The Water Quality of Sam Rayburn Reservoir, Eastern Texas

GEOLOGICAL SURVEY WATER-SUPPLY PAPER 1999-J

Prepared in cooperation with the U.S. Army Corps of Engineers

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By JACK RAWSON *and* MYRA W. LANSFORD

CONTRIBUTIONS TO THE HYDROLOGY OF THE UNITED STATES

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THE WATER QUALITY OF SAM RAYBURN RESERVOIR, EASTERN TEXAS

By Jack Rawson and Myra W. Lansford

ABSTRACT

Inflow of wastes to the Angelina River has caused some local deterioration of the quality of water downstream from Lufkin. However, the volume of flow in the Angelina River has been adequate to prevent serious deterioration of the quality of water in Sam Rayburn Reservoir.

From March 1965 to September 1968, the time-weighted concentration of dissolved solids in water released from Sam Rayburn Reservoir averaged about 120 mg/l (milligrams per liter). The average dissolved-solids content of water in the reservoir during 13 surveys ranged from about 100 to 145 mg/l.

The dissolved-oxygen content of water in the reservoir varied seasonally and was intimately related to the pattern of thermal stratification. During 10 reservoir surveys, the depth-integrated concentration of dissolved oxygen at deep sites in the downstream half of the reservoir averaged more than 5 mg/l. The concentration of dissolved oxygen usually was much greater during periods of winter circulation than during periods of summer stagnation. About 2 river miles upstream from Sam Rayburn Dam, the depth-integrated dissolved-oxygen concentration ranged from 1.2 mg/l (16-percent saturation) on June 30, 1965, to 10.9 mg/l (91-percent saturation) on February 4, 1966. During periods of summer stagnation, water below depths of 25–35 feet usually contained less than 2.5 mg/l dissolved oxygen and often contained less than 1.0 mg/l.

The dissolved-oxygen content of water usually was less in the upstream half of the reservoir than in the downstream half. During 10 reservoir surveys, the depth-integrated concentration of dissolved oxygen about 41.5 miles upstream from Sam Rayburn Dam averaged 4.2 mg/l. Part of the dissolved-oxygen deficit (difference between saturated concentration and actual concentration) resulted from the inflow of wastes; however, data for tributary arms of the reservoir indicate that part of the dissolved-oxygen deficit resulted from the decomposition of naturally occurring organic debris in the water and in the area inundated by the reservoir.

Concentrations of iron and manganese in the water varied seasonally and were related to the dissolved-oxygen content of the water. The concentrations of iron and manganese throughout the reservoir were much smaller during periods of winter circulation than during periods of summer stagnation. During each of three reservoir surveys in February, the concentrations of iron and manganese near Sam Rayburn Dam were less than 0.40 and 0.25 mg/l, respectively. However, on October 6, 1965, the iron content of water ranged from less than 1 mg/l at depths less than 30 feet to as much at 14 mg/l at greater depths. Similarly, on September 9, 1966, the concentration of manganese near the dam ranged from less than 0.5 mg/l at depths less than 10 feet to as much as 6.9 mg/l at greater depths.

Although storage of water in Sam Rayburn Reservoir has resulted in a decrease in variations of dissolved solids and principal chemical constituents in the Angelina River downstream from the reservoir, it has resulted in significant seasonal variations in the concentrations of dissolved oxygen, iron, and manganese at downstream sites.

Results of periodic surveys indicate that dissolved-oxygen concentrations at three sites in the 19-mile reach of the Angelina River downstream from Sam Rayburn Dam were low in late summer and early fall after periods of summer stagnation in the reservoir. Moreover, the amount of reaeration that occurred in the reach was insignificant. During periods when the dissolved-oxygen deficiency was large, the concentrations of iron and manganese at each of the three sites increased greatly.

INTRODUCTION

Sam Rayburn Reservoir on the Angelina River is a multipurpose project owned by the U.S. Government and operated by the U.S. Army Corps of Engineers. The reservoir was designed to control and regulate floods, generate power, and conserve water for municipal, industrial, agricultural, and recreation purposes. Construction of the project by the Corps of Engineers was started in September 1956 and was completed in July 1966. Deliberate impoundment of water began in March 1965, and power generation began in July 1966 (Dowell and Breeding, 1967, p. 177–180).

Before closure of Sam Rayburn Reservoir, chemical-quality data for the Angelina River indicated that water impounded in the reservoir would be of acceptable quality for most uses. However, some of the tributaries to the reservoir are used for the disposal of industrial or municipal effluents. Normally, the flow of the Angelina River is sufficient to dilute these wastes adequately; however, during extended low-flow periods, significant changes in the quality of water in the Angelina River and Sam Rayburn Reservoir could result from the inflow of municipal and industrial wastes. In October 1963, before closure of Sam Rayburn Reservoir, the U.S. Geological Survey in cooperation with the Corps of Engineers began a study to obtain information on the quality of water available for storage in the reservoir.

After closure of the reservoir, the study was expanded to monitor and explain the variations of selected water-quality parameters—including dissolved solids, dissolved oxygen, iron, and manganese—in the reservoir and in the Angelina River downstream from the reservoir.

DESCRIPTION OF SAM RAYBURN RESERVOIR AND ITS ENVIRONMENT

The area studied is in eastern Texas and extends from near Lufkin in Angelina County to near Bevelport in Jasper County (fig. 1). The drainage area consists mostly of heavily timbered low hills with wide flood plains along the Angelina River.

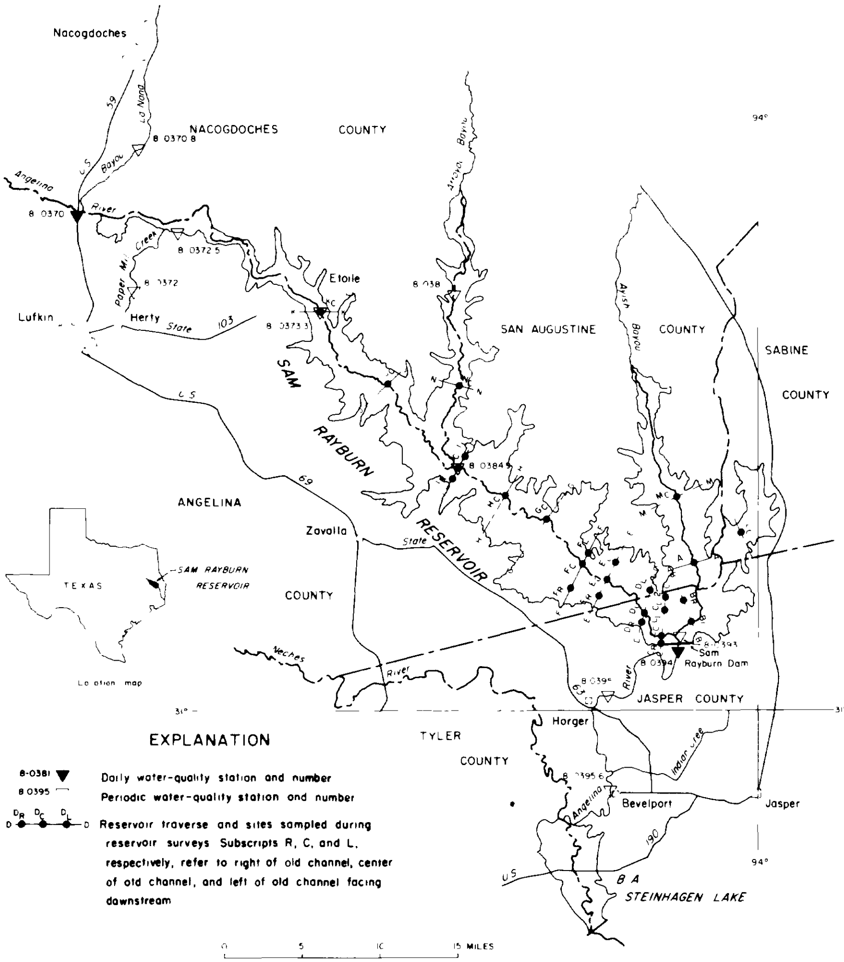


FIGURE 1.—Location of water-quality data-collection sites.

Sam Rayburn Dam is on the Angelina River about 11 miles northwest of Jasper in Jasper County; Sam Rayburn Reservoir extends into Angelina, Sabine, San Augustine, and Nacogdoches Counties. The reservoir has a total capacity of 2,852,600 acre-feet and a surface area of 114,550 acres at the top of the power and conservation pools at elevation 164.0 feet. Other data regarding the dam and reservoir are given below.

Feature	Elevation (feet)	Capacity (acre-feet)
Maximum-design water surface	183.0	5,610,000
Crest of emergency spillway	176.0	4,442,400
Top of flood-control pool	173.0	3,997,600
Top of power designated power pool	164.0	2,852,600
Top of power head and sediment pool	149.0	1,452,000
Invert of flood-control outlet works	105.0	21,940

Records of reservoir contents are published annually by the U.S. Geological Survey (1965–68).

ANALYSIS OF WATER-QUALITY DATA

STREAM RECORDS

Locations of the water-quality data-collection sites are shown in figure 1. Water-quality records for the daily stations are summarized in table 1. Results of periodic water-quality surveys at selected sites are given in table 2.

Duration data in table 1 show that before closure of Sam Rayburn Reservoir, the concentrations of dissolved solids, sodium, hardness, and chloride in the Angelina River generally were less variable at the station below Sam Rayburn Dam than at the station near Lufkin. For example, during about 80 percent of the period October 1963–February 1965, the dissolved-solids content of the Angelina River below Sam Rayburn Dam was between 75 and 430 mg/l (milligrams per liter). During about 80 percent of the period, the dissolved-solids content of the Angelina River near Lufkin ranged between 110 and 590 mg/l. The time-weighted concentration of dissolved solids averaged about 220 mg/l at the station below Sam Rayburn Dam and about 250 mg/l at the station near Lufkin. This decrease in the time-weighted average concentration of dissolved solids indicates that flow in the Angelina River generally has been adequate to prevent wastes released into the river downstream from Lufkin from causing serious deterioration of the inorganic quality of the water at the station downstream from Sam Rayburn Dam.

Since closure of Sam Rayburn Reservoir, regulation of flow by the reservoir has greatly decreased the variation of dissolved constituents and has resulted in more uniform chemical quality of the water at downstream sites. For example, during the period March 1965–September 1968, the dissolved-solids content of the Angelina River below Sam Rayburn Dam was between 110 and 140 mg/l during 80 percent of the time. During the same period, the dissolved-solids content of the Angelina River near Lufkin was between 90 and 305 mg/l for 80 percent of the time. The time-weighted concentration of dissolved solids during the period averaged about 120 mg/l at the station below Sam Rayburn Dam and about 150 mg/l at the station near Lufkin.

Before closure of Sam Rayburn Reservoir, the dissolved-solids content of water at both stations generally varied inversely with water discharge (table 2 and fig. 2). Also, during low-flow periods, the

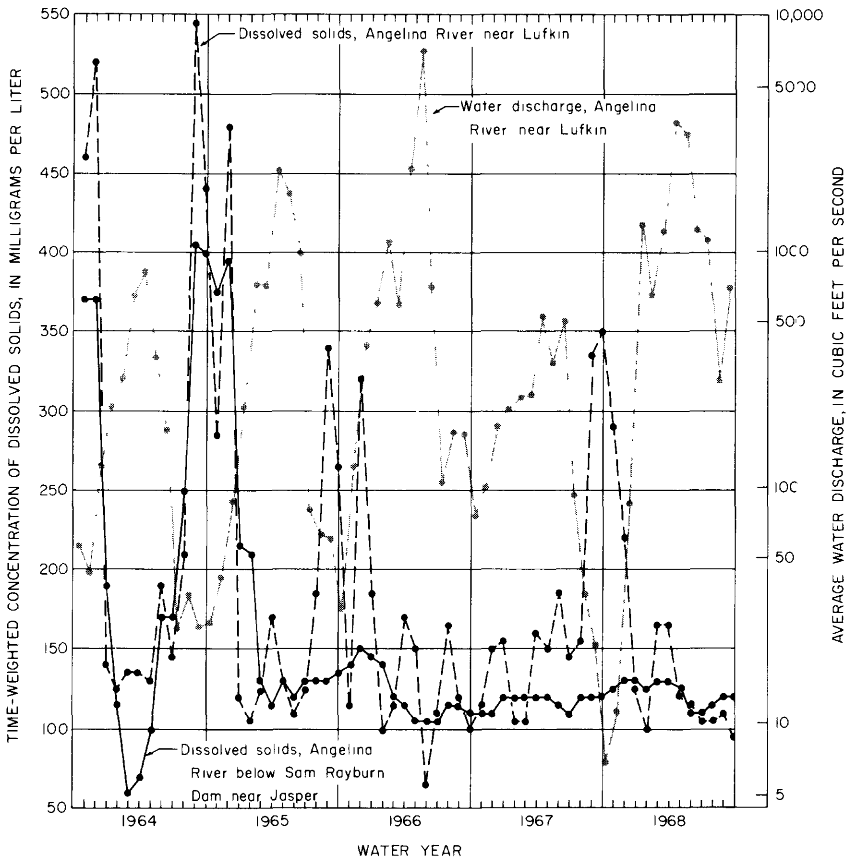


FIGURE 2.—Water discharge and concentrations of dissolved solids for daily chemical-quality stations, water years 1964–68.

dissolved-solids content of the Angelina River was considerably higher at the station near Lufkin than at the station below Sam Rayburn Dam. For example, in November 1963, when the water discharge of the Angelina River near Lufkin averaged less than 50 cfs (cubic feet per second), the time-weighted concentrations of dissolved solids in the Angelina River averaged about 520 mg/l at the station near Lufkin and about 370 mg/l at the station below Sam Rayburn Dam. Much of the dissolved-mineral content of the Angelina River originates upstream from Lufkin; the inflow downstream from Lufkin usually results in a decrease in the dissolved-mineral content of the Angelina River below Sam Rayburn Dam.

Before closure of the reservoir, no serious depletion of dissolved oxygen was noted at the station Angelina River below Sam Rayburn Dam (table 2). However, the quality of the water in the river was degraded locally between the stations near Lufkin and below Paper Mill Creek near Herty. During 39 surveys, the concentrations of dissolved solids and dissolved oxygen in the Angelina River below Paper Mill Creek averaged about 340 and 3.9 mg/l, respectively. During these surveys, the concentrations of dissolved solids and dissolved oxygen in the Angelina River near Lufkin averaged about 170 and 8.7 mg/l, respectively.

Tributaries that contribute to the degradation of the quality of water in the Angelina River downstream from Lufkin include Bayou LaNana and Paper Mill Creek. According to records of the Texas Water Development Board (Herbert Cook, written commun., 1968), about 4 cfs of treated municipal effluent is discharged into Bayou LaNana and about 30 cfs of treated industrial effluent is discharged into Paper Mill Creek.

Concentrations of dissolved solids and dissolved oxygen in Bayou LaNana near Nacogdoches averaged about 190 and 5 mg/l, respectively (table 2). The BOD (5-day, 20°C biochemical oxygen demand) during 12 surveys ranged from 2.8 to 6.1 mg/l. Because the quantity of water contributed by Bayou LaNana was small compared to the flow of the Angelina River, the influence of inflow from Bayou LaNana on the dissolved-solids and dissolved-oxygen content of the main stem usually was small. During some of the surveys, Bayou LaNana contained large concentrations of nutrients (as much as 48 mg/l nitrate, 27 mg/l ammonia, and 14 mg/l total phosphate). However, the inflow of nutrient-rich water from Bayou LaNana has not greatly increased the concentrations of nitrate and total phosphate in the main stem between the stations near Lufkin and below Paper Mill Creek.

During 53 surveys, most of which were made at about monthly intervals, the dissolved-solids content of Paper Mill Creek ranged from about 700 to 1,150 mg/l and averaged about 940 mg/l; the dissolved-oxygen content ranged from 0.0 to 5.7 mg/l and averaged about 1.7 mg/l; the temperature ranged from 25.5° to 41.5°C and averaged about 35°C. The BOD during 10 surveys ranged from 7.2 to 25 mg/l and averaged about 15 mg/l. These data indicate that most of the degradation of the quality of water in the Angelina River between the stations near Lufkin and Herty resulted from the inflow of wastes from Paper Mill Creek.

The dissolved-oxygen content of Paper Mill Creek has increased significantly since October 1967 and has resulted in a corresponding increase in the dissolved-oxygen content of the Angelina River below Paper Mill Creek.

RESERVOIR WATER QUALITY

THERMAL STRATIFICATION

Impoundment of water in a reservoir may result in significant changes in the quality of the water. Some of the changes are beneficial; others are detrimental. Many of the detriments are related to thermal stratification—layering of the water due to temperature-induced density differences.

The following table (after Lange, 1967, p. 1199) shows that pure water reaches its maximum density at a temperature of about 4°C and that the difference in density per 1°C is much greater at high temperatures than at low temperatures.

Temperature (°C)	*Density (g/ml)*
0. 0	0. 999841
4. 0	. 999973
5. 0	. 999965
10. 0	. 999700
15. 0	. 999099
20. 0	. 998203
25. 0	. 997044
30. 0	. 995646
35. 0	. 994033

A change in temperature from 29° to 30°C results in a change in density of about 0.0003 g/ml (grams per milliliter), whereas a change in temperature from 10° to 11°C results in a density change of about 0.0001 g/ml. Stable stratification is common in lakes and reservoirs where the density of the upper and lower levels of water differs by about 0.001–0.002 g/ml. Thus, temperature differences of 3°–4°C during the summer may result in stable stratification.

Other factors that may cause density differences between the inflowing and stored water are variations in suspended matter and salinity. However, the Angelina River water seldom contains more than 400 mg/l dissolved solids (table 1). Consequently, salinity-induced stratification of water in Sam Rayburn Reservoir is much less important than thermal stratification.

Thermal stratification may assume many patterns, which depend on geographical location, climatological conditions, depth, surface area, and configurations of the lake or reservoir. During the winter, many reservoirs in the temperate zone are characteristically isothermal—that is, the water has a uniform temperature and density and circulates freely. With the onset of spring, solar heating warms the incoming water and the water at the reservoir surface and causes a decrease in density. This warm surface water floats on the colder and denser water. As the surface becomes progressively warmer, the density gradient steepens and the depth to which wind can mix the water is diminished. Thus, water in the reservoir often is separated into three fairly distinct strata: (1) The epilimnion—a warm freely circulating surface stratum, (2) the hypolimnion—a cold stagnant lower stratum, and (3) the thermocline—a middle stratum characterized by rapid temperature change.

Thermal stratification usually persists until fall when a decrease in atmospheric temperatures cools both the surface water in the reservoir and inflow from streams. When the temperatures and densities of the epilimnion and thermocline approach those of the hypolimnion, the resistance to mixing is reduced, and wind action produces a complete mixing or overturn of the water.

The pattern of thermal stratification in Sam Rayburn Reservoir varies somewhat from the classical three-layered pattern, especially in shallow areas. Here a gradual temperature gradient, rather than three distinct layers, is usually present. Nevertheless, there were three fairly distinct layers in deep areas during eight of the 13 reservoir surveys, as indicated in typical profiles in figures 3 and 8. Data in tables 3–16 show that water in the reservoir was nearly iosthermal during surveys 5 (Feb. 2–4, 1966) and 8 (Feb. 15–17, 1967) and was only slightly stratified during surveys 10 (Nov. 1–2, 6, 1967) and 13 (Feb. 11–12, 1969).

Thermal stratification of water in Sam Rayburn Reservoir usually begins to develop in March or April and persists into October or November. For example, at site C_C, a deep area about 2 river miles upstream from Sam Rayburn Dam, the water temperature ranged from 10.0° to 9.0°C on February 17, 1967; from 27.0° to 16.5°C on June 17, 1967; and from 21.0° to 18.5°C on November 2, 1967.

DISSOLVED OXYGEN

Fish and other aquatic organisms require oxygen in one form or another to maintain the metabolic processes that produce energy for growth and reproduction. Moreover, dissolved oxygen is related to the cycles of some of the important elements dissolved in water and thus is one of the most important factors influencing the composition of water in a reservoir.

Water entering a reservoir contains organic material both from natural sources and from the activities of man. Bacterial stabilization of this organic material requires oxygen. Also, trees, brush, and other preexisting oxidizable material within the area inundated by the reservoir exert an oxygen demand.

The distribution of dissolved oxygen in a reservoir is closely related to thermal stratification (fig. 3). Oxygen enters the surface stratum of a reservoir by plant photosynthesis and by absorption from the atmosphere. During the period of winter circulation, the water is repeatedly exposed to the atmosphere and dissolved oxygen utilized in the decomposition of organic matter is replenished. However, during spring and summer, thermal stratification results in a reduction of vertical circulation of the water. Therefore, oxygen utilized in the decomposition of organic material is not replaced in the lower stagnant stratum of the reservoir, and a vertical dissolved-oxygen gradient develops.

Dissolved-oxygen data for Sam Rayburn Reservoir are shown in tables 3–15, and data for three sites are summarized graphically in figure 4. At most sites, the dissolved-oxygen gradient was large during

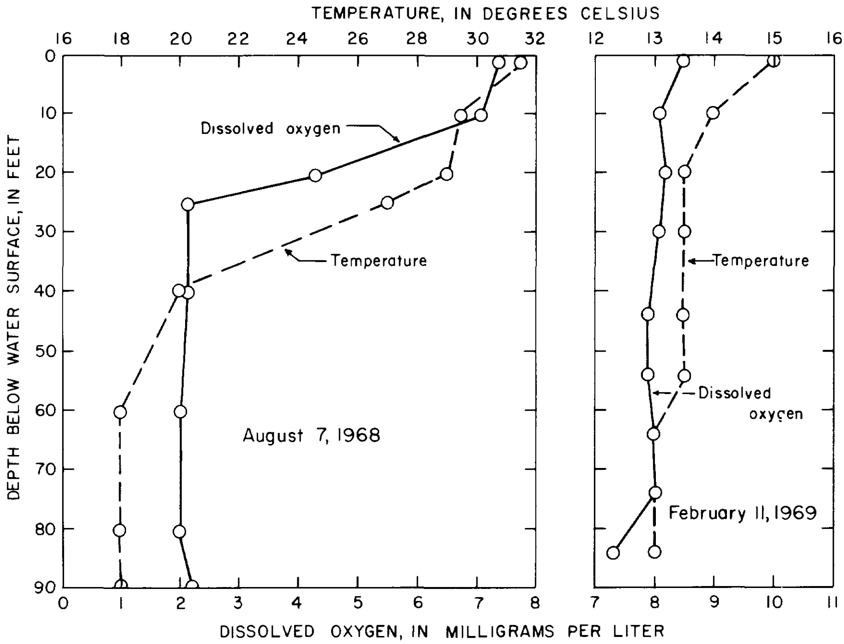


FIGURE 3.—Profiles of dissolved oxygen and water temperature for site Cc, August 7, 1968, and February 11, 1969.

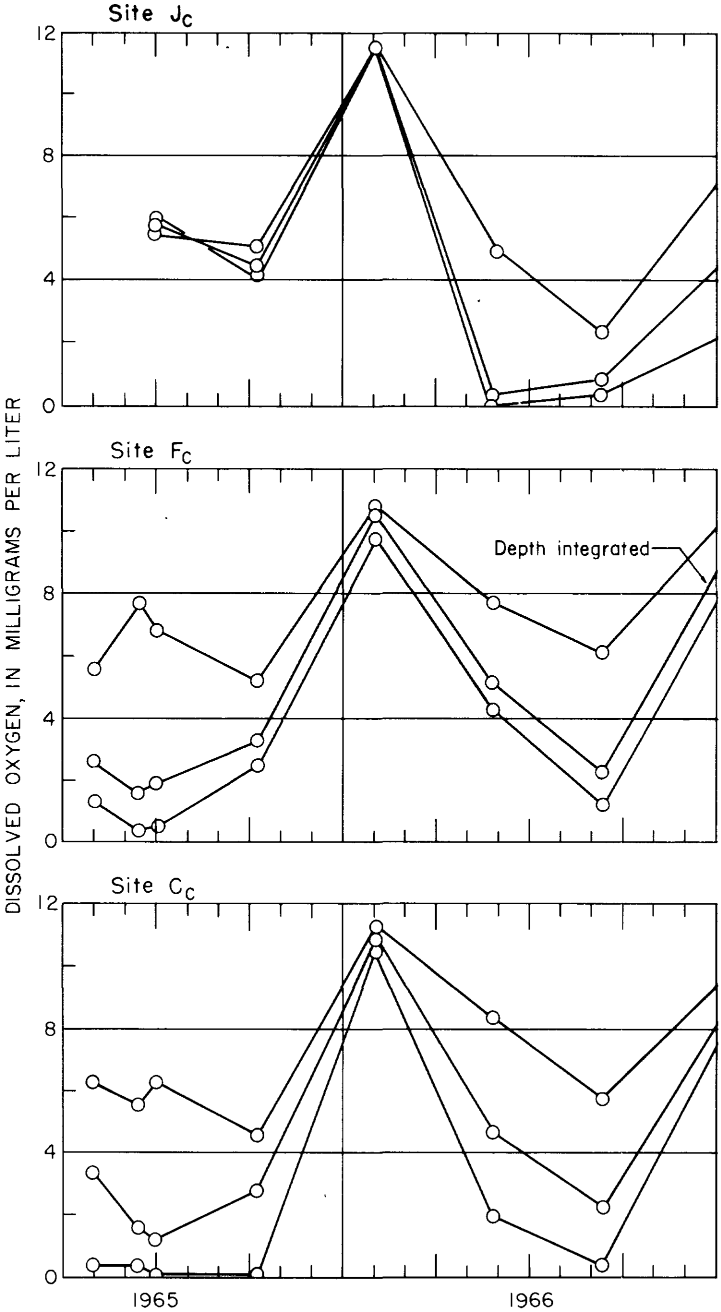
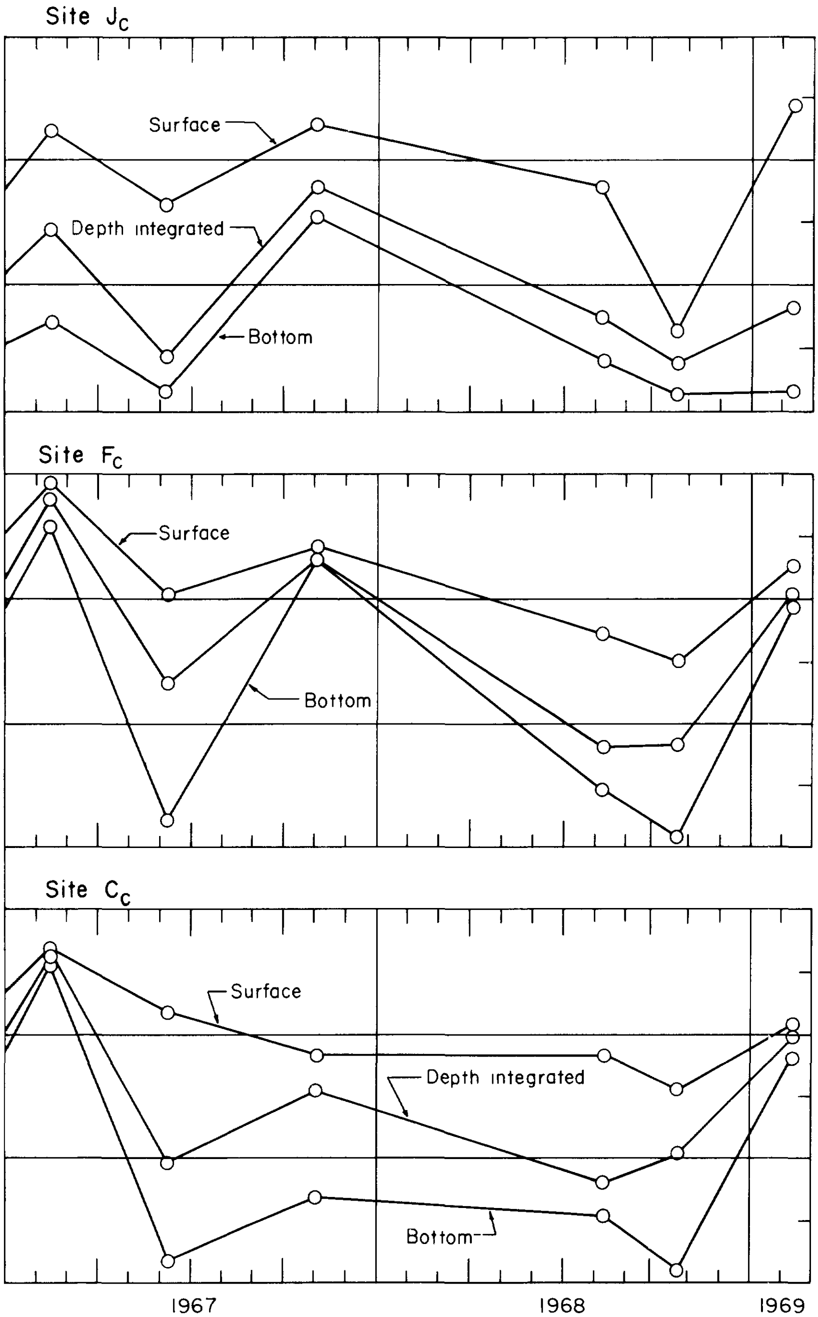


FIGURE 4.—Variations of dissolved oxygen



at selected sites, April 1965–February 1969.

the period of summer stagnation but decreased greatly during periods of winter circulation. Also, data in figure 4 show that the dissolved-oxygen content of water in the reservoir varied seasonally and areally. The concentration of dissolved oxygen usually was much greater during periods of winter circulation than during periods of summer stagnation. For example, at site C_C near Sam Rayburn Dam, the depth-integrated dissolved-oxygen concentration during the reservoir surveys ranged from 1.2 mg/l (16-percent saturation) on June 30, 1965, to 10.9 mg/l (91-percent saturation) on February 4, 1966.

Figure 4 indicates that the oxygen content of water was generally greater in the downstream half of the reservoir than in the upstream half. This is illustrated more clearly by figure 5. Data in figure 5 show that the mean depth-integrated concentration of dissolved oxygen at sites along the drowned channel of the Angelina River during surveys 3–13 ranged from 5.8 mg/l (60-percent saturation) at site F_C (about 12.0 river miles upstream from Sam Rayburn Dam) to 4.2 mg/l (43-percent saturation) at site J_C (about 41.5 river miles upstream from the dam).

Organic wastes contributed by Paper Mill Creek were partly responsible for the low concentration of dissolved oxygen in the upstream half of the reservoir. However, dissolved-oxygen concentrations in tributary arms were not significantly greater than those in the upstream half of the reservoir. For example, the depth-integrated concentrations of dissolved oxygen during surveys 3–4 and 6–13 averaged 4.0 mg/l (45-percent saturation) at site M_C in the drowned channel of Ayish Bayou. The depth-integrated concentrations of dissolved oxygen during surveys 6–13 averaged 4.7 mg/l (50-percent saturation) at site N_C in the lower reach of the Attoyac Bayou arm. Much of these tributary areas and the upstream half of the reservoir area were inundated considerably later than the downstream half. Therefore, during the later surveys, the decomposition of trees, brush, and the other preexisting organic debris was more active in tributary areas and the upstream half of the reservoir and required more oxygen than was required in the downstream half of the reservoir.

During the first three surveys, which were in 1965 when the downstream half of the reservoir was freshly inundated, the depth-integrated concentration of dissolved oxygen at most sites averaged less than 4 mg/l. Thus, part of the dissolved-oxygen deficit in the upstream half of the reservoir resulted from the decomposition of preexisting organic debris. Also, as the Angelina River and tributaries merge into Sam Rayburn Reservoir, the cross-sectional area increases.

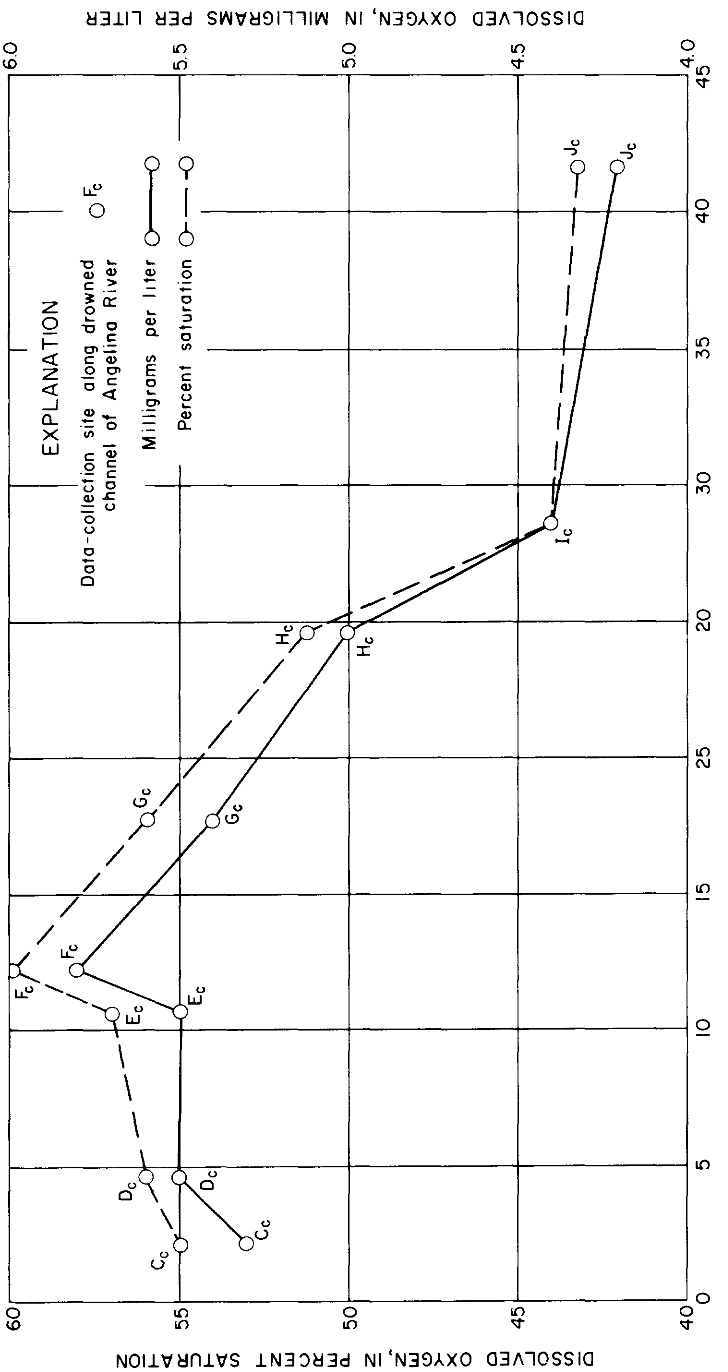


FIGURE 5.—Profile of the mean depth-integrated concentration of dissolved oxygen, surveys 3–13.

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Consequently, traveltime in the reach inundated by the reservoir increases, and a large part of the oxygen-demanding material from natural sources and activities of man is stabilized before the water enters the downstream reach of the reservoir.

Although the depth-integrated concentrations of dissolved oxygen at sites near Sam Rayburn Dam averaged more than 5 mg/l during the reservoir surveys, water below depths of 25–35 feet usually contained less than 2.5 mg/l and often contained less than 1.0 mg/l during periods of summer stagnation (fig. 3).

DISSOLVED SOLIDS

Because the dissolved-solids content and specific conductance of a water are directly related, field measurements of specific conductance can be used to detect variations in the dissolved-solids content of water in a reservoir. Therefore, during each reservoir survey, the specific conductance of water at each data-collection site was determined at depth intervals of about 5–10 feet. The relation of dissolved solids to specific conductance was determined by laboratory analyses of samples collected from several of the sites.

Usually, agreement between laboratory and field measurements of specific conductance was good. However, for some samples collected near the bottom of the reservoir when anaerobic conditions prevailed, the oxidation and precipitation of iron and manganese before analysis caused laboratory conductance to be much lower than field values. Therefore, unless otherwise indicated, the conductances reported in tables 3–15 are those measured in the field, and these data were used to estimate the average concentration of dissolved solids in the reservoir during each of the surveys (fig. 6).

Data in figure 6 show that the average concentration of dissolved solids during the reservoir surveys ranged from about 100 to 145 mg/l and was most variable during the first year after closure of the reservoir. A comparison of figure 6 with figure 2 shows that the greatest variation occurred during periods when variation of the dissolved-solids content of the Angelina River near Lufkin also was large. These data indicate that most of the variation in the dissolved-solids content of the reservoir resulted from variations in the volume and dissolved-solids content of inflow upstream from Lufkin.

Conductance data in tables 3–15 show that both vertical and longitudinal stratification of waters with different concentrations of dissolved solids occurred in Sam Rayburn Reservoir. After fall overturn, the concentration of dissolved solids was fairly uniform at a particular site but varied areally. During periods of winter circulation, water

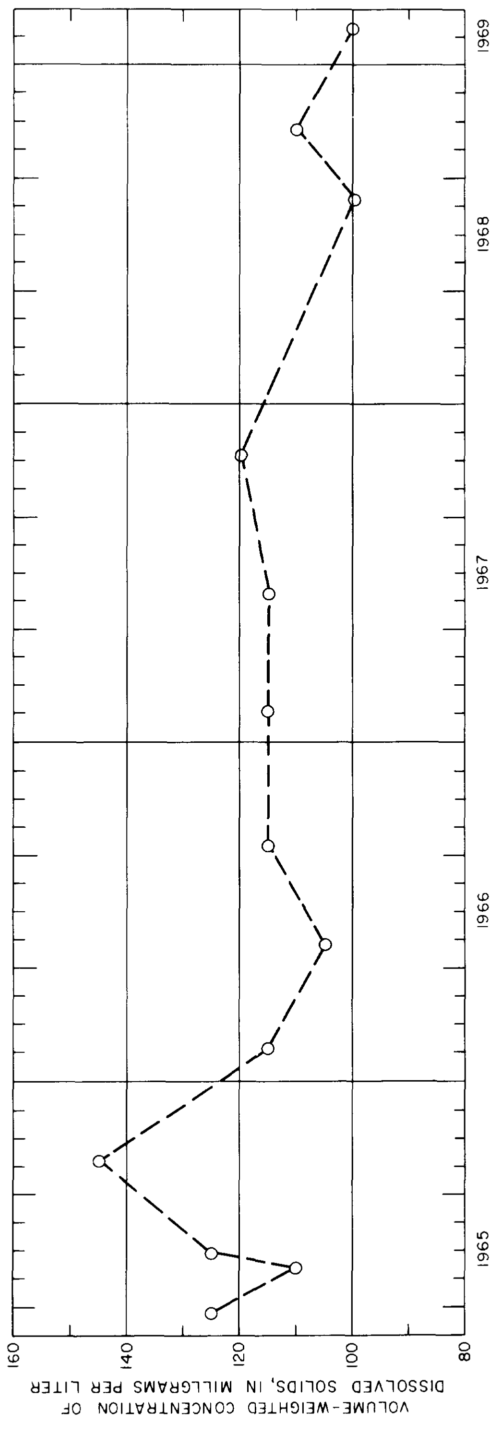

FIGURE 6.—Variation of the average concentration of dissolved solids, April 1965–February 1969.

apparently moved downstream with a minimum of longitudinal mixing (fig. 7). During periods of thermal stratification, the dissolved-solids stratification pattern was more complex and was somewhat variable. However, when the inflowing water was warmer than water in the reservoir, it generally flowed downstream over the colder water. The concentration of dissolved solids in inflowing water usually varied inversely with water discharge. Consequently, thermal stratification of the water usually was accompanied by chemical stratification (fig. 7). During summer, the concentration of dissolved solids at a particular site generally was fairly uniform in the epilimnion, increased sharply below the thermocline, and was greatest just above the bottom of the reservoir where anaerobic conditions led to the solution of minerals (principally iron and manganese) from the sediments.

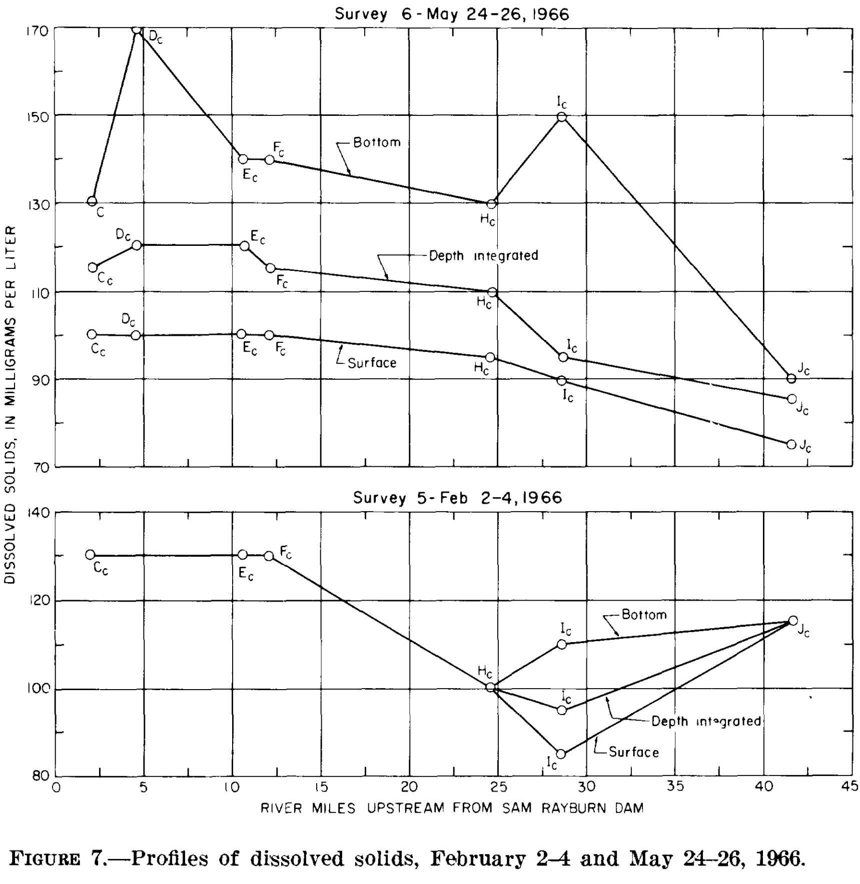

FIGURE 7.—Profiles of dissolved solids, February 2–4 and May 24–26, 1966.

IRON AND MANGANESE

The occurrence and distribution of iron and manganese in waters of a reservoir are intimately related to the dissolved-oxygen content. During summer stratification, the hypolimnion is unable to replenish dissolved oxygen utilized in the decomposition of organic matter. In the period of anaerobic decompositon that follows, reducing conditions often result in the solution of iron and manganese from sediments at the bottom of the reservoir. Throughout the duration of summer stagnation, the concentrations of iron and manganese in the bottom waters increase and may eventually reach very high values. After circulation begins in the fall and oxygen is replenished throughout the depth of the reservoir, most of the iron and manganese is oxidized to less soluble forms and settles to the bottom of the reservoir.

Iron and manganese data collected during the surveys of Sam Rayburn Reservoir are given in tables 5–15. These values are for iron and manganese in solution when the samples were collected. The concentrations of iron and manganese throughout the reservoir were much lower during periods of winter circulation than during periods of summer stagnation.

During each of three reservoir surveys made in February (surveys 5, 8, and 13), the concentrations of iron and manganese at site C_C near Sam Rayburn Dam were less than 0.40 and 0.25 mg/l, respectively. During periods of summer stagnation, however, the concentrations of iron and manganese increased greatly, especially below the thermocline where the concentration of dissolved oxygen was low. For example, during survey 4 (Oct. 6, 1965), the iron content of water at site C_C ranged from less than 1 mg/l at depths less than 30 feet to as much as 14 mg/l at greater depths (fig. 8). During survey 7 (Sept. 9, 1966), the concentration of dissolved manganese at site C_C ranged from less than 0.4 mg/l at depths less than 10 feet to as much as 6.2 mg/l at greater depths.

OTHER PROPERTIES OR CONSTITUENTS

Data in table 1 indicate that the variations in concentrations of principal chemical constituents in water released from the reservoir usually were small. During the period March 1965–September 1968, water released from the reservoir generally contained 21–30 mg/l sodium, 25–38 mg/l chloride, 10–20 mg/l sulfate, and 6–9 mg/l silica. Hardness of the water usually was between 43 and 60 mg/l.

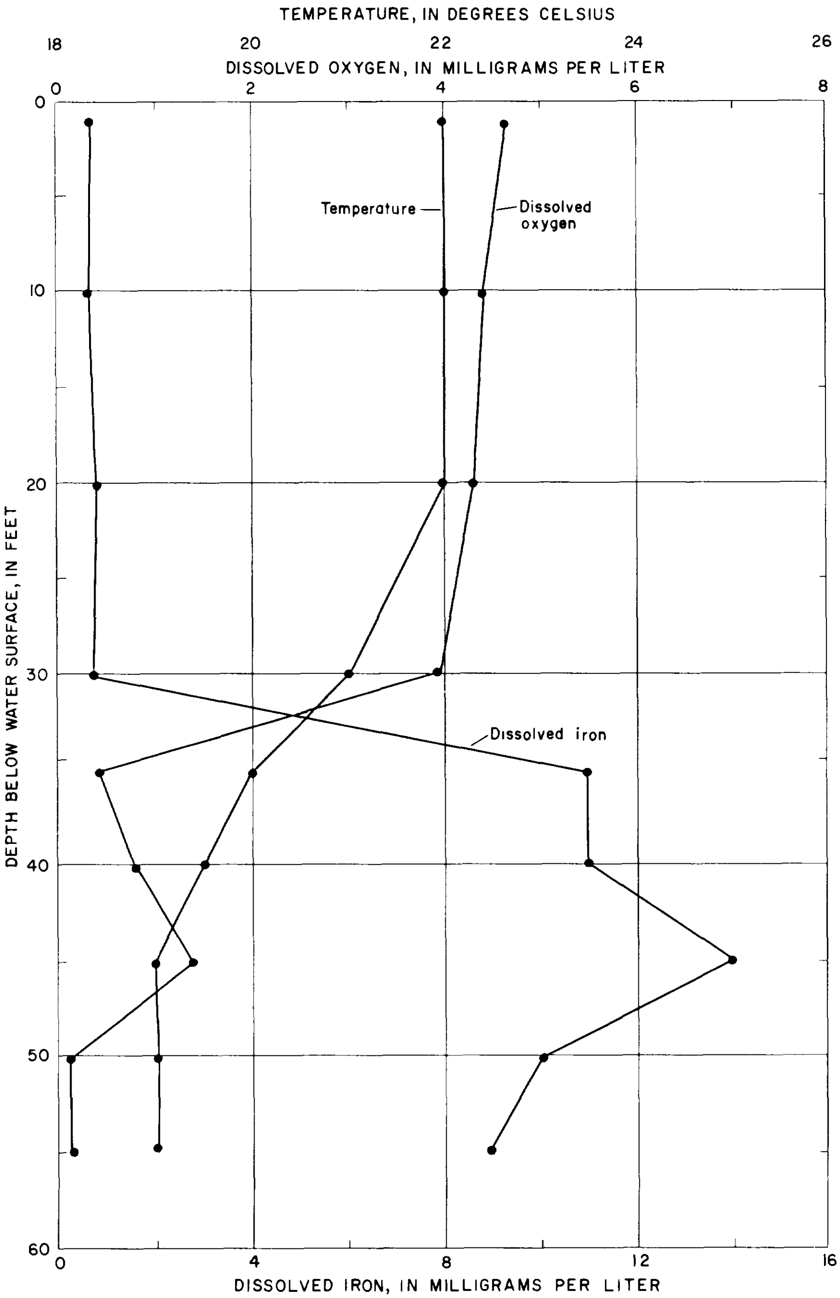

FIGURE 8.—Profiles of water temperature, dissolved oxygen, and dissolved iron for site Cc, October 6, 1965.

CHANGES IN WATER QUALITY DOWNSTREAM FROM SAM RAYBURN RESERVOIR

Concurrent data collected at three sites during 17 surveys (table 2), after deliberate impoundment began in the reservoir, indicate that no significant changes in the quality of water occurred in the 19-mile reach downstream from Sam Rayburn Dam. The concentrations of dissolved solids averaged about 105 mg/l at the station Angelina River below Sam Rayburn Dam and about 100 mg/l at the other two stations.

Data in table 2 and figure 9 show that the dissolved-oxygen concentration at each of the sites varied seasonally and usually was lowest in late summer or early fall after periods of summer stagnation in the reservoir. During the 1968 calendar year, for example, the dissolved-oxygen concentration of the Angelina River ranged from 11.3 mg/l

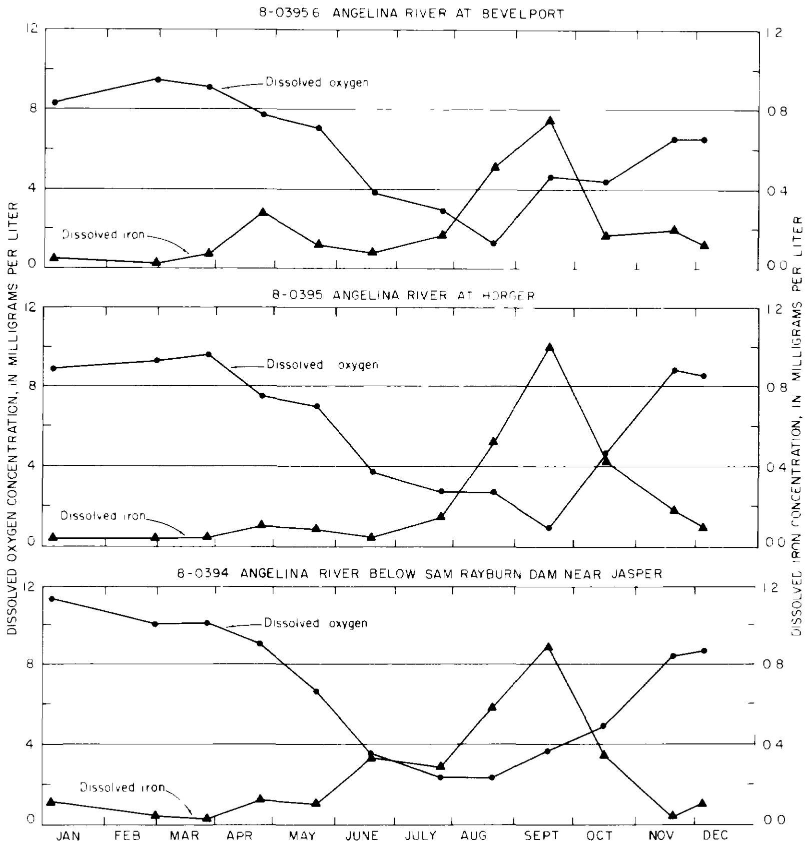

Figure 9.—Variation of dissolved oxygen and iron at three sites on the Angelina River downstream from Sam Rayburn Reservoir, 1968 calendar year.

(109-percent saturation) in January to 2.3 mg/l (less than 30-percent saturation) in July and August at the station below Sam Rayburn Dam. The similarity of the graphs in figure 9 shows that the amount of reaeration that occurred in the reach studied was insignificant.

During 1968, the concentration of iron in the Angelina Piver ranged from 0.02 mg/l in March to 0.89 mg/l in September at the station below Sam Rayburn Dam. Graphs in figure 9 show that similar concentrations were measured at the other two stations. The concentrations of iron and manganese were usually maximum during periods when the dissolved-oxygen deficit was large.

SUMMARY OF CONCLUSIONS

Before closure of Sam Rayburn Reservoir, the concentration of dissolved solids in the Angelina River was less variable at the daily chemical-quality station below Sam Rayburn Dam thar at the upstream station near Lufkin. The dissolved-solids content of water at both stations generally varied inversely with water discharge, but during low-flow periods, usually was considerably higher at the station near Lufkin than at the station downstream from Sam Rayburn Dam.

Flow in the Angelina River was adequate to prevent wastes released into the river downstream from Lufkin from causing serious deterioration of the inorganic quality of water at the station downstream from Sam Rayburn Dam. Before closure of the reservoir, the time-weighted concentration of dissolved solids in the Angelina River during the period from October 1963 to February 1965 averaged about 250 mg/l at the station near Lufkin and about 220 mg/l at the station below Sam Rayburn Dam.

Regulation of flow by Sam Rayburn Reservoir has greatly decreased the variation of dissolved solids and has resulted in more uniformity of the chemical quality of the Angelina River downstream from the reservoir. During 80 percent of the time from March 1965 to September 1968, the dissolved-solids content of the Angelina River below Sam Rayburn Dam was between 110 and 140 mg/l. During 80 percent of the same period, the dissolved-solids content of the Angelina River upstream at the station near Lufkin was between 90 and 305 mg/l.

Wastes from Paper Mill Creek near Herty caused local degradation of the quality of water in the Angelina River. During 39 surveys, the concentrations of dissolved solids and dissolved oxygen in the Angelina River below Paper Mill Creek averaged about 340 ar d 3.9 mg/l, respectively. Upstream, at the station near Lufkin, the concentrations of dissolved solids and dissolved oxygen in the river during the 39 surveys averaged about 170 and 8.7 mg/l, respectively. The concentrations of dissolved solids and dissolved oxygen in Paper Mill Creek during 53 surveys averaged about 940 and 1.7 mg/l, respectively. The 5-day, 20°C biochemical oxygen demand during 10 surveys ranged from 7.2 to 25 mg/l and averaged about 15 mg/l. Since October 1967, the disolved-oxygen content of Paper Mill Creek has increased significantly and has resulted in a corresponding increase in the dissolved-oxygen content of the Angelina River below Paper Mill Creek.

Water-quality surveys of the reservoir indicate that thermal stratification generally begins in March or April and persists into October or November. When the water was thermally stratified, three fairly distinct layers usually were present in deep areas: (1) the epilimnion, a warm freely circulating surface stratum, (2) the hypolimnion, a cold stagnant lower stratum, and (3) the thermocline, a cold middle stratum characterized by rapid temperature change. In shallow areas, the water temperature usually decreased gradually from the surface to the bottom.

The dissolved-oxygen content of water in the reservoir varied seasonally and was related to thermal stratification. During winter circulation, the concentration of dissolved oxygen at most sites usually was much higher than during summer stagnation. At site C_C about 2 river miles upstream from Sam Rayburn Dam, the depth-integrated dissolved-oxygen concentration during 13 reservoir surveys ranged from 1.2 mg/l (16-percent saturation) on June 30, 1965, to 10.9 mg/l (91-percent saturation) on February 4, 1966.

During periods of summer stagnation when the water was thermally stratified, the lower stagnant stratum of water at most sites usually contained much less dissolved oxygen than the surface stratum. Although the depth-integrated concentration of dissolved oxygen at deep sites near Sam Rayburn Dam averaged more than 5 mg/l during the reservoir surveys, water below depths of 25–35 feet during periods of summer stagnation usually contained less than 2.5 mg/l and often contained less than 1.0 mg/l.

The dissolved-oxygen content of water in Sam Rayburn Reservoir varied areally and was significantly greater in the downstream half than in the upstream half. During surveys 3–13, the depth-integrated concentration of dissolved oxygen ranged from 5.8 mg/l (60-percent saturation) at site F_C (about 12.0 river miles upstream from Sam Rayburn Dam) to 4.2 mg/l (43-percent saturation) at site J_C (about 41.5 miles upstream from Sam Rayburn Dam). Although organic wastes contributed by Paper Mill Creek were responsible for part of the dissolved-oxygen deficit in the upstream half of the reservoir, part of the deficit resulted from the oxidation of naturally occurring debris in the water and in the area inundated by the reservoir.

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The average concentration of dissolved solids during 13 reservoir surveys ranged from about 100 to 145 mg/l and was most variable during the first year after closure of the reservoir when the dissolved-solids content of water passing the daily station Angelina River near Lufkin was also highly variable.

The dissolved-solids content of water in the reservoir varied areally and was related to the patterns of inflow and thermal stratification. During periods of winter circulation, water moved through the reservoir with a minimum of longitudinal mixing. Thus, the concentration of dissolved solids was fairly uniform at a particular site but varied areally.

During spring and summer, inflowing water usually was warmer than water in the reservoir and moved over the colder water, the result being chemical stratification. During summer, the concentration of dissolved solids at a particular site usually was fairly uniform in the epilimnion, increased sharply below the thermocline, and was greatest just above the bottom of the reservoir where anaerobic conditions led to the solution of minerals from the sediments.

The concentrations of dissolved iron and manganese in Sam Rayburn Reservoir varied seasonally and generally were much lower during winter circulation than during summer stagnation. During the three February surveys, water at site C_C near Sam Rayburn Dam contained less than 0.40 mg/l iron and 0.25 mg/l manganese. However, on October 6, 1965, the iron content of water at site C_C ranged from less than 1 mg/l at depths of less than 30 feet below the surface to as much as 14 mg/l at greater depths. Similarly, on September 9, 1966, the manganese content of water at site C_C ranged from less than 0.4 mg/l at depths of less than 10 feet to as much as 6.9 mg/l at greater depths.

Chemical-quality records for the daily station Angelina River below Sam Reyburn Dam near Jasper indicate that the variations in concentrations of principal chemical constituents in water released from the reservoir usually were small. During the period March 1965–September 1968, the water usually contained 21–30 mg/l sodium, 25–38 mg/l chloride, and 10–20 mg/l sulfate. Hardness of the water usually was between 43 and 60 mg/l.

Although storage of water in Sam Rayburn Reservoir has resulted in a decrease in variations of dissolved solids and principal chemical constituents in the Angelina River downstream from the reservoir, it has resulted in significant seasonal variations in the concentrations of dissolved oxygen, iron, and manganese at downstream sites.

The dissolved-oxygen concentrations at three sites in the 19-mile reach of the Angelina River downstream from Sam Rayburn Dam were low in late summer and early fall after periods of summer stagnation in the reservoir. Moreover, the amount of reaeration that occurred in the reach was insignificant. During periods when the dissolved-oxygen deficit was large, the concentrations of iron and manganese at each of the three sites increased greatly.

REFERENCES CITED

Dowell, C. L., and Breeding, S. D., 1967, Dams and reservoirs in Texas: Texas Water Devel. Board Rept. 48, 267 p.

Lange, N. A., compiler and ed., 1967, Handbook of chemistry [10th ed.]: New York, McGraw-Hill, 2001 p.

U.S. Geological Survey, 1965–68, Water resources data for Texas, 1965, [1966, 1967, 1968, respectively]—Part 1, Surface water records: U.S. Geol. Survey open-file report.

TABLES 1–16

TABLE 1.—*Concentrations of selected constituents, Angelina River near Lufkin and Angelina River below Sam Rayburn Dam near Jasper*

Station No. (fig. 1)	Station name	Date	Constituent	Concentration of constituent, in milligrams per liter, that was equaled or exceeded for indicated percentage of days				
				10	25	50	75	90
8-0370	Angelina River near Lufkin	Oct. 1963–Feb. 1965	Sodium (Na)	185	105	40	30	25
			Chloride (Cl)	325	175	50	35	25
			Dissolved solids	590	360	160	130	110
			Hardness as $CaCO_3$	110	70	40	35	30
		Mar. 1965–Sept. 1968	Sodium (Na)	90	45	30	25	15
			Chloride (Cl)	140	60	35	25	20
			Dissolved solids	305	180	130	110	90
			Hardness as $CaCO_3$	60	40	35	30	25
8-0394	Angelina River below Sam Rayburn Dam near Jasper.	Oct. 1963–Feb. 1965	Sodium (Na)	130	100	50	30	15
			Chloride (Cl)	155	120	55	30	15
			Dissolved solids	430	355	205	130	75
			Hardness as $CaCO_3$	75	70	45	35	20
		Mar. 1965–Sept. 1968	Sodium (Na)	30	27	25	24	21
			Chloride (Cl)	38	33	31	28	25
			Dissolved solids	140	130	125	120	110
			Hardness as $CaCO_3$	60	54	51	48	43

TABLE 2.-Results of periodic water-quality surveys, Angelina River watershed, Texas

[Results in milligrams per liter except as indicated]

Date	Mean discharge (cfs)	Silica (SiO_2)	Iron (Fe) (a)	Manganese (Mn) (a)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Phosphate Ortho	Phosphate Total	Dissolved solids (calculated)	Hardness as $CaCO_3$ Calcium, magnesium	Hardness as $CaCO_3$ Noncarbonate	Specific conductance (micromhos at 25° C)	pH	Dissolved oxygen (DO) mg/l	Dissolved oxygen (DO) Percent saturation	Biochemical oxygen demand (BOD)	Temperature (°C)	Ammonia (NH_4)	Nitrite (NO_2)
8-0370 ANGELINA RIVER NEAR LUFKIN																										
June 9, 1964...	235	--	--	--	--	--	--	--	16	--	21	--	--	--	--	--	34	21	183	6.3	6.2	76	--	26.5	--	--
July 28.......	42	12	--	--	10	5.8	48	3.4	41	21	71	0.2	0.0	0.11	--	192	49	15	364	6.9	7.0	95	--	31.5	--	0.00
Aug 28	26	--	--	--	--	--	--	--	14	39	200	--	--	--	--	--	76	64	766	6.4	6.0	77	--	29.0	--	--
Oct. 1.........	30	--	--	--	--	--	--	--	16	8.0	148	--	--	--	--	--	56	43	583	6.7	7.8	88	--	22.0	--	--
Oct. 22.......	9.8	--	--	--	--	--	--	--	42	28	54	--	--	--	--	--	30	0	316	6.7	9.8	100	--	17.0	--	--
Nov. 11.......	24	--	--	--	--	--	--	--	9	42	245	--	--	--	--	475	92	84	941	6 0	9.4	98	--	18.0	--	--
Dec. 3.......	53	11	--	--	19	5.7	131		66	56	171	.4	1.8	--	--	428	71	17	799	6.5	5.9	56	--	13.0	--	--
Jan. 13, 1965..	134	17	--	--	7.0	3.1	30		23	28	31	.1	3.2	--	--	130	30	16	210	7 1	10.1	90	--	10.5	--	--
Feb 2.........	230	16	--	--	6.5	3.1	23		10	31	27	.1	.6	--	--	112	29	21	187	6.5	10.6	91	--	9.0	--	--
Mar. 9.........	975	35	--	--	14	6.6	50		10	49	78	.2	.0	--	--	238	62	54	397	6.4	10.0	92	--	12.0	--	--
Apr. 2.........	3130	35	--	--	9.5	5.2	29		13	36	42	.2	.5	--	--	163	45	34	258	5.8	6.7	68	--	17 0	--	--
Apr. 29..... ..	310	18	--	--	9.2	4.9	25		30	26	32	.1	.2	--	--	130	43	18	217	6.8	7.7	86	--	21.0	--	--
June 11........	1500	15	--	--	10	5.6	21		40	23	26	.2	.5	--	--	121	48	15	208	6.5	5.3	63	--	25.0	--	--
July 1.	174	20	--	--	9.0	5.0	26		38	21	33	.2	.1	--	--	133	43	12	222	6.4	6.9	88	--	28.5	--	--
July 29........	85	14	--	--	19	9.1	97		14	46	167	.1	.0	--	--	359	85	74	699	5.8	6.7	85	--	28.0	--	--
Aug 27........	64	7.8	1.2	--	12	7.3	85		28	22	140	.3	.1	--	--	289	60	37	569	6.5	6.7	86	--	28.5	--	.02
Oct. 8.........	36	12	2.4	--	5.5	2.7	22	3.2	26	23	22	.2	.1	.07	--	105	25	4	177	6.3	8.6	91	--	19.0	--	.03
Nov. 2....	131	13	2.3	--	5.5	3.0	20	3.3	32	16	21	.4	.4	.06	--	99	26	0	161	6.1	9.7	96	--	15.5	0.00	.09
Nov. 29.......	102	12	.11	--	12	5.8	79	3.6	22	29	130	.3	.4	.01	--	283	54	36	540	6.1	7.3	73	--	16.0	.00	.06
Dec. 28........	482	--	--	--	--	--	--	--	10	--	20	--	--	--	--	--	30	22	163	6.0	9.3	83	--	10.5	--	--
Feb. 1, 1966...	950	--	--	--	--	--	--	--	11	--	22	--	--	--	--	--	42	33	194	6.0	13.1	107	--	7.0	--	--
Mar. 3........	840	12	.20	--	11	5.8	39		12	40	59	.1	.2	--	--	173	51	41	316	6.1	13.1	125	--	13.5	--	--
Mar. 31........	680	--	--	--	--	--	--	--	21	--	27	--	--	--	--	--	40	23	197	6.3	10.0	104	--	17.5	--	--
May 6..........	13000	--	--	--	--	--	--	--	16	--	14	--	--	--	--	--	24	11	107	5.9	7.2	77	--	19.5	--	--
May 25.........	3060	11	--	--	6.0	2.7	9.3	.1	22	13	13	.1	.9	--	--	67	26	8	114	6.3	7.0	81	--	23.5	--	--
July 2.........	102	19	--	--	8.5	4.6	22	1.6	36	17	30	.2	.3	--	--	121	40	11	200	6.5	4 9	60	--	27.0	--	--
Aug. 6.........	48	--	--	--	8.4	4.4	--	--	31	16	47	.2	--	--	--	--	39	14	254	6.3	6.2	76	--	26.5	--	--
Sept. 11.......	158	14	--	--	6.9	2.8	16	2.6	26	14	22	1	1.2	--	--	93	29	7	147	6.8	6.6	79	--	25.0	--	--
Oct. 19........	116	--	--	--	6 3	3.1	--	--	34	11	25	--	--	--	--	--	28	1	167	6.6	8.3	85	--	16.5	--	--
Nov. 27........	146	--	--	--	8.8	4.0	--	--	32	17	67	--	--	--	--	--	38	12	319	6.6	9.0	98	--	20.0	--	--
Jan. 9, 1967...	235	16	--	--	7 5	3.1	19	3.2	20	22	26	.1	.5	.03	--	107	31	15	169	6.3	11.4	91	--	6.0	--	--
Feb. 16........	177	10	.53	0.06	8.0	3.4	20	2.2	29	16	27	.1	.0	.04	--	101	34	10	175	6.5	9.0	83	--	12.0	--	--
Mar. 30........	260	13	.82	.10	6.0	3.9	21	2.6	28	22	27	.2	0	--	--	112	36	13	188	6.9	8.0	87	--	20.0	--	--
May 4..........	406	17	--	--	14	6.2	56	3.2	26	28	97	.2	.5	--	--	235	60	39	425	6.1	9.1	97	--	19.0	--	--
June 6.........	1180	13	.21	.06	6.2	2.6	14	2.9	13	23	17	.1	.5	--	--	85	26	16	131	5.8	8.9	105	--	24.0	--	--
July 14..... ..	155	13	.50	--	8.0	2.9	37	3.0	18	23	56	.2	.1	.01	--	152	32	17	263	6.4	6 4	81	--	28.0	--	--
Sept. 19.......	66	10	1.0	--	13	6.4	90	3.8	30	18	156	.3	2	.02	--	313	59	34	591	6.6	8.4	102	--	26.5	--	--
Oct. 31... ...	6.7	8.0	.15	--	12	5.6	79	4.0	27	31	123	.2	.2	.10	--	276	54	32	520	7.8	6.7	66	--	15.0	--	--
Dec. 6.........	21	12	.03	--	5.5	2 7	34	3.8	69	15	22	4	.3	.05	.17	130	25	0	219	b7.0	9.7	97	--	14.0	--	00
Jan. 3, 1968...	137	15	.48	--	6 0	2.8	21	3.1	16	24	27	.2	.0	--	.10	107	26	13	174	b7.0	12.9	111	0 9	7.5	--	--
Feb. 26.... ...	635	12	.30	--	9.5	4.8	25	2.4	10	42	35	.3	.0	--	.08	136	43	35	235	b7.2	10.0	96	1.1	12.0	--	--
Mar. 26..	1150	12	.35	--	11	6.1	39	2.4	12	40	64	.2	.0	--	.12	181	53	43	333	b6.9	12.6	135	1.0	17.5	--	02
Apr. 24.......	3460	13	.30	--	10	5.0	26	2.9	26	25	41	.2	.0	--	.25	136	46	24	243	b6.7	5.8	64	.8	19.0	--	--
May 22........	4290	11	.27	--	7.5	3.5	17	2.9	23	18	25	1.8	.0	--	.22	98	33	14	167	b6.7	6.4	75	2.0	22 0	--	--
June 19..... ..	304	18	1.1	--	9.5	4.8	19	2.6	38	17	26	2.0	.4	--	.17	118	43	12	196	b6.4	5.2	66	1.9	26.5	--	--

See footnotes at end of table.

TABLE 2.-Results of periodic water-quality surveys, Angelina River watershed, Texas-Continued

Date	Mean discharge (cfs)	Silica (SiO_2)	Iron (Fe) (a)	Manganese (Mn) (a)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Phosphate Ortho	Phosphate Total	Dissolved solids (calculated)	Hardness as $CaCO_3$ Calcium, magnesium	Hardness as $CaCO_3$ Noncarbonate	Specific conductance (micromhos at 25° C)	pH	Dissolved oxygen (DO) mg/l	Dissolved oxygen (DO) Percent saturation	Biochemical oxygen demand (BOD)	Temperature (°C)	Ammonia (NH_4)	Nitrite (NO_2)
8-0370. ANGELINA RIVER NEAR LUFKIN--continued																										
July 22, 1968	328	18	0.18	0.12	8.0	4.4	17	2.4	30	20	23	0.2	0.5	0.15	0.22	109	38	13	182	b6.6	5.9	75	1.0	27.0	--	--
Aug 19	155	16	75	30	7.0	3.8	15	2.5	31	16	18	1	.2	--	21	94	33	8	151	b7.0	5.8	78	1.2	31.0	--	--
Sept 18	1020	15	15	--	4.2	2.1	7.9		10	12	11	.0	2	--	.34	57	19	11	101	b6.0	6.6	77	9	21.5	--	--
Oct 14	--	15	68	08	6.2	3.1	16		18	21	18	1	.1	--	14	88	28	13	143	b6.7	7.2	84	9	23.5	--	--
Nov 19	--	15	67	09	6.0	3.6	19		22	20	22	2	.2	--	.29	97	30	12	162	b6.9	8.9	79	--	10.5	--	--
Dec 3	--	11	44	03	6.0	3.5	18		10	23	26	2	1	--	.32	93	29	21	162	b6.7	8.4	78	1.6	12.0	--	--
Jan 14, 1969	--	17	11	--	9.5	5.6	20		16	39	26	1	0	--	--	125	47	34	206	b6.8	10.0	84	--	8.0	--	--
Feb. 3	--	13	53	11	8.5	4.7	25		17	29	36	.1	2	--	26	124	41	27	219	b6.3	9.4	90	1.3	13.5	--	--
Mar 4	--	12	22	--	9.0	4.5	26		10	33	38	2	1	--	14	128	41	33	228	b6.8	9.3	83	--	10.5	--	--
8-0370.8. BAYOU LaNANA NEAR NACOGDOCHES																										
Aug 28, 1964		10	--	--	11	6.5	35	6.8	88	41	14	0.6	0.3	2.0	--	172	54	0	348	6.7	0.4	5	--	25.5	--	0.00
Oct 1		15	--	--	12	5.4	52	7.5	135	50	22	.5	1.9	.90	--	251	52	0	451	6.9	1.8	20	--	20.0	10	5.7
Oct 22		16	--	--	14	7.1	74	12	179	102	30	6	2.2	06	--	377	64	0	670	7.0	2.8	26	--	13.0	23	3.4
Nov 12		--	--	--	--	--	--	--	135	82	23	--	--	--	--	--	68	0	500	6.8	1.7	17	--	16.5	--	--
Dec 3		13	--	--	16	6.6	53		32	82	22	4	48	--	--	258	67	41	414	6.0	4.1	40	--	14.5	1.0	50
Jan 12, 1965		--	--	--	--	--	--	--	38	76	19	--	--	--	--	--	70	39	350	6.1	5.5	47	--	9.0	--	--
Feb. 2		--	--	--	--	--	--	--	16	62	16	--	--	--	--	--	65	52	262	6.0	9.2	79	--	9.0	--	--
Mar. 9		--	--	--	--	--	--	--	22	49	14	--	--	--	--	--	56	38	230	6.0	8.5	78	--	12.0	--	--
Apr 2		--	--	--	--	--	--	--	20	37	12	--	--	--	--	--	50	34	180	6.4	7.4	76	--	17.0	--	--
Apr 29		--	--	--	--	--	--	--	50	39	16	--	--	--	--	--	56	15	265	6.2	4.9	50	--	16.5	--	--
June 11		--	--	--	--	--	--	--	79	39	15	--	--	--	--	--	58	0	279	6.7	3.8	45	--	24.5	--	--
July 1		--	--	--	--	--	--	--	44	27	13	--	--	--	--	--	59	23	254	6.3	3.3	39	--	25.0	--	--
July 29		--	--	--	--	--	--	--	166	57	23	--	2.6	--	--	--	64	0	503	6.6	2.5	30	--	26.0	--	--
Aug 27		--	--	--	--	--	--	--	243	34	26	--	--	--	--	--	48	0	568	7.2	1.1	13	--	25.5	--	.02
Oct 8		19	--	--	10	6.1	62	9.2	204	50	27	2.4	1.8	2.7	--	314	50	0	568	6.8	3.7	38	--	17.0	23	12
Nov 2		19	--	--	10	5.3	90	9.8	237	64	29	1.7	4.6	4.2	--	379	47	0	649	6.7	3.8	36	--	13.5	23	1.0
Nov 29		18	--	--	17	6.7	59	8.2	153	83	25	2.1	3.1	1.1	--	317	70	0	560	6.5	3.7	36	--	14.5	19	07
Dec 28		--	--	--	--	--	--	--	20	47	16	--	.9	52	--	--	55	39	269	6.4	8.3	70	--	8.5	5.5	06
Feb 1, 1966		--	--	--	--	--	--	--	32	29	12	--	3.0	11	--	--	50	24	174	6.2	9.1	78	--	9.0	1.2	.20
Mar 3		13	--	--	11	6.1	21		40	39	15	--	2.5	.26	--	128	53	20	217	6.5	7.9	78	--	15.5	--	36
Mar 31		--	--	--	--	--	--	--	41	49	19	--	3.4	39	--	--	64	30	260	6.3	6.7	71	--	18.0	2.6	.86
May 6		--	--	--	--	--	--	--	40	28	11	--	0	.31	--	--	46	13	173	6.1	7.3	78	--	19.0	00	2.0
May 25		15	--	--	11	5.0	11	1.1	28	30	12	1.1	3	79	--	102	48	25	173	6.2	7.0	80	--	22.0	50	05
July 2		16	--	--	11	4.8	46	4.9	136	34	21	1.1	21	1.3	--	238	47	0	383	6.9	2.4	29	--	24.5	8.3	1.0
Aug 6		20	0.10	--	26	7.4	73	9.3	135	138	27	4.1	4.4	7.2	--	383	96	0	693	6.3	9	11	--	24.5	21	04
Sept 11		10	--	--	11	3.2	18	4.1	55	28	10	5	2.0	91	--	119	41	0	211	6.6	3.6	41	--	22.5	2.1	2.0
Oct 19		12	--	--	12	3.7	26	5.4	88	26	14	.6	.8	.74	--	149	45	0	260	7.0	3.5	34	--	14.5	4.5	00
Nov 27		13	--	--	13	3.9	32	5.7	92	28	18	6	3.8	.68	--	168	48	0	288	7.2	--	--	--	16.5	4.1	.00
Jan 9, 1967		15	--	--	13	5.7	34	5.5	78	56	18	1.7	5.9	57	--	200	56	0	330	6.5	6.2	49	--	5.5	6.3	--
Feb 16		11	--	--	14	5.5	38	5.7	104	47	20	1.3	5.9	.85	--	210	58	0	362	6.8	3.5	34	--	14.0	10	--
Mar. 30		15	--	--	16	7.1	24	4.2	50	52	18	7	16	40	--	182	69	28	277	6.4	5.3	58	--	20.0	3.9	--
May 4		16	--	--	12	5.3	31	5.4	79	44	17	6	5.5	87	--	183	52	0	307	6.4	4.2	42	--	16.0	5.9	03
June 6		17	--	--	15	6.4	22	4.1	60	49	16	.8	3	38	--	165	64	15	246	6.4	6.3	72	--	22.0	4.3	19
July 14		12	--	--	9.0	2.0	32	4.6	63	25	14	8	0	1.1	--	136	31	0	224	6.6	2.2	26	--	25.0	4.9	01
Sept 19		19	--	--	5.8	3.3	85	11	245	21	32	3.5	.2	7.9	--	336	28	0	592	6.9	9	10	--	24.0	27	.01
Oct 31		6.5	.10	--	12	1.8	18	6.2	69	31	9.6	1.4	3.8	1.9	--	136	37	0	237	b7.5	2.6	25	--	15.0	9.0	31
Dec. 6		13	.16	--	14	3.8	58	8.9	172	56	20	1.5	.9	3.9	6.7	285	51	0	491	b7.1	2.7	27	--	14.0	18	01
Jan. 3, 1968		8.7	.22	--	14	3.8	25	4.8	74	38	14	8	0	--	1.6	149	51	0	267	b7.3	6.7	60	6.0	9.0	3.5	02
Feb 26		10	32	--	13	7.3	20	2.8	47	49	19	3	5	--	70	148	62	24	263	b7.1	7.1	70	6.0	13.0	2.0	.71
Mar 26		13	10	--	12	6.4	18	2.4	41	42	16	4	2.1	--	80	134	56	23	227	b6.9	7.7	84	5.6	18.0	1.7	20

See footnotes at end of table

TABLE 2.-Results of periodic water-quality surveys, Angelina River watershed, Texas-Continued

Date	Mean discharge (cfs)	Silica (SiO_2)	Iron (Fe) (a)	Manganese (Mn) (a)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Phosphate Ortho	Phosphate Total	Dissolved solids (calculated)	Hardness as $CaCO_3$ Calcium, magnesium	Hardness as $CaCO_3$ Noncarbonate	Specific conductance (micromhos at 25° C)	pH	Dissolved oxygen (DO) mg/l	Dissolved oxygen (DO) Percent saturation	Biochemical oxygen demand (BOD)	Temperature (°C)	Ammonia (NH_4)	Nitrite (NO_2)
8-0370.8. BAYOU LaNANA NEAR NACOGDOCHES--continued																										
Apr 24, 1968		16	0.33	--	11	4.7	13	2.7	30	27	11	1.7	2 9	3.4	4.3	109	47	22	183	b6.6	6.5	70	5.8	17 5	0.52	0.06
May 22		16	.07	--	15	5 0	14	2.4	6	36	12	3.3	1.7	--	14	123	58	53	212	b6.6	6 1	70	3.6	21.0	.26	.43
June 19		13	.11	--	13	3.7	15	11	42	84	20	1.2	1.8	7.2	7.2	215	48	13	399	b6.6	3.0	38	6 1	25.5	24	05
July 22		8.0	.25	0.12	5 2	2 7	4 2	3 2	18	13	5 2	3	2	.20	.21	52	24	9	88	b6 3	5 1	64	5 8	25.5	1.1	.02
Aug 19		17	.20	.34	11	5.2	28	4.0	82	35	14	.4	8.0	--	3.3	167	49	0	272	b7 0	2.7	35	4.3	28.5	3 7	56
Sept. 18		18	.78	--	11	4.5	25		56	25	14	.4	6.8	--	1.8	138	46	0	219	b6.6	4.4	51	3.6	21.5	2 2	94
Oct. 14		17	13	.34	12	5 2	33		76	37	22	5	6	--	1.6	171	51	0	267	b7 0	2.9	34	3.4	23 5	4 5	.44
Nov. 19		16	.18	.34	14	6.2	17		36	44	15	.4	.1	--	.25	131	60	31	231	b6.8	7.6	67	--	10.0	--	--
Dec. 3		14	.11	.17	10	5 4	12		21	33	13	1.3	.4	--	1.9	99	47	30	167	b6.6	8 3	79	3 8	13.5	--	.04
Jan. 14, 1969		17	.38	--	10	5.7	24		50	36	15	1.2	1.0	--	--	147	48	7	223	b6.6	8.0	69	--	9 0	1.4	03
Feb. 3		14	.13	.16	9.8	5.5	14		26	33	12	3	4.5	--	30	106	47	26	165	b6 2	9.2	67	2 8	13 0	--	08
Mar. 4		16	.03	--	10	5.4	14		24	33	12	2.5	2.6	--	.78	108	47	28	179	b6.7	9.0	80	--	10.0	.79	.10
8-0372. PAPEH MILL CREEK NEAR HERTY																										
July 28, 1964		13	--	--	44	4.9	241	4.8	204	89	272	1.4	0.5	0.56	--	772	130	0	1340	6.7	0.0	0	--	40.0	--	--
Aug. 27		--	--	--	--	--	--	--	202	91	242	--	--	--	--	--	128	0	1330	6.6	0	0	--	39.5	--	--
Oct. 1		--	--	--	--	--	--	--	242	67	244	--	--	--	--	--	124	0	1220	6.9	.0	0	--	38.0	--	--
Oct. 22		--	--	--	--	--	--	--	240	100	216	--	--	--	--	--	138	0	1220	6.8	.2	3	--	35.0	--	--
Nov. 11		--	--	--	--	--	--	--	227	74	255	--	--	--	--	--	114	0	1260	8.7	.2	3	--	34.0	--	--
Dec. 3		14	--	--	41	4.7	287		283	80	296	1.6	6.1	--	--	871	122	0	1500	7 0	3	4	--	36.5	--	--
Jan. 12, 1965		--	--	--	--	--	--	--	180	124	328	--	--	--	--	--	104	0	1550	6.4	6	9	--	36.5	--	--
Feb. 2		--	--	--	--	--	--	--	263	117	312	--	--	--	--	--	132	0	1570	6 8	1.2	17	--	35 0	--	--
Mar. 9		15	--	--	40	4.4	275	4.9	301	123	238	--	.0	--	--	848	118	0	1430	7.0	.3	4	--	33.5	--	--
Apr. 2		14	--	--	56	3.5	264	5.3	368	84	240	--	.0	--	--	848	154	0	1430	7 2	.6	8	--	34.5	--	--
Apr. 30		--	--	--	--	--	--	--	338	83	346	--	--	--	--	--	147	0	1630	7.1	.8	12	--	38.0	--	--
June 10		--	--	--	--	--	--	--	313	99	302	--	--	--	--	--	186	0	1630	6.9	.2	3	--	41.0	--	--
July 1		--	--	--	--	--	--	--	426	79	326	--	--	--	--	--	195	0	1790	7 2	.0	0	--	42.0	--	--
July 29		--	--	--	--	--	--	--	270	103	342	--	--	--	--	--	174	0	1730	6.9	1.0	15	--	39.0	--	--
Aug 27		--	--	--	--	--	--	--	314	99	322	--	--	--	--	--	196	0	1730	7.0	.7	11	--	41.5	--	--
Oct 7		--	--	--	--	--	--	--	432	94	215	--	--	--	--	--	178	0	1500	7.0	.7	9	--	29.5	--	--
Nov. 2		--	--	--	--	--	--	--	356	143	371	--	--	--	--	--	226	0	1910	6.7	.3	4	--	34.5	--	--
Nov. 29		--	--	--	--	--	--	--	302	112	358	--	--	--	--	--	164	0	1740	6.8	1.3	18	--	37.5	--	--
Dec. 28		--	--	--	--	--	--	--	490	63	282	--	--	--	--	--	178	0	1740	6.9	1	1	--	32.5	--	--
Feb. 1, 1966		--	--	--	--	--	--	--	272	158	320	--	--	--	--	--	168	0	1750	6.9	.1	1	--	33.0	--	--
Mar. 3		--	--	--	65	3.4	275		272	31	368	--	--	--	--	--	176	0	1760	6.8	.8	11	--	35.0	--	--
Mar. 31		--	--	--	--	--	--	--	434	113	354	--	--	--	--	--	264	0	1860	7.0	.5	7	--	36.0	--	--
May 6		--	0.20	0.70	--	--	--	--	462	49	316	--	--	--	--	--	194	0	1650	7.0	.8	12	--	38.0	--	--
May 25		--	.48	--	83	5.1	--	--	407	135	304	--	2.4	--	--	--	228	0	1780	7 7	1.9	29	--	39 5	--	--
July 2		--	.16	--	--	--	--	--	415	91	340	--	.4	--	--	--	230	0	1780	7.1	.0	0	--	41.5	--	--
Aug. 6		--	.30	72	67	3.3	--	--	369	81	337	1.7	--	--	--	--	180	0	1760	6.7	.3	5	--	41.5	--	--
Sept. 10		--	.16	.73	67	3.4	--	--	400	101	285	--	--	--	--	--	181	0	1760	7 0	.2	3	--	39.5	--	--
Oct. 19		--	51	90	84	3.3	--	--	432	128	298	--	--	--	--	--	223	0	1780	7.5	.1	1	--	37.0	--	--
Nov 27		--	00	.90	67	3.6	--	--	360	150	342	--	--	--	--	--	182	0	1820	7.3	2	3	--	35.0	--	--
Jan. 10		--	.14	.80	90	3.7	--	--	396	165	339	--	--	--	--	--	240	0	1900	6.9	.0	0	--	35.5	--	--
Feb. 16, 1967		--	.42	.84	80	3 8	--	--	448	172	321	--	--	--	--	--	215	0	1900	6.9	0	0	--	36.5	--	--
Mar. 29		--	.59	.60	64	3.9	--	--	350	202	323	--	--	--	--	--	176	0	1890	7 3	0	0	--	36.5	--	--
May 4		--	.29	.60	46	3.9	--	--	164	244	283	--	--	--	--	--	131	0	1630	6 5	0	0	--	36.0	--	--
June 6		--	.00	.70	46	3.6	--	--	196	182	284	--	--	--	--	--	130	0	1570	6.7	.0	0	--	37.0	--	--
July 14		15	.46	--	40	2.4	361	5.5	255	237	316	--	.3	.94	--	1100	110	0	1780	7.1	2.4	35	--	38.0	--	--
Sept. 19		13	.30	--	41	3.2	277	6.1	181	206	265	--	.8	.90	--	892	116	0	1490	7.7	.0	0	--	36.5	--	--
Oct. 31		14	.48	--	50	2.9	336	6.9	228	224	323	--	1.5	3 9	--	1080	137	0	1760	b7.7	4.8	65	--	32.0	1.3	0.06
Dec. 6		12	25	--	50	3.4	354	6.3	258	256	309	--	1.5	.61	1.9	1120	139	0	1840	b7.6	5.1	72	--	34.0	1.5	.01
Jan. 3, 1968		13	35	--	33	4.0	312	6.4	136	242	308	--	2.0	--	1.3	987	99	0	1670	b7.1	5.1	69	--	31.0	--	02
Feb. 26		12	.20	--	36	3.4	314	6.8	224	241	252	--	.0	--	.23	975	104	0	1620	b7.5	3.7	50	--	31 5	--	.01

See footnotes at end of table.

TABLE 2.-Results of periodic water-quality surveys, Angelina River watershed, Texas-Continued

Date	Mean discharge (cfs)	Silica (SiO_2)	Iron (Fe) (a)	Manganese (Mn) (a)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Phosphate: Ortho	Phosphate: Total	Dissolved solids (calculated)	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Noncarbonate	Specific conductance (micromhos at 25° C)	pH	Dissolved oxygen (DO): mg/l	Dissolved oxygen (DO): Percent saturation	Biochemical oxygen demand (BOD)	Temperature (°C)	Ammonia (NH_4)	Nitrite (NO_2)
8-0372. PAPER MILL CREEK NEAR HERTY--continued																										
Mar. 26, 1968...		12	0.37	--	18	3.3	358	7.6	246	245	274	--	0.0	--	0.70	1040	58	0	1740	b7.6	3.8	53	23	33.0	0.12	0.00
Apr 24........		13	.35	--	26	3.0	276	5.5	161	200	250	--	.0	--	.38	854	76	0	1450	b7.6	5.4	75	7.2	33.0	1.1	.04
May 22.		12	47	--	36	3.3	283	5.1	224	202	234	--	1.4	0.72	1.5	890	104	0	1490	b7.5	4.6	66	19	33.5	1.8	.01
June 19..		12	56	--	46	3.4	238	4.8	204	228	175	--	.0	.40	.44	808	129	0	1430	b7.5	5.3	77	14	36.0	.17	02
July 22........		13	.45	0.54	34	3.2	247	4.3	206	173	215	--	2.2	.50	60	796	98	0	1370	b7.2	4.9	70	12	35.5	1.9	02
Aug. 19		13	.47	49	24	2.5	261	4.7	257	190	164	0.3	4	--	85	786	70	0	1330	b7.9	5.7	84	7.7	37.5	--	--
Sept 18.......		19	55	--	35	3.2	252		181	189	214	.3	.2	--	.64	802	100	0	1380	b7.6	4.4	64	7.5	37.0	--	--
Oct 14. .		13	.66	.70	21	3.3	221		38	193	223	--	.0	--	1.2	693	66	0	1250	b6.9	5.3	76	19	36.0	--	--
Nov. 19..		15	.65	.66	64	4.3	260		426	116	193	--	.8	--	1.3	862	177	0	1440	b7.2	1.2	15	--	29.0	--	--
Dec. 4 .		14	.51	.62	24	3.4	281		106	209	270	--	2	--	1.2	854	74	0	1500	b7.0	5.3	64	25	25.5	--	--
Jan. 15, 1969...		14	56	--	41	3.6	271		120	192	289	--	1	--	--	870	118	0	1520	b6.9	4.3	58	--	31.5	--	--
Feb. 3		13	.45	60	28	3.5	282		183	227	220	--	1.6	--	.70	865	84	0	1460	b7.1	3.6	48	22	31.0	--	--
Mar 4		14	.27	--	56	3.6	276		216	194	267	--	.2	--	.50	917	154	0	1600	b7.5	3.9	53	--	32.0	--	--
8-0372.5. ANGELINA RIVER BELOW PAPER MILL CREEK NEAR HERTY																										
Oct. 23, 1964...		--	--	--	--	--	--	--	182	78	193	--	--	--	--	--	116	0	1030	6.7	0.3	3		20.0	--	--
Nov 11........		10	--	--	30	7.8	170	5.3	120	68	222	0.8	0.6	0.19	--	576	107	6	1070	6.5	.3	3		20.5	0.40	0.60
Dec. 3.........		12	--	--	18	3.4	120	4.0	108	54	122	.7	2.0	.43	--	390	59	0	698	6.5	1.7	17		15.0	.00	.14
Jan. 12, 1965...		16	--	--	16	2.9	114		79	58	122	.8	.1	--	--	369	52	0	651	6.8	2.9	28		14.0	--	--
Feb. 2.........		16	--	--	14	2.9	72		53	49	76	.5	.0	--	--	256	47	3	445	6.8	6.7	60		11.0	--	--
Mar. 9.........		36	--	--	13	6.0	65		26	48	89	.2	.2	--	--	270	57	36	450	6.4	8.9	80		11.0	--	--
Apr. 1.		37	--	--	10	4.6	34		18	30	47	2.0	.8	--	--	174	44	29	273	6.0	9.1	92		16.5	--	--
Apr. 20........		17	--	--	15	5.3	61		64	41	67	.3	1.0	--	--	239	59	7	423	6.4	3.8	41		19.5	--	--
June 10........		16	--	--	11	5.0	33	2.6	50	23	39	3	.7	.14	--	156	48	7	269	6.6	4.1	50		26.0	--	.01
July 1.........		19	--	--	19	5.5	77	3.0	97	37	84	.3	.0	.20	--	294	70	0	517	6.7	1	1		28.5	--	04
July 29........		15	2.3	--	22	5.6	96	3.5	92	49	114	.5	.8	.27	--	352	78	2	635	6.3	.5	6		28.5	--	.04
Aug. 27........		13	1.0	--	34	7.5	159	4.2	158	55	192	.4	.0	.34	--	544	116	0	1040	7.1	.4	5		29.0	--	.04
Oct. 8.........		13	2.5	--	8.5	3.4	40	3.7	46	29	39	1.1	.2	.14	--	164	35	0	288	6.5	5.0	54		19.5	--	.90
Nov. 2.........		14	2.8	--	28	4.1	130	4.3	151	75	122	1.0	.2	.11	--	453	87	0	782	6.4	1.0	10		17.0	--	.00
Nov. 29........		13	1.1	--	26	6.6	149	4.4	100	66	190	1.0	.1	.22	--	506	92	10	917	6.2	.4	4		18.0	--	.00
Dec. 28........		--	--	--	--	--	--	--	39	43	44	--	.2	--	--	--	48	16	319	6.1	6.9	61		10.0	--	.00
Feb. 1, 1966....		--	--	--	--	--	--	--	59	60	72	--	.5	--	--	--	61	13	476	6.5	6.6	58		9.5	--	.02
Mar. 3.........		12	.37	--	16	4.8	57		43	51	66	--	1.4	--	--	229	60	24	410	6.4	5.6	54		14.5	--	.08
Mar. 31........		--	--	--	--	--	--	--	58	46	55	--	--	--	--	--	60	12	385	6.3	3.8	40		18.0	--	--
May 6..........		--	--	--	--	--	--	--	81	47	65	--	--	--	--	--	66	0	455	6.2	.1	1		20.5	--	--
July 2...... ...		--	--	--	27	4.5	--	--	141	36	97	--	.8	--	--	--	86	0	616	6.8	.3	4		28.0	--	--
Aug. 6.........		--	--	--	30	4.3	--	--	172	55	162	.4	--	--	--	--	92	0	930	6.4	.2	3		29.0	--	--
Sept. 10.......		15	--	--	22	2.9	82	3.4	130	40	82	.6	.2	--	--	312	67	0	568	6.8	.3	4		27.0	--	--
Oct. 19........		--	--	--	21	3.4	--	--	120	62	91	--	--	--	--	--	66	0	623	6.9	.7	7		18.0	--	--
Nov. 27........		--	--	--	26	4.0	--	--	122	46	135	--	--	--	--	--	81	0	730	7.0	7.7	82		19.0	--	--
Jan. 10, 1967...		16	--	--	23	3.3	--	--	92	49	85	--	--	--	--	--	71	0	528	6.6	3.7	30		7.0	--	--
Feb. 16........		13	.30	0.34	25	3.7	--	--	130	49	95	--	--	--	--	--	78	0	607	6.8	2.0	19		14.0	--	--
Mar. 29.		--	--	--	17	4.4	--	--	72	41	59	--	--	--	--	--	60	2	398	6.9	4.0	45		22.0	--	--
May 4..........		--	--	--	20	5.7	--	--	46	61	118	--	--	--	--	--	73	36	600	6.1	5.5	60		20.0	--	--
June 6.........		--	--	--	10	3.0	--	--	27	37	37	--	--	--	--	--	37	15	254	6.2	8.6	99		23.0	--	--
July 14........		13	--	--	16	3.9	103	3.6	52	67	119	.6	.6	.04	--	353	56	14	618	7.5	5.0	63		28.5	--	--
Sept 19		12	--	--	23	4.9	169	5.4	92	92	198	--	.2	.46	--	551	78	2	976	6.8	5.0	61		26.5	--	--
Oct. 31........		13	.44	--	57	3.3	273	6.9	237	176	264	--	2.1	2.0	--	917	156	0	1510	b7.5	.3	3		20.0	2.6	.22
Dec. 6.........		14	.58	--	22	3.4	182	5.7	157	121	152	--	2.2	1.8	2.7	582	69	0	997	b7.2	2.3	24		16.0	.58	.02
Feb. 26, 1968...		11	.30	--	12	4.9	57	2.9	33	63	56	.4	1.1	--	.09	225	50	23	402	b7.1	8.5	82		12.0	--	.02
Mar. 26........		11	.21	--	11	5.1	49	2.7	32	54	53	.3	6.4	--	.22	210	48	22	361	b6.9	7.6	81		17.0	1.2	.08
Nov. 19........		14	.75	.15	13	3.4	41		59	34	36	.4	.2	--	.47	171	46	0	296	b6.8	5.5	51		12.0	--	--
Jan. 14, 1969...		16	.39	--	14	5.4	46		46	49	47	.4	.2	--	--	201	57	19	342	b7.0	8.9	77		9.0	--	--
Feb 4..........		13	.76	.26	15	4.6	76		58	74	69	--	.1	--	.30	281	56	9	485	b6.7	7.3	65	4.6	10.0	--	--

See footnotes at end of table.

TABLE 2.-Results of periodic water-quality surveys, Angelina River watershed, Texas-Continued

Date	Mean discharge (cfs)	Silica (SiO_2)	Iron (Fe) (a)	Manganese (Mn) (a)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Phosphate Ortho	Phosphate Total	Dissolved solids (calculated)	Hardness as $CaCO_3$ Calcium, magnesium	Hardness as $CaCO_3$ Noncarbonate	Specific conductance (micromhos at 25° C)	pH	Dissolved oxygen (DO) mg/l	Dissolved oxygen (DO) Percent saturation	Biochemical oxygen demand (BOD)	Temperature (°C)	Ammonia (NH_4)	Nitrite (NO_2)
8-0373.3. ANGELINA RIVER NEAR ETOILE																										
July 28, 1964...		16	--	--	30	5.1	213	4.4	205	75	216	1.2	4.8	0.96	--	669	96	0	1170	6 9	0.2	3	--	32.0	--	0.13
Aug. 27.........		--	--	--	--	--	--	--	62	65	174	--	--	--	--	--	79	12	878	6.6	1.9	25	--	30.0	--	--
Sept. 30........		--	--	--	--	--	--	--	104	61	162	--	--	--	--	--	84	0	639	6.6	3.4	39	--	23.0	--	--
Oct. 22....		--	--	--	--	--	--	--	158	76	196	--	--	--	--	--	116	0	1040	6.9	4.3	45	--	16.0	--	--
Nov. 11.........		--	--	--	--	--	--	--	95	62	195	--	--	--	--	--	94	16	919	6.6	4.1	43	--	18.0	--	--
Dec. 3..........		11	--	--	19	5.7	131		66	56	171	.4	1.8	--	--	428	71	17	799	6.5	5.9	56	--	13.5	--	--
Jan. 12.........		--	--	--	--	--	--	--	56	44	84	--	--	--	--	--	45	0	471	7.1	7.2	65	--	11.5	--	--
Feb. 2, 1965....		--	--	--	--	--	--	--	23	48	50	--	--	--	--	--	36	19	320	6.6	9.1	61	--	10.0	--	--
Mar. 9..........		--	--	--	--	--	--	--	12	43	72	--	--	--	--	--	52	42	367	6.8	10.0	100	--	11.5	--	--
Apr. 1..........		--	--	--	--	--	--	--	22	36	40	--	--	--	--	--	44	26	256	6.2	7.9	76	--	15.5	--	--
Apr. 30.........		--	--	--	--	--	--	--	50	39	56	--	--	--	--	--	60	19	364	6.4	5.9	63	--	19.0	--	--
June 10.		--	--	--	--	--	--	--	40	24	30	--	--	--	--	--	46	13	223	6.5	5.1	63	--	27 0	--	--
June 30...... ..		--	--	--	--	--	--	--	54	32	47	--	--	--	--	--	57	13	324	6.5	5.0	66	--	30.5	--	--
July 28.........		--	3.3	--	--	--	--	--	102	43	100	--	--	--	--	--	76	0	593	6.4	4.3	57	--	31.0	--	--
Aug. 26.........		--	--	--	--	--	--	--	164	62	220	--	--	--	--	--	112	0	1150	6.9	2.6	34	--	30.0	--	--
Oct. 7..........		--	2.6	--	--	--	--	--	34	28	70	--	.6	--	--	--	45	17	372	6.3	7.3	83	--	22.5	--	--
Nov. 2..........		--	.33	--	--	--	--	--	20	92	115	--	.0	--	--	--	66	0	666	6.8	4.8	48	--	15.5	--	.00
Nov. 30.........		--	1.1	--	--	--	--	--	98	58	173	--	.1	--	--	--	66	6	639	6 4	6.4	62	--	14.0	--	.02
Dec. 29.........		--	--	--	--	--	--	--	14	34	25	--	.2	--	--	--	32	21	199	5.9	9 7	81	--	7.5	--	.00
Feb. 1, 1966. .		--	--	--	--	--	--	--	20	38	26	--	--	--	--	--	42	26	217	6.1	9.5	78	--	7.0	--	--
Mar. 4..........		--	.46	--	10	4.3	31		22	41	35	--	.8	--	--	--	43	25	256	6.5	8.7	84	--	14.0	--	.02
Apr. 1....		--	--	--	--	--	--	--	26	36	33	--	.9	--	--	--	42	21	247	6.1	7.1	73	--	17.0	--	.03
May 6...........		--	--	--	--	--	--	--	16	12	16	--	.9	--	--	--	22	9	113	5.9	7.5	82	--	20.0	--	.04
July 2..........		--	--	--	--	--	--	--	81	15	44	--	1.9	--	--	--	62	0	316	6.5	1.7	20	--	25.5	--	.05
Aug. 6..........		--	--	--	21	5.5	--	--	111	29	95	.4	--	--	--	--	75	0	558	6.5	2.6	33	--	29.0	--	--
Sept. 10...		14	--	--	24	3.8	76	3.5	109	43	82	.5	.2	--	--	--	76	0	544	6.7	.5	6	--	26.5	--	--
Oct. 20.........		--	--	--	--	--	--	--	98	37	73	--	--	--	--	--	60	0	481	6.8	2.2	23	--	17.0	--	--
Nov. 27....		--	--	--	--	--	--	--	116	32	65	--	--	--	--	--	65	0	536	7.0	10.5	101	--	14.0	--	--
Jan. 10, 1967...		17	--	--	17	3.4	49	3.2	52	37	54	3.6	.5	.20	--	211	56	14	352	6.5	5.5	45	--	7.0	--	--
Feb. 16.........		12	.64	0.22	18	3.7	60	3.2	76	38	62	1.8	1.0	.12	--	237	60	0	407	6.6	5.5	50	--	11.5	--	--
Mar. 29.........		11	--	--	16	5.0	53	3.3	58	40	62	.8	.5	--	--	221	60	13	392	6.2	5.6	64	--	23.0	--	.04
May 3...........		15	.48	.15	13	5.1	49	3.6	26	34	74	.3	.5	--	--	208	53	32	370	5.9	3.8	41	--	20.0	--	--
June 6..........		12	.17	.06	7.8	3.0	23	3.1	21	26	26	1.1	1.0	--	--	113	32	15	165	6.0	7.2	85	--	24.0	--	--
July 14.........		13	2.4	--	16	4.4	72	3.9	69	45	80	.5	.2	.01	--	269	58	1	467	6.9	3.8	47	--	27.0	--	--
Sept. 19........		11	--	--	22	5.7	143	4.6	100	77	169	.7	.0	.06	--	482	78	0	851	6.6	4.2	51	--	26.5	--	--
Oct. 31.........		9.2	2.4	--	24	4.9	163	5.3	118	107	194	--	4.6	.40	--	592	80	0	1020	b7.5	7.7	79	--	17.0	1.3	.03
Dec. 6..........		11	1.2	--	32	4.9	211	6.0	160	137	211	--	.2	.40	0.71	693	100	0	1190	b7.0	4.2	42	--	14.0	.35	.02
Jan. 3, 1966....		14	1.1	--	14	3.3	58	4.1	64	46	54	.4	1.5	--	.33	226	48	0	391	b7.0	10.1	88	2.1	8.0	--	.01
Feb. 27.........		11	.60	--	12	5.3	46	2.8	20	49	65	.2	.0	--	.09	204	52	35	370	b7.0	8.3	76	2.4	10.0	--	.04
Mar. 27.........		10	.58	--	10	4.9	32	2.6	16	44	42	.0	.0	--	.11	154	45	32	274	b6.6	7.1	74	1.3	16.0	--	.03
Apr. 24.........		--	1.2	--	8.2	3.8	--	--	26	--	25	--	3.3	--	.21	--	36	15	187	b6.7	1.2	14	1.9	21.0	.15	.02
May 22..........		10	.17	--	9.0	3 6	22	2.2	28	20	28	1.6	.9	18	32	112	37	14	205	b6.6	1.1	13	1.7	24.0	.15	--
June 19.........		12	3.5	--	9.5	4.4	17	2.8	46	12	22	1.9	.0	.31	.31	105	42	4	182	b6.6	1.9	24	3.0	25.5	.06	.04
July 23.........		14	.94	.28	9.0	4.2	14	2.6	36	17	18	.3	.2	.22	.34	98	40	10	164	b6.3	1.6	20	1.3	27.0	.06	.03
Aug. 20.........		10	2.9	.60	8.2	3.8	17	2.8	37	15	22	.2	.2	--	.41	97	36	6	174	b6.5	1.4	30	.6	29.5	--	--
Sept. 17........		11	.23	.60	8.2	3.0	24		43	14	25	.2	.1	--	.30	106	33	0	202	b6.6	2.7	33	1.6	24.5	--	--
Oct. 15.........		12	.36	.54	8.2	3.2	22		29	23	24	.2	.1	--	.14	107	34	10	166	b6.4	1.5	17	1.5	23.0	--	--
Nov. 19.........		12	.25	.35	9.0	4.0	37		34	28	44	.2	.2	--	.12	151	39	11	271	b6.8	4.4	42	--	13.5	--	--
Dec. 4..........		12	.37	.19	8.5	4.1	32		22	32	39	.3	.0	--	.25	139	38	20	245	b6.9	5.6	50	1.7	11.0	--	--
Jan. 14, 1969...		14	.14	--	9.0	4.8	28		15	37	36	.4	.2	--	--	136	42	30	234	b6.8	8.0	68	--	8.5	--	--
Feb. 4..........		13	.52	.47	10	5.4	30		21	42	36	.2	.2	--	.19	147	47	30	264	b6.4	5.0	47	.9	13.0	--	--
Mar. 4..........		12	.64	--	7.8	3.8	23		14	31	28	.2	.4	--	.18	113	35	24	193	b6.9	5.6	54	--	12.5	--	--

See footnotes at end of table.

TABLE 2.–Results of periodic water-quality surveys, Angelina River watershed, Texas–Continued

Date	Mean discharge (cfs)	Silica (SiO_2)	Iron (Fe) (a)	Manganese (Mn) (a)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Phosphate Ortho	Phosphate Total	Dissolved solids (calculated)	Hardness as $CaCO_3$ Calcium, magnesium	Hardness as $CaCO_3$ Noncarbonate	Specific conductance (micromhos at 25° C)	pH	Dissolved oxygen (DO) mg/l	Dissolved oxygen (DO) Percent saturation	Biochemical oxygen demand (BOD)	Temperature (°C)	Ammonia (NH_4)	Nitrite (NO_2)
8-0381. ATTOYAC BAYOU NEAR ETOILE																										
July 28, 1965		13	--	--	8.5	4.6	15	2.2	56	11	12	0.1	0.2	0.06	--	95	40	0	159	6.4	5.4	71		30.0	--	0.00
Aug. 26		8.6	--	--	9.5	2.5	15	2.3	53	11	10	.1	.4	.07	--	86	34	0	140	6.8	6.6	85		28.5	--	.04
Oct. 7		--	--	--	--	--	--	--	25	16	8.4	--	.0	--	--	--	27	6	113	6.4	7.1	80		21.5	--	--
Nov. 2		15	--	--	5.5	3.7	12	2.1	41	10	9.2	.3	.7	.02	--	79	29	0	116	6.4	8.6	82		13.5	0.00	.08
Nov. 30		18	--	--	6.0	3.4	10	2.7	32	13	9.0	.3	.7	.04	--	80	29	3	110	6.1	8.2	77		12.5	.00	09
Dec. 29		15	0.15	--	6.8	3.7		12	19	26	9.8	.1	.5	.02	--	83	32	16	125	6.0	10.0	84		8.0	--	--
Feb. 1, 1966		12	--	--	8.2	4.6	9.6	2.1	19	30	11	.2	.5	--	--	87	39	24	144	6.1	12.2	98		6.5	--	--
Mar. 4		14	--	--	9.7	5.6	14	1.8	26	36	15	.1	.5	.02	--	110	47	26	186	6.6	9.6	90		12.5	--	.00
Apr. 1		13	--	--	8.9	4.7	12	1.6	30	23	14	.1	.8	--	--	93	42	17	149	6.3	8.9	88		15.5	--	.01
May 6		9.4	.25	--	6.3	3.5	5.9	2.5	25	14	6.5	.2	.7	--	--	61	30	10	99	6.0	6.4	70		20.0	.00	.03
May 25		7.8	.50	--	4.5	1.9	4.3	1.6	22	9.2	4.2	.2	.3	.08	--	45	19	1	72	7.0	6.4	74		23.0	--	.04
July 2		15	.15	--	6.2	3.5	12	1.1	38	12	11	.1	3.1	.10	--	83	30	0	130	6.3	4.3	52		26.0	--	.10
Aug. 6		11	.08	0.33	5.9	3.0	9.8	2.3	29	12	7.2	.1	.8	.14	--	67	27	3	108	6.3	3.6	45		27.5	--	.02
Sept. 10		11	.10	.30	5.0	2.2	3.8	2.2	19	9.6	5.2	.1	.2	--	--	48	22	6	79	6.3	6.1	73		25.5	--	--
Oct. 20		13	.25	.02	6.4	2.9	6.8	2.6	29	14	8.0	.2	.8	.06	--	71	28	4	113	6.4	6.8	85		14.5	--	.05
Nov. 27		16	.36	.14	5.6	2.7	7.1	2.5	34	4.0	7.7	.2	.8	.10	--	64	25	0	96	6.7	10.3	103		16.0	--	.00
Jan. 10, 1967		17	.37	.08	8.0	3.5	10	2.0	28	19	10	.1	.2	--	--	84	34	12	124	6.4	10.3	82		5.5	--	--
Feb. 16		13	--	--	8.0	3.4	9.8	1.6	25	20	11	.1	.5	--	--	79	34	13	122	6.3	9.0	82		11.5	--	--
Mar. 29		15	--	--	11	4.6	13	2.0	35	26	14	.2	.5	--	--	103	46	18	157	6.1	8.0	87		20.0	--	--
May 3		17	--	--	12	4.6	14	2.3	43	22	15	.2	1.8	--	--	110	49	14	166	6.3	5.6	61		20.0	--	--
June 6		9.3	.52	.06	5.5	2.5	5.5	3.6	16	16	6.1	.1	1.0	--	--	58	24	11	81	5.9	8.3	94		22.0	--	--
July 14		--	.80	--	7.5	2.9	--	--	44	12	10	--	--	--	--	--	31	0	133	6.7	4.8	61		28.0	--	--
Sept. 19		12	--	--	5.5	2.9	15	3.0	46	11	9.0	.1	.2	--	--	82	26	0	127	6.9	5.8	67		24.0	--	--
Oct. 31		10	.86	--	6.0	2.6	16	2.8	54	8.4	9.0	.2	.2	--	--	82	26	0	134	b7.1	7.0	69		15.0	--	--
Dec. 7		--	.29	--	4.5	2.4	--	--	34	--	7.0	--	1.1	--	--	--	21	0	98	b7.1	9.0	88		13.0	--	--
Jan. 3, 1968		14	.76	--	5.5	3.0	--	--	19	--	10	--	.2	--	--	--	26	10	115	b7.1	7.6	66		7.5	--	.02
Feb. 27		--	.50	--	11	5.8	--	--	25	--	18	--	.3	--	--	--	51	31	195	b7.4	9.2	82		9.0	--	.03
Mar. 27		9.8	.04	--	6.8	2.2	--	--	28	--	18	--	1.0	--	--	--	26	3	180	b6.8	8.5	87		15.0	--	.04
Apr. 23		--	1.1	--	9.0	4.6	--	--	40	--	8.6	--	.0	--	0.19	--	41	9	139	b6.5	3.1	35		20.0	--	--
May 22		--	1.3	--	8.0	4.0	--	--	34	--	7.6	--	.1	--	--	--	36	9	126	b6.4	3.8	45		22.0	--	--
June 19		--	1.6	--	9.2	4.6	--	--	48	--	11	--	--	--	--	--	42	2	143	b6.5	2.8	35		26.5	--	--
July 23		--	.79	.26	9.5	4.4	--	--	43	--	--	--	--	--	--	--	42	7	139	b6.3	2.1	27		26.5	--	--
Aug. 20		13	.96	.60	6.5	3.5		11	34	12	9.2	--	.1	--	--	72	31	3	114	b6.5	1.8	23		28.5	--	--
Sept. 17		--	.62	--	6.5	3.0	--	--	26	--	--	--	--	--	--	--	29	7	109	b6.0	2.5	30		23.5	--	--
Oct. 15		--	.77	.31	6.2	3.5	--	--	24	--	--	--	.1	--	--	--	30	10	125	b6.3	3.9	44		22.5	--	--
Nov. 19		--	.24	.10	6.0	3.0	--	--	22	--	--	--	--	--	--	--	27	9	97	b6.8	6.6	63		14.0	--	--
Dec. 4		--	.06	.03	6.0	3.2	--	--	19	--	--	--	.1	--	.38	--	28	13	102	b6.9	8.7	78		11.0	--	--
Jan. 14, 1969		--	.31	--	9.8	5.7	--	--	30	--	--	--	--	--	--	--	48	23	177	b6.8	10.3	87		8.5	--	--
Feb. 4		--	.29	.23	11	6.1	--	--	32	--	--	--	.2	--	--	--	53	26	197	b6.4	7.8	70		11.0	--	--
Mar. 4		--	.49	--	8.0	4.3	--	--	24	--	--	--	.2	--	--	--	38	18	141	b6.6	8.9	81		11.5	--	--
8-0384.9. SAM RAYBURN RESERVOIR AT STATE HIGHWAY 147 NEAR ZAVALLA c/																										
July 28, 1964	59	15			20	5.8	157	3.8	161	70	145	0.7	1.5	0.36	0.22	500	74	0	857	b7 0	4 5	59		30.0	--	--
Aug 27	111	--			--	--	--	--	57	51	89	--	--	--	--	--	50	3	520	b6.7	4.9	62		28.0	--	--
Sept. 30	90	--			--	--	--	--	86	51	140	--	--	--	--	--	74	4	716	b6.8	6.9	79		23.0	--	--
Oct 22	50	--			--	--	--	--	108	60	163	--	--	--	--	--	89	0	824	b6.9	8.4	86		17.0	--	--
Nov. 11	90	--			--	--	--	--	105	47	91	--	--	--	--	--	60	0	375	b7 1	8 0	82		17 0	--	--
Dec. 3	150	12			16	4.9		101	68	48	120	.4	4.5	--	--	340	60	4	624	b6.9	9.0	87		14.5	--	--
Jan. 12, 1965	202	--			--	--	--	--	49	37	60	--	--	--	--	--	41	1	363	b7.6	9.8	88		11.0	--	--
Feb. 2	--	--			--	--	--	--	24	37	38	--	--	--	--	--	34	14	255	b7.3	10.4	92		10.0	--	--
Mar. 9	--	--			--	--	--	--	13	42	55	--	--	--	--	--	48	37	310	b6.6	10.5	95		11.0	--	--
Apr 1	--	--			--	--	--	--	21	30	20	--	--	--	--	--	34	17	172	b6 4	8 1	80		15 5	--	--

See footnotes at end of table.

TABLE 2.-Results of periodic water-quality surveys, Angelina River watershed, Texas-Continued

Date	Mean discharge (cfs)	Silica (SiO_2)	Iron (Fe) (a)	Manganese (Mn) (a)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Phosphate Ortho	Phosphate Total	Dissolved solids (calculated)	Hardness as $CaCO_3$ Calcium, magnesium	Hardness as $CaCO_3$ Noncarbonate	Specific conductance (micromhos at 25° C)	pH	Dissolved oxygen (DO) mg/l	Dissolved oxygen (DO) Percent saturation	Biochemical oxygen demand (BOD)	Temperature (°C)	Ammonia (NH_4)	Nitrite (NO_2)
8-0384.9. SAM RAYBURN RESERVOIR AT STATE HIGHWAY 147 NEAR ZAVALLA c/--continued																										
Apr. 29, 1965	--	17	--	--	14	6.3	49	3.0	52	35	63	0.2	0.8	0 09	--	215	61	18	371	6.4	6.0	67		22 0	0.00	0.02
July 28	--	17	4.4	--	17	6.7	50	3.8	90	21	59	.2	.6	.19	--	220	70	0	395	6.2	--	--		28.0	--	--
Aug. 26	--	12	--	--	24	8.3	99	4.2	112	35	131	.0	0	.18	--	371	94	2	682	6.6	--	--		29.0	--	.03
Oct. 6	--	10	--	--	15	2 8	18	3.4	45	25	21	.1	.3	.05	--	118	49	12	206	6.3	--	--		27.5	--	--
Nov. 1	--	11	.21	--	11	4.3	33	4.0	46	25	40	1.0	.4	09	--	153	45	7	269	6 3	--	--		17.0	.00	.09
Nov 30	--	12	1 2	--	17	5.7	75	4.0	71	39	98	.6	.0	04	--	287	66	8	536	6.2	--	--		16.5	.00	.00
Dec. 29	--	13	.45	--	6.2	2.6	17		14	25	16	.5	.8	.08	--	88	26	15	149	5.9	--	--		11.0	.00	.00
Mar. 4, 1966	--	9.7	.25	--	6.2	2.7	9.7	2.7	18	19	11	.2	1.9	06	--	72	27	12	113	6.4	--	--		13.0	00	.07
Apr. 1	--	11	.94	--	9.2	4.3	18	2 9	25	27	24	.2	.6	.06	--	110	41	20	189	5.9	--	--		17.0	--	.14
May 5	--	8.3	.51	0.89	8 5	4.0	21	3.2	26	18	33	.2	.8	.10	--	110	38	16	203	5.8	--	--		20.5	.00	.02
July 2	--	11	.94	--	10	3.7	14	2 8	48	10	19	.2	1 1	.27	--	96	40	1	170	6.0	--	--		25.5	--	.05
Aug. 6	--	9.0	2.9	.87	10	4 1	16	3.3	44	12	21	.2	.2	18	--	99	42	6	181	5 9	--	--		29.0	--	.01
Oct 20	--	8.1	.06	.20	11	4.0	17	4.3	52	12	22	.2	.5	.02	--	105	44	1	188	6.7	--	--		15.0	--	.00
Nov. 27	--	7.8	.02	.40	12	4.1	17	4.4	54	12	23	.2	.5	01	--	108	47	3	192	7.0	--	--		17.0	--	.06
Jan 10, 1967	--	7.5	.05	.12	13	4.1	17	4.3	50	15	23	.2	1.2	.00	--	110	49	8	187	6.8	--	--		9.0	--	--
Mar. 29	--	5.4	.12	.00	13	4.2	18	4 1	49	16	25	.2	.0	.05	--	110	50	10	189	6.5	--	--		18.5	--	--
May 3	--	4 6	--	--	13	4.1	19	4.1	50	16	26	.2	2	.02	--	112	49	8	198	6.4	--	--		22.0	--	--
July 14	--	--	2.0	--	12	3.9	--	--	60	12	36	--	--	--	--	--	46	0	244	6.7	--	--		25.5	--	--
Sept. 19	--	3 9	.05	--	12	4.1	21	4.6	58	12	27	.2	2	00	--	114	47	0	205	6.9	--	--		27.0	--	.00
Nov. 6	--	4.3	.06	--	12	3.8	24	4.8	61	13	29	3	.1	--	--	121	46	0	223	b7.0	9.5	99		18.0	--	--
Dec. 7	--	--	02	--	12	4.3	--	--	60	--	29	--	.5	--	--	--	48	0	228	b7.0	7.4	76		15.0	--	--
Jan. 3, 1968	--	4.0	12	--	11	4.1	--	--	54	--	30	--	.6	--	--	--	44	0	222	b7.2	7.4	69		11.0	--	--
Feb 27	--	--	.46	--	10	3.6	--	--	44	--	30	--	.7	--	--	--	40	4	220	b7.2	7.7	71		10.0	--	--
Mar. 27	--	12	54	--	9.2	5.7	--	--	27	--	16	--	.7	--	--	--	46	24	240	b6.9	6.2	63		15.0	--	--
Apr 23	--	5.2	1.2	--	9.5	3.6	26	3.0	30	28	31	--	.0	--	.46	122	38	14	226	b6.9	5.0	54		18.0	--	--
May 22	--	--	2 8	--	8.0	3.1	--	--	35	--	21	--	.0	--	--	--	33	4	180	b6 7	4 9	58		22.0	--	--
June 27	--	--	1.9	--	8.8	3.6	--	--	40	--	22	--	--	--	--	--	37	4	176	b6.5	4.5	57		27.0	--	--
July 23	--	--	2.5	.49	9.0	3.9	--	--	44	--	--	--	--	--	--	--	38	2	183	b6.4	4.4	56		26.0	--	--
Aug. 20	--	9 4	6.1	1.0	9.2	4.1	24		56	14	22	--	.0	--	--	111	40	0	181	b6.3	3.8	49		27.5	--	--
Sept 17	--	--	4.8	1 0	10	3.6	--	--	56	--	--	--	--	--	--	--	40	0	181	b6.2	5 0	62		25.0	--	--
Oct. 15	--	--	9.9	1.3	9.8	3.8	--	--	50	--	--	--	.1	--	--	--	40	0	176	b6.4	2.3	27		23.5	--	--
Nov. 19	--	--	.06	.10	9.5	3.7	--	--	42	--	--	--	1.4	--	.07	--	39	4	168	b7 0	8.6	85		15.5	--	.05
Dec. 4	--	--	03	.04	9 0	3.7	--	--	38	--	--	--	1.0	--	.04	--	38	6	177	b6.9	8.7	83		13.5	--	.07
Jan. 15, 1969	--	--	.46	--	8.0	3.6	--	--	26	--	--	--	--	--	--	--	35	13	167	b7.0	8.7	76		9.5	--	--
Feb. 4	--	--	15	13	7 8	3.3	--	--	22	--	--	--	1.2	--	--	--	33	15	180	b6.3	8.4	76		11.5	--	--
Mar. 5	--	--	.43	--	8.0	3.4	--	--	16	--	--	--	4	--	--	--	34	21	168	b6.7	7.9	72		11.5	--	--
8-0393. SAM RAYBURN RESERVOIR NEAR JASPER d/																										
Nov. 1, 1965		9.1	0.09	--	16	4.9	23	5.7	68	14	32	0 4	0.6	0.00	--	139	60	4	254	6.3	3.5	39		21.0	0.00	0.17
Nov. 30		9 0	.15	--	15	5.5	22	5.8	67	15	31	.4	.5	.00	--	138	60	5	253	6.5	8.4	87		17 0	.00	.51
Dec 29		7.9	.03	--	15	2.6	29		59	18	30	.2	7	.02	--	133	48	0	250	6 4	9.0	92		16.5	.00	.17
Mar. 4, 1966		7.7	--	--	11	3.1	18	4.3	43	15	23	.2	1.5	.02	--	104	38	2	188	6.5	8.9	82		12.0	--	.00
Apr. 1		7 1	06	.02	11	4.0	18	4.2	43	16	24	.2	1.1	.01	--	107	44	9	191	6.4	9.0	96		18.5	--	.05
May 5		--	.18	--	--	--	--	--	40	18	23	--	.9	--	--	--	42	9	187	6 4	8.5	97		22.5	--	.08
Nov. 27		9.1	.00	1.0	13	3.8	25	4.4	56	14	33	.2	.8	.00	--	131	48	2	240	6.8	9.5	98		17.0	--	.02
Jan. 10, 1967		8.1	.04	.20	12	4.0	16	4.2	48	14	22	.2	1.2	.00	--	106	46	7	183	7.1	9.0	76		8.0	--	--
Sept. 19		7.8	2.6	--	13	4.3	20	4.5	70	7.0	25	.2	.2	.01	--	116	50	0	208	6 7	--	--		--	.00	.03
Nov 21		6.4	3.9	--	14	3.9	19	4.5	74	7.6	23	.2	.1	.04	--	115	51	0	210	6.7	6.2	67		20.0	--	--
Dec. 7		4.8	.03	--	13	4 2	20	4.4	60	12	26	.3	.7	--	--	115	50	1	205	b7.2	9.0	97		17.5	--	--
Jan. 4, 1968		1.7	.01	--	12	4.0	19	4.5	57	11	24	.3	.9	--	--	105	46	0	203	b7.0	11.1	105		11.5	--	--
Feb. 27		--	.08	--	12	3.9	--	--	53	--	24	--	1.3	--	--	--	45	3	199	b7.4	9.5	93		13.0	--	--
Mar. 27		4.5	31	--	9.0	3.5	--	--	41	--	34	--	1.1	--	--	--	37	3	198	b7.4	9.7	96		13.5	--	--
Apr. 23		--	.07	--	10	3.7	--	--	47	--	22	--	.0	--	0.04	--	40	2	191	b7.2	8.4	93		19.0	--	--

See footnotes at end of table.

TABLE 2.-Results of periodic water-quality surveys, Angelina River watershed, Texas-Continued

Date	Mean discharge (cfs)	Silica (SiO_2)	Iron (Fe) (a)	Manganese (Mn) (a)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Phosphate Ortho	Phosphate Total	Dissolved solids (calculated)	Hardness as $CaCO_3$ Calcium, magnesium	Hardness as $CaCO_3$ Noncarbonate	Specific conductance (micromhos at 25° C)	pH	Dissolved oxygen (DO) mg/l	Dissolved oxygen (DO) Percent saturation	Biochemical oxygen demand (BOD)	Temperature (°C)	Ammonia (NH_4)	Nitrite (NO_2)
8-0393. SAM RAYBURN RESERVOIR NEAR JASPER d/--continued																										
May 21, 1968		--	0.07	--	9.5	3.2	--	--	42	--	20	--	--	--	--	--	37	2	180	b6.8	7.5	91		24.0	--	--
June 19		--	03	--	9.2	3.3	--	--	41	--	21	--	--	--	--	--	36	3	175	b7.2	7.2	92		27.5	--	--
July 23		--	.04	0.12	9.0	3.5	--	--	39	--	--	--	--	--	--	--	37	5	172	b6.8	6.1	79		28.5	--	--
Aug 20		4.7	.11	.29	8.5	3.6	17		39	10	21	--	0.2	--	--	84	36	4	165	b6.9	4.6	61		29.0	--	--
Sept. 17		--	.06	.27	9.5	3.2	--	--	42	--	--	--	--	--	--	--	37	2	168	b6.6	5.1	64		26.0	--	--
Oct. 15		--	.66	28	9.5	3.5	--	--	44	--	--	--	.1	--	--	--	38	2	170	b6.8	6.1	73		25.0	--	--
Nov. 19		--	19	.44	10	3 8	--	--	48	--	--	--	.1	--	0.06	--	41	1	181	b6.9	8 4	86		16.5	--	--
Dec. 4		--	.09	.30	10	3.8	--	--	46	--	--	--	.4	--	.06	--	41	3	179	b6.9	8.6	84		15.0	--	0.17
Jan 15, 1969		--	.09	--	9.5	3.6	--	--	41	--	--	--	--	--	--	--	38	5	175	b7.0	8.9	79		10.5	--	--
Feb. 4		--	.05	.00	9.0	3.4	--	--	42	--	--	--	1.2	--	--	--	36	2	173	b6.7	11.4	106		12.0	--	--
Mar. 5		--	.05	--	9.0	3.2	--	--	37	--	--	--	.9	--	--	--	36	5	167	b6.9	9.3	85		11.5	--	--
8-0394. ANGELINA RIVER BELOW SAM RAYBURN DAM NEAR JASPER d/																										
Oct. 1, 1963		12	--	--	11	3 5	67	3.5	52	24	87	0 2	1 2	0.01	--	236	42	0	433	6.4	6 6	71	--	19.5	--	--
Jan. 7, 1964		16	--	--	8.5	3 6	31	3 1	27	33	35	.7	.8	.05	--	145	36	14	244	7.3	9.8	84	--	9.0	--	--
Apr 21		13	--	--	9 2	3 9	19	2.7	28	25	24	.2	1.5	00	--	113	39	16	181	6 9	5 9	68	--	23.0	--	--
June 9		14	--	--	8.5	3.6	23	2.8	29	27	25	.2	.5	.11	--	119	36	12	204	6.5	6.3	81	--	29.0	--	--
July 28		16	--	--	12	4.6	58	3.3	72	25	64	.2	.8	14	--	220	49	0	393	6 8	5 2	67	--	29.0	--	0.01
Aug 27		10	--	--	22	5.1	140	5.0	102	60	164	.5	2.0	.01	--	460	76	0	834	6.9	4.0	51	--	29.0	--	.08
Sept. 30		12	--	--	18	3.6	91	4.0	96	42	102	.4	.8	.06	--	322	60	0	584	6 9	6.5	74	--	22.5	--	.00
Oct. 22		11	--	--	20	5.3	105	4.0	92	52	122	2	.7	.06	--	367	72	0	657	7.0	7.6	78	--	17 0	0.20	.04
Nov 11		10	--	--	19	3 8	97	4.0	96	52	102	4	.1	09	--	337	63	0	610	7 0	7 5	80	--	19.0	.10	.04
Dec. 3		12	--	--	17	4 5	98	3.9	65	46	127	4	1 9	.11	--	343	61	8	636	6.7	9 1	90	--	15 5	.12	.04
Jan. 12, 1965		16	--	--	12	3 2	63	3 1	64	35	66	.3	.0	.06	--	230	43	0	397	7 1	10 0	90	--	11 0	00	.03
Mar. 9		36	--	--	6.5	3.4	18	3.9	19	26	21	3	.5	.38	--	125	30	15	172	6 1	11.6	103	--	10.0	--	.02
July 28		6.8	--	--	12	4 6	23	4 0	46	20	31	.2	.2	.01	--	125	49	11	229	6.6	7.3	97	--	31.0	--	.00
Aug 26		--	0.25	--	12	5 4	21	5 0	54	18	30	.2	1	01	--	119	52	8	231	6.5	8 1	103	--	28.0	--	.01
July 2, 1966		7.9	.09	--	10	3 4	18	3.0	43	16	25	.2	.8	.02	--	105	39	4	191	6.4	3.8	44	--	24 0	--	.02
Aug. 6		9 5	27	2 5	12	4.1	32	3.7	62	14	38	.2	3.4	.10	--	147	47	0	263	6.2	4.7	51	--	20.0	.80	.02
Oct 20		8.3	.00	42	11	3.7	17	4 4	50	12	23	.2	.5	00	--	105	43	2	187	6.7	6.1	66	--	20.0	--	.00
Mar. 29, 1967		11	13	.04	12	3.4	23	3 7	44	20	28	.2	.5	--	--	124	44	8	204	6.4	10.0	108	--	19.5	--	--
May 3		7.3	.07	.00	14	4 0	24	4 2	54	18	31	2	1 0	--	--	131	51	7	221	6.3	7 5	72	--	14.0	--	--
July 14		7 3	1.7	--	13	3.6	20	4 2	58	11	25	.3	.6	.00	--	114	47	0	202	6.9	2 5	27	--	20.0	--	--
Oct 31		4 9	.05	--	13	3 7	21	4.6	63	10	25	2	2	.13	--	114	48	0	206	b6 7	7.9	84	--	19.0	--	--
Dec. 7		5.5	.07	--	14	4.1	29	4 4	66	13	36	.3	.2	06	0.25	139	52	0	254	b7.2	11.0	110	--	17.0	--	.00
Jan 4, 1968		4 6	11	--	13	4.0	28	4.5	64	14	34	3	1.9	--	.02	135	49	0	251	b7.0	11.3	109	0 9	12.0	--	--
Feb 27		4.4	.04	--	12	3 9	28	4 1	60	15	34	2	1.3	--	03	133	46	0	250	b7.3	10.0	100	1 0	12.0	--	--
Mar. 27		3.2	.02	--	11	3.9	19	3.9	50	14	24	2	.0	--	08	104	44	2	195	b7.1	10.1	113	1 6	19.5	--	.05
Apr. 23		--	.12	--	12	3.9	--	--	54	--	31	--	1.5	--	.06	--	46	2	235	b7.0	9.0	95	.7	16.5	--	--
May 21		--	.10	--	9.5	3.5	--	--	45	--	23	--	.6	00	.02	--	38	1	184	b6.8	6.6	79	.9	23 0	--	--
June 18		3.5	33	--	9 8	3.5	--	--	44	--	23	--	.2	.00	.04	--	39	3	189	b6 5	3.4	40	1.0	22.5	--	--
July 23		2 7	.28	.67	10	3.7	18	3 2	44	14	22	.2	2.2	.02	.05	98	40	4	185	b6.6	2.3	28	1.3	24 0	--	00
Aug. 20		5.1	58	1.3	10	3 7	17	3.4	45	13	21	.2	.4	--	06	96	40	3	179	b6.7	2.3	29	.6	26.5	--	--
Sept 17		9.9	.89	2 2	10	3.2	23		51	8.8	26	.2	1	--	.04	106	38	0	198	b6.4	3.6	42	.9	22.5	--	--
Oct. 15		5.5	34	.91	10	3.7	19		48	12	21	.2	.0	--	.00	95	40	1	178	b5.4	4.8	56	6	24.5	--	--
Nov 19		6.0	.03	.27	10	3.8	20		49	12	22	.3	.2	--	05	98	41	0	182	b6.9	8.4	87	--	17.0	--	--
Dec. 4		5 3	10	.30	10	3.7	19		46	12	22	.2	6	--	.03	96	40	2	179	b6.9	8.6	85	1.0	15.5	--	22
Jan 15, 1969		5.6	.09	--	10	3 7	18		42	13	21	.1	1.2	--	--	94	40	6	175	b6.9	9.1	81	--	10.5	--	--
Feb. 4		5.0	01	.05	9 2	3 5	19		41	14	20	.3	1 2	--	05	92	37	4	173	b6.7	11.6	107	4	12.0	--	--
Mar. 5		5 3	06	--	9.0	3.2	18		37	15	20	.2	.8	--	.05	90	36	5	168	b6.9	9.4	87	--	12.0	--	--

See footnotes at end of table.

TABLE 2.-Results of periodic water-quality surveys, Angelina River watershed, Texas-Continued

Date	Mean discharge (cfs)	Silica (SiO_2)	Iron (Fe) (a)	Manganese (Mn) (a)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Phosphate Ortho	Phosphate Total	Dissolved solids (calculated)	Hardness as $CaCO_3$ Calcium, magnesium	Hardness as $CaCO_3$ Noncarbonate	Specific conductance (micromhos at 25° C)	pH	Dissolved oxygen (DO) mg/l	Dissolved oxygen (DO) Percent saturation	Biochemical oxygen demand (BOD)	Temperature (°C)	Ammonia (NH_4)	Nitrite (NO_2)
8-0395. ANGELINA RIVER AT HORGER																										
July 14, 1967		--	0.21	--	12	3.4	--	--	51	12	22	--	--		--	--	44	2	181	7.0	5.1	63		27.0		
Sept. 19		4.6	--	--	12	4.0	19	4.5	58	11	25	0.2	0.2		--	110	46	0	196	6 9	5 3	63		25.0		
Nov. 3		5.0	.04	--	13	3.6	20	4.6	62	9.8	24	.2	.2		--	110	47	0	202	b7.0	7.3	74		17.0		
Dec. 7		--	04	--	12	3.8	--	--	58	--	27	--	.3		--	--	46	0	210	b7.1	8 3	66		16.0		
Jan 4, 1966		4.2	.03	--	12	3.9	--	--	56	--	24	--	.7		--	--	46	0	199	b7.0	6.9	64		11.5		
Feb 27		--	.03	--	11	3.6	--	--	46	--	24	--	1.2		--	--	42	3	190	b7.2	9 3	89		12.0		
Mar. 27		10	.04	--	7.0	2.5	--	--	30	--	16	--	.7		--	--	28	3	135	b7.0	9.6	100		16.0		
Apr 23		--	.10	--	10	3.6	--	--	44	--	22	--	.5		0.04	--	40	4	182	b7 0	7.5	79		16.5		
May 21		--	.08	--	9.5	3.2	--	--	43	--	21	--	.6		--	--	37	2	183	b6.9	7.0	63		23.0		
June 16		--	04	--	10	3.6	--	--	44	--	23	--	--		--	--	40	4	185	b6 9	3.7	45		23 5		
July 23		--	.14	0.51	10	3.7	--	--	42	--	--	--	--		--	--	40	6	180	b6 7	2 7	33		24.5		
Aug 20		5.6	.52	1.3	9.8	3.6	19		44	13	22	--	.3		--	95	39	3	173	b6.6	2.7	34		26.5		
Sept. 17		--	1.0	2.1	10	3.5	--	--	50	--	--	--	--		--	--	39	0	182	b6.5	9	11		23 0		
Oct 15		--	.42	.70	10	3.6	--	--	46	--	--	--	.0		--	--	40	2	174	b6.7	4.7	57		26.0		
Nov 19		--	.18	.41	10	3.8	--	--	48	--	--	--	1		.06	--	41	1	181	b6 9	8 9	91		16 5		
Dec. 4		--	.09	.25	10	3.7	--	--	46	--	--	--	.4		.06	--	40	2	177	b6.9	8.6	85		15.5		0.24
Jan. 15, 1969		--	.09	--	9.5	3.8	--	--	41	--	--	--	--		--	--	39	6	175	b6.9	9.2	62		10.5		
Feb. 4		--	.13	.00	9.5	3.4	--	--	42	--	--	--	1.2		--	--	38	3	173	b6.6	11.1	103		12 0		
Mar 5		--	.06	--	9.0	3.2	--	--	36	--	--	--	.7		--	--	36	6	165	b6.9	9.6	69		12.0		
8-0395.6. ANGELINA RIVER AT BEVELPORT																										
July 14, 1967		--	0.15	--	12	3.3	--	--	51	12	22	--	--		--	--	44	2	182	6.9	7.2	95		30 0		
Sept. 19		5 0	.04	--	12	3 9	19	4 7	60	10	24	0.2	0.2	0.00	--	109	46	0	196	6.9	7.6	92		25 5		
Nov 3		5 3	03	--	12	3 3	20	4.4	58	10	24	.2	.3		--	109	44	0	195	b7.0	8 6	88		17.0		
Dec 7		--	05	--	11	3 5	--	--	56	--	23	--	3		--	--	42	0	190	b6.9	8 9	91		17 0		
Jan 4, 1968		5 5	05	--	11	3.6	--	--	52	--	23	--	8		--	--	42	0	191	b7.0	8.3	78		11.0		
Feb 27		--	02	--	12	3 7	--	--	52	--	24	--	1 1		--	--	45	3	194	b7 2	9 5	91		12.0		
Mar. 27		7.7	.07	--	7.0	2.3	--	--	30	--	14	--	.7		--	--	27	2	126	b7.0	9.1	93		15.0		
Apr. 23		--	29	--	9 5	3 2	--	--	43	--	21	--	.9		0.06	--	37	2	177	b6 9	7.7	82		17.0		
May 21		--	.12	--	9.8	3.2	--	--	43	--	20	--	.6		--	--	38	2	183	b7.1	7.1	84		23 0		
June 18		--	.08	--	9 8	3 6	--	--	44	--	22	--	--		--	--	39	3	184	b6 6	3.8	47		25 0		
July 23		--	.17	0.35	9.5	3.7	--	--	42	--	--	--	--		--	--	39	4	178	b6 7	3 0	37		24 5		
Aug. 20		5 5	52	1 3	9.5	3.7	19		44	13	22	--	.4		--	95	39	3	174	b6.6	1.3	16		26.5		
Sept. 17		--	.75	.92	9.5	3.3	--	--	46	--	--	--	--		--	--	37	0	177	b6.6	4.7	59		26.0		
Oct. 15		--	17	70	10	3.5	--	--	46	--	--	--	.0		--	--	39	2	171	b6.5	4.4	52		24.0		
Nov 19		--	.20	.37	10	3.8	--	--	48	--	--	--	2		.07	--	41	1	180	b6 9	8 6	88		16.5		
Dec 4		--	.12	.25	10	3.7	--	--	46	--	--	--	.5		.02	--	40	2	176	b6 8	8.6	84		15 0		0 22
Jan. 15, 1969		--	10	--	9.8	3.7	--	--	42	--	--	--	--		--	--	40	5	174	b6.8	9.3	84		11.0		
Feb. 5		--	.06	00	9.5	3.5	--	--	41	--	--	--	1.2		--	--	38	4	172	b6.7	10 8	100		12 0		
Mar. 5		--	06	--	9.2	3.2	--	--	36	--	--	--	.7		--	--	36	7	165	b6.9	9.5	88		12.0		

a In solution at time of sampling.

b Field determination

c Prior to March 1965, station was known as Angelina River near Zavalla.

d Samples from this station were collected at the water surface.

TABLE 3.–Chemical-quality survey of Sam Rayburn Reservoir, survey 1, Apr. 28-29, 1965

[Results in milligrams per liter except as indicated. Elevation, 122.12 ft. Content, 230,400 acre-ft.]

Sampling site	Date	Depth (ft)	Silica (SiO_2)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Orthophosphate (PO_4)	Dissolved solids (calculated)	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Noncarbonate	Specific conductance (micromhos at 25° C) (Lab)	pH (Lab)	Dissolved oxygen (DO): mg/l	Dissolved oxygen (DO): Percent saturation	Temperature (°C)
TRAVERSE A																							
A_C	Apr. 29	1	0.7			9.0	3.3	14	4.9	34	21	16	0.2	0.0		86	36	8	158	7.0	3.6	42	24.0
		5																	a177		2.1	24	22.0
		12																	165		2.2	25	22.0
TRAVERSE B																							
B_C	Apr. 29	1																	201		6.2	72	23.5
		5																	a220		4.9	56	22.0
		10																	a220		4.7	53	22.0
		15																	a220		2.6	29	21.5
		20																	a187		.6	6	18.0
		25																	194		9	9	14.5
TRAVERSE C																							
C_R	Apr 29	1	--			--	--	--	--	--	--	--	--	--	--	--	--	--	199	--	6.2	72	23.5
		5	--			--	--	--	--	--	--	--	--	--	--	--	--	--	a187	--	6.0	68	22.0
		10	--			--	--	--	--	--	--	--	--	--	--	--	--	--	a187	--	5.8	66	22.0
		15	--			--	--	--	--	--	--	--	--	--	--	--	--	--	a187	--	5.7	65	22.0
		19	--			--	--	--	--	--	--	--	--	--	--	--	--	--	200	--	5.6	64	22.0
C_C	Apr. 29	1	9.8			8.5	4.1	20	4.0	37	18	26	0.4	0.5	0.04	110	38	8	199	6.9	6.3	73	23.5
		5	--			--	--	--	--	--	--	--	--	--	--	--	--	--	a198	--	5.8	66	22.0
		10	--			--	--	--	--	--	--	--	--	--	--	--	--	--	a209	--	5.9	67	22.0
		20	--			--	--	--	--	--	--	--	--	--	--	--	--	--	a230	--	5.5	62	22.0
		30	--			--	--	--	--	--	--	--	--	--	--	--	--	--	a230	--	4	4	14.5
		40	--			--	--	--	--	--	--	--	--	--	--	--	--	--	a171	--	.4	4	13.0
		43	12			9.0	3.8	13	3.8	38	15	16	.3	.5	.06	93	38	7	156	6.8	4	4	13.0
C_L	Apr. 29	1	--			--	--	--	--	28	27	26	--	--	--	--	38	15	202	6.5	6.1	70	23.0
		5	--			--	--	--	--	--	--	--	--	--	--	--	--	--	a198	--	5.7	65	22.0
		10	--			--	--	--	--	--	--	--	--	--	--	--	--	--	a205	--	5.3	60	21.5
		15	--			--	--	--	--	--	--	--	--	--	--	--	--	--	a209	--	4.1	46	21.5
		21	--			--	--	--	--	34	25	27	--	--	--	--	--	--	210	6.7	.8	9	18.5
TRAVERSE D																							
D_R	Apr. 29	1																	202		4.8	55	22.0
		5																	a198		4.6	52	22.0
		10																	a198		4.6	52	22.0
		17																	202		4.3	49	22.0
D_C	Apr 29	1																	205		4.8	55	23.0
		10																	a198		4.7	53	22.0
		17																	--		3.1	35	22.0
		20																	a252		.2	2	20.0
		30																	a230		.4	4	14.5
		40																	205		7	7	14.0
D_L	Apr. 29	1																	203		5.4	62	23.0
		5																	a205		5.2	58	21.5
		10																	a205		5.0	56	21.5
		16																	205		5.1	57	21.5

See footnote at end of table.

TABLE 3.-Chemical-quality survey of Sam Rayburn Reservoir, survey 1, Apr. 28-29, 1965-Continued

Sampling site	Date	Depth (ft)	Silica (SiO_2)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Orthophosphate (PO_4)	Dissolved solids (calculated)	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Noncarbonate	Specific conductance (micromhos at 25° C) (Lab)	pH (Lab)	Dissolved oxygen (DO): mg/l	Dissolved oxygen (DO): Percent saturation	Temperature (°C)
TRAVERSE E																							
E_R	Apr 28	1																	225		3.7	46	27.0
		5																	a220		3.1	36	23.5
		11																	222		2.4	27	21.5
E_C	Apr. 28	1																	223		3.3	38	22.0
		10																	a236		1.9	22	23.0
		20																	a252		.5	6	21.0
		30																	a252		.8	8	16.0
		37																	249		.7	7	16.0
TRAVERSE F																							
F_R	Apr. 28	1								37	28	43					53	23	282	6.2	1.1	13	25.0
		5								--	--	--					--	--	a273	--	.8	10	24.5
		9								38	29	43					53	22	280	6.7	.7	8	23.0
F_C	Apr 28	1								37	28	43					52	22	280	6.2	5.6	65	23.5
		10								--	--	--					--	--	a284	--	3.9	45	23.0
		20								--	--	--					--	--	a262	--	.5	5	20.0
		32								48	22	26					50	11	254	6.8	1.3	13	17.0
F_L	Apr. 28	1								35	26	43					50	21	271	6.6	3.8	45	24.0
		5								--	--	--					--	--	a268	--	2.4	28	23.0
		8								35	27	43					51	22	273	7.0	2.6	30	22.0
TRAVERSE G																							
G_C	Apr. 28	1																	296		2.3	27	24.0
		10																	a295		.4	5	23.0
		20																	a295		.6	7	22.0
		31																	304		1.4	16	22.0
TRAVERSE M																							
M_C	Apr 29	1								37	19	14					38	8	153	6.5	6.3	73	23.5
		8																	a135		3.5	39	21.0

a Adjusted conductance values based on lab and field conductances

TABLE 4.—*Chemical-quality survey of Sam Rayburn Reservoir, survey 2, June 9–10, 1965*

[Results in milligrams per liter except as indicated. Elevation, 129.45 ft. Content, 431,400 acre-ft.]

Sampling site	Date	Depth (ft)	Silica (SiO_2)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Orthophosphate (PO_4)	Dissolved solids (calculated)	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Noncarbonate	Specific conductance (micromhos at 25° C) (Field)	pH (Lab)	Dissolved oxygen (DO): mg/l	Dissolved oxygen (DO): Percent saturation	Temperature (°C)
TRAVERSE A																							
A_C	June 10	1	0.0			11	4.5	22	4.7	43	22	28	0.2	0.1		114	46	11	200	6.9	6.7	88	30.0
		5																	200		6.3	81	29.0
		10																	190		1.7	22	28.0
		13																	200		8	10	27.0
TRAVERSE B																							
B_C	June 10	1																	210		5.9	76	28.5
		5																	220		4.9	61	27.5
		10																	220		2.7	36	30.0
		20																	220		4	5	25.0
		32																	260		4	4	18.0
TRAVERSE C																							
C_R	June 10	1								44	22	32					48	12	220	6.5	5.2	64	27.0
		5								--	--	--					--	--	220	--	4.2	52	27.0
		10								--	--	--					--	--	220	--	4.2	51	26.5
		15								--	--	--					--	--	220	--	3.9	48	26.0
		20								43	22	32					50	15	220	6.4	2.5	30	26.0
C_C	June 10	1	7.1			12	4.4	24	4.4	43	22	32	0.3	0.6	0.00	128	48	13	220	6.4	5.6	71	28.0
		5								--	--	--					--	--	220	--	3.2	40	27.0
		10								--	--	--					--	--	220	--	2.5	30	26.5
		15								--	--	--					--	--	220	--	1.8	22	26.0
		20								--	--	--					--	--	220	--	2.2	26	25.0
		30								74	11	33					60	0	260	6.2	4	4	20.0
		40								--	--	--					--	--	220	--	4	4	17.0
		50								71	8.2	19					55	0	200	6.3	4	4	17.0
C_L	June 10	1								--	--	--					--	--	210	--	6.9	90	29.5
		5								--	--	--					--	--	210	--	5.8	73	28.0
		10								--	--	--					--	--	205	--	2.1	26	26.5
		15								--	--	--					--	--	210	--	1.7	21	26.0
		25								--	--	--					--	--	210	--	2	2	24.0
		29								--	--	--					--	--	230	--	.2	2	21.5
C_{L2}	June 10	5								43	22	32					48	13	210	6.4	6.2	79	28.5
		10								--	--	--					--	--	210	--	2.9	35	26.5
		15								--	--	--					--	--	205	--	1.6	19	25.5
		25								52	14	28					48	5	210	6.2	2	2	24.0
		27								122	9.2	30					68	0	310	6.1	2	2	23.0
TRAVERSE D																							
D_R	June 10	1																	200		6.4	81	28.0
		5																	210		5.2	64	27.0
		10																	190		4.4	54	26.5
		15																	185		2.0	24	26.0
		25																	230		5	6	24.0
D_C	June 10	1																	200		6.8	87	28.5
		5																	200		6.3	78	27.0
		10																	200		4.4	54	26.5
		15																	190		1.5	18	25.5
		25																	210		2	2	23.0
		35																	230		3	3	18.0
		45																	200		5	5	16.0
		49																	215		4	4	17.0
D_L	June 10	1																	200		6.8	89	30.0
		5																	190		6.4	81	28.0
		10																	215		3.4	42	27.0
		15																	220		1.6	19	25.5
		25																	210		2	2	24.0

TABLE 4.-Chemical-quality survey of Sam Rayburn Reservoir, survey 2, June 9-10, 1965-Continued

Sampling site	Date	Depth (ft)	Silica (SiO_2)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Orthophosphate (PO_4)	Dissolved solids (calculated)	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Noncarbonate	Specific conductance (micromhos at 25° C) (Field)	pH (Lab)	Dissolved oxygen (DO): mg/l	Dissolved oxygen (DO): Percent saturation	Temperature (°C)
TRAVERSE E																							
E_R	June 9	1																	160		6.8	87	29.0
		5																	175		6.7	86	29.0
		10																	165		3.6	44	27.0
		15																	155		.3	4	26.0
		18																	190		.1	1	25.0
E_C	June 9	1																	200		7.7	101	30.0
		5																	200		7.4	95	29.5
		10																	170		1.5	19	27.5
		20																	190		.2	2	25.5
		25																	160		.5	6	25.5
		30																	240		.5	6	21.5
		40																	260		.7	7	18.5
E_L	June 9	1																	210		7.8	103	30.0
		5																	210		6.8	89	30.0
		10																	210		.3	4	28.0
		15																	210		.3	4	26.5
		18																	210		.3	4	26.0
TRAVERSE F																							
F_R	June 9	1								36	20	25					40	10	180	6.3	6.7	87	29.5
		5								--	--	--					--	--	180	--	6.2	79	29.0
		10								--	--	--					--	--	180	--	3.3	41	27.0
		17								36	21	22					40	10	180	6.4	.4	5	26.5
F_C	June 9	1								36	20	25					40	10	170	6.3	7.7	101	30.0
		5								--	--	--					--	--	160	--	6.7	86	29.0
		10								--	--	--					--	--	160	--	1.2	15	26.5
		20								--	--	--					--	--	175	--	.2	2	25.5
		30								--	--	--					--	--	210	--	.3	3	22.5
		40								--	--	--					--	--	240	--	.4	4	19.0
		43								78	9.0	32					66	2	220	6.2	.4	4	19.0
F_L	June 9	1								36	21	25					40	10	180	6.4	7.9	104	30.0
		5								--	--	--					--	--	180	--	7.8	103	30.0
		10								--	--	--					--	--	170	--	.2	2	27.0
		15								34	20	24					38	10	170	6.3	.4	5	26.5
TRAVERSE G																							
G_C	June 9	1																	170		8.7	116	31.0
		3																	--		7.2	95	30.5
		5																	--		2.3	29	28.0
		10																	160		.1	1	26.0
		20																	160		.1	1	26.0
		30																	160		.1	1	25.5
		40																	160		.3	4	25.5
		45																	160		.4	5	25.0
TRAVERSE H																							
H_C	June 9	1																	170		1.0	13	28.0
		10																	165		.3	4	26.0
		20																	165		.5	6	26.0
		31																	165		.4	5	26.0
TRAVERSE I																							
I_C	June 9	1								38	20	25					43	12	170	6.2	3.4	42	27.0
		10								--	--	--					--	--	170	--	3.5	43	27.0
		20								--	--	--					--	--	170	--	3.4	42	27.0
		31								38	20	25					42	11	180	6.5	3.4	42	27.0
TRAVERSE L																							
L_C	June 10	1								44	20	26					44	8	190	6.3	5.5	73	31.0
		5																	190		3.3	43	29.5
		8																	180		.4	5	28.0

TABLE 5.-Chemical-quality survey of Sam Rayburn Reservoir, survey 3, June 29-30, 1965

[Results in milligrams per liter except as indicated. Elevation, 130.47 ft. Content 466,000 acre-ft.]

Sampling site	Date	Depth (ft)	Silica (SiO_2)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Orthophosphate (PO_4)	Dissolved solids (calculated)	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Noncarbonate	Specific conductance (micromhos at 25° C) (Field)	pH (Lab)	Dissolved oxygen (DO): mg/l	Dissolved oxygen (DO): Percent saturation	Temperature (°C)
TRAVERSE A																							
A_C	June 30	1	3.2			12	4.9	19	5.1	50	16	28	0.3	0.2		114	50	9	210	6.1	6.1	85	33.5
		3								--	--	--		--			--	--	210	--	5.0	64	29.0
		5								--	--	--		--			--	--	210	--	3.8	49	29.0
		10								--	--	--		--			--	--	220	--	3.5	45	28.5
		15								--	--	--		--			--	--	230	--	3	4	27.5
		19								68	11	26		2			58	2	240	6.5	4	5	26.0
TRAVERSE B																							
B_C	June 30	1																	170		6.4	86	32.0
		3																	170		5.8	74	29.0
		5																	170		4.8	62	28.5
		10																	170		9	11	27.5
		15																	175		2	2	27.0
		20																	190		2	2	25.0
		33																	220		2	2	19.5
TRAVERSE C																							
C_R	June 30	1		--						44	20	31					48	12	190	6.7	6.0	80	31.0
		3		--						--	--	--					--	--	190	--	4.7	60	29.0
		5		--						--	--	--					--	--	190	--	3.3	42	28.0
		10		--						--	--	--					--	--	190	--	2.5	32	28.0
		15		--						--	--	--					--	--	200	--	2.2	28	27.5
		21		--						50	19	32					50	9	220	6.1	3	4	26.0
C_C	June 30	1	6.8	0.15		11	5.0	22	4.8	45	19	30	0.3	0.2		121	48	11	190	6.6	6.3	84	31.0
		3		--						--	--	--					--	--	190	--	4.5	58	28.5
		5		--						--	--	--					--	--	190	--	3.6	46	28.0
		10		--						--	--	--					--	--	190	--	3.0	38	28.0
		15		--						--	--	--					--	--	200	--	2.3	29	27.5
		20		--						--	--	--					--	--	220	--	1	1	25.5
		30		--						--	--	--					--	--	250	--	1	1	22.0
		40		--						--	--	--					--	--	210	--	1	1	17.5
		51		6.7						70	7.8	21					54	0	210	6.4	1	1	17.0
C_L	June 30	1		--						--	--	--					--	--	190	--	6.1	80	30.0
		3		--						--	--	--					--	--	190	--	5.6	72	28.5
		5		--						--	--	--					--	--	190	--	4.7	60	28.5
		10		--						--	--	--					--	--	195	--	4.0	51	28.0
		15		--						--	--	--					--	--	200	--	.2	2	27.5
		20		--						--	--	--					--	--	220	--	2	2	25.5
		25		--						--	--	--					--	--	230	--	2	2	25.0
C_{L2}	June 30	1		--						46	21	30					48	10	190	6.4	6.0	79	30.0
		3		--						--	--	--					--	--	190	--	5.5	71	29.0
		5		--						--	--	--					--	--	190	--	4.8	62	28.5
		10		--						--	--	--					--	--	190	--	3.8	49	28.5
		15		--						--	--	--					--	--	200	--	1	1	27.5
		20		--						--	--	--					--	--	220	--	1	1	25.0
		30		15						78	7.8	30					63	0	290	6.3	1	1	21.5

TABLE 5.-Chemical-quality survey of Sam Rayburn Reservoir, survey 3, June 29-30, 1965-Continued

Sampling site	Date	Depth (ft)	Silica (SiO_2)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Orthophosphate (PO_4)	Dissolved solids (calculated)	Hardness as $CaCO_3$ Calcium, magnesium	Hardness as $CaCO_3$ Noncarbonate	Specific conductance (micromhos at 25° C) (Field)	pH (Lab)	Dissolved oxygen (DO) mg/l	Dissolved oxygen (DO) Percent saturation	Temperature (°C)
											TRAVERSE D												
D_R	June 30	1																	210		6.2	82	30.5
		3																	210		5.8	74	29.0
		5																	210		5.3	70	29.0
		10																	210		4.6	59	28.5
		15																	210		2	3	28.0
		21																	240		3	4	25.5
D_C	June 30	1																	195		6.0	80	31.0
		3																	195		6.0	78	29.5
		5																	200		5.6	72	29.0
		10																	200		5.1	65	29.0
		15																	210		1	1	27.5
		20																	220		1	1	25.0
		30																	280		1	1	22.0
		40																	220		1	1	18.0
		48																	220		.1	1	18.0
D_L	June 30	1																	210		5.9	77	29.5
		3																	210		5.4	69	29.0
		5																	210		5.3	68	29.0
		10																	210		4.4	56	28.5
		15																	230		3	4	27.0
		20																	240		3	4	26.0
											TRAVERSE E												
E_R	June 30	1																	185		6.1	80	30.5
		3																	185		5.8	75	29.5
		5																	185		5.3	68	29.0
		10																	185		4.8	62	29.0
		15																	180		5	6	28.0
		21																	210		.6	7	25.5
E_C	June 30	1																	200		6.5	86	30.5
		3																	200		6.4	84	30.0
		5																	200		5.9	77	29.5
		10																	200		5.3	68	29.0
		15																	200		.2	3	28.0
		20																	210		2	2	25.5
		30																	220		8	9	22.0
		40																	220		1.1	12	18.5
		44																	220		1.2	13	19.0
E_L	June 30	1																	190		5.1	67	30.5
		3																	190		5.4	71	30.0
		5																	190		5.4	71	30.0
		10																	190		4.7	61	29.5
		15																	190		3	4	28.0
		18																	220		3	4	27.0

TABLE 5.-Chemical-quality survey of Sam Rayburn Reservoir, survey 3, June 29-30, 1965-Continued

Sampling site	Date	Depth (ft)	Silica (SiO_2)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Orthophosphate (PO_4)	Dissolved solids (calculated)	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Noncarbonate	Specific conductance (micromhos at 25° C) (Field)	pH (Lab)	Dissolved oxygen (DO): mg/l	Dissolved oxygen (DO): Percent saturation	Temperature (°C)
TRAVERSE F																							
F_R	June 29	1		--						44	21	29					46	10	185	6 9	7 2	100	33 5
		3		--						--	--	--					--	--	180	--	6 8	89	30 5
		5		--						--	--	--					--	--	180	--	4 8	62	29 5
		10		--						--	--	--					--	--	180	--	4 8	62	29 5
		18		--						42	28	25					55	21	210	6 3	1 4	17	27 0
F_C	June 29	1		0 23						44	20	29					46	10	190	6 4	6 8	93	33 0
		3		--						--	--	--					--	--	180	--	6 1	80	30 0
		5		--						--	--	--					--	--	180	--	4 8	63	29 5
		10		--						--	--	--					--	--	180	--	3 6	46	29 0
		20		--						--	--	--					--	--	180	--	5	6	26 5
		30		--						--	--	--					--	--	190	--	4	5	24 0
		40		--						--	--	--					--	--	220	--	7	8	20.0
		46		7 5						68	13	31					60	4	220	6.6	5	5	20.0
F_L	June 29	1		0 23						43	20	30					46	11	190	6 8	7 2	99	33 0
		3		--						--	--	--					--	--	185	--	6 8	92	31.5
		5		--						--	--	--					--	--	180	--	4.1	53	29.5
		10		--						--	--	--					--	--	200	--	1 8	23	29 5
		19		5 8						60	11	23					52	3	200	6 2	.4	5	27.0
TRAVERSE G																							
G_C	June 29	1																	270		5 1	69	32.0
		3																	270		3 1	41	30 0
		5																	260		1 4	18	29 0
		10																	240		.2	2	27 0
		20																	230		2	2	27 0
		25																	230		2	2	27 0
		31																	220		2	2	26 5
TRAVERSE H																							
H_C	June 29	1																	360		7 3	100	33 0
		3																	300		2 4	32	30.5
		5																	240		1	1	28 0
		10																	240		1	1	27 5
		15																	230		1	1	27 0
		20																	230		1	1	27.0
		25																	230		1	1	27 0
		29																	230		.0	0	27 0
TRAVERSE I																							
I_C	June 29	1		2 0						68	21	45					60	4	320	6 3	4 5	61	32 0
		5		--						--	--	--					--	--	240	--	2	3	28 0
		10		--						--	--	--					--	--	240	--	2	3	28 0
		15		--						--	--	--					--	--	230	--	3	4	28 0
		20		--						--	--	--					--	--	230	--	3	4	27.0
		23		5 5						69	17	27					58	1	240	6 4	3	4	27 0
TRAVERSE J																							
J_C	June 29	1																	320		5 7	75	30 0
		5																	320		5 8	75	29 5
		10																	320		5.8	75	29 5
		15																	320		5.9	77	29.5
TRAVERSE L																							
L_C	June 30	1	3 1			12	4 9	20	5.8	51	18	28	0 3	0 2			50	8	210	6.3	4 2	58	33 5
		3																	210		2 1	27	29 5
		6																	210		4	5	29 5
TRAVERSE M																							
M_C	June 30	1								60	16	24					54	5	210	6.5	4 6	62	32 0
		3																	210		3 1	41	30 0
		5																	210		4	5	29 5
		8																	210		4	5	29.5

TABLE 6.-Chemical-quality survey of Sam Rayburn Reservoir, survey 4, Oct. 6-7, 1965

[Results in milligrams per liter except as indicated. Elevation, 129.83 ft. Content, 444,100 acre-ft.]

Sampling site	Date	Depth (ft)	Silica (SiO_2)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Orthophosphate (PO_4)	Dissolved solids (calculated)	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Noncarbonate	Specific conductance (micromhos at 25° C) (Field) a	pH (Field)	Dissolved oxygen (DO): mg/l	Dissolved oxygen (DO): Percent saturation	Temperature (°C)
TRAVERSE A																							
A_C	Oct 7	1		0.41						70	16	30					63	6	240	7.1	3.9	44	22.5
		5		36						--	--	--					--	--	240	7.1	3.9	44	22.0
		10		34						--	--	--					--	--	240	7.1	3.4	39	22.0
		15		40						--	--	--					--	--	240	7.0	3.5	40	22.0
		20		45						68	16	30					64	8	240	7.0	3.7	42	22.0
TRAVERSE B																							
B_C	Oct 7	1																	200	7.1	3.3	38	23.0
		10																	200	7.1	3.5	40	22.5
		20																	200	7.1	3.4	39	22.0
		30																	215	7.1	2.9	33	22.0
		40																	290	7.8	.1	1	20.0
		45																	320	7.6	.2	2	19.5
		52																	390	7.5	.9	10	18.5
TRAVERSE C																							
C_C	Oct 6	1		0.61						64	17	31					58	6	210	7.1	4.6	52	22.0
		10		58						--	--	--					--	--	210	7.1	4.4	50	22.0
		20		76						--	--	--					--	--	210	7.2	4.3	49	22.0
		30		71						--	--	--					--	--	270	7.8	4.0	44	21.0
		35		11						--	--	--					--	--	320	7.8	.4	4	20.0
		40		11						--	--	--					--	--	330	7.7	.8	9	19.5
		45		14						--	--	--					--	--	350	7.7	1.4	15	19.0
		50		10						--	--	--					--	--	340	7.6	.1	1	19.0
		55		8.9						120	36	26					79	0	430	7.6	.1	1	19.0
C_L	Oct. 6	1		--						64	17	31					59	7	220	7.0	4.7	53	22.5
		10		--						--	--	--					--	--	220	7.0	3.6	41	22.0
		20		--						--	--	--					--	--	220	7.0	3.4	39	22.0
		24		--						65	15	31					59	6	220	6.9	3.0	34	22.0
TRAVERSE D																							
D_C	Oct 6	1																	220	7.1	3.3	38	22.5
		10																	220	7.1	2.6	30	22.5
		20																	220	7.2	2.1	24	22.0
		30																	235	7.3	2.0	23	22.0
		40																	330	7.6	.1	1	19.5
		45																	330	7.6	.1	1	19.5
TRAVERSE E																							
E_C	Oct 6	1																	230	7.0	3.2	36	22.5
		10																	230	7.0	2.7	31	22.5
		20																	230	7.0	2.4	27	22.5
		30																	230	7.1	2.5	28	22.0
		41																	370	7.6	.7	8	20.5
TRAVERSE F																							
F_R	Oct 6	1								68	16	33					60	4	255	6.7	6.4	72	21.5
		5								--	--	--					--	--	255	6.8	5.6	63	21.5
		10								--	--	--					--	--	250	6.8	4.4	49	21.5
		17								70	16	34					63	6	255	6.7	4.5	51	21.5
F_C	Oct 6	1								65	15	33					59	6	255	6.9	5.2	59	22.0
		10								--	--	--					--	--	255	7.0	3.4	39	22.0
		20								--	--	--					--	--	255	7.0	3.1	35	22.0
		30								--	--	--					--	--	255	7.1	2.7	31	22.0
		40								69	16	33					62	5	260	7.1	2.5	28	22.0

See footnote at end of table

TABLE 6.–Chemical-quality survey of Sam Rayburn Reservoir, survey 4, Oct. 6-7, 1965–Continued

Sampling site	Date	Depth (ft)	Silica (SiO_2)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Orthophosphate (PO_4)	Dissolved solids (calculated)	Hardness as $CaCO_3$: Calcium magnesium	Hardness as $CaCO_3$: Noncarbonate	Specific conductance (micromhos at 25° C) (Field)[a]	pH (Field)	Dissolved oxygen (DO): mg/l	Dissolved oxygen (DO): Percent saturation	Temperature (°C)
TRAVERSE G																							
G_C	Oct 6	1																	310	6.8	4.3	49	22.0
		10																	310	6.8	2.9	33	21.5
		20																	310	6.8	3.1	34	21.0
		25																	310	6.8	3.1	35	21.5
		30																	310	6.7	2.7	30	21.0
TRAVERSE H																							
H_C	Oct. 6	1																	355	6.9	3.6	40	21.5
		10																	355	6.9	2.0	22	21.0
		20																	355	6.9	2.1	23	21.0
		30																	355	6.9	2.1	23	21.0
		36																	355	6.7	2.2	24	20.5
TRAVERSE I																							
I_C	Oct. 6	1	10	--		15	2.8	18	3.4	45	25	21	0.1	0.3	0.05	118	49	12	205	7.3	2.9	32	20.5
		5		1.6						--	--	--					--	--	195	7.3	1.9	21	20.5
		10		2.6						--	--	--					--	--	190	7.3	1.8	20	20.0
		15		1.5						--	--	--					--	--	190	7.3	1.4	15	20.0
		20		1.5						--	--	--					--	--	190	7.3	1.3	14	20.0
		24		2.3						52	26	21					56	13	190	7.2	1.1	12	20.0
TRAVERSE J																							
J_C	Oct 6	1		1.9															400	7.1	5.1	57	21.5
		5		1.9															400	7.1	4.6	51	21.0
		10		1.9															400	7.1	4.6	51	21.0
		15		1.8															400	7.1	4.4	49	21.0
		20		2.0															405	7.1	4.3	48	21.0
		23		1.8															405	7.1	4.3	18	21.0
TRAVERSE L																							
L_C	Oct. 7	1								66	11	26					54	0	220	7.0	4.9	55	21.5
		5								--	--	--					--	--	225	7.1	3.2	36	21.0
		7								64	13	27					56	4	225	7.0	2.9	32	21.0
TRAVERSE M																							
M_C	Oct 7	1								86	14	29					72	2	255	7.1	5.2	59	22.0
		5								--	--	--					--	--	250	7.0	3.4	38	21.0
		11								82	14	28					72	5	250	7.0	3.6	40	21.0

a 30 micromhos added to each determined field conductance to improve correlation with laboratory conductance

TABLE 7.-Chemical-quality survey of Sam Rayburn Reservoir, survey 5, Feb. 2-4, 1966

[Results in milligrams per liter except as indicated. Elevation, 137.15 ft. Content, 739,000 acre-ft.]

Sampling site	Date	Depth (ft)	Silica (SiO_2)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Orthophosphate (PO_4)	Dissolved solids (calculated)	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Noncarbonate	Specific conductance (micromhos at 25° C) (Field)	pH (Field)	Dissolved oxygen (DO): mg/l	Dissolved oxygen (DO): Percent saturation	Temperature (°C)
												TRAVERSE A											
A_C	Feb. 4	1	7.5			9.4	2.8	11	4.0	36	14	14	0.2	0.5		82	35	5	135	7.5	11.0	90	7.0
		10								--	--	--					--	--	135	7.4	11.4	92	6.5
		20								--	--	--					--	--	132	7.4	11.4	92	6.5
		25								--	--	--					--	--	134	7.4	11.4	92	6.5
		32								36	13	14					36	6	134	7.4	11.4	92	6.5
												TRAVERSE C											
C_C	Feb 4	1	8.3	0.23	0.21	13	4.8	23	5.0	57	16	30	0.2	1.0		129	52	6	220	7.3	11.3	93	7.0
		10		--	--					--	--	--					--	--	220	7.3	11.3	93	7.0
		20		--	--					--	--	--					--	--	220	7.3	10.7	90	8.0
		30		--	--					--	--	--					--	--	220	7.3	11.0	92	7.5
		40		--	--					--	--	--					--	--	220	7.3	10.8	90	7.5
		50		--	--					--	--	--					--	--	225	7.3	10.8	89	7.0
		59		38	22					56	17	33					52	6	225	7.3	10.5	86	7.0
C_L	Feb 4	1								56	16	29					54	8	215	7.3	11.2	93	7.5
		10								--	--	--					--	--	215	7.3	11.3	93	7.0
		20								--	--	--					--	--	215	7.3	11.0	92	7.5
		30								--	--	--					--	--	215	7.2	11.0	92	7.5
		35								56	16	29					54	8	215	7.2	11.0	92	7.5
												TRAVERSE E											
E_C	Feb 4	1		0.24	0.19					58	16	31					54	6	220	7.2	10.8	91	8.0
		10		--	--					--	--	--					--	--	220	7.2	10.8	90	7.5
		20		--	--					--	--	--					--	--	220	7.2	10.5	88	7.5
		30		--	--					--	--	--					--	--	220	7.2	10.5	88	7.5
		45		.24	19					--	--	--					--	--	220	7.2	10.8	90	7.5
		55		.32	.28					57	17	32					54	7	220	7.3	10.8	89	7.0
												TRAVERSE F											
F_C	Feb 4	1								58	17	32					54	6	225	7.1	10.8	90	7.5
		10								--	--	--					--	--	225	7.1	10.8	91	8.0
		20								--	--	--					--	--	225	7.1	10.5	88	8.0
		30								--	--	--					--	--	225	7.1	10.5	88	8.0
		40								--	--	--					--	--	225	7.1	10.2	86	8.0
		50								52	19	32					52	9	225	7.0	9.8	83	8.5
												TRAVERSE H											
H_C	Feb. 3	1										20							168	6.8	8.3	68	7.0
		10										--							168	6.8	8.4	68	6.5
		20										--							168	6.8	8.3	67	6.5
		30										--							170	6.8	8.3	67	6.5
		40										21							170	6.8	8.3	67	6.5
												TRAVERSE I											
I_C	Feb 3	1		0.27	0.09					19	28	14					36	20	145	6.7	8.2	66	6.0
		10		--	--					--	--	--					--	--	150	6.7	8.2	65	5.5
		20		17	07					20	31	17					37	21	157	6.7	7.8	62	6.0
		25		--	--					--	--	--					--	--	188	6.8	8.2	66	6.0
		30		17	--					--	--	--					--	--	189	6.8	8.4	67	6.0
												TRAVERSE J											
J_C	Feb 2	1										25							192	6.9	11.5	97	8.0
		10										--							192	6.9	11.5	97	8.0
		15										--							192	6.9	11.5	97	8.0
		19										24							192	7.4	11.5	97	8.0
												TRAVERSE L											
L_C	Feb 4	1	5.0			8.3	2.5	11	3.7	31	16	12	0.1	0.5		74	31	6	128	7.3	11.1	91	7.0
		10										12							128	7.3	10.8	87	6.5

TABLE 8.-Chemical-quality survey of Sam Rayburn Reservoir, survey 6, May 24-26, 1966

[Results in milligrams per liter except as indicated. Elevation, 154.74 ft. Content, 1,918,000 acre-ft.]

Sampling site	Date	Depth (ft)	Silica (SiO_2)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Orthophosphate (PO_4)	Dissolved solids (calculated)	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Noncarbonate	Specific conductance (micromhos at 25° C) (Field)	pH (Field)	Dissolved oxygen (DO): mg/l	Dissolved oxygen (DO): Percent saturation	Temperature (°C)
TRAVERSE A																							
A_C	May 26	1	6.1			10	3.9	15	4.3	45	14	20	0.0	0.5	0.00	96	41	4	151	7.0	7.6	93	26.5
		10																	152	7.0	7.3	89	26.0
		15																	152	6.9	6.8	82	25.5
		18																	162	6.5	2.3	26	21.0
		20																	162	6.4	.8	9	21.0
		30																	165	6.3	.2	2	20.5
		35																	164	6.4	0	0	20.5
		38																	172	6.5	.0	0	20.0
TRAVERSE B																							
B_C	May 26	1																	159	6.9	7.7	94	26.0
		10																	159	6.8	7.2	86	25.0
		20																	160	6.7	6.8	81	24.5
		30																	163	6.7	3.4	39	22.0
		40																	172	6.7	.6	6	18.0
		50																	205	6.7	.4	4	15.0
		60																	205	6.7	.5	5	14.0
		66																	205	6.7	.5	5	13.5
TRAVERSE C																							
C_C	May 26	1	6.3	0.26	0.07	10	3.7	17	4.1	42	16	22	0.0	0.5	0.00	101	40	6	159	7.4	8.4	102	26.5
		15		--	--					--	--	--					--	--	159	7.2	8.0	98	26.0
		30		--	--					--	--	--					--	--	162	6.7	5.8	67	23.5
		50		.33	3.5					--	--	--					--	--	205	6.6	1.8	17	14.5
		65		--	--					--	--	--					--	--	205	6.7	1.8	17	14.0
		75		.61	3.9					58	14	25					50	2	205	6.6	2.0	19	13.0
C_L	May 26	1		--	--					41	16	22					41	7	158	7.1	7.7	95	27.0
		15		--	--					--	--	--					--	--	160	6.9	7.5	89	25.0
		30		--	--					--	--	--					--	--	168	6.7	2.9	33	22.0
		46		--	--					53	14	24					47	4	185	6.7	2.0	20	16.5
TRAVERSE D																							
D_C	May 26	1																	160	7.2	8.4	102	26.0
		15																	160	6.2	8.4	100	25.0
		25																	165	6.7	5.1	60	24.0
		40																	190	6.8	1.9	20	17.5
		55																	270	6.7	1.8	17	14.5
TRAVERSE E																							
E_C	May 26	1																	156	7.0	7.8	94	25.5
		10																	158	6.9	7.2	86	25.0
		25																	160	6.8	6.2	73	24.0
		35																	170	6.8	3.6	40	21.0
		50																	220	6.8	3.8	37	15.0
		64																	225	6.8	4.5	43	14.0
TRAVERSE F																							
F_C	May 26	1																	160	7.0	7.7	94	26.0
		10																	160	6.9	7.2	86	25.0
		20																	160	6.7	6.4	76	24.5
		35																	170	6.7	3.4	37	20.5
		50																	220	6.7	4.1	41	16.0
		66																	220	6.8	4.3	42	15.0

TABLE 8.—Chemical-quality survey of Sam Rayburn Reservoir, survey 6, May 24-26, 1966—Continued

Sampling site	Date	Depth (ft)	Silica (SiO_2)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Orthophosphate (PO_4)	Dissolved solids (calculated)	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Noncarbonate	Specific conductance (micromhos at 25° C) (Field)	pH (Field)	Dissolved oxygen (DO): mg/l	Dissolved oxygen (DO): Percent saturation	Temperature (°C)
TRAVERSE G																							
G_C	May 26	1																	151	7.1	7.8	95	26.5
TRAVERSE H																							
H_C	May 26	1																	150	7.3	8.5	105	27.0
		10																	145	6.9	8.0	98	26.5
		20																	135	6.5	3.0	33	21.0
		40																	210	6.4	3.5	38	20.0
		50																	210	6.5	3.6	38	18.0
TRAVERSE I																							
I_C	May 24	1		0.21	0.02					29	18	20					35	11	145	7.2	7.4	94	28.0
		5		--	--					--	--	--					--	--	141	6.7	5.1	62	26.0
		10		--	--					--	--	--					--	--	140	6.6	4.0	49	26.0
		13		.36	.07					24	14	20					--	--	130	6.4	3.3	39	25.0
		20		--	--					--	--	--					30	10	112	6.1	0	0	21.0
		30		2.1	.70					--	--	--					--	--	129	6.1	.0	0	20.5
		40		--	--					--	--	--					--	--	185	6.2	.0	0	19.5
		50		6.1	3.7					82	6.8	27					61	0	235	6.2	.0	0	17.0
TRAVERSE J																							
J_C	May 24	1		--	--					26	15	15					30	9	116	6.7	5.0	62	27.0
		5		--	--					--	--	--					--	--	124	6.4	2	2	25.0
		10		--	--					--	--	--					--	--	131	6.2	.0	0	22.0
		15		--	--					--	--	--					--	--	130	6.3	0	0	22.0
		20		--	--					--	--	--					--	--	130	6.3	.0	0	21.5
		25		2.3	1.1					--	--	--					--	--	135	6.3	0	0	21.0
		30		--	--					--	--	--					--	--	138	6.3	.0	0	20.0
		36		4.2	1.3					41	7.2	14					35	1	140	6.2	0	0	20.0
TRAVERSE K																							
K_C	May 24	1																	168	6.5	0	0	25.5
		10																	168	6.6	0	0	25.0
		15																	168	6.6	0	0	25.0
		20																	168	6.6	0	0	25.0
		25																	172	6.6	0	0	24.5
		30								46									178	6.4	0	0	23.0
TRAVERSE L																							
L_C	May 26	1								48	13	20					42	3	156	6.9	6.7	81	25.5
		5								--	--	--					--	--	159	6.7	5.1	61	25.5
		8								--	--	--					--	--	170	6.4	3	4	24.0
		10								--	--	--					--	--	168	6.4	0	0	23.0
		15								--	--	--					--	--	185	6.2	0	0	22.0
		25								--	--	--					--	--	215	6.1	.0	0	19.0
		29								93	8.4	25					65	0	214	6.1	0	0	19.0
TRAVERSE M																							
M_C	May 26	1		0.16	0.03					47	13	17					42	4	145	6.9	7.0	85	26.5
		5		--	--					--	--	--					--	--	145	6.7	5.2	63	25.5
		10		--	--					--	--	--					--	--	150	6.6	2	2	24.5
		20		2.8	1.8					--	--	--					--	--	140	6.2	0	0	19.5
		30		3.6	2.9					--	--	--					--	--	285	6.2	0	0	16.5
		35		--	--					128	2	29					110	5	320	6.4	0	0	14.5
TRAVERSE N																							
N_C	May 24	1		0.34	0.04					28	14	12					32	9	110	7.2	6.3	83	30.0
		5		--	--					--	--	--					--	--	115	6.3	6	7	26.0
		10		--	--					--	--	--					--	--	147	6.3	0	0	22.5
		18		--	--					--	--	--					--	--	147	6.3	0	0	21.5
		23		2.3	2.4					56	12	20					49	3	146	6.2	0	0	21.5

TABLE 9.-Chemical-quality survey of Sam Rayburn Reservoir, survey 7, Sept. 9-10, 1966

[Results in milligrams per liter except as indicated. Elevation, 154.02 ft. Content 1,855,000 acre-ft.]

Sampling site	Date	Depth (ft)	Silica (SiO_2)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Orthophosphate (PO_4)	Dissolved solids (calculated)	Hardness as $CaCO_3$: Calcium magnesium	Hardness as $CaCO_3$: Noncarbonate	Specific conductance (micromhos at 25° C) (Field) a	pH (Lab)	Dissolved oxygen (DO): mg/l	Dissolved oxygen (DO): Percent saturation	Temperature (°C)
											TRAVERSE A												
A_C	Sept 9	1	6.0	0.11	0.02	11	3.6	16	4.4	44	14	22	0.2	0.2		100	42	6	165	7.2	4.8	63	30.0
		10		--	--	--	--			--		--					--	--	165	--	4.2	55	30.0
		20		.80	2.5	--	--			--		--					--	--	175	--	.5	6	26.5
		30		--	--	--	--			--		--					--	--	190	--	.6	7	22.0
		35		4.0	3.1	11	3.6			52		22					42	0	190	7.1	.9	10	23.0
											TRAVERSE B												
B_C	Sept 9	1				10	3.6			43		21					40	4	160	7.0	4.4	57	29.5
		10				--	--			--		--					--	--	160	--	3.8	49	29.5
		20				--	--			--		--					--	--	160	--	2.8	36	29.0
		30				--	--			--		--					--	--	180	7.1	3	4	24.5
		40				12	3.9			54		23					46	2	190	--	.3	3	22.0
		50				--	--			--		--					--	--	235	--	4	4	19.5
		60				--	--			--		--					--	--	250	--	8	8	18.0
		68				16	5.2			74		22					61	1	250	7.1	8	8	18.0
											TRAVERSE C												
C_C	Sept. 9	1	7.5	0.20	0.08	11	3.6	16	4.1	43	14	22	0.2	0.2		100	42	7	155	7.2	5.8	76	30.0
		10	--	44	40	--	--	--	--	--	--	--	--	--		--	--	--	160	--	4.8	62	29.5
		20	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	160	--	5.0	65	29.5
		30	--	4.4	2.8	--	--	--	--	--	--	--	--	--		--	--	--	180	--	.8	10	24.5
		40	--	--	--	11	3.9	--	--	52	--	23	--	--		--	44	1	185	7.1	9	10	22.0
		50	--	6.9	5.3	--	--	--	--	--	--	--	--	--		--	--	--	220	--	8	9	19.5
		60	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	230	--	4	4	18.0
		70	9.9	1.4	6.2	14	5.1	18	4.8	72	4.4	25	.2	2.5	0.07	119	56	0	230	7.4	4	4	17.5
C_L	Sept 9	1	6.9	--	--	11	3.6	16	4.2	44	14	22	2	2		100	42	6	160	7.1	5.7	75	30.0
		10	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	160	--	5.2	68	30.0
		20	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	160	--	5.0	65	29.5
		23	--	--	02	--	--	--	--	--	--	--	--	--		--	--	--	160	--	4.8	62	29.0
		25	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	160	--	1.4	18	29.0
		30	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	175	--	8	9	24.0
		40	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	190	--	6	7	22.0
		51	--	--	--	13	4.5	--	--	65	--	24	--	--		--	51	0	210	7.0	.7	7	20.0
											TRAVERSE D												
D_C	Sept 9	1				10	3.6			43		22					40	4	160	7.3	6.0	79	30.5
		10				--	--			--		--					--	--	160	--	5.1	67	30.5
		20				--	--			--		--					--	--	160	--	4.8	63	30.0
		30				--	--			--		--					--	--	175	--	3	4	24.5
		40				--	--			--		--					--	--	195	--	.3	3	22.0
		53				16	5.6			88		25					63	0	250	7.3	1.1	12	19.5
											TRAVERSE E												
E_C	Sept. 9	1				10	3.7			42		22					40	6	160	7.1	5.9	79	31.0
		8				--	--			--		--					--	--	160	--	5.1	67	30.5
		15				--	--			--		--					--	--	160	--	4.5	59	30.5
		25				--	--			--		--					--	--	165	--	.2	3	29.0
		35				11	3.9			52		23					44	1	185	7.1	2	2	23.5
		47				15	5.4			70		25					60	2	250	7.2	7	8	21.0

See footnote at end of table.

TABLE 9.-Chemical-quality survey of Sam Rayburn Reservoir, survey 7, Sept. 9-10, 1966-Continued

Sampling site	Date	Depth (ft)	Silica (SiO_2)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Orthophosphate (PO_4)	Dissolved solids (calculated)	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Noncarbonate	Specific conductance (micromhos at 25° C) (Field) a	pH (Lab)	Dissolved oxygen (DO): mg/l	Dissolved oxygen (DO): Percent saturation	Temperature (°C)
												TRAVERSE F											
F_C	Sept 9	1	7.3	0.30	0.02	10	3.7	16	4.1	42	14	22	0.2	0.0		98	40	6	160	7.0	6.1	81	31.0
		10		--	--	--	--			--		--					--	--	160	--	5.3	70	30.5
		20		--	--	--	--			--		--					--	--	160	--	4.8	63	30.5
		30		--	--	--	--			--		--					--	--	180	--	3	4	24.5
		40		9.8	4.2	--	--			--		--					--	--	215	--	3	3	22.0
		50		--	--	--	--			--		--					--	--	250	--	4	4	20.0
		65		11	6.5	15	5.5			79		26					60	0	250	7.2	1.2	13	19.0
												TRAVERSE G											
G_C	Sept 10	1				10	3.7			42		22					40	6	165	7.0	5.1	66	29.5
		5				--	--			--		--					--	--	165	--	5.1	66	29.5
		15				--	--			--		--					--	--	165	--	5.1	66	29.5
		20				--	--			--		--					--	--	165	--	2.5	32	29.5
		25				--	--			--		--					--	--	180	--	.7	9	27.0
		35				--	--			--		--					--	--	230	--	.7	8	23.0
		45				13	5.3			81		22					54	0	235	7.4	.8	9	21.0
		55				--	--			--		--					--	--	240	--	.9	10	20.0
												TRAVERSE H											
H_C	Sept 10	1				10	3.6			43		22					40	4	165	7.2	4.8	62	29.5
		10				--	--			--		--					--	--	165	--	4.5	58	29.5
		20				--	--			--		--					--	--	165	--	4.5	58	29.5
		30				--	--			--		--					--	--	240	--	.4	5	24.0
		40				--	--			--		--					--	--	240	--	.5	6	22.5
		51				14	5.0			58		21					56	8	235	7.1	.5	6	21.0
												TRAVERSE I											
I_C	Sept 10	1		--	--	10	3.6			44		22					40	4	165	7.0	4.2	55	29.5
		10		0.26	0.12	--	--			--		--					--	--	165	--	4.0	52	29.5
		18		--	--	--	--			--		--					--	--	165	--	3.8	49	29.5
		20		--	--	--	--			--		--					--	--	190	--	.3	4	28.5
		30		15	3.1	--	--			--		--					--	--	250	--	.4	5	24.5
		40		17	4.1	--	--			--		--					--	--	260	--	.5	6	23.5
		47		--	--	--	--			--		--					--	--	--	--	--	--	23.0
		49	12	21	4.5	16	6.3	14	4.6	75	7.2	17	0.2	9.8	0.15	124	66	4	290	7.3	.5	6	22.0
												TRAVERSE J											
J_C	Sept. 10	1	7.7			10	3.7	16	4.1	42	14	22	0.2	0.5	0.00	99	40	6	165	6.9	2.4	31	29.0
		5				--	--			--		--					--	--	165	--	2.2	28	29.0
		10				--	--			--		--					--	--	170	--	1.0	13	28.5
		15				--	--			--		--					--	--	250	--	.2	2	27.0
		20				--	--			--		--					--	--	300	--	.4	5	26.5
		25				--	--			--		--					--	--	290	--	.4	5	25.5
		31				16	6.1			98		33					65	0	280	6.7	.4	5	24.5

See footnote at end of table.

TABLE 9.-Chemical-quality survey of Sam Rayburn Reservoir, survey 7, Sept. 9-10, 1966-Continued

Sampling site	Date	Depth (ft)	Silica (SiO_2)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Orthophosphate (PO_4)	Dissolved solids (calculated)	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Noncarbonate	Specific conductance (micromhos at 25° C) (Field)a	pH (Lab)	Dissolved oxygen (DO): mg/l	Dissolved oxygen (DO): Percent saturation	Temperature (°C)
										TRAVERSE K													
K_C	Sept 10	1				13	3.6			58		48					47	0	270	7.2	0.4	5	27.0
		5				--	--			--		--					--	--	270	--	2	2	27.0
		10				--	--			--		--					--	--	280	--	2	2	26.5
		15				--	--			--		--					--	--	290	--	2	2	26.5
		23	11			18	5.8	40	4.0	104	7.6	48	0.3	0.5		186	69	0	320	7.8	4	5	25.0
										TRAVERSE L													
L_C	Sept 9	1				11	3.6			48		22					42	3	170	7.4	3.5	45	29.5
		8				--	--			--		--					--	--	170	--	1.9	25	29.5
		15				--	--			--		--					--	--	200	--	.5	6	27.5
		24				--	--			--		--					--	--	260	--	.8	10	25.5
		28				19	5.0			78		22					68	4	260	7.0	.5	6	25.0
										TRAVERSE M													
M_C	Sept 9	1				11	3.7			48		22					43	3	165	7.0	3.8	49	29.5
		10				--	--			--		--					--	--	165	--	3.3	43	29.5
		19				14	4.1			62		21					52	1	190	6.8	1.1	14	28.0
										TRAVERSE N													
N_C	Sept 10	1	7.3			11	3.8	14	4.2	47	12	19	0.2	0.2		95	43	5	155	7.1	1.0	13	28.5
		5				--	--			--		--					--	--	155	--	.8	10	28.5
		10				9.7	3.8			50		11					40	0	155	7.0	.5	6	27.5

a 20 micromhos added to each determined field conductance to improve correlation with laboratory conductance

TABLE 10.-Chemical-quality survey of Sam Rayburn Reservoir, survey 8, Feb. 15-17, 1967

[Results in milligrams per liter except as indicated. Elevation, 152.61 ft. Content, 1,736,000 acre-ft.]

Sampling site	Date	Depth (ft)	Silica (SiO_2)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Orthophosphate (PO_4)	Dissolved solids (calculated)	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Noncarbonate	Specific conductance (micromhos at 25° C) (Field)	pH (Field)	Dissolved oxygen (DO): mg/l	Dissolved oxygen (DO): Percent saturation	Temperature (°C)
TRAVERSE B																							
B_C	Feb 17	1				11	3.8			46	13	21					43	5	138	7.3	10.9	94	9.0
		10				--	--			--	--	--					--	--	138	7.3	10.9	94	9.0
		20				--	--			--	--	--					--	--	135	7.3	10.9	94	9.0
		30				--	--			--	--	--					--	--	135	7.0	10.9	94	9.0
		40				--	--			--	--	--					--	--	132	7.0	10.9	94	9.0
		50				--	--			--	--	--					--	--	130	7.0	10.9	94	9.0
		60				--	--			--	--	--					--	--	125	7.0	9.7	84	9.0
		67				10	3.9			46	13	21					41	3	125	7.0	9.1	78	9.0
TRAVERSE C																							
C_C	Feb. 17	1	7.0	0.07	0.00	10	3.9	16	4.0	45	13	21	0.1	1.0		98	41	4	138	6.8	10.8	96	10.0
		10	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	140	6.8	10.5	93	10.0
		20	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	140	6.8	10.5	93	10.0
		30	--	.07	.00	--	--	--	--	--	--	21	--	--		--	--	--	138	6.8	10.3	91	10.0
		40	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	132	6.8	10.9	84	9.0
		50	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	140	6.8	10.6	91	9.0
		60	6.8	.08	.07	10	3.9	16	4.0	45	13	21	.1	1.0		98	41	4	138	6.6	10.3	89	9.0
TRAVERSE D																							
D_C	Feb 16	1										22							145	6.6	11.4	101	10.0
		7										--							144	6.6	11.7	104	10.0
		15										--							142	6.7	11.4	101	10.0
		25										--							142	6.6	10.9	96	10.0
		34										--							142	6.6	10.9	96	10.0
		44										22							140	6.5	10.3	91	10.0
TRAVERSE E																							
E_C	Feb 17	1										22							175	7.0	10.5	95	11.0
		10										--							176	6.9	11.1	98	10.0
		20										--							176	6.8	10.8	96	10.0
		30										--							174	6.8	10.5	93	10.0
		42										22							170	6.8	10.0	88	10.0
TRAVERSE F																							
F_C	Feb. 16	1	6.1			10	4.1	17	4.0	46	14	22	0.2	0.8		101	42	4	178	7.3	11.7	104	10.0
		10				--	--			--	--	--					--	--	178	7.3	11.7	104	10.0
		20				--	--			--	--	--					--	--	176	7.3	10.5	94	10.5
		30				--	--			--	--	22					--	--	172	7.3	11.4	101	10.0
		38				10	4.1			45	14	22					42	5	170	7.1	10.3	91	10.0
TRAVERSE G																							
G_C	Feb 16	1										22							170	7.3	11.4	101	10.0
		10										--							170	7.2	10.9	96	10.0
		20										--							168	6.9	9.7	86	10.0
		30										22							165	6.9	9.7	86	10.0
TRAVERSE H																							
H_C	Feb 17	1				11	4.1			46	14	22					44	7	176	6.8	10.5	95	11.0
		7										--							175	6.8	10.5	94	10.5
		15										--							176	6.8	10.5	94	10.5
		25										--							174	6.8	10.5	94	10.5
		33										22							170	6.9	10.5	94	10.5

TABLE 10.-Chemical-quality survey of Sam Rayburn Reservoir, survey 8, Feb. 15-17, 1967-Continued

Sampling site	Date	Depth (ft)	Silica (SiO_2)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Orthophosphate (PO_4)	Dissolved solids (calculated)	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Noncarbonate	Specific conductance (micromhos at 25° C) (Field)	pH (Field)	Dissolved oxygen (DO): mg/l	Dissolved oxygen (DO): Percent saturation	Temperature (°C)
												TRAVERSE I											
I_C	Feb. 17	1		0.10	0.04							22							188	6.8	10.5	94	10.5
		7		--	--							--							183	6.7	10.5	93	10.0
		15		.09	.00							--							183	6.7	10.5	93	10.0
		25		.12	.18							22							182	6.6	11.0	97	10.0
												TRAVERSE J											
J_C	Feb. 17	1	7.0	0.35	0.32	12	4.5	30	4.2	65	14	35	0.2	0.2		139	48	0	250	6.5	9.0	80	10.5
		5	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	248	6.4	8.4	74	10.0
		10	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	248	6.4	8.2	73	10.0
		15	--	.40	.32	--	--	--	--	--	--	35	--	--		--	--	--	280	6.4	8.6	75	9.5
		20	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	288	6.2	4.6	40	9.0
		25	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	324	6.2	2.3	20	9.0
		30	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	325	6.2	2.3	20	9.0
		35	8.7	.70	1.1	17	4.6	47	4.2	82	20	54	.3	.8		197	61	0	325	6.2	2.9	25	9.0
												TRAVERSE L											
L_C	Feb. 15	1	5.8			10	3.4	15	3.8	41	13	20	0.0	1.0		92	39	5	168	7.3	10.5	95	11.0
		5				--	--			--	--	--					--	--	168	7.2	10.3	93	11.0
		10				--	--			--	--	--					--	--	168	7.2	9.5	86	11.5
		13				10	3.4			41	13	20					39	5	162	7.1	9.7	87	11.0
												TRAVERSE M											
M_C	Feb. 15	1	6.5			11	3.8	16	4.1	45	13	21	0.1	1.0		98	43	6	180	7.1	10.3	93	11.0
		5																	180	7.1	10.3	92	10.5
		10																	180	7.1	9.7	87	10.5
		15																	180	7.2	9.5	85	10.5
		20																	181	7.2	9.2	82	10.5
		25																	181	7.3	9.2	82	10.5
		30																	180	7.4	8.6	77	10.5
												TRAVERSE N											
N_C	Feb. 15	1	5.1			7.5	3.5	11	2.5	32	15	13	0.0	0.2		74	33	7	140	6.0	9.2	82	10.5
		3				--	--			--	--	--					--	--	140	6.0	9.1	81	10.0
		5				--	--			--	--	--					--	--	145	6.0	10.3	91	10.0
		7				7.5	3.6			32	15	13					34	7	155	6.0	9.1	81	10.0

TABLE 11.–*Chemical-quality survey of Sam Rayburn Reservoir, survey 9, June 7–8, 1967*

[Results in milligrams per liter except as indicated. Elevation, 155.49 ft. Content, 1,985,000 acre-ft.]

Sampling site	Date	Depth (ft)	Silica (SiO_2)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Orthophosphate (PO_4)	Dissolved solids (calculated)	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Noncarbonate	Specific conductance (micromhos at 25° C) (Field)	pH (Field)	Dissolved oxygen (DO): mg/l	Dissolved oxygen (DO): Percent saturation	Temperature (°C)
TRAVERSE A																							
A_C	June 7	1																	145	8.0	7.9	96	26.5
		10																	150	7.2	7.2	85	24.0
		20																	155	7.0	6.4	74	23.5
		30																	152	6.5	1.5	17	22.0
		40																	175	6.6	0.8	9	22.0
TRAVERSE B																							
B_C	June 7	1				12	3.6			45		21					45	8	152	8.0	8.3	101	26.5
		10				--	--			--		--					--	--	155	7.7	8.3	100	25.5
		20				--	--			--		--					--	--	158	6.8	6.4	74	23.5
		30				--	--			--		--					--	--	160	6.6	5.8	66	22.0
		40				12	3.8			48		22					46	6	170	6.4	0.6	7	21.0
		50				--	--			--		--					--	--	200	6.6	0.7	7	16.5
		60				13	4.2			58		22					50	2	200	6.6	1.5	15	16.5
TRAVERSE C																							
C_C	June 7	1	4.8	0.02	0.04	12	3.6	16	3.9	47	13	21	0.2	0.5	0.02	98	45	6	148	8.0	8.8	109	27.0
		10	--	.02	.02	12	3.6	--	--	46	--	21	--	--	.00	--	45	7	150	7.4	8.0	96	25.5
		20	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	158	7.1	6.7	80	24.5
		30	--	.02	.04	12	3.7	--	--	48	13	22	--	--	.01	--	45	6	160	7.1	6.7	79	24.0
		35	--	.03	.26	12	3.8	--	--	48	13	22	--	--	.01	--	46	6	160	6.9	1.7	19	22.0
		37	--	.10	1.2	13	3.9	--	--	49	13	22	--	--	.02	--	48	8	160	6.6	5.4	61	22.0
		40	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	172	6.6	.7	8	19.5
		50	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	175	6.6	.8	8	16.5
		60	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	175	6.7	.8	8	16.5
		70	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	194	6.7	.8	8	16.5
		75	7.8	1.2	4.9	13	4.2	17	4.1	56	13	22	.2	.5	.03	110	50	4	195	6.7	.8	8	16.5
C_L	June 7	1																	145	8.2	7.4	94	28.0
		10																	150	7.2	6.7	80	25.0
		20																	152	6.9	5.3	63	24.5
		30																	154	6.8	3.8	45	24.5
TRAVERSE D																							
D_C	June 7	1																	152	8.3	8.0	99	27.0
		10																	155	8.1	8.5	102	25.5
		20																	158	7.2	7.1	84	24.0
		30																	160	7.1	5.8	66	22.0
		40																	180	6.7	.7	7	19.0
		50																	210	6.8	.7	7	18.0
		57																	220	6.8	1.0	11	18.0
TRAVERSE E																							
E_R	June 7	1																	162	8.3	7.9	101	28.5
		7																	161	8.3	7.7	94	26.5
		15																	160	7.4	7.4	88	25.0
		25																	162	7.2	6.5	77	24.5
		35																	165	7.2	.8	9	22.0
		45																	220	6.7	.9	10	18.5
E_C	June 7	1				11	3.8			48		23					43	4	172	8.4	7.7	99	29.0
		7				--	--			--		--					--	--	175	8.4	8.3	102	27.0
		15				--	--			--		--					--	--	175	7.1	5.8	81	25.0
		25				--	--			--		--					--	--	172	7.1	6.3	75	24.5
		35				--	--			--		--					--	--	180	6.6	.8	9	22.0
		45				14	4.5			70		29					53	0	250	6.7	.9	10	19.5

TABLE 11.-Chemical-quality of Sam Rayburn Reservoir, survey 9, June 7-8, 1967-Continued

Sampling site	Date	Depth (ft)	Silica (SiO_2)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Orthophosphate (PO_4)	Dissolved solids (calculated)	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Noncarbonate	Specific conductance (micromhos at 25° C) (Field)	pH (Field)	Dissolved oxygen (DO): mg/l	Dissolved oxygen (DO): Percent saturation	Temperature (°C)
TRAVERSE F																							
F_C	June 8	1																	165	8.3	8.1	99	26.5
		10																	168	8.0	8.0	95	25.0
		20																	170	7.2	6.4	76	24.5
		25																	170	6.8	2.2	26	24.0
		30																	175	6.7	.8	9	23.0
		37																	270	6.6	9	10	21.5
TRAVERSE G																							
G_C	June 8	1																	162	8.3	7.4	90	26.5
		10																	165	8.1	7.6	93	26.5
		20																	165	7.0	5.8	71	26.5
		32																	180	6.6	8	9	24.0
TRAVERSE H																							
H_C	June 8	1				12	3.9			51	13	23					46	4	170	8.3	7.3	90	27.0
		10				--	--			--	--	--					--	--	170	7.7	7.2	87	25.5
		20				--	--			--	--	--					--	--	175	6.9	4.7	56	24.5
		25				13	3.9			54	13	25					48	4	180	6.7	1.2	14	24.0
		30				--	--			--	--	--					--	--	250	6.5	4	4	21.5
		35				--	--			--	--	--					--	--	280	6.4	3	3	21.0
		40				--	--			--	--	--					--	--	290	6.4	5	6	21.0
		52				16	4.7			79	8.8	44					59	0	290	6.4	7	8	21.5
TRAVERSE I																							
I_C	June 8	1	4.0	0.52	0.29	11	3.9	19	4.1	51	13	24	0.2	0.2	0.02	104	44	2	180	8.4	6.9	87	28.0
		10	--	.05	.07	12	3.9	--	--	51	--	24	--	--	.05	--	46	4	180	8.0	7.2	88	26.5
		15	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	180	6.7	2.0	24	25.0
		20	--	.06	.28	12	3.9	--	--	52	13	26	--	--	.04	--	46	3	190	6.6	4	5	24.5
		25	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	190	6.4	.4	5	23.0
		30	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	310	6.4	5	6	21.0
		40	--	2.6	2.2	16	4.7	--	--	75	11	46	--	--	91	--	59	0	320	6.3	.5	5	20.5
		50	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	320	6.5	5	5	20.0
		59	11	4.3	4.0	19	5.2	29	4.1	99	3.6	35	3	2.0	30	158	69	0	320	6.5	.7	8	20.0
TRAVERSE J																							
J_C	June 8	1	4.6	0.07	0.10	13	4.0	27	4.0	54	17	34	0.3	0.5	0.01	131	49	5	210	8.1	6.6	85	28.5
		5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	210	7.4	7.2	89	27.0
		10	--	07	40	14	4.0	--	--	54	18	35	--	--	.09	--	51	7	210	6.5	.3	4	25.5
		15	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	240	6.4	4	5	24.0
		20	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	290	6.2	4	4	21.5
		25	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	300	6.2	.5	6	21.0
		30	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	320	6.1	5	5	20.5
		35	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	320	6.1	5	5	20.5
		38	12	7.5	2.2	15	4.8	43	4.1	81	14	55	4	1.5	.35	190	62	0	320	6.1	7	8	20.5
TRAVERSE L																							
L_C	June 7	1				10	3.1			42	11	17					38	3	128	7.9	8.5	104	26.5
		5				--	--			--	--	--					--	--	125	7.2	7.9	95	25.5
		10				--	--			--	--	--					--	--	155	6.6	3.8	44	23.5
		16				12	3.6			52	11	19					45	2	152	6.4	7	8	23.0
TRAVERSE M																							
M_C	June 7	1				13	3.7			49	11	20					48	8	144	8.1	7.3	94	28.5
		5				--	--			--	--	--					--	--	142	7.6	7.9	96	26.5
		10				--	--			--	--	--					--	--	148	7.0	6.9	82	25.0
		15				--	--			--	--	--					--	--	152	6.6	2.6	31	24.5
		20				--	--			--	--	--					--	--	158	6.6	9	11	24.0
		24				12	3.9			49	11	21					46	6	175	6.6	7	8	24.0
TRAVERSE N																							
N_C	June 8	1	6.0	0.08	0.01	11	4.3	15	3.6	52	13	17	0.5	0.2	0.06	97	45	3	150	7.4	6.1	78	29.0
		4		--	--	--	--			--	--	--			--		--	--	142	7.0	6.0	73	26.5
		8		--	--	--	--			--	--	--			--		--	--	148	6.5	5	6	26.0
		12		23	17	12	4.2			52	10	14			.03		47	5	162	6.4	5	6	26.0

TABLE 12.-Chemical-quality survey of Sam Rayburn Reservoir, survey 10, Nov. 1-2, 6 1967

[Results in milligrams per liter except as indicated. Elevation, 151.85 ft. Content, 1,673,000 acre-ft.]

Sampling site	Date	Depth (ft)	Silica (SiO_2)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Orthophosphate (PO_4)	Dissolved solids (calculated)	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Noncarbonate	Specific conductance (micromhos at 25° C) (Field)	pH (Field)	Dissolved oxygen (DO): mg/l	Dissolved oxygen (DO): Percent saturation	Temperature (°C)
TRAVERSE A																							
A_C	Nov 2	1		0.08	0.08							24							194	6.8	9.0	98	18.0
		10		--	--							--							194	6.8	9.0	98	18.0
		20		--	--							--							194	6.8	9.0	98	18.0
		30		--	--							--							194	6.8	9.0	98	18.0
		40		--	--							--							194	6.7	9.0	98	18.0
		45		.10	.18							24							194	6.5	9.0	98	18.0
TRAVERSE B																							
B_R	Nov 1	1		0.08	0.54							24							195	6.7	7.6	84	19.0
		10		--	--							--							197	6.6	7.0	78	19.0
		20		--	--							--							197	6.6	7.0	78	19.0
		30		--	--							--							197	6.6	7.0	78	19.0
		36		.09	.50							24							202	6.5	7.2	79	18.5
B_C	Nov. 1	1		0.11	0.20							24							195	7.0	8.1	89	18.5
		10		--	--							--							195	7.0	8.1	89	18.5
		20		--	--							--							195	7.0	7.9	88	19.0
		30		.50	.40							24							195	6.9	8.2	91	19.0
		40		--	--							--							198	8.9	8.4	92	18.5
		50		--	--							--							198	6.9	8.1	89	18.5
		55		.38	.63							--							200	8.6	6.7	74	19.0
		60		--	--							--							365	6.4	4.5	48	17.0
		67		32	13							22							380	6.4	5.2	55	17.0
TRAVERSE C																							
C_C	Nov 2	1	4.6	0.32	1.6	13	4.2	20	4.6	63	9.8	25	0.3	0.2		113	50	0	198	6.8	7.4	85	21.0
		10	--	.05	.46	--	--	--	--	--	--	24	--	--		--	--	--	198	6.8	7.4	84	20.0
		20	--	.06	.52	--	--	--	--	--	--	--	--	--		--	--	--	198	6.8	7.4	84	20.0
		30	--	.08	.61	--	--	--	--	--	--	--	--	--		--	--	--	198	6.8	7.4	84	20.0
		40	--	.12	.71	--	--	--	--	--	--	--	--	--		--	--	--	198	6.7	7.4	84	20.0
		50	--	.12	.90	--	--	--	--	--	--	--	--	--		--	--	--	198	6.8	7.2	82	20.0
		55	--	5.4	15	--	--	--	--	--	--	23	--	--		--	--	--	280	6.5	3.5	40	20.0
		60	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	305	8.5	2.6	29	18.5
		71	11	8.6	11	15	4.9	17	4.7	71	2.8	22	.3	9.1		122	58	0	300	6.4	2.8	31	18.5
C_L	Nov. 2	1		0.11	0.55							24							198	6.9	8.3	95	21.0
		10		--	--							--							195	6.8	7.7	88	20.5
		20		--	--							--							195	6.8	7.6	87	21.0
		30		--	--							--							195	6.8	7.6	87	21.0
		45		.11	.40							24							195	6.8	7.5	87	21.5
TRAVERSE D																							
D_C	Nov 2	1		0.19	0.86							24							202	6.9	7.8	91	21.5
		5		--	--														200	6.8	7.7	88	20.5
		10		--	--														202	6.8	7.3	83	20.5
		20		--	--														198	6.9	8.0	91	20.0
		30		--	--														198	6.9	8.1	92	20.0
		40		--	--														198	6.8	8.1	92	20.0
		50		.45	1.2														200	6.8	8.0	91	19.5
		55		--	--														320	6.5	2.3	26	20.0
		60		--	--														320	5.5	2.1	24	19.5
		65		18	13														320	6.5	2.1	24	19.5

TABLE 12.-Chemical-quality survey of Sam Rayburn Reservoir, survey 10, Nov. 1-2, 6, 1967-Continued

Sampling site	Date	Depth (ft)	Silica (SiO_2)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Orthophosphate (PO_4)	Dissolved solids (calculated)	Hardness as $CaCO_3$		Specific conductance (micromhos at 25° C) (Field)	pH (Field)	Dissolved oxygen (DO)		Temperature (°C)
																	Calcium, magnesium	Noncarbonate			mg/l	Percent saturation	
												TRAVERSE E											
E_C	Nov. 2	1		0.25	1.1							25							203	6.8	7.9	91	21.0
		5		--	--							--							203	6.8	7.4	85	21.0
		10		--	--							--							203	6.8	7.0	80	20.0
		20		--	--							--							203	6.7	7.0	80	20.0
		30		--	--							--							203	6.7	7.2	82	20.0
		40		--	--							--							203	6.6	7.2	82	20.0
		50		--	--							--							203	6.6	7.2	82	20.0
		55		2.0	5.5							25							235	6.2	3.7	42	20.0
		60		7.9	9.1							26							285	6.2	2.0	23	20.0
												TRAVERSE F											
F_C	Nov. 6	1	4.2	0.09	0.16	12	4.3	21	4.6	59	12	26	0.3	0.8		114	48	0	205	7.1	9.6	104	18.0
		5	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	205	7.1	9.6	104	18.0
		10	--	.09	.16	--	--	--	--	--	--	--	--	--		--	--	--	205	7.0	9.3	100	17.5
		20	--	.10	.18	--	--	--	--	--	--	--	--	--		--	--	--	205	7.0	9.3	100	17.5
		30	--	.11	.19	--	--	--	--	--	--	--	--	--		--	--	--	205	7.0	9.3	100	17.5
		40	--	.11	.21	--	--	--	--	--	--	26	--	--		--	--	--	205	7.0	9.3	100	17.5
		50	--	.11	.22	--	--	--	--	--	--	--	--	--		--	--	--	205	7.0	9.3	100	17.5
		55	4.2	.30	.38	12	4.2	21	4.6	57	12	26	.3	.8		113	47	0	205	7.0	9.3	100	17.5
												TRAVERSE G											
G_C	Nov. 2	1		0.12	0.17							26							203	6.9	8.9	101	20.0
		10		--	--							--							203	6.8	8.7	98	19.5
		20		--	--							--							203	6.8	8.0	91	20.0
		29		.10	.20							26							203	6.8	8.1	92	20.0
												TRAVERSE H											
H_C	Nov. 6	1		0.11	0.39							27							208	7.1	9.5	103	18.0
		10		--	--							--							208	7.1	9.4	101	17.5
		20		--	--							--							208	7.1	9.4	101	17.5
		30		--	--							--							208	7.0	9.8	104	17.0
		34		.39	.65							27							208	7.0	9.6	103	17.5
												TRAVERSE I											
I_C	Nov. 6	1		0.09	0.14	13	4.3			61		28					50	0	218	7.1	9.6	104	18.0
		5		--	--	--	--			--		--					--	--	218	7.1	9.4	101	17.5
		10		--	--	--	--			--		--					--	--	216	7.1	9.6	102	17.0
		20		--	--	--	--			--		--					--	--	218	7.1	9.6	102	17.0
		30		--	--	--	--			--		--					--	--	218	7.0	9.0	96	17.0
		40		--	--	--	--			--		--					--	--	218	7.0	8.8	94	17.0
		45		.15	.18	12	4.4			60		29					48	0	218	7.0	9.0	96	17.0
												TRAVERSE J											
J_C	Nov. 6	1		0.23	0.25							42							270	6.8	9.2	98	17.0
		5		--	--							--							270	6.8	8.5	90	17.0
		10		--	--							--							275	6.7	7.1	76	17.0
		20		--	--							--							275	6.7	6.5	69	17.0
		30		.39	.36							43							275	6.7	6.2	66	17.0

TABLE 12.–Chemical-quality survey of Sam Rayburn Reservoir, survey 10, Nov. 1-2, 6, 1967–Continued

Sampling site	Date	Depth (ft)	Silica (SiO_2)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Orthophosphate (PO_4)	Dissolved solids (calculated)	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Noncarbonate	Specific conductance (micromhos at 25° C) (Field)	pH (Field)	Dissolved oxygen (DO): mg/l	Dissolved oxygen (DO): Percent saturation	Temperature (°C)
											TRAVERSE K												
K_C	Nov 6	1																	325		8.4	88	16.0
		8	5.5	0.46	0.33	13	4.7	46	4.8	68	22	54	0.5	0.2		184	52	0	325	6.6	6.1	64	16.0
											TRAVERSE L												
L_C	Nov. 2	1																	195	6.5	8.7	94	17.5
		8		0.09	0.25	12	4.0			56		24					46	0	195	6.4	8.7	93	17.0
											TRAVERSE M												
M_C	Nov 2	1	4.3	0.12	0.30	13	4.2	17	4.7	61	10	22	0.3	1.2		107	50	0	193	6.3	6.4	70	18.5
		10	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	193	6.3	6.5	71	18.0
		16	4.2	.13	32	13	4.2	17	4.7	60	10	22	3	1.2		107	50	1	195	6.3	6.2	67	18.0
											TRAVERSE N												
N_C	Nov 6	1	5.0	0.09	0.20	12	4.4	21	4.6	59	14	25	0.4	0.2		116	48	0	205	6.8	10.4	107	15.5
		5	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	205	6.8	10.2	105	15.5
		10	5.3	14	23	12	4.5	20	4.7	58	14	23	3	8		114	48	1	200	6.6	8.5	87	15.0

TABLE 13.–Chemical-quality survey of Sam Rayburn Reservoir, survey 11, Aug. 7–8, 1968

[Results in milligrams per liter except as indicated. Elevation, 163.45 ft. Content, 2,791.000 acre-ft.]

Sampling site	Date	Depth (ft)	Silica (SiO_2)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Orthophosphate (PO_4)	Dissolved solids (calculated)	Hardness as $CaCO_3$		Specific conductance (micromhos at 25° C) (Field)	pH (Field)	Dissolved oxygen (DO)		Temperature (°C)
																	Calcium, magnesium	Noncarbonate			mg/l	Percent saturation	
												TRAVERSE A											
A_C	Aug 7	1										19							145	7.5	7.1	99	33.0
		10										20							145	7.3	6.9	93	31.0
		15										19							135	6.5	1.9	25	30.0
		20										--							170	6.5	1.9	25	28.0
		30										19							160	6.6	1.6	20	26.0
		40										--							190	6.6	2.1	24	21.0
		50										--							240	6.6	1.6	17	18.5
		60										16							260	6.5	2.3	26	19.0
												TRAVERSE B											
B_R	Aug. 7	1		--	--	--	--			--		20					--	--	140	7.9	7.2	99	32.0
		15		--	--	--	--			--		20					--	--	140	7.3	6.8	91	30.5
		23		--	--	--	--			--		21					--	--	160	6.8	1.9	25	29.0
B_C	Aug 7	1		0.04	0.14	8.2	3.2			37		20					34	3	150	7.2	7.3	100	32.0
		10		--	--	--	--			--		--					--	--	155	7.8	7.0	94	31.0
		15		--	--	--	--			--		20					--	--	155	6.8	6.4	85	30.0
		20		--	--	--	--			--		21					--	--	155	6.4	4.0	53	29.5
		30		--	--	--	--			--		--					--	--	170	6.4	2.0	25	25.5
		40		--	--	--	--			--		--					--	--	200	6.5	2.1	24	21.0
		50		--	--	--	--			--		--					--	--	220	6.5	2.1	23	18.5
		60		--	--	--	--			--		--					--	--	220	6.5	2.1	23	18.5
		75		2.9	3.6	12	4.2			59		25					47	0	240	6.6	2.4	26	18.5
												TRAVERSE C											
C_R	Aug 7	1	--	--	--	--	--	--	--	--	--	21	--	--		--	--	--	150	7.1	7.2	97	31.0
		15	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	150	6.8	6.5	86	30.0
		25	--	--	--	--	--	--	--	--	--	21	--	--		--	--	--	150	6.8	4.6	61	29.5
		33	--	--	--	--	--	--	--	--	--	21	--	--		--	--	--	170	6.5	1.9	24	26.5
C_C	Aug 7	1	3.7	0.02	0.06	8.5	3.2	16	3.4	38	14	20	0.1	0.1		88	34	3	150	7.2	7.4	100	31.5
		10	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	155	6.9	7.1	94	29.5
		20	--	.04	.23	--	--	--	--	--	--	21	--	--		--	--	--	155	6.6	4.3	57	29.0
		25	--	.13	1.2	--	--	--	--	--	--	21	--	--		--	--	--	170	6.5	2.1	27	27.0
		40	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	200	6.5	2.1	24	20.0
		60	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	210	6.6	2.0	22	18.0
		80	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	220	6.8	2.0	22	18.0
		90	6.2	3.0	4.8	13	4.5	20	4.3	65	8.0	25	.2	2.2		115	51	0	220	6.8	2.2	24	18.0
C_L	Aug 7	1	--	--	--	--	--	--	--	--	--	20	--	--		--	--	--	150	7.3	7.2	97	31.0
		15	--	--	--	--	--	--	--	--	--	20	--	--		--	--	--	150	6.9	6.8	91	30.0
		20	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	160	6.4	2.0	26	28.5
		25	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	175	6.5	2.1	27	27.0
		40	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	195	6.5	2.1	24	20.5
		50	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	210	6.6	2.1	23	18.5
		68	--	--	--	--	--	--	--	--	--	26	--	--		--	--	--	230	6.6	2.7	30	19.0

TABLE 13.-Chemical-quality survey of Sam Rayburn Reservoir survey 11, Aug. 7-8, 1968-Continued

Sampling site	Date	Depth (ft)	Silica (SiO_2)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Orthophosphate (PO_4)	Dissolved solids (calculated)	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Noncarbonate	Specific conductance (micromhos at 25° C) (Field)	pH (Field)	Dissolved oxygen (DO): mg/l	Dissolved oxygen (DO): Percent saturation	Temperature (°C)
												TRAVERSE D											
D_C	Aug 7	1										20							150	7.5	7.4	100	31.0
		7.5										--							150	7.2	7.4	100	31.0
		11										--							150	7.1	7.1	96	31.0
		15										21							150	6.7	6.0	79	29.5
		20										--							155	6.4	2.5	32	28.5
		25										--							170	6.5	1.9	24	26.0
		40										--							195	6.5	2.1	25	21.5
		50										--							220	6.6	2.2	24	18.0
		60										--							225	6.8	2.1	23	17.5
		75										--							250	6.8	2.2	24	17.5
		88										25							250	6.6	2.6	28	17.5
												TRAVERSE E											
E_C	Aug. 8	1										21							150	7.7	6.8	92	31.0
		15										21							150	7.5	6.8	91	30.0
		20										--							165	7.0	2.9	37	27.0
		25										--							170	6.9	2.9	36	26.5
		30										--							175	6.9	2.7	31	20.5
		40										--							195	6.9	2.7	30	19.0
		50										--							210	6.9	2.6	29	19.0
		58										26							220	6.7	2.5	28	19.0
												TRAVERSE F											
F_C	Aug 8	1	4.0	0.01	0.12	8.5	3.4	17	3.4	38	14	21	0.1	0.1		90	35	4	150	7.0	6.9	93	31.5
		10	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	150	6.9	6.9	92	30.5
		20	--	--	--	--	--	--	--	--	--	21	--	--		--	--	--	150	6.6	6.3	84	30.5
		25	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	170	6.1	1.9	24	26.0
		35	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	180	6.1	1.7	20	23.0
		45	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	210	6.3	1.6	18	19.0
		60	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	220	6.3	1.6	17	17.5
		75	6.1	4.2	3.9	12	4.3	20	4.1	62	8.8	25	2	2.0		112	48	0	225	6.3	1.9	20	17.5
												TRAVERSE G											
G_C	Aug. 8	1										21							145	7.1	6.9	95	32.5
		10										--							145	6.8	6.8	92	31.0
		20										21							145	6.2	4.3	57	30.0
		25										--							170	5.9	2.5	31	26.0
		40										--							225	5.8	2.2	25	21.0
		50										--							230	6.0	2.4	27	19.5
		60										28							230	6.1	2.6	29	19.0
												TRAVERSE H											
H_C	Aug 8	1										21							150	7.4	7.0	96	32.0
		10										--							145	6.7	6.3	85	31.0
		20										20							145	6.4	6.0	80	30.0
		25										--							150	5.9	2.2	28	27.5
		40										--							230	5.8	1.9	22	21.0
		55										27							220	6.0	2.2	25	20.0

TABLE 13.-Chemical-quality survey of Sam Rayburn Reservoir, survey 11, Aug. 7-8, 1968-Continued

Sampling site	Date	Depth (ft)	Silica (SiO_2)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Orthophosphate (PO_4)	Dissolved solids (calculated)	Hardness as $CaCO_3$		Specific conductance (micromhos at 25° C) (Field)	pH (Field)	Dissolved oxygen (DO)		Temperature (°C)
																	Calcium, magnesium	Noncarbonate			mg/l	Percent saturation	
TRAVERSE 1																							
I_C	Aug. 8	1		0.06	0.11	8.5	3 3			38		21					35	4	145	7.1	6.8	93	32.5
		7		--	--	--	--			--		--					--	--	145	7.0	6 6	89	31 0
		15		--	--	--	--			--		21					--	--	145	6.7	6.6	88	30.5
		20		--	--	--	--			--		--					--	--	140	6.0	2.5	33	30 0
		25		--	--	--	--			--		--					--	--	165	5.9	2.3	29	27 0
		40		--	--	--	--			--		--					--	--	235	5.9	2.4	28	22 0
		55		18	2 8	12	5.0			62		19					50	0	240	5.9	2.3	26	20.5
TRAVERSE J																							
J_C	Aug. 8	1										21							160	7.4	7.2	100	33.0
		5										--							160	6.7	6 9	94	31 0
		10										20							160	6.2	5.1	69	31.0
		15										--							160	5 8	1 1	14	28.0
		20										--							175	5.7	1.0	13	25.5
		25										--							185	5 6	1.1	13	24 0
		35										21							205	5.7	1 7	21	21 0
TRAVERSE K																							
K_C	Aug. 8	1	10	0.48	0 00	8 5	3 4	19	2 8	31	20	23	0.2	0.3		102	35	10	155	6.2	6 0	81	31.0
		5	--	--	--	--	--	--	--	--	--	22	--	--		--	--	--	155	6 0	4 9	64	29 5
		10	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	170	5.9	1.5	19	28.0
		15	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	180	5 9	1 6	20	27 0
		20	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	195	5.9	1.8	23	26.0
		30	13	6 3	1.0	10	4.4	16	2 9	50	11	20	.2	2.2		105	43	2	185	5 9	1 9	24	26 0
TRAVERSE L																							
L_C	Aug 7	1		0 02	0.06	9.0	3.2			42		20					36	1	135	7.2	7 3	100	32 0
		5		--	--	--	--			--		20					--	--	135	7.0	7 4	100	31.0
		10		--	--	--	--			--		20					--	--	130	6.3	2.2	29	30.5
		15		--	--	--	--			--		20					--	--	150	6.2	1.9	25	29.0
		19		1.9	1.7	11	3 3			52		20					41	0	155	6 2	2.1	28	29.0
TRAVERSE M																							
M_C	Aug. 7	1	3.3	0.03	0.07	9.0	3.0	15	3 4	40	12	19	0 1	0.2		85	35	2	145	7 2	7 2	99	32.0
		5	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	130	6.8	6.3	86	32.0
		10	--	--	--	--	--	--	--	--	--	19	--	--		--	--	--	130	6.8	6.6	89	31 0
		15	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	120	6 2	1 9	25	30.0
		20	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	120	6.0	2.0	25	27.0
		32	10	6.2	1.3	11	3.2	7.0	2 9	46	4.0	8 2	.1	6.4		76	41	3	150	6 0	2 1	26	24.5
TRAVERSE N																							
N_C	Aug. 8	1	5.2	0 04	0.00	8.5	3 3	14	3 2	36	15	16	0.1	0 2		86	35	5	130	7.6	7.0	96	32 5
		5	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	130	7 0	7 3	98	31 0
		10	--	--	--	--	--	--	--	--	--	18	--	--		--	--	--	130	6 6	6.7	89	30 5
		15	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	130	5.7	1 4	18	27 5
		20	10	3 6	87	9 2	3 6	8 4	2.8	44	8 0	9 0	.1	1.9		75	38	2	130	5.7	1.5	19	26.5

TABLE 14.-Chemical-quality survey of Sam Rayburn Reservoir, survey 12. Oct. 21-22, 1968

[Results in milligrams per liter except as indicated. Elevation, 162.01 ft. Content, 2,632,000 acre-ft.]

Sampling site	Date	Depth (ft)	Silica (SiO_2)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Orthophosphate (PO_4)	Dissolved solids (calculated)	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Noncarbonate	Specific conductance (micromhos at 25° C) (Field)	pH (Field)	Dissolved oxygen (DO): mg/l	Dissolved oxygen (DO): Percent saturation	Temperature (°C)
TRAVERSE A																							
A_C	Oct 21	1																	165	6.7	5 9	69	24 0
		10																	165	6 7	5 6	66	24 0
		20																	165	6.6	5 3	62	24.0
		30																	165	6 7	5 2	60	23 5
		40																	175	6.5	2.2	25	23 0
		45																	250	6 4	7	8	20.5
		55																	320	6 4	8	9	19.0
TRAVERSE B																							
B_R	Oct. 21	1		--	--	--	--			--		--					--	--	172	6 7	6.0	71	24.5
		10		--	--	--	--			--		--					--	--	172	6 7	5 6	66	24 0
		20		--	--	--	--			--		--					--	--	172	6 6	5.5	65	24.0
		30		--	--	--	--			--		--					--	--	172	6 6	5 4	64	24 0
		40		--	--	--	--			--		--					--	--	172	6.6	5.3	62	23 5
		45		--	--	--	--			--		--					--	--	220	6 5	4	5	22.0
		49		--	--	--	--			--		--					--	--	240	6.5	.5	5	20 0
B_C	Oct 21	1		0 04	0 00	10	3.5			46		22					39	2	170	6 7	6.2	74	24.5
		10		--	--	--	--			--		--					--	--	170	6 6	5.7	67	24.0
		20		--	--	--	--			--		--					--	--	170	6.6	5 7	67	24.0
		30		--	--	--	--			--		--					--	--	172	6.6	5 4	64	24.0
		40		07	56	10	3.5			45		21					39	2	172	6.6	5.3	62	23.5
		45		--	--	--	--			--		--					--	--	195	6.5	.6	7	22.5
		50		--	--	--	--			--		--					--	--	240	6.5	6	6	19 5
		59		9 6	5.7	13	4 4			62		25					51	0	260	6 5	6	6	19 0
TRAVERSE C																							
C_R	Oct 21	1	5 0	0.03	0 07	9 0	3 6	21		45	13	22	0.2	0.3		96	37	0	172	6 8	6.3	75	25 0
		10	--	03	.07	--	--	--		--	--	--	--	--		--	--	--	172	6 8	6 2	73	24 0
		20	--	05	13	--	--	--		--	--	--	--	--		--	--	--	172	6 8	6.2	73	24.0
		30	--	07	18	--	--	--		--	--	--	--	--		--	--	--	172	6.7	6 1	72	24 0
		40	--	50	.67	--	--	--		--	--	--	--	--		--	--	--	172	6.7	6.1	72	24 0
		45	--	--	--	--	--	--		--	--	--	--	--		--	--	--	230	6 5	.4	4	21.0
		50	--	4.1	4 8	--	--	--		--	--	--	--	--		--	--	--	230	6.5	5	5	19.0
		59	6 2	5 2	3.9	12	4.3	17		61	9 4	16	3	2 5		98	48	0	240	6 6	5	5	18.5
C_L	Oct 21	1																	170	6 8	6.4	76	25 0
		10																	170	6 7	6.3	74	24.0
		20																	170	6 7	6 1	72	24.0
		30																	170	6.7	6 1	72	24.0
		40																	170	6 7	5.8	68	24 0
		45																	230	6.6	.4	4	21 0
		50																	230	6 6	2	2	19.0
		55																	240	6.6	.5	5	18 5
		60																	250	6 6	.5	5	18.0
		67																	320	6.7	5	5	18.0
TRAVERSE D																							
D_C	Oct 21	1																	170	6.7	6 3	76	25.5
		10																	165	6 7	5.9	69	24 0
		20																	165	6.7	5.9	69	24.0
		30																	165	6.7	5 8	68	24.0
		40																	172	6 7	5 6	66	24 0
		45																	235	6 5	4	4	21.0
		50																	240	6.5	.5	5	19 5
		55																	250	6.4	5	5	19.0
		59																	340	6.4	.5	5	18.0

TABLE 14.-Chemical-quality survey of Sam Rayburn Reservoir, survey 12, Oct. 21-22, 1968-Continued

Sampling site	Date	Depth (ft)	Silica (SiO_2)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Orthophosphate (PO_4)	Dissolved solids (calculated)	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Noncarbonate	Specific conductance (micromhos at 25° C) (Field)	pH (Field)	Dissolved oxygen (DO): mg/l	Dissolved oxygen (DO): Percent saturation	Temperature (°C)
											TRAVERSE E												
E_C	Oct 21	1																	170	6.7	6.1	73	25.0
		10																	170	6.6	5.4	64	24.0
		20																	170	6.6	5.4	64	24.0
		30																	170	6.6	5.4	64	24.0
		40																	170	6.6	5.0	59	24.0
		45																	260	6.5	.2	2	21.0
		55																	265	6.4	.3	3	18.5
		69																	275	6.5	.5	5	18.0
											TRAVERSE F												
F_C	Oct 21	1																	170	6.6	6.0	71	25.0
		10																	170	6.6	5.8	69	24.5
		20																	170	6.6	5.5	65	24.5
		30																	170	6.6	5.5	65	24.5
		40																	170	6.6	5.2	61	24.0
		45																	245	6.4	.2	2	21.0
		50																	265	6.5	.2	2	20.0
		60																	275	6.5	.3	3	18.5
		73																	280	6.6	.3	3	18.5
											TRAVERSE G												
G_C	Oct 22	1		0.14	0.63														170	6.6	4.6	54	25.0
		10		--	--														170	6.5	3.9	46	24.5
		20		--	--														170	6.6	3.9	46	24.5
		30		--	--														170	6.6	3.8	45	24.5
		40		--	--														210	6.4	.4	5	23.5
		45		--	--														310	6.3	.4	4	21.0
		50		--	--														310	6.4	.4	4	20.0
		61		9.7	4.1														290	6.5	.7	7	19.0
											TRAVERSE H												
H_C	Oct 22	1																	170	6.4	4.0	48	25.0
		10																	170	6.4	3.6	43	24.5
		20																	170	6.4	3.6	43	24.5
		30																	170	6.4	3.6	43	24.5
		35																	170	6.4	3.6	43	24.5
		40																	290	6.0	.4	5	23.0
		50																	310	6.2	.4	4	20.0
		64																	310	6.2	.4	4	19.5
											TRAVERSE I												
I_R	Oct 22	1																	162	6.6	4.6	55	25.0
		10																	162	6.5	4.0	48	24.5
		20																	162	6.6	4.0	48	24.5
		35																	162	6.6	3.6	43	24.5
I_C	Oct 22	1	5.9	0.07	0.09	9.0	3.6	18		42	13	20	0.2	0.4		91	37	3	162	6.6	4.6	55	25.0
		10	--	.07	.08	--	--	--		--	--	--	--	--		--	--	--	162	6.6	3.9	46	24.5
		20	--	.09	.20	--	--	--		--	--	--	--	--		--	--	--	162	6.6	3.9	46	24.5
		30	--	.15	.20	--	--	--		--	--	--	--	--		--	--	--	162	6.5	3.6	43	24.5
		35	--	.31	.47	9.0	3.6	--		38	--	20	--	--		--	37	6	165	6.5	3.2	38	24.0
		40	--	21	3.3	--	--	--		--	--	--	--	--		--	--	--	240	6.1	.4	5	23.0
		50	--	7.8	4.0	--	--	--		--	--	--	--	--		--	--	--	300	6.3	.4	4	21.5
		57	16	17	4.6	14	5.7	24		66	0.4	22	1.6	27		143	58	4	360	6.4	.4	4	21.0

TABLE 14.-Chemical-quality survey of Sam Rayburn Reservoir, survey 12, Oct. 21-22, 1968-Continued

Sampling site	Date	Depth (ft)	Silica (SiO_2)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Orthophosphate (PO_4)	Dissolved solids (calculated)	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Noncarbonate	Specific conductance (micromhos at 25° C) (Field)	pH (Field)	Dissolved oxygen (DO): mg/l	Dissolved oxygen (DO): Percent saturation	Temperature (°C)
TRAVERSE J																							
J_C	Oct 22	1																	165	6.2	2.6	31	25.5
		10																	165	6.2	2.0	24	25.0
		20																	165	6.2	1.5	18	25.0
		35																	240	6.1	6	7	23.0
TRAVERSE K																							
K_C	Oct 22	1	13	0.13	0.20	7.8	3.4	25		33	24	24	0.3	0.4		114	33	6	185	5.9	4.7	55	24.0
		10	--	36	37	--	--	--		--	--	--	--	--		--	--	--	190	5.8	2.2	25	23.0
		20	--	.29	71	--	--	--		--	--	--	--	--		--	--	--	235	5.7	4	5	22.5
		27	14	33	71	8.5	3.7	33		35	26	36	2	3		139	36	8	235	5.7	4	5	22.5
TRAVERSE L																							
L_C	Oct 21	1		0.25	0.35	10	3.5			46		22					39	2	172	6.4	4.9	58	24.5
		10		--	--	--	--			--		--					--	--	172	6.4	4.5	53	24.0
		20		--	--	--	--			--		--					--	--	172	6.4	4.5	53	24.0
		29		11	42	10	3.5			45		21					39	2	172	6.4	4.3	51	24.0
TRAVERSE M																							
M_C	Oct 21	1	4.4	0.32	1.1	10	3.3	17		47	10	18	0.2	0.2		86	38	0	160	6.3	3.5	41	24.0
		10	--	--	--	--	--	--		--	--	--	--	--		--	--	--	160	6.3	3.0	35	24.0
		20	--	--	--	--	--	--		--	--	--	--	--		--	--	--	160	6.3	3.0	35	23.5
		30	--	--	--	--	--	--		--	--	--	--	--		--	--	--	200	6.1	8	9	23.5
		40	12	45	4.6	18	5.1	13		74	0	11	.2	22		117	66	5	320	6.1	8	9	22.0
TRAVERSE N																							
N_C	Oct 22	1	7.2	0.08	0.13	7.8	3.2	14		38	12	13	0.2	0.2		77	33	1	130	6.2	6.4	76	25.0
		10	--	--	--	--	--	--		--	--	--	--	--		--	--	--	135	5.9	4.1	49	24.5
		20	7.3	37	44	7.5	3.2	14		37	13	13	.2	.1		76	32	2	135	5.7	2.5	29	24.0

TABLE 15.-Chemical-quality survey of Sam Rayburn Reservoir, survey 13, Feb. 11-12, 1969

[Results in milligrams per liter except as indicated. Elevation, 160.93 ft. Content, 2,517,000 acre-ft.]

Sampling site	Date	Depth (ft)	Silica (SiO_2)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Orthophosphate (PO_4)	Dissolved solids (calculated)	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Noncarbonate	Specific conductance (micromhos at 25° C) (Field)	pH (Field)	Dissolved oxygen (DO): mg/l	Dissolved oxygen (DO): Percent saturation	Temperature (°C)
TRAVERSE A																							
A_C	Feb 11	1																	190	7.1	8.7	85	15.0
		10																	190	6.9	8.5	83	14.5
		20																	190	6.9	8.3	81	14.5
		30																	190	6.8	8.1	78	14.0
		40																	195	6.7	7.5	72	14.0
		55																	195	6.6	5.9	57	14.0
TRAVERSE B																							
B_R	Feb. 11	1																	192	7.1	8.3	83	16.0
		10																	192	7.0	8.4	82	15.0
		20																	195	7.0	8.2	80	15.0
		27																	195	7.0	8.5	83	15.0
B_C	Feb 11	1	5.0	0.04	0.00	10	3.4	18		41	13	21	0.2	1.2		92	39	5	194	7.0	8.6	85	15.5
		10	--	.04	.00	--	--	--		--	--	--	--	--		--	--	--	192	7.0	8.5	83	14.5
		20	--	.04	.00	--	--	--		--	--	--	--	--		--	--	--	192	6.9	8.3	81	14.5
		30	--	.19	.00	--	--	--		--	--	--	--	--		--	--	--	192	6.9	8.3	81	14.5
		40	--	.04	.03	--	--	--		--	--	--	--	--		--	--	--	192	6.8	7.8	76	14.5
		50	--	.05	.04	--	--	--		--	--	--	--	--		--	--	--	192	6.8	7.8	75	14.0
		60	--	.06	.08	--	--	--		--	--	--	--	--		--	--	--	192	6.7	7.8	75	14.0
		70	--	.07	.26	--	--	--		--	--	--	--	--		--	--	--	197	6.5	5.6	54	14.0
		80	6.5	.09	.59	10	3.5	18		41	14	21	.3	1.2		94	39	6	197	6.4	4.2	40	13.5
TRAVERSE C																							
C_R	Feb 11	1																	190	6.6	8.3	78	13.0
		10																	190	6.6	8.3	78	13.0
		20																	190	6.6	8.3	78	13.0
		30																	190	6.6	8.3	78	13.0
		46																	190	6.6	8.3	78	13.0
		56																	190	6.6	8.3	78	13.0
C_C	Feb 11	1	5.1	0.05	0.00	9.5	3.4	20		40	15	22	0.3	1.2		96	38	5	190	6.9	8.4	82	15.0
		10	--	.07	.00	--	--	--		--	--	--	--	--		--	--	--	190	6.9	8.1	78	14.0
		20	--	.04	.00	--	--	--		--	--	--	--	--		--	--	--	190	6.9	8.2	78	13.5
		30	--	.05	.04	--	--	--		--	--	--	--	--		--	--	--	190	6.8	8.1	77	13.5
		44	--	.06	.05	--	--	--		--	--	--	--	--		--	--	--	190	6.8	7.9	75	13.5
		54	--	.06	.04	--	--	--		--	--	--	--	--		--	--	--	190	6.8	7.9	75	13.5
		64	--	.37	.06	--	--	--		--	--	--	--	--		--	--	--	190	6.8	8.0	75	13.0
		74	--	.06	.07	--	--	--		--	--	--	--	--		--	--	--	190	6.8	8.0	75	13.0
		64	5.2	.08	.09	10	3.4	17		40	11	22	.2	1.2		90	39	6	190	6.7	7.3	69	13.0
C_L	Feb 11	1																	190	7.0	8.4	82	15.0
		10																	190	6.9	8.2	80	14.5
		20																	190	6.9	8.0	78	14.5
		30																	190	6.8	8.0	78	14.5
		46																	190	6.8	7.5	73	14.5
TRAVERSE D																							
D_C	Feb. 11	1																	192	7.1	9.0	88	15.0
		10																	192	7.0	8.6	83	14.0
		20																	192	7.0	8.4	81	14.0
		30																	192	7.0	8.4	81	14.0
		40																	192	6.9	7.8	75	14.0
		50																	192	6.8	7.8	75	14.0
		60																	192	6.8	7.5	72	14.0
		70																	192	6.8	7.5	72	14.0
		80																	192	6.8	7.5	72	14.0

TABLE 15.-Chemical-quality survey of Sam Rayburn Reservoir, survey 13, Feb. 11-12, 1969-Continued

Sampling site	Date	Depth (ft)	Silica (SiO_2)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Orthophosphate (PO_4)	Dissolved solids (calculated)	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Noncarbonate	Specific conductance (micromhos at 25° C) (Field)	pH (Field)	Dissolved oxygen (DO): mg/l	Dissolved oxygen (DO): Percent saturation	Temperature (°C)
TRAVERSE E																							
E_C	Feb 11	1																	190	7.1	9.0	88	15.0
		10																	190	7.0	8.4	81	14.0
		20																	190	7.0	8.1	78	14.0
		30																	190	6.9	8.1	78	14.0
		40																	190	6.9	8.0	77	14.0
		50																	190	6.9	7.8	75	14.0
		60																	190	6.8	7.5	72	14.0
		70																	196	6.7	5.8	55	13.5
		78																	196	6.7	5.3	50	13.5
TRAVERSE F																							
F_C	Feb 11	1																	190	7.1	9.0	88	15.0
		10																	190	6.9	8.3	80	14.0
		20																	190	6.8	8.1	77	13.5
		30																	190	6.8	8.1	77	13.5
		40																	190	6.8	8.1	77	13.5
		50																	190	6.8	8.1	77	13.5
		60																	190	6.8	8.1	77	13.5
		70																	190	6.8	7.7	73	13.5
		79																	190	6.8	7.7	73	13.5
TRAVERSE G																							
G_C	Feb 12	1		0.11	0.07														190	7.0	9.4	92	15.0
		10		--	--														190	6.9	9.2	88	14.0
		20		--	--														190	6.8	8.1	78	14.0
		30		--	--														190	6.7	8.1	77	13.5
		40		--	--														190	6.7	7.7	73	13.5
		50		--	--														190	6.6	7.1	68	13.5
		64		.54	.33														190	6.5	3.2	30	12.5
TRAVERSE H																							
R_C	Feb 12	1																	190	6.9	9.2	92	16.0
		10																	192	6.7	9.0	88	15.0
		20																	195	6.4	8.1	78	14.0
		30																	196	6.3	7.5	72	14.0
		40																	198	6.3	6.6	63	14.0
		50																	200	6.2	5.0	48	14.0
		59																	195	6.3	4.4	42	14.0
TRAVERSE I																							
I_R	Feb 12	1																	195	7.0	9.7	97	16.0
		10																	195	6.5	7.9	77	14.5
		20																	199	6.4	7.3	71	14.5
		34																	198	6.4	7.0	68	14.5
I_C	Feb 12	1	9.3	0.38	0.00	8.0	3.3	20		25	23	22	0.3	0.6		99	34	13	195	7.1	9.6	96	16.0
		10	--	.32	.06	--	--	--		--	--	--	--	--		--	--	--	195	6.7	7.9	77	14.5
		20	--	.32	.08	--	--	--		--	--	--	--	--		--	--	--	200	6.5	7.5	72	14.0
		30	--	.38	.19	--	--	--		--	--	--	--	--		--	--	--	200	6.4	5.9	57	14.0
		40	--	.49	.41	--	--	--		--	--	--	--	--		--	--	--	215	6.2	2.7	25	13.0
		50	--	.55	.45	--	--	--		--	--	--	--	--		--	--	--	215	6.2	2.7	25	13.0
		56	12	.50	.35	7.5	3.4	24		18	27	28	.3	1.0		112	33	18	215	6.2	3.2	30	13.0

TABLE 15.-Chemical-quality survey of Sam Rayburn Reservoir, survey 13, Feb. 11-12, 1969-Continued

Sampling site	Date	Depth (ft)	Silica (SiO_2)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Orthophosphate (PO_4)	Dissolved solids (calculated)	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Noncarbonate	Specific conductance (micromhos at 25° C) (Field)	pH (Field)	Dissolved oxygen (DO): mg/l	Dissolved oxygen (DO): Percent saturation	Temperature (°C)
											TRAVERSE I--continued												
I_L	Feb 12	1																	199	7.1	9.4	94	16 0
		5																	199	7.1	9.2	92	16 0
		10																	199	6 6	7.9	77	14.5
		20																	199	6.6	7.9	77	14.5
		36																	199	6.5	6.9	66	14.0
											TRAVERSE J												
J_C	Feb 12	1																	235	6 9	9 8	103	18.0
		5																	252	6.3	7.9	77	15.0
		10																	252	6.1	5.9	57	14.5
		16																	232	5 8	1 4	13	12.5
		26																	232	5.8	7	7	12.5
		36																	232	5.8	7	7	12.5
											TRAVERSE K												
K_C	Feb. 12	1	14	0 64	0 36	9 0	4.8	27		20	36	33	0.3	0.8		135	42	26	260	6.3	6.7	68	16.5
		5	--	.53	.32	--	--	--		--	--	--	--	--		--	--	--	260	6.2	5.8	58	16.0
		10	--	.72	.35	--	--	--		--	--	--	--	--		--	--	--	265	6.2	4 6	46	15.5
		15	--	.82	.36	--	--	--		--	--	--	--	--		--	--	--	255	6.2	4.0	39	15.0
		20	--	82	.37	--	--	--		--	--	--	--	--		--	--	--	255	6.2	4.0	39	15.0
		27	14	.58	36	8.8	4.8	27		20	36	31	.4	1.7		134	42	25	255	6.2	3.8	37	15.0
											TRAVERSE L												
L_C	Feb 11	1	5 0	0.04	0.31	9.2	3.2	19		38	14	22	0.2	1.1		93	36	5	182	6.9	2 9	30	16.5
		10	--	--	--	--	--	--		--	--	--	--	--		--	--	--	185	6.8	2.8	28	15.5
		20	--	--	--	--	--	--		--	--	--	--	--		--	--	--	190	6.5	2 2	22	15.0
		34	7.6	.18	2.6	10	3 2	18		40	19	17	.3	8		96	38	5	195	6 3	5	5	14.0
											TRAVERSE M												
M_C	Feb. 11	1	6 0	0 18	0 07	9.5	3 2	14		36	14	16	0.2	1.0		82	37	7	165	6.8	7 9	79	16.0
		10	--	--	--	--	--	--		--	--	--	--	--		--	--	--	160	6.5	7 7	75	14 5
		20	--	--	--	--	--	--		--	--	--	--	--		--	--	--	152	6.1	2.7	25	13.0
		30	--	--	--	--	--	--		--	--	--	--	--		--	--	--	150	6.1	1 0	9	13 0
		40	8 6	20	.52	9 5	3 0	12		33	17	11	2	8		78	36	9	148	6.1	1 0	9	13 0
											TRAVERSE N												
N_C	Feb 12	1	12	0 10	0 44	9 0	4 8	13		24	31	13	0 2	0 5		96	42	23	180	6.7	9 0	90	16 0
		10	--	--	--	--	--	--		--	--	--	--	--		--	--	--	172	6 1	3 1	30	14.0
		20	14	27	45	8 2	4 4	14		23	30	13	1	8		96	39	20	172	6 1	1 6	15	13 5

TABLE 16.—*Summary of water-temperature measurements at site C_C in Sam Rayburn Reservoir*

Reservoir survey	Date	Water temperature (°C) 1 ft below surface	Water temperature (°C) 1 ft above bottom	Water temperature (°C) Depth integrated	Approximate depth interval of thermocline (ft below surface)
1	Apr. 29, 1965	23.5	13.0	18.5	25–35
2	June 10	28.0	17.0	22.0	20–30
3	June 30	31.0	17.0	23.5	20–30
4	Oct. 6	22.0	19.0	20.5	
5	Feb. 4, 1966	7.0	7.0	7.5	
6	May 26	26.5	13.0	20.0	30–40
7	Sept. 9	30.0	17.5	24.0	20–30
8	Feb. 17, 1967	10.0	9.0	9.5	
9	June 17	27.0	16.5	21.0	30–40
10	Nov. 2	21.0	18.5	20.0	
11	Aug. 7, 1968	31.5	18.0	22.5	20–40
12 [1]	Oct. 21	25.0	18.0	22.5	40–50
13	Feb. 11, 1969	15.0	13.0	13.5	

[1] No measurement made at site C_C. Data shown are for site C_L.

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