taken on each survey (Table 7). Chloride (1599 mg/l) and specific conductivity (4150 umoh/cm) readings were high when compared to other lakes surveyed. On all surveys the water was quite turbid (Secchi disc average 12-24 inches). Due to its shallow nature and wind action, physicochemical stratification is doubtful. This is also indicated from temperature and dissolved oxygen profiles during summer sampling.

### Garza-Little Elm Reservoir

Garza-Little Elm, impounded in 1955, is the largest reservoir (39,080 surface acres), in Region 2-A. Located in Denton County, the lake draws sportsmen from a large area due to good access to its 183 miles of shoreline and fine outdoor facilities. Maximum depth is 67 feet with a mean depth of 25 feet. Controlled by the Corps of Engineers, the lake is used for flood control, municipal and industrial water supply, and recreation. Walleye have been stocked in the lake for the past two years.

A total of 15 gill nets were set on each quarterly survey. Stations were selected to provide maximum diversity of fishes collected (Figure 5). Rough fishes were predominant by number (64.22%) and by weight (86.08%) with river carpsucker, smallmouth buffalo, and longnose gar most abundant (Table 8). See Figure 4 for game fish percentages for each survey. White bass and white crappie were the prevalent game fishes caught. Six walleye, weighing a total of 5.78 pounds, were also caught in gill nets. Four of these fish were caught at station No. 4, off the dam.

Frame nets were also set on the last three surveys in an attempt to recover walleye, but none were taken. Game fishes were prevalent by

number(74.30%) and by weight (83.55%). White crappie and bluegill were caught in largest numbers with threadfin shad accounting for the majority of the rough fishes (Table 9).

Seine collections were attempted at 15 stations during each survey. High water on two of the surveys hampered efforts and had a varying effect on catch at a few stations. Eighteen species were represented with Mississippi silverside and threadfin shad being caught in largest numbers (Table 2). No walleye were recovered from night time seining.

Dissolved oxygen profiles for the August survey indicated the lake did chemically stratify. As also indicated by the readings of other parameters measured, the middle of the thermocline was about 25-30 feet deep (Table 10). Temperature readings did not drop off as quickly as would be expected in the area of the thermocline.

#### Hubbard Creek Reservoir

Hubbard Creek Reservoir, located in Stephens County, is a 15,250 surface acre lake on the Big Sandy Creek tributary of the Brazos River. At normal pool level, the maximum depth is 70 feet with a mean depth of 20.84 feet. During this segment the lake level was five to twelve feet below normal. Fishermen access to the 130 miles of shoreline is limited. Impounded in 1962, the lake is controlled by the West Central Texas Municipal Water District and used primarily for industrial, mining, and municipal water supply.

A total of 15 gill nets were set during two nights, on each survey (Figure 6). Station positions changed slightly each survey due to decreasing water levels. Game fish were caught in largest numbers (56.27%) but rough fishes in greater poundage (73.70%). The percentage of game fishes collected was consistently greater with each survey (Figure 4). Species caught in greatest numbers were white crappie, smallmouth buffalo, channel catfish, river carpsucker, and gizzard shad, respectively (Table 11). White bass, common to most other Region 2-A reservoirs were not collected in Hubbard Creek.

Seining collections were made at 10 stations on each survey (Figure 6). Stations were in close proximity to each other due to the rough weather encountered on each survey. Fish species caught at each station were relatively the same with red shiners and gizzard shad being prevalent. Seventeen species were represented in seining samples (Table 2).

Water samples were taken near the dam and at the Highway 180 bridge. Profiles of dissolved oxygen and water temperature in the warm summer months indicated the lake did not stratify (Table 12). This was possibly due to large water level fluctuations and prevailing strong winds.

#### III. Significant Deviation:

There was no deviation from the planned schedule this segment.

#### IV. Conclusions and Recommendations:

From netting results this segment, it is fairly evident that Lake

Benbrook has good populations of white bass, white crappie, and bluegill. Fishermen using the lake primarily fish for these species. Trotline fishermen also have good success fishing for flathead and channel catfish.

Comparing this year's results with surveys of 1970, game fish percentages have increased from 21% to 42%. But there is an obvious deficiency of both adult and young-of-the year largemouth bass. Evidently some factor in the aquatic community is inhibiting a successful largemouth bass spawn to any degree. Due to the small recoveries in this year's survey and in the survey in 1970, it is recommended that largemouth bass be stocked. This should be accomplished when hatchery supplies are adequate to supply 4 to 6 inch fingerlings that could be marked to evaluate the success of such a stocking.

In surveys the last three years Lake Diversion has had a declining percentage of game fish captures. Due to drastic water level fluctuations this year and previous years, fish populations may have moved out of the stable state common to old lakes and is now more cyclic. Surveys in 1974 may see an increase in game fish captures.

Walleye stocking in Lake Diversion has been pursued since 1969. In 1972 and 1973 a total of 1,807,475 fry and fingerlings, a rate of 529/acre, were stocked. With this many walleye being stocked more should have been recovered. Only four were recovered this year and none last year. Based on recovery data on gill nets, frame nets, and seining, it is recommended that walleye stockings should not be undertaken in 1974. Walleye surveys will be conducted on the lake in 1974. If netting and seining efforts produce young-of-the-year walleye, a limited stocking is suggested to possibly provide a nursery stock for the Dundee State Fish Hatchery. The walleye planned for this year's stocking of Lake Diversion could be better utilized in a lake with better fishermen appeal and access.

As indicated by netting results, Garza-Little Elm Reservoir had a good white bass and white crappie population. From surveys the last three years game fish percentages have been in the 35-45% range. This is good when the selectivity of gill nets is taken into consideration. Numbers of largemouth bass captured have been low in past years, but fishermen still have relatively good luck catching them. Most people fish primarily for the two species in greatest abundance, white bass and white crappie.

Walleye have been stocked in Garza-Little Elm Reservoir for the past two years. A total of 743,550 fingerlings, a rate of 19/acre, have been stocked. Six walleye were recovered this year with all fish being in excellent shape. There have also been reported catches by fishermen. The lake is highly utilized by fishermen and shows promise as being a good walleye lake. It is recommended that walleye stockings be continued in 1974.

As in the 1971 survey of Hubbard Creek Reservoir, the percentage of game fishes captured was greater than that of rough fishes. From this year's data, largemouth bass, channel catfish, and white crappie seem to be well established in the lake. Fishermen have had good success catching all three fish, but have been hampered this year as far as access to the lake because of low water levels. Water level fluctuations this year possibly helped control the numbers of rough fishes. The lowering water levels concentrated prey species enabling predators to crop them easier. Due to the favorable

game fish-rough fish ratio, no management practices are recommended.

In 1974, surveys will be conducted on lakes in Region 2-A that have been stocked with walleye. These are Lakes Diversion, Eagle Mountain, Garza-Little Elm, and Possum Kingdom. Standardized walleye evaluation procedures will be used on all lakes.

V. Prepared by: Robert B. Gamble  
Assistant Project Leader

Date: December 17, 1973

Robert L. Bounds  
Region 2 Inland Fisheries  
Director

Approved by: *Louis L. Pritchard*  
Dingell-Johnson Coordinator

Table 1

Checklist for Fish Species Collected in Region 2-A in 1973

<u>Common Name</u>	<u>Scientific Name</u>
Spotted gar	<u>Lepisosteus oculatus</u>
Longnose gar	<u>L. osseus</u>
Shortnose gar	<u>L. platostomus</u>
Gizzard shad	<u>Dorosoma cepedianum</u>
Threadfin shad	<u>D. petenense</u>
Carp	<u>Cyprinus carpio</u>
Silvery minnow	<u>Hybognathus nuchalis</u>
Golden shiner	<u>Notemigonus crysoleucas</u>
Pugnose minnow	<u>Notropis emiliae</u>
Red shiner	<u>N. lutrensis</u>
Sharpnose shiner	<u>N. oxyrhynchus</u>
Silverband shiner	<u>N. shumardi</u>
Blacktail shiner	<u>N. venustus</u>
Mimic shiner	<u>N. volucellus</u>
Suckermouth minnow	<u>Phenacobius mirabilis</u>
Fathead minnow	<u>Pimephales promelas</u>
Bullhead minnow	<u>P. vigilax</u>
River carpsucker	<u>Carpiodes carpio</u>
Smallmouth buffalo	<u>Ictiobus bubalus</u>
Spotted sucker	<u>Minytrema melanops</u>
Gray redhorse	<u>Moxostoma congestum</u>
Blue catfish	<u>Ictalurus furcatus</u>
Channel catfish	<u>I. punctatus</u>
Flathead catfish	<u>Pylodictis olivaris</u>
Red River pupfish	<u>Cyprinodon rubrofluviatilis</u>
Mosquitofish	<u>Gambusia affinis</u>
Mississippi silverside	<u>Menidia audens</u>
White bass	<u>Morone chrysops</u>
Green sunfish	<u>Lepomis cyanellus</u>
Warmouth	<u>L. gulosus</u>
Orangespotted sunfish	<u>L. humilis</u>
Bluegill	<u>L. macrochirus</u>
Longear sunfish	<u>L. megalotis</u>
Redear sunfish	<u>L. microlophus</u>
Spotted bass	<u>Micropterus punctulatus</u>
Largemouth bass	<u>M. salmoides</u>
White crappie	<u>Pomoxis annularis</u>
Black crappie	<u>P. nigromaculatus</u>
Bluntnose darter	<u>Etheostoma chlorosomum</u>
Logperch	<u>Percina caprodes</u>
Walleye	<u>Stizostedion vitreum vitreum</u>
Freshwater drum	<u>Aplodinotus grunniens</u>

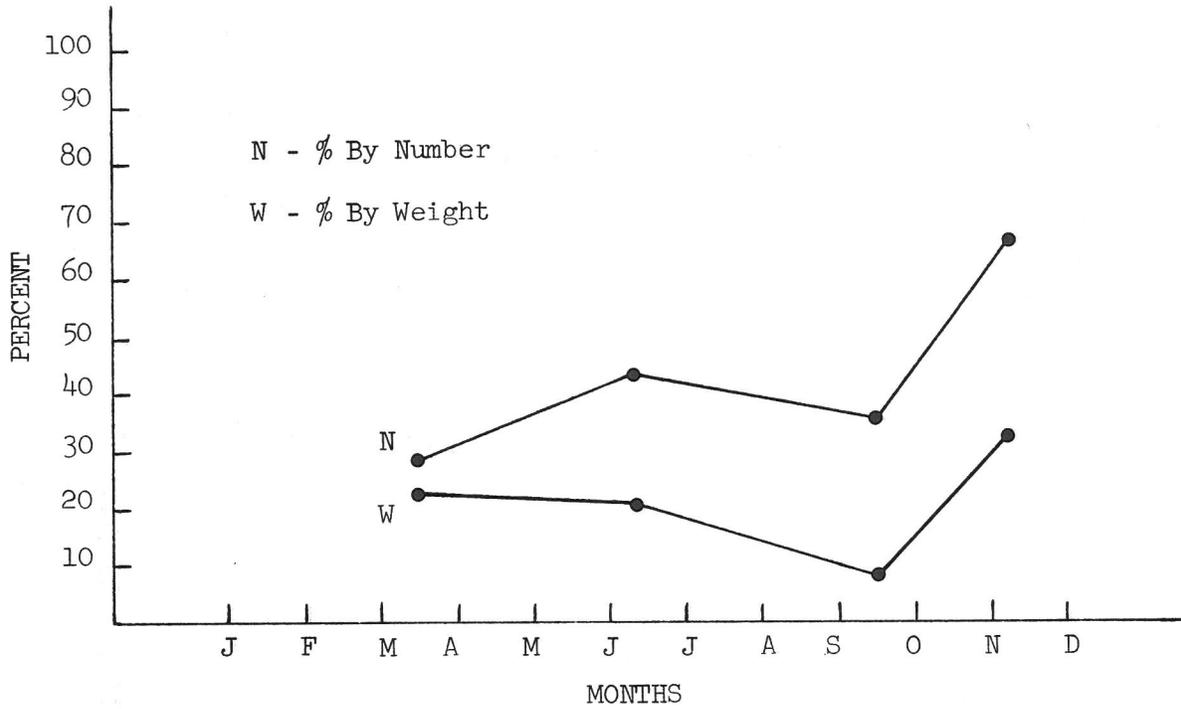
Table 2

Catch Per Unit Effort for Seine Samples Collected in 1973  
for Region 2-A Waters

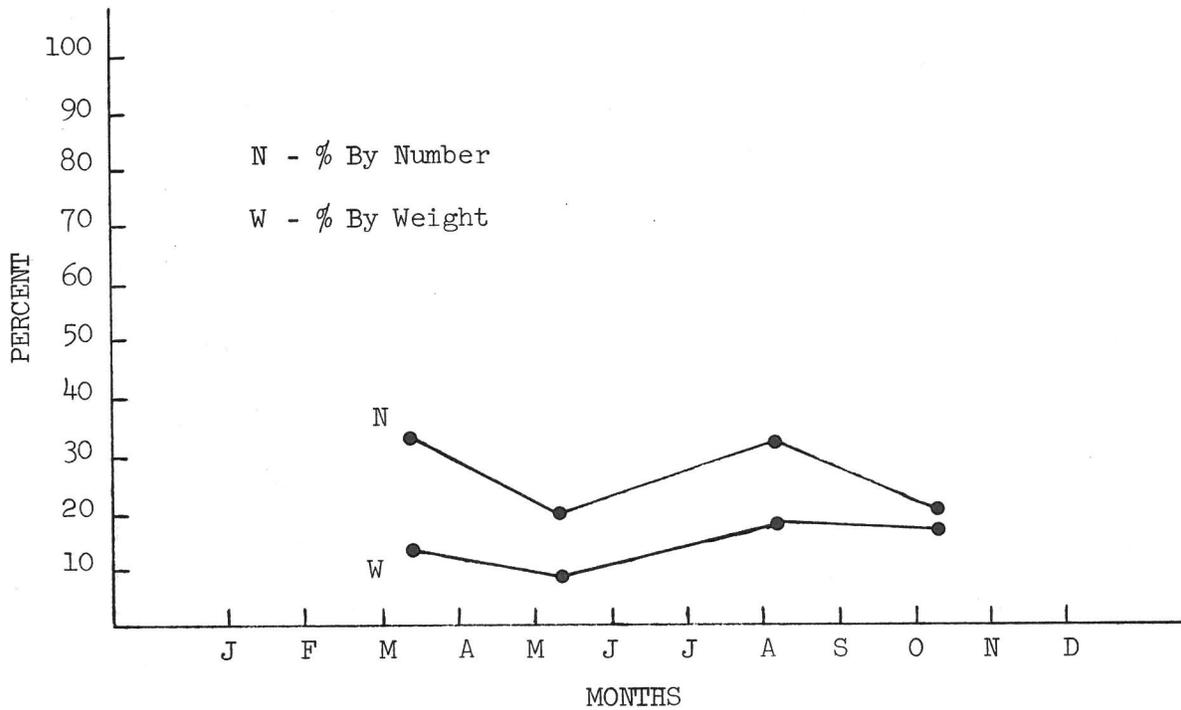
Species	Lake Benbrook	Lake Diversion	Garza Little Elm Reservoir	Hubbard Creek Reservoir
Number of 50 foot drags	40	72	96	80
Gizzard shad	-	1.51	0.49	8.88
Threadfin shad	0.50	-	16.51	-
Carp	-	0.01	0.03	-
Silvery minnow	-	0.08	-	-
Golden shiner	0.12	-	0.14	-
Pugnose minnow	-	-	0.33	0.14
Red shiner	5.18	1.85	3.77	35.04
Sharpnose shiner	-	0.28	-	-
Silverband shiner	0.10	-	-	-
Blacktail shiner	6.38	-	-	2.10
Mimic shiner	-	-	-	0.03
Suckermouth minnow	-	0.04	-	-
Fathead minnow	-	-	-	0.08
Bullhead minnow	6.08	0.75	0.91	2.45
River carpsucker	-	-	-	0.02
Smallmouth buffalo	-	0.08	-	-
Channel catfish	-	-	0.06	-
Red River Pupfish	-	0.01	-	-
Mosquitofish	0.08	0.03	0.01	0.81
Mississippi silverside	59.50	0.60	34.90	-
White bass	-	0.08	0.18	-
Green sunfish	-	0.03	-	0.03
Warmouth	-	-	-	0.03
Orangespotted sunfish	-	0.07	0.02	0.08
Bluegill	0.80	1.94	0.35	1.63
Longear sunfish	0.35	0.53	0.14	0.10
Redear sunfish	0.12	0.04	-	-
Largemouth bass	0.17	0.42	0.21	0.10
White crappie	-	-	0.07	0.06
Bluntnose darter	-	-	0.01	-
Logperch	0.05	0.36	0.05	0.14
Total	79.43	8.71	58.18	51.72

Catch Per Unit Effort - catch/one 50 foot drag with a 20-foot common seine  
(3/16-inch square mesh measure)

Figure 1



Game fish collected in gill nets in Lake Benbrook in 1973.



Game fish collected in gill nets in Lake Diversion in 1973

Figure 2

### LAKE BENBROOK

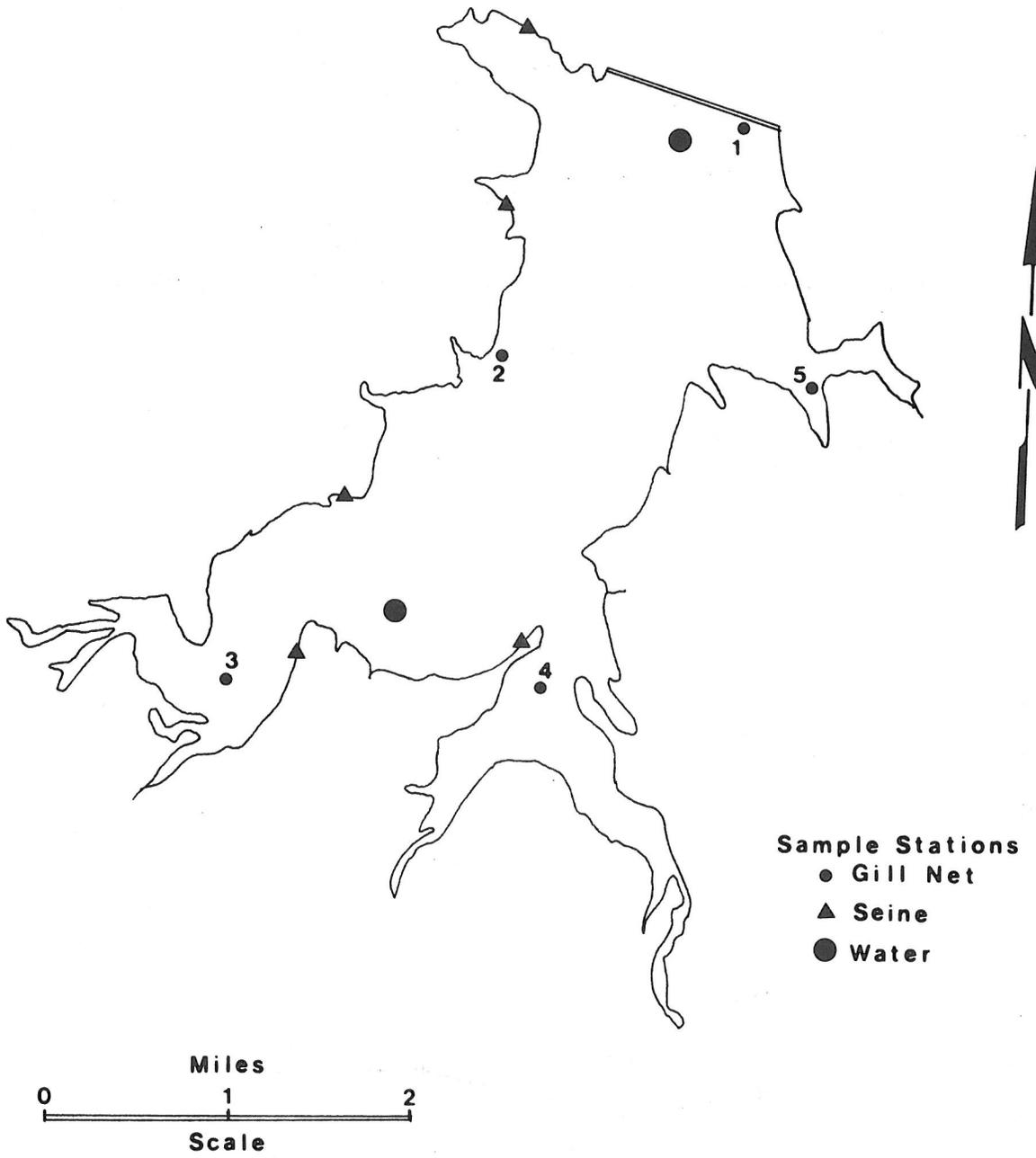


Table 3

Lake Benbrook Gill Netting Results for 1973  
20 Nets

Species	Total No.	Percent of Total	Total Weight (Pounds)	Percent of Weight	**Catch/Unit No.	Effort Weight
Gizzard shad*	45	9.28	17.11	2.34	2.25	0.86
Carp*	30	6.19	138.01	18.88	1.50	6.90
Golden shiner*	14	2.89	2.92	0.40	0.70	0.15
River carpsucker*	72	14.84	287.88	39.38	3.60	14.39
Spotted sucker*	98	20.21	136.03	18.61	4.90	6.80
Gray redhorse*	1	0.21	1.06	0.14	0.05	0.05
Channel catfish	14	2.89	28.77	3.94	0.70	1.44
Flathead catfish	2	0.41	17.05	2.33	0.10	0.85
White bass	78	16.08	44.50	6.09	3.90	2.23
Green sunfish	3	0.62	0.25	0.03	0.15	0.01
Warmouth	1	0.21	0.11	0.02	0.05	0.01
Bluegill	38	7.83	5.80	0.79	1.90	0.29
Longear sunfish	4	0.82	0.54	0.07	0.20	0.03
Redear sunfish	1	0.21	0.26	0.04	0.05	0.01
Largemouth bass	9	1.85	7.64	1.05	0.45	0.38
White crappie	53	10.93	33.39	4.57	2.65	1.67
Black crappie	2	0.41	1.05	0.14	0.10	0.05
Freshwater drum*	20	4.12	8.64	1.18	1.00	0.43
Total	485	100.00	731.01	100.00	24.25	36.55
Game fish	205	42.26	139.36	19.07		
Rough fish*	280	57.74	591.65	80.93		

\*\*Catch/Unit Effort - catch/one standard gill net

Table 4

## Water Quality Data for Lake Benbrook for 1973

## Station I - Dam

Date	Depth ft	Temperature °C		Oxygen mg/l	pH	Total Alkalinity mg/l	Hardness mg/l	Specific Conductivity umoh/cm	Chlorides mg/l	Turbidity JTU
		Air	Water							
3/15	1	10	14	9.7	7.6	124.0	-	-	-	-
	10	10	13	9.5	7.6	120.0	-	-	-	-
	20	10	13	9.7	7.6	124.0	-	-	-	-
	30	10	13	9.7	7.6	118.0	-	-	-	-
	40	10	13	9.5	7.6	118.0	-	-	-	-
	50	10	13	9.3	7.6	126.0	-	-	-	-
	56	10	13	9.0	7.4	126.0	-	-	-	-
6/6	1	27	25	7.6	8.2	128.0	96	332	25	5
	10	27	24	6.9	8.1	130.0	94	333	24	5
	20	27	24	6.7	8.1	124.0	100	336	25	6
	30	27	24	6.6	8.1	128.0	98	340	24	2
	40	27	23	5.5	7.9	124.0	92	331	23	20
	50	27	23	2.6	7.6	116.0	80	300	21	50
	9/13	1	30	28	8.4	8.3	108.0	136	310	21
	10	30	27	8.2	8.3	100.0	132	310	23	5
	20	30	27	6.6	8.3	108.0	124	320	23	9
	30	30	26	4.2	8.3	112.0	128	330	22	9
	40	30	26	2.0	6.9	170.0	172	340	20	80
11/5	1	10	18	7.6	7.8	128.0	140	290	26	15
	10	10	18	7.4	7.8	126.0	172	290	26	25
	20	10	18	7.4	7.8	118.0	156	300	24	20
	35	10	18	7.3	7.8	124.0	168	300	25	80

Table  
(continued)

Station II - Upper End

Date	Depth ft	Temperature °C		Oxygen mg/l	pH	Total Alkalinity mg/l	Hardness mg/l	Specific Conductivity umoh/cm	Chlorides mg/l	Turbidity JTU
		Air	Water							
3/15	1	10	14	10.0	7.6	128.0	-	-	-	-
	10	10	15	10.4	7.6	130.0	-	-	-	-
6/6	1	27	25	8.1	7.9	138.0	92	330	25	70
	7	27	22	2.5	8.1	124.0	94	270	23	38
9/13	1	30	28	8.4	7.1	106.0	128	310	23	11
	10	30	27	8.2	7.6	110.0	132	310	21	10
	20	30	27	5.2	7.8	110.0	132	320	22	10
	30	30	26	1.0	7.4	112.0	132	340	21	10
11/5	1	10	18	9.0	8.1	124.0	152	280	27	45
	10	10	18	8.8	8.1	120.0	180	290	26	70
	20	10	18	8.5	8.1	122.0	156	290	25	60

Figure 3

### LAKE DIVERSION

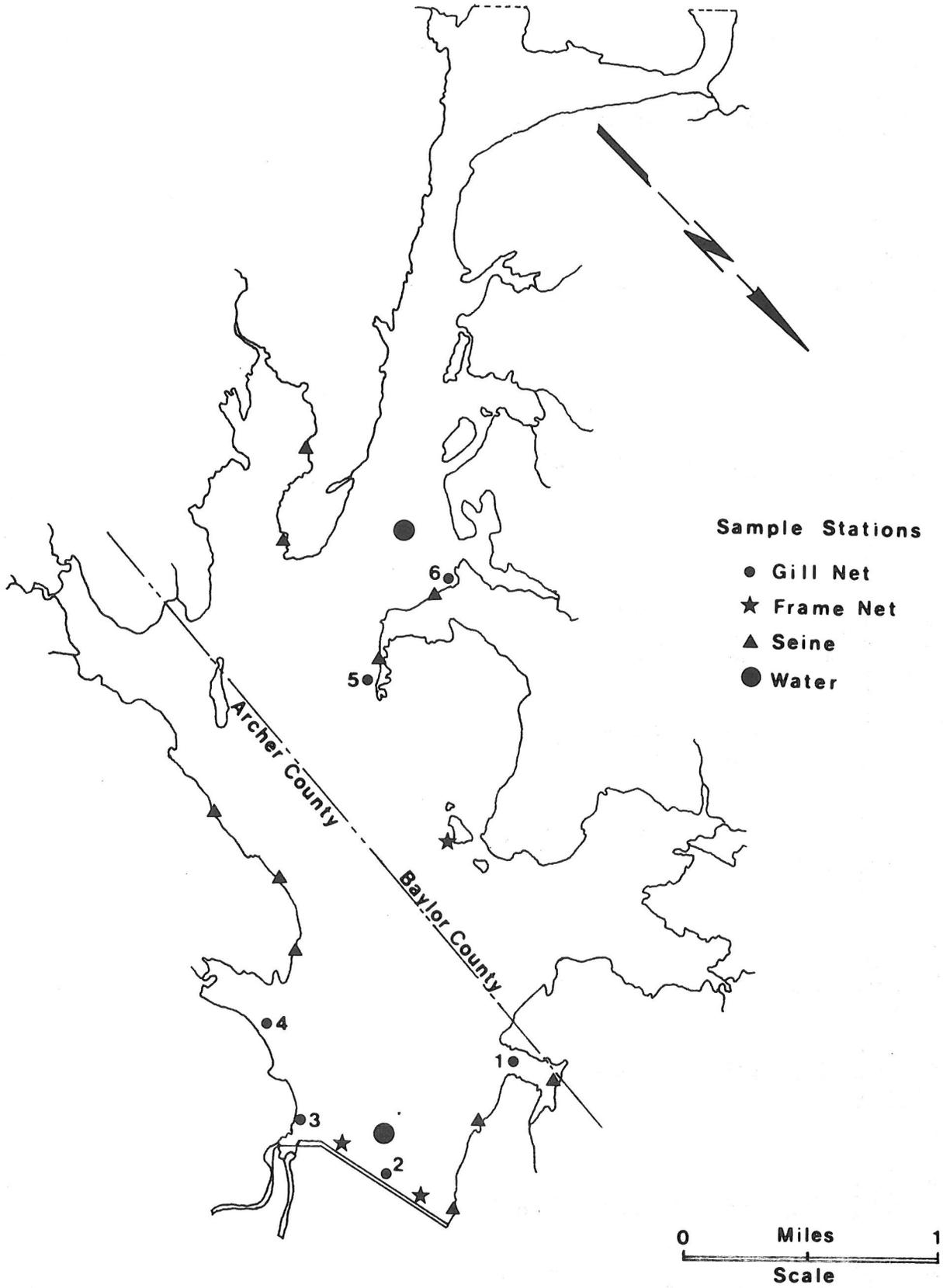


Table 5

Lake Diversion Gill Netting Results for 1973  
24 Nets

Species	Total No.	Percent of Total	Total Weight (Pounds)	Percent of Weight	**Catch/Unit No.	Effort Weight
Longnose gar*	31	6.83	92.55	12.57	1.29	3.86
Shortnose gar*	1	0.22	2.50	0.34	0.04	0.10
Gizzard shad*	128	28.19	72.53	9.85	5.33	3.02
Carp*	7	1.54	24.39	3.31	0.29	1.02
River carpsucker*	76	16.74	130.49	17.73	3.17	5.44
Smallmouth buffalo*	100	22.03	324.83	44.13	4.17	13.53
Channel catfish	23	5.07	32.62	4.43	0.96	1.36
Flathead catfish	2	0.44	0.70	0.10	0.08	0.03
White bass	26	5.73	13.48	1.83	1.08	0.56
Green sunfish	7	1.54	0.68	0.09	0.29	0.03
Bluegill	19	4.19	3.69	0.50	0.79	0.15
Longear sunfish	1	0.22	0.16	0.02	0.04	0.01
Largemouth bass	13	2.86	24.75	3.36	0.54	1.03
White crappie	16	3.52	8.90	1.21	0.67	0.37
Walleye	3	0.66	3.52	0.48	0.13	0.15
Freshwater drum*	1	0.22	0.40	0.05	0.04	0.02
Total	454	100.00	736.19	100.00	18.91	30.68
Game fish	110	24.23	88.50	12.02		
Rough fish*	344	75.77	647.69	87.98		

\*\*Catch/Unit Effort - catch/one standard gill net

Table 6

Lake Diversion Frame Netting Results for 1973  
10 Nets

Species	Total No.	Percent of Total	Total Weight (Pounds)	Percent of Weight	**Catch/Unit No.	Effort Weight
Gizzard shad*	5	4.13	0.23	0.86	0.50	0.02
Carp*	1	0.83	5.31	19.82	0.10	0.53
River carpsucker*	2	1.65	3.43	12.81	0.20	0.34
Smallmouth buffalo*	1	0.83	2.62	9.79	0.10	0.26
Channel catfish	1	0.83	0.16	0.60	0.10	0.02
White bass	4	3.30	0.78	2.91	0.40	0.08
Green sunfish	2	1.65	0.30	1.12	0.20	0.03
Warmouth	1	0.83	0.11	0.41	0.10	0.01
Bluegill	68	56.20	8.15	30.44	6.80	0.82
Longear sunfish	2	1.65	0.12	0.45	0.20	0.01
White crappie	32	26.44	4.61	17.21	3.20	0.46
Walleye	1	0.83	0.75	2.80	0.10	0.08
Freshwater drum*	1	0.83	0.21	0.78	0.10	1.02
Total	121	100.00	26.78	100.00	12.10	2.68
Game fish	111	91.73	14.98	55.94		
Rough fish*	10	8.27	11.80	44.06		

\*\*Catch/Unit Effort - catch/one frame net

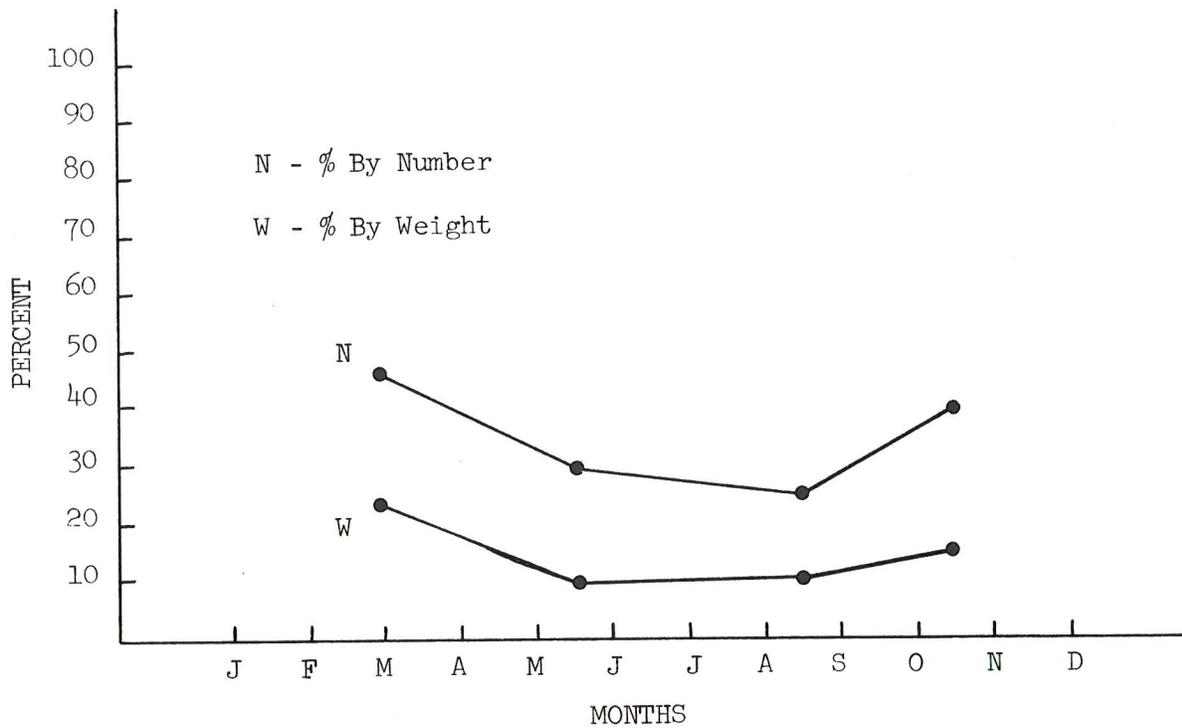
Water Quality Data for Lake Diversion for 1973

Station I - Dam

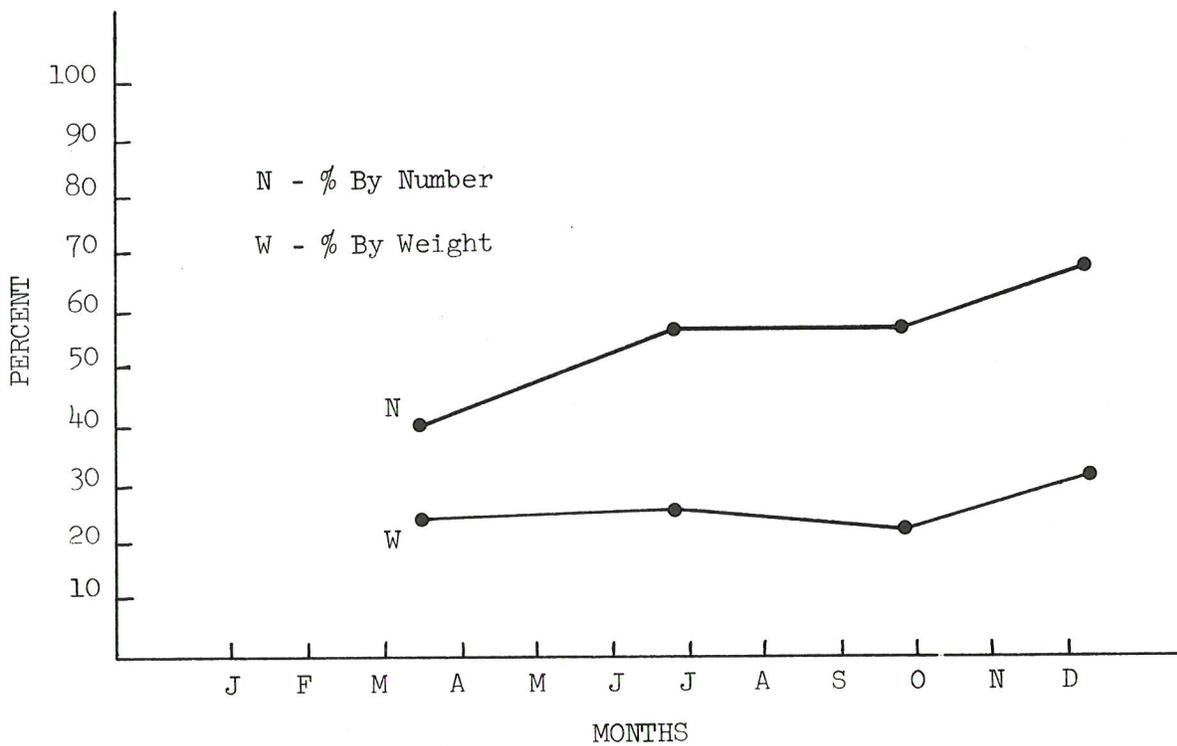
Date	Depth ft	Temperature °C		Oxygen mg/l	pH	Total		Hardness mg/l	Specific Conductivity umoh/cm	Chlorides mg/l	Turbidity JTU
		Air	Water			Alkalinity mg/l	Alkalinity mg/l				
3/6	1	20	12	10.4	7.7	84.0	84.0	584	-	842	-
	10	20	12	10.2	7.8	92.0	92.0	-	-	-	-
	25	20	11	10.2	7.9	92.0	92.0	580	-	802	-
5/7	1	21	20	5.5	7.3	56.0	56.0	488	3000	-	-
	10	21	20	5.4	7.3	72.0	72.0	512	3000	-	-
	20	21	20	5.3	7.3	80.0	80.0	512	3000	-	-
	30	21	19	4.9	7.3	82.0	82.0	468	3000	-	-
8/8	1	33	28	7.9	8.1	64.0	64.0	650	3900	1050	12
	10	33	27	7.9	8.0	62.0	62.0	640	4000	1350	15
	20	33	27	7.9	8.0	62.0	62.0	660	4100	1499	10
	26	33	26	6.9	8.2	66.0	66.0	660	4100	1499	78
10/4	1	15	23	8.6	8.1	82.0	82.0	860	3900	1599	30
	10	15	23	8.2	8.2	86.0	86.0	920	4000	1399	20
	23	15	23	8.2	8.2	88.0	88.0	780	4000	1250	20

Station II - Upper End

3/6	1	15	13	9.9	7.9	92.0	92.0	592	-	886	-
	10	15	13	10.6	7.3	90.0	90.0	-	-	-	-
5/7	1	25	20	5.7	7.2	62.0	62.0	424	2780	-	-
	10	25	20	5.3	7.3	42.0	42.0	440	2880	-	-
8/8	1	31	28	7.6	8.2	62.0	62.0	640	4150	1200	25
	13	31	27	7.5	8.3	64.0	64.0	680	4100	1350	18
10/4	1	15	23	7.6	8.2	88.0	88.0	770	3800	1250	0
	10	15	23	7.4	8.2	80.0	80.0	730	3900	1200	18
	15	15	23	6.8	8.2	84.0	84.0	800	3700	1150	0



Game fish collected in gill nets in Garza Little Elm Reservoir in 1973



Game fish collected in gill nets in Hubbard Creek Reservoir in 1973

Figure 5

### GARZA LITTLE ELM RESERVOIR

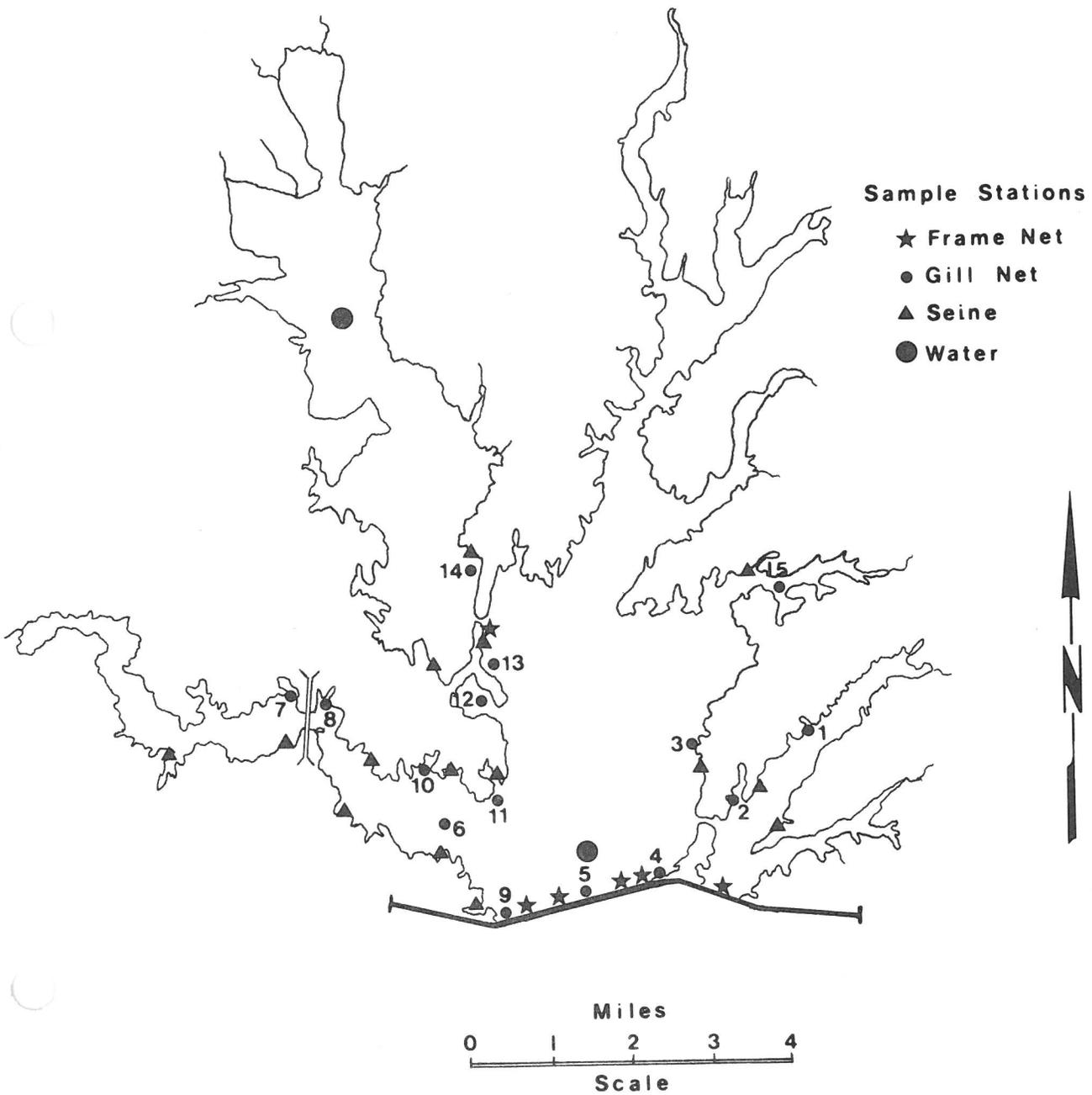


Table 8

Garza Little Elm Reservoir Gill Netting Results for 1973  
59 Nets

Species	Total No.	Percent of Total	Total Weight (Pounds)	Percent of Weight	**Catch/Unit No.	Effort Weight
Spotted gar*	18	1.30	34.47	1.38	0.31	0.07
Longnose gar*	106	7.65	547.10	21.22	1.80	9.27
Shortnose gar*	2	0.14	4.18	0.16	0.03	0.07
Gizzard shad*	98	7.07	49.88	1.93	1.66	0.85
Threadfin shad*	16	1.15	1.23	0.05	0.27	0.02
Carp*	70	5.05	169.48	6.57	1.19	2.87
River carpsucker*	311	22.44	586.59	22.75	5.27	9.94
Smallmouth buffalo*	256	18.48	807.42	31.32	4.34	13.69
Spotted sucker*	1	0.07	0.81	0.03	0.02	0.01
Channel catfish	44	3.17	62.88	2.44	0.75	1.07
Flathead catfish	3	0.22	9.62	0.37	0.05	0.16
White bass	195	14.07	148.17	5.75	3.31	2.51
Bluegill	38	2.74	4.98	0.19	0.64	0.08
Longear sunfish	12	0.87	0.99	0.04	0.20	0.02
Spotted bass	2	0.14	0.51	0.02	0.03	0.01
Largemouth bass	20	1.44	14.92	0.58	0.34	0.25
White crappie	176	12.07	111.06	4.31	2.98	1.88
Walleye	6	0.43	5.78	0.22	0.10	0.10
Freshwater drum*	12	0.87	18.34	0.71	0.20	0.31
Total	1386	100.00	2578.41	100.00	23.49	43.69
Game fish	496	35.78	358.91	13.92		
Rough fish*	890	64.22	2219.50	86.08		

\*\*Catch/Unit Effort - catch/one standard gill net

Table 9

Garza Little Elm Reservoir Frame Netting Results for 1973  
15 Nets

Species	Total No.	Percent of Total	Total Weight (Pounds)	Percent of Weight	**Catch/Unit No.	Effort Weight
Longnose gar*	2	0.43	7.62	8.88	0.13	0.51
Gizzard shad*	2	0.43	0.14	0.16	0.13	0.01
Threadfin shad*	113	24.62	4.36	5.08	7.53	0.29
Smallmouth buffalo*	1	0.22	2.00	2.33	0.07	0.13
White bass	27	5.88	9.33	10.88	1.80	0.62
Bluegill	131	28.54	11.83	13.79	8.73	0.79
Longear sunfish	24	5.23	2.20	2.56	1.60	0.15
Redear sunfish	1	0.22	0.11	0.13	0.07	0.01
Largemouth bass	6	1.31	0.03	0.03	0.40	0.01
White crappie	152	33.12	48.18	56.16	10.13	3.21
Total	459	100.00	85.80	100.00	30.59	5.72
Game fish	341	74.30	71.68	83.55		
Rough fish*	118	25.70	14.12	16.45		

\*\*Catch/Unit Effort - catch/one frame net

Table 10

## Water Quality Data for Garza Little Elm Reservoir for 1973

## Station I - Dam

Date	Depth ft	Temperature °C		Oxygen mg/l	pH	Total		Hardness mg/l	Specific Conductivity umoh/cm	Chlorides mg/l	Turbidity JTU
		Air	Water			Alkalinity mg/l	Alkalinity mg/l				
2/28	1	13	8	12.2	7.2	110.0	-	-	-	-	-
	10	13	8	11.5	7.2	106.0	-	-	-	-	-
	20	13	7	11.5	7.2	100.0	-	-	-	-	-
	30	13	7	11.3	7.2	102.0	-	-	-	-	-
	40	13	7	11.7	7.3	106.0	-	-	-	-	-
	50	13	7	11.0	7.3	98.0	-	-	-	-	-
5/16	1	25	24	9.6	8.1	108.0	128	339	29	15	
	10	25	23	9.0	8.2	112.0	130	340	28	15	
	20	25	22	9.4	8.2	116.0	134	332	28	15	
	30	25	21	9.6	8.2	116.0	130	338	28	15	
	40	25	20	6.4	7.8	114.0	148	342	30	50	
8/15	1	36	30	8.2	8.5	98.0	114	600	26	0	
	10	36	28	8.8	8.5	96.0	114	600	27	1	
	20	36	28	6.3	8.1	96.0	110	750	27	1	
	30	36	27	1.2	7.6	98.0	110	470	26	2	
	40	36	25	0.1	7.5	112.0	116	380	26	5	
	50	36	23	0.1	7.3	130.0	126	-	31	15	
60	36	22	-	7.2	134.0	144	-	29	58		
10/15	1	20	23	7.0	7.7	100.0	112	700	40	10	
	10	20	24	6.6	7.7	104.0	114	700	40	11	
	20	20	24	6.4	7.8	104.0	118	700	58	23	
	30	20	24	6.6	7.7	104.0	115	700	54	23	
	40	20	24	6.4	7.7	108.0	114	700	43	30	
	50	20	24	6.4	7.7	112.0	116	700	47	55	

Table  
(continued)

Station II - Upper End

Date	Depth ft	Temperature °C		Oxygen mg/l	pH	Total Alkalinity mg/l	Hardness mg/l	Specific Conductivity umoh/cm	Chlorides mg/l	Turbidity JTU
		Air	Water							
2/28	-	-	-	-	-	-	-	-	-	-
5/16	1	25	24	7.5	7.8	124.0	134	360	30	90
	10	25	21	6.6	7.7	126.0	140	340	30	100
8/15	1	27	29	6.2	8.5	114.0	114	335	25	95
	10	27	29	6.0	8.5	114.0	116	350	26	120
10/15	1	20	20	8.6	7.4	86.0	84	230	26	145
	10	20	20	8.8	7.4	92.0	84	250	26	180

Figure 6

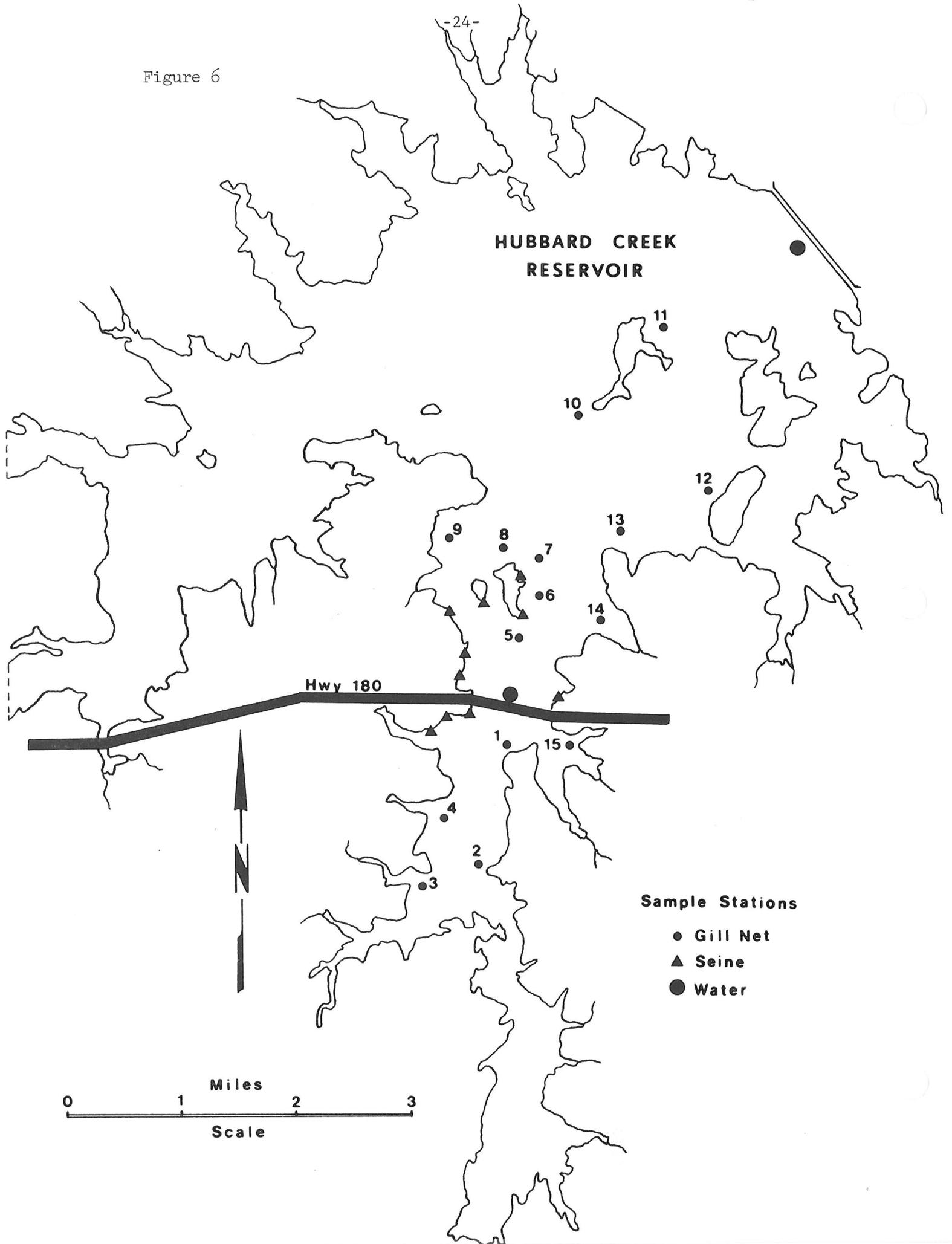


Table 11

Hubbard Creek Reservoir Gill Netting Results for 1973  
60 Nets

Species	Total No.	Percent of Total	Total Weight (Pounds)	Percent of Weight	**Catch/Unit No.	Effort Weight
Spotted gar*	4	0.22	20.55	0.76	0.07	0.34
Longnose gar*	11	0.63	65.26	2.40	0.18	1.09
Shortnose gar*	2	0.11	8.99	0.33	0.03	0.15
Gizzard shad*	149	8.52	23.87	0.88	2.48	0.40
Carp*	125	7.15	253.46	9.33	2.08	4.22
River carpsucker*	181	10.35	337.76	12.43	3.02	5.63
Smallmouth buffalo*	275	15.72	1274.53	46.90	4.58	21.24
Blue catfish	1	0.06	20.23	0.74	0.02	0.34
Channel catfish	203	11.61	244.46	8.99	3.38	4.07
Flathead catfish	25	1.43	120.71	4.44	0.42	2.01
Warmouth	1	0.06	0.09	0.01	0.02	0.01
Orangespotted sunfish	1	0.06	0.08	0.01	0.02	0.01
Bluegill	49	2.80	4.42	0.16	0.82	0.07
Longear sunfish	6	0.34	0.47	0.02	0.10	0.01
Redear sunfish	1	0.06	0.24	0.01	0.02	0.01
Largemouth bass	50	2.86	89.56	3.29	0.83	1.49
White crappie	647	36.99	234.70	8.63	10.78	3.91
Freshwater drum*	18	1.03	18.40	0.67	0.30	0.31
Total	1749	100.00	2717.78	100.00	29.15	45.31
Game fish	984	56.27	714.96	26.30		
Rough fish*	765	43.73	2002.82	73.70		

\*\*Catch/Unit Effort - catch/one standard gill net

Table 12

Water Quality Data for Hubbard Creek Reservoir for 1973

Station I - Dam

Date	Depth ft	Temperature °C		Oxygen mg/l	pH	Total		Hardness mg/l	Specific Conductivity umoh/cm	Chlorides mg/l	Turbidity JTU
		Air	Water			Alkalinity mg/l	Alkalinity mg/l				
3/12	1	22	12	9.7	7.6	112.0	-	-	-	-	-
	10	22	13	9.7	7.6	102.0	-	-	-	-	-
	20	22	13	9.4	7.6	100.0	-	-	-	-	-
	30	22	14	9.9	7.4	102.0	-	-	-	-	-
	40	22	14	9.8	7.4	98.0	-	-	-	-	-
6/26	50	22	13	9.5	7.4	104.0	-	-	-	-	-
	1	31	28	8.6	8.2	110.0	120	1300	380	9	
	10	31	27	8.1	8.3	108.0	122	1380	360	0	
	20	31	27	7.9	8.3	110.0	120	1420	350	5	
	30	31	26	7.1	8.1	112.0	125	1420	360	5	
9/26	40	31	25	6.6	7.6	112.0	137	1420	355	39	
	1	20	25	7.1	8.0	100.0	304	1450	450	0	
	10	20	25	7.1	8.0	96.0	308	1400	370	0	
	20	20	25	7.2	8.0	100.0	308	1400	410	0	
	33	20	25	7.2	8.0	100.0	296	1400	370	0	
12/5	1	15	14	10.5	8.2	100.0	312	1000	310	5	
	10	15	14	9.6	8.1	100.0	296	1000	320	15	
	20	15	13	9.6	8.1	96.0	280	1000	330	15	
	30	15	13	9.8	8.1	98.0	300	1000	310	15	
	40	15	13	9.4	8.1	102.0	288	1100	355	70	

Table  
(continued)

Date	Depth ft.	Temperature °C		Oxygen mg/l	pH	Total Alkalinity mg/l	Hardness mg/l	Specific Conductivity umoh/cm	Chlorides mg/l	Turbidity JTU
		Air	Water							
3/12	1	22	13	9.5	7.4	100.0	-	-	-	-
	10	22	14	9.3	7.6	98.0	-	-	-	-
	15	22	14	9.4	7.6	96.0	-	-	-	-
6/26	1	30	27	7.2	8.1	120.0	-	1390	340	38
	10	30	26	7.0	8.1	116.0	-	1300	320	41
9/26	1	21	25	7.4	7.6	100.0	352	1200	410	30
	10	21	25	7.1	7.2	94.0	312	1250	345	10
12/5	1	13	12	10.6	8.2	112.0	312	900	350	10
	6	13	12	9.0	8.0	100.0	300	900	330	20

LITERATURE CITED

American Public Health Association 1971. Standard methods for the examination of water and wastewater (13th ed.): New York, 874 pp.