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Report of Fisheries Investigations

A Study of Crappie in Lake Whitney

by

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SEGMENT COMPLETION REPORT

State of TEXAS

Project No. F4R4 Name: Fisheries Investigations and Surveys of the Waters of Region 4-B.

Job No. E-4 Title: A Study of Crappie in Lake Whitney.

Period Covered: November 1, 1956 through October 31, 1957

ABSTRACT:

A study was made of the crappie in Lake Whitney, a large clear water impoundment, from November 1956 through October 1957. Various models of wire traps were evaluated as to their ability for capturing crappie. Small traps were constructed and used to sample the crappie fry population. The fry grew from a total length of 70 millimeters in June to a length of 147 millimeters by the first of October. Over 5700 fish were trapped, about 30 percent were crappie.

About 850 crappie were tagged and returns from 34 of them were evaluated. The crappie are nomadic in Lake Whitney and seldom occupy one site for any extended length of time. The harvest of crappie by fishermen apparently is related to how much is known regarding the location of the fish at various times of the year. The chemical stratification of the impoundment is affected by the prevailing south and southwest winds and fluctuates considerably during the summer. The crappie migrated vertically, as well as horizontally, as the carbon dioxide and oxygen content of the water changed at different depths.

A study was made of the effects that an abundance of organic materials has on the oxygen and carbon dioxide content of the water when the lake was at flood stage as well as following the flood.

It was learned that a bacterial type of disease which infects the crappie occurs on less than one percent of the population. Two institutions were contacted for a more complete identification of the disease.

OBJECTIVES:

To determine the population of crappie in Lake Whitney and the reasons for the recent small harvest. Study the pattern and extent of travel of tagged or marked crappie and the ecological factors influencing their distribution. To develop satisfactory methods of sampling crappie fry and study the effects of a bacterial type of infection found on some of the crappie.

HISTORY OF CRAPPIE HARVEST:

Data from the creel census that was worked on Lake Whitney from August 1953 through October 1955 revealed that fishermen caught 87 pounds of crappie per surface acre from

that lake during the 27-month period (Job B-1 June 1, 1953-October 31, 1955). The creel census also showed that the harvest of crappie was not as good during 1955 as it had been in the two previous years. From January through October 1954 fishermen averaged catching 0.32 crappie per hour of fishing time. During the same period of 1955, fishermen caught an average of only 0.10 crappie per hour of fishing time. Many anglers have complained of the poor results obtained from crappie fishing during the past few years. (The sharp decline in crappie harvest was the primary reason for the current survey.)

TRAPS AND OTHER METHODS USED IN MAKING COLLECTIONS:

The main gear used for collecting crappie was wire traps. The type of trap used most intensively was constructed of six gauge concrete reinforcement mesh measuring 6 by 6 inches to the mesh. A six-foot section of the material was rolled into a cylinder allowing two meshes to overlap. This formed a round body for the trap and added strength and rigidity to the structure. The frame was lashed together with soft iron wire and covered with one-inch mesh chicken wire. This made a trap 23 inches in diameter and 5 feet long. Funnels made of chicken wire, with a 6-inch opening at the apex, were lashed into one end or sometimes both ends of the trap. A door made of $\frac{1}{2}$ -inch hardware cloth, and of sufficient size to overlap one of the 6-inch by 6-inch mesh of the wire frame, was located at one end of the trap, usually the end opposite the funnel on the single throat traps. The door was hinged with wire rings and held closed with a snap fastener. This allowed an easy and rapid means of taking fish from the traps. The single throat trap weighed 19 pounds and cost \$2.50 for material.

Several variations of the trap were used. They ranged from 19 to 29 inches in diameter. Single throat as well as double throat models were made. Traps with frames welded from $\frac{3}{8}$ -inch reinforcement steel were also tried. These traps were also covered with $\frac{1}{2}$ -inch mesh chicken wire and measured 29 inches in diameter by 6 feet long. Both single throat and double throat versions were used.

Small traps constructed of $\frac{1}{2}$ -inch mesh hardware cloth were made to capture crappie fry. The traps were made in single throat and double throat models and ranged from 13 inches to 18 inches in diameter. All traps were 36 inches long. Three different size openings in the small end of the throats were experimented with; namely $1\frac{1}{2}$ -inch, 2-inch and $2\frac{7}{8}$ -inch. All traps had a nylon hand line with a yellow identification block floated at one end.

Gill nets were used to check the population of all species of fish, and to supplement the data for the crappie study. Most of the gill net sets were made during the high water period when many of the trapping sites were completely flooded and the traps could not be checked. The amount of netting done was limited by the time available for such operations.

A small number of hoop net sets, baited with cottonseed cake, were made. The same type of net had been used before and the results had not been encouraging. It is possible that hoop nets with their throats arranged differently from those that were used could be beneficial in a crappie survey.

Liquid rotenone and rotenone powder were used to sample several stations. The liquid rotenone (Chemfish regular and Chemfish special) was tried along rock bluffs and in isolated deep and medium deep coves. The five percent powdered rotenone was used to supplement minnow seines in the checking of seine stations.

A rather intensive seining program was carried on, primarily at the time when the lake was in flood stage as the high water followed the spawning time for most species of fish. The seining was done with 1/8-inch mesh common sense minnow seines 20 feet long and 3/16-inch mesh tied seines 15 feet long. Our main objective in all of the seine operations was to locate crappie fry and the fry of largemouth bass.

Hook and line sampling was tried at two or three stations in conjunction with the traps that were used on those stations at that time.

METHODS OF RECORDING DATA:

We found the most effective method of keeping records of our trapping stations, while working in the field, was to use a separate card for each station. File cards measuring 5 by 8 inches were found to be a handy size to use. The location and description of the station, as well as the kind of trap used and the depth of the set, were placed at the top of the card. Each time the trap was run we recorded the date, a detailed description of the catch and the surface temperature. Notes were occasionally made on the cards concerning items of specific interest to that particular catch or station. As a card became filled with information, or if the station was changed or abandoned, the data card was transferred from the active field file to a permanent file in the regional office. Data concerning tagged fish were handled in a similar manner. Each time a tagged fish was captured a card was filled out for that particular fish and placed in the office files. A system of cross-reference was devised to simplify correlating the data between fish tagged and those recaptured. All water analysis data were recorded on physical chemical field record sheets.

Printed posters which contained information about the crappie trapping and tagging program were displayed at many of the business sites, fishing camps and concessions throughout the lake area. Small cards, which contained pertinent information regarding the data that was desired from captured tagged fish, were widely distributed around Lake Whitney. Additional publicity was obtained through newspaper articles and speeches made at meetings.

RESULTS OF TRAPPING:

Trapping stations were established from the upper part of the lake at White Bluffs to Little Rocky near the dam, a distance of 15 to 20 miles. These stations covered all major areas of water with the exception of the upper third of the lake where the impoundment is confined to the second banks of the Brazos River. However, a large part of the trapping was done in an area about seven miles long between the Katy Railroad Bridge and Bear Creek. Consideration was given to compressing the scope of the survey to a manageable size and establishing a number of permanent accessible stations. A maximum of 28 traps were used at any one time.

The first traps were set in Lake Whitney November 11, 1956 and trapping continued through October 1957. During that time 138 stations were sampled with wire traps and 5,785 fish were captured. White crappie accounted for 1,733 or nearly 30 percent of the total fish caught. Only six black crappie were captured during the trapping period. Twenty-two species of fish were trapped plus a few snakes, crayfish and turtles. Bluegill were the most abundant species taken and accounted for about one-half of the entire catch. Table 1 lists the number of each species taken and the percent of the total catch that they represent.

Traps constructed of one-inch mesh chicken wire stretched over a frame of concrete reinforcement mesh were found to catch satisfactorily. Sizes smaller than 23 inches in diameter are not recommended. The traps with frames welded from 3/8-inch reinforcement steel and measuring 29 inches in diameter and 6 feet long caught larger samples of crappie than any other type trap but they are quite heavy to handle. The heavy trap is not recommended for use except in very limited numbers. Both double and single throat traps were about equally effective. A 29-inch diameter trap made with a reinforcement rod frame was fairly light and captured fish very satisfactory. The trap was used with a single throat.

The 16 and 18-inch diameter fry traps were successful in both single and double throat versions. It is suggested that the size of the opening in the apex of the throat be governed by the size of the fry that one wishes to catch. A large opening in the throat of a small trap will naturally capture larger fish but it also makes it easier for them to escape. Likewise, double throats on short traps of large diameter places the inside openings of the funnels too close to each other.

TRAPS PLUS ATTRACTORS:

Several devices were used to attract crappie into the traps. The trap containing the attractor was always set near a duplicate trap used as a control. All factors were kept as near equal as possible.

Burlap strips were woven into one trap to simulate brush. The trap was set with a control trap in Wannas Canyon and checked 8 times during 15 days. The burlap trap captured four crappie and a total of seven fish. The control trap caught 9 crappie and a total of 18 fish. The experiment was also tried along a rock bluff but little success was had with either trap.

Burlap cloth was used to cover one trap completely except the end which contained the throat. The trap was set with a control trap in water 9 feet deep. The burlap covered trap caught only bluegills, 39 in number. The control trap captured 16 bluegills, 1 largemouth bass, 1 white bass and 1 carpsucker for a total of 19 fish. Neither trap captured crappie. The traps were checked 9 times in a 21 day period.

Minnows were confined in a wire mesh box within one trap which was set 15 feet from a control trap. All known factors were equal. Both traps were examined 5 times within 10 days. The trap containing minnows captured 28 crappie and a total of 36 fish. The control trap caught seven crappie and a total of eight fish. The experiment was terminated by a very large rise in the lake level.

A punctured can of sardines was suspended by wire within one trap. The control trap was set 20 feet away. Both traps were set eight feet deep in Wannas Canyon. All known factors were equal. The traps were checked twice in four days before the experiment was terminated by the flood. The trap containing the sardines caught five crappie and a total of twenty-four fish. The control trap captured no fish.

We noticed throughout the survey that a new trap appeared to be more successful than an old trap in capturing crappie. Traps that became covered with silt or sediment rarely made good catches of fish. It has been suggested that the light reflecting qualities of the new and brighter traps may have been the attracting factor. Experiments will be conducted on that theory.

HOOP NETS:

Several crappie were tagged and placed in the traps to learn how long it would take for the fish to escape. In all thirty-seven fish were returned to the traps. Nineteen escaped in one day; one was released after one day; five were released after two days; one was released after four days; nine escaped after five days; one escaped after six days and one escaped after seven days. There was no difference in the holding qualities of single throat and double throat traps.

SAMPLING WITH GILL NETS:

Gill nets were used to sample twenty-four stations between March and July of 1957. The nets were eight feet deep and most of them had one and one-half inch mesh measured on the square. A total of two thousand eight hundred and fifty feet of net was used. Table 2 is a tabulation of data from gill net collections made on Lake Whitney.

SAMPLING WITH HOOP NETS:

Three hoop nets were used for a short while during June at various locations on the lake. The impoundment was still flooded at that time but was being drawn down to its normal level. There were no spectacular catches made in the hoop nets. All nets were baited with cottonseed cake. A few crappie were captured along with several other species of fish. Frequent checks of the nets revealed that crappie could easily escape through the ring-type throats. A finger-type throat would have been an improvement in the catching and holding qualities of the hoop nets.

THE USE OF ROTENONE:

Powdered rotenone and liquid rotenone were used several times at various places in the lake. Five percent rotenone powder was used at a number of shallow water stations. The major part of the sampling was done during May and June when the lake level was very high. Adequate samples of many species of fish were taken but we did not locate young crappie, which was our main objective.

Liquid rotenone (Chemfish regular and Chemfish special) was used a few times to sample areas along rock bluffs and in coves. Detailed records were kept of the amount of time that passed before various reactions were observed. Again, we collected several species of fish but found only two crappie fry which were captured in October while using the liquid rotenone in a cove. Our main purpose in using the liquid rotenone was to experiment with methods of dispersing a small quantity. We used ten ounces, far below the surface to spot check for crappie. We did not have a pump so we tried lowering the liquid rotenone twelve to eighteen feet deep in a paper bag. A rock was placed in the bag for ballast and the bag, rock and rotenone were lowered to the desired depth and allowed to remain there a few minutes. A tug on the cord then released the rock and rotenone from the water-soaked bag. The method is obviously clumsy and, no doubt, crappie as well as some of the other fish could easily escape the slowly dispersed chemical.

We could not tell from our limited survey any appreciable difference between the action of Chemfish regular and Chemfish special. Except that we did note exceptionally good dispersion of Chemfish special when applied to the surface of very calm and protected waters.

RESULTS OF SEINING:

Our main purpose in making minnow seine checks was to locate crappie fry. Many stations were seined, a lot of them in May and June when the water level was high, and excellent samples of young fry of a number of species were taken. But crappie fry were not found in any of the seine samples. Visual reference was made as to the abundance of various species and a few choice samples were retained for future study. Some of the species were so concentrated that any effort toward evaluating each species percentage wise would have been erroneous. The species most accessible for seining were shad, carp, and white bass. Gar, bass sunfish, and minnows were also well represented in some seine samples.

GROWTH AND MOVEMENT OF CRAPPIE FRY:

Many questions have arisen concerning the success of the crappie spawn in Lake Whitney. We did not have enough data from the previous basic survey to intelligently answer inquiries about the growth and movement of the young crappie in that impoundment. Gill nets were not effective in obtaining such information and sampling with rotenone and minnow seines had not produced the desired results. Plans were included in the current survey to study the crappie spawn on an experimental scale.

A number of small traps were constructed and set in the lake at various depths and in different types of ecological habitats. The fry traps were checked weekly from November 1956 until a large flood occurred in the lake the last of April 1957. A number of young fish of several species were caught but only one small crappie was taken. It was captured on the bottom of a creek channel thirty feet deep December 10, and measured ninety millimeters (2 3/4 inches) total length. The trapping of this specimen surprised us as we did not expect to find small crappie that late in the year. Evidently the fish was from a very late spawn or perhaps was a stunted specimen.

Several of the larger traps were moved into two winding, narrow coves the fourth day of April and good catches of crappie six to nine inches long were taken throughout the month. Most of the traps were set six to ten feet deep. Most of the fish were dark-colored males and gravid females ready to spawn. Many of the females flowed eggs when slight pressure was applied to the abdomen. Fry traps were moved into the coves April 22. We did not capture any baby crappie for the next four days, at which time the spawning sites as well as our traps were covered by the flood.

Most of the available time during May and June was used in checking the shallow water of the flooded areas for spawn of crappie and other species. Minnow seines and powdered rotenone were used to capture young of a number of species of fish but we did not take any crappie fry during that time. Although the lake was on a large rise, the backwater available for sampling was usually clear due to the large amount of organic materials present. Evidently the crappie spawn did not inhabit the clear, shallow areas.

Nine crappie which weighed from twenty-five to sixty-nine grams were trapped June 11 in one of our regular size traps twelve feet down over water eighteen feet deep. The trap was set among trees on a ridge surrounded by deeper water. The lake level was dropping at the rate of more than one foot per day at that time making it impossible to establish regular collecting stations. Therefore, we do not have sufficient data to try to evaluate the ages of that particular catch of crappie. The smaller ones could possibly have some from an early spawn but the ages of the larger ones are very uncertain. The collection is mentioned only as a point of interest.

By June 25 the lake level had fallen until it was only about 18 feet above normal. On that day we set two fry traps in the flooded coves where we trapped the gravid females. On June 26 we had one tiny crappie that measured 88 millimeters total length and weighed 8 grams. This was the first specimen of very young crappie that we had taken from the lake. We trapped several fry in that area during the next few days. The smallest crappie trapped measured 58 millimeters total length and weighed 3 grams. Fry any smaller than 3 grams could easily escape through the one-half inch mesh hardware cloth. The weights of the other fry ranged from 4 to 8 grams. The fry were taken in traps 5 to 10 feet deep which were not resting on the bottom. The surface temperature varied from 82 to 84 degrees F. and the water was slightly turbid from plankton and organic materials.

Most of the crappie fry moved out of the coves about the last of June. Very few young fish were trapped at the cove stations after that date. Adult fish and a few fry that were taken in the traps had begun to die when confined in the traps overnight. The organic material that the water had collected during the flood was causing a high Biochemical Oxygen Demand over the entire lake and especially in the areas that were protected from the wind.

We almost lost track of the crappie fry between the last of June, when the low oxygen and high carbon dioxide content of the water forced them out of the protected areas, until the last week in July. At that time a number of traps were set along rock bluffs. Cedar Creek bluffs were about 300 yards from the spawning grounds and across Cedar Creek channel but not in the main part of the lake. The minimum water depth here was 28 feet, maximum depth about 45 feet. The bluffs of the Brazos River were about one-half mile away and formed one shore of the open lake. The river channel followed the bluffs and the minimum water depth was 53 feet, maximum depth 65 feet. Crappie fry were captured along the rock bluffs in varying quantities from July 29 through most of October. The greater number of traps, about eight, were set along the bluffs of the Brazos River. The traps were spread over a distance of about 100 yards and were set at depths from 6 feet to 35 feet below the surface. The traps which were set at depths of 6, 15, 19, and 25 feet were not changed. Other traps were set at various depths according to the movement of the fish and the changes in the chemical content of the water.

Regular size traps as well as small fry traps were set at the bluffs. Some of the larger fry which weighed from 25 to 35 grams were taken in the traps constructed of one-inch mesh chicken wire. But several fry of that size hung themselves in the traps trying to force their way through the one-inch mesh wire. Hot, still days during the latter part of July warmed the surface water to a maximum temperature of 95 degrees F. along the bluffs. Data taken from our trap catches, as well as data from the water analysis suggests that the crappie fry made the following vertical movements during the last days of July. About July 28 or 29 the young crappie began a downward migration from a minimum depth of 6 feet to a maximum depth of 17 feet over a period of two or three days. Temperature records of the lake show that the water had warmed to about 88 degrees at the 17-foot depth. Chemical analysis at the trapping site revealed that the 17-foot depth was approaching the limit of oxygen and carbon dioxide tolerance of the fish. Traps set at 19 feet caught two crappie. One was dead and the other was barely alive. Changes in the condition of the water at various depths during August and September caused great variation in the catch of fry at different depths as well as in the total number caught from day to day.

Minnow seine and rotenone checks failed to produce crappie fry from July to September. Traps set seven feet deep on sandy shores and at various depths in cove areas were not

successful. Traps set shallow in boat basins did not catch crappie fry but traps set 10 to 12 feet deep did produce fry on occasions. In some instances they did not move into the traps until after sun-up.

We captured only two or three black crappie fry during the entire survey. The first fish was taken alone on August 19 at a trapping site located in a cove. The trap was set 10 feet deep. The fish was 65 millimeters long and weighed 7 grams. Another fish was captured August 20 along a rock bluff. It was taken in a trap 12 feet deep along with nine white crappie fry. The specimen measured 100 millimeters in length and weighed 10 grams. Some of the white crappie fry were of comparable size. Table 3 shows the probable trend of growth of 205 white crappie fry from June 27 to the first of October. We used only those groups of fish which we believed were approximately the same age. Even then there was considerable variation in the sizes of individual fish.

ECOLOGICAL DATA:

Crappie were caught in limited quantities in fairly deep water, 14 to 26 feet, along rock bluffs and near brush from November through January. A quick drop in the surface temperature of the water always moved the crappie out of the shallow water. But if the colder temperature remained constant for as long as ten days some of the crappie would move back into the shallow water. Very few crappie were caught in water of any depth if shelter such as brush, tree tops or rock ledges were not present. The crappie apparently moved about considerably from February through March but usually stayed in the deeper water. The crappie moved into the coves and up the creeks during April as the surface temperature of those areas approached 65 degrees. If the temperature dropped quickly the fish moved out of the coves.

A very large rise in the lake level, which began the last of April, flooded all trapping stations and most of the traps. There were no crappie captured in May and only a few were taken in June. The fish were captured fairly shallow and none were taken in the sheltered areas which contained lots of carbon dioxide and a small amount of oxygen. Some crappie were captured in the protected coves during July but many of the fish died in the traps at night. Most of the crappie moved out of the coves and many were captured along the rock bluffs during the latter part of July and most of August. The most productive depths along the bluffs were between 12 and 19 feet.

The water began to cool during September causing the crappie to move around a lot. They were never concentrated in any one place for very long from the middle of September through October. Good harvest of large crappie were made by fishermen at times during late September and early October. The fish weighed from 12 to 16 ounces and were of a size group that had never been caught before in quantities. The run of large crappie was noticed over the entire lake and was reflected in our trap catches. However, the duration of the run was too short for us to track the run with our traps or gain much information about it. The problem of an inadequate harvest of crappie in Lake Whitney could perhaps be solved by more accurate knowledge of the habitats preferred by the fish under various conditions. Crappie are quite nomadic in that impoundment and their movements are not easy to follow or predict.

TAGGED FISH:

A strap-type jaw tag, number one size, was used to tag approximately 850 white crappie

between February 13 and October 9, 1957. The tag was attached to the premaxillary. Anesthetics were not used. The total length was recorded in millimeters and weight in grams. The tag number, date and place of release are also recorded. We had 34 returns or 4 percent of the total number tagged. Several of the fish were retrapped by the biological crew and the remainder were reported by fishermen. Two were retrapped twice.

A large number of fish were tagged in two neighboring coves. Both coves are long and winding and are known locally as Wanns Canyon and Juniper Cove. The returns from the fish tagged in the coves are of interest. A very large rise in the lake level interrupted the tagging program from April 26 until June 11.

A total of 98 crappie were tagged and released in Juniper Cove between April 3 and April 26. Thirteen of the fish were recaptured before the lake flooded. Nine of them were recaptured in Wanns Canyon and one was retrapped in Juniper Cove. One was captured by a fisherman as it was apparently leaving Wanns Canyon, two other fish were caught after they had left the canyon. Two crappie, from the group of 98 were captured by fishermen far down the lake after the impoundment had flooded. None of the fish were recaptured in the canyon after the flood. Another group of 57 fish were tagged in Wanns Canyon after the lake had flooded (June 11 to August 7). Fishermen caught three of the fish. One was captured within the canyon and two others had moved out a short ways.

A total of 88 crappie were tagged and released in Juniper Cove between April 3 and April 26. Eight of the fish were recaptured before the lake flooded. Six of them were retrapped within the cove and two were retrapped in Wanns Canyon, a neighboring cove. A fisherman captured one of the fish a short distance out of Juniper Cove after the lake had begun to rise. Another fish was caught far down the lake when the impoundment was at high flood stage. None of the fish were recaptured in the cove after the flood. Sixty seven tagged fish were released in Juniper Cove after the flood (June 11 to August 7). Two of the fish were retrapped in the cove. None of the other fish were recaptured. The return of four of the fish that were tagged in or near open water has not been discussed. Two of the fish were tagged at Cedar Creek Dock, one was captured at the same place after a few days of freedom and the other in Juniper Cove about six weeks after it was tagged. Two other fish were captured from a group that were tagged at the Brazos River Bluffs. One fish traveled across very deep water and was caught near Cedar Creek Dock after being free for one month. The other fish was trapped near deep water in Helms Cove, up lake from the bluffs, about one week after it was released. The last two fish discussed were tagged on the same date from a single group of fish. We thought it quite interesting to note that not a single crappie was recaptured along the Brazos River Bluffs. Although we tagged 186 fish at the bluffs following the flood and captured nearly 500 crappie there, we did not retrap a single tagged fish. It should be mentioned that we had a large number of traps set along the bluffs at all times. Evidently we were working with highly mobile groups of fish. It will be remembered that by contrast we recaptured a number of fish that were tagged in the coves. It is quite probable that the only reason the fish remained in the coves as long as they did was because they were on their spawning beds. Table 4 is a tabulation of data regarding the tagged fish that were recaptured. Table 5 is a record of the lake level during the time when the survey was conducted.

CHEMICAL ANALYSIS AND LAKE STRATIFICATION:

Temperature readings and analysis for oxygen, carbon dioxide and pH were taken several times. The dissolved gases and pH were analyzed according to standard biological methods. The temperatures were taken with an electric, direct-reading thermometer. The temperature readings made June 19 were taken with a stem glass thermometer.

Lake Whitney is normally unstable as far as thermal and chemical stratification is concerned. When winds of high velocity blow for several days from one direction the upper layers of the lake are usually mixed rather thoroughly. Flood conditions during May and June and the large amount of organic materials that the water contained caused some of the chemical readings to be abnormal.

The analysis taken June 19 at three net stations located on a flooded finger of Cedar Creek is one example of the effects that an excess of organic matter has on a lake. The lake was acutally quite a large body of water at all stations except the one located approximately one mile up the flooded creek. Evidently the oxygen disappeared from the water during the night as fish were dead in all nets except the one near open water. The analysis of the water at the three netting stations is reported in Table 6.

The analysis taken June 27 at a station located in open water is another example of the effect that the decay of organic material has on a lake. Normally, you would not find carbon dioxide near the surface in any appreciable quantities in the open waters of Lake Whitney. Table 7 records the chemical and thermal analysis taken on the lake during the crappie survey. Most of the crappie were trapped between the 15 and 17 foot depths July 31, and between the 15 and 17 foot depths September 16. Crappie prefer a stratum of water containing 3 to 5 percent carbon dioxide on most of the large clear-water impoundments that I have surveyed. The analysis taken September 24 shows how a cold rain or cool nights can mix the lake water. The lake did not restratify.

We did not know whether the degree of chemical stratification remained stable throughout the night or changed. An analysis was taken at the Brazos River Bluffs trapping station about 5:00 P. M. of July 31, another analysis was taken at 5:30 A. M. the following morning. Reference to those dates in Table 7 shows that the chemical content of the water did change.

The U. S. Army Corps of Engineers have checked on the chloride content, as sodium chloride, of the water at several stations on Lake Whitney. The analysis were made from a number of depths at each station and covered a period of approximately 13 months. I am indebted to Dr. William E. Burris and the Ft. Worth District Office of the Corps of Engineers for the loan of the data. The material is greatly appreciated. It is possible that the data has not been made available to the public so the entire series is repeated here. It will be noticed that the sodium chloride content increased as the lake aged. The chloride also stratifies and is usually more abundant near the bottom of the lake. The sodium chloride is diluted as fresh water comes into the lake as indicated at station number 4 May 15, 1956, when a rise was coming down the river. The analysis taken June 27, 1957 at station number 2 about mid-lake reveals how the chloride is diluted in a reservoir following a flood. Table 8 records the results of the chloride rests. The following is a description of the sampling stations.

DESCRIPTION OF WATER SAMPLING STATIONS WHITNEY RESERVOIR

- Station 1 - Brazos River channel immediately above Whitney Dam. Maximum water depth is about 95 feet with the reservoir elevation at 520 m.s.l.
- Station 2 - Brazos River channel at the mouth of Cedar Creek. Twelve lake miles above Whitney Dam. Maximum water depth is about 65 feet with the reservoir elevation 520 m.s.l.

Station 3 - Brazos River channel at Powelldale Park. Twenty lake miles above Whitney Dam. Maximum water depth is about 44 feet with the reservoir elevation 520 m.s.l.

Station 4 - Brazos River channel at Kimball Bridge. Twenty-nine lake miles above Whitney Dam. Maximum water depth is about 25 feet with the reservoir elevation at 520 m.s.l.

BACTERIAL DISEASE ON CRAPPIE:

It was noted that less than one percent of the fish captured were affected by the disease. Two institutions have been contacted for help on identification of the infection, but plans for sending the materials for study have not been completed.

RECOMMENDATIONS:

It is recommended that the study of crappie on Lake Whitney be continued. It is suggested that considerable attention be given to the growth of crappie after they reach a total length of 150 millimeters as the study of the growth of fry was not carried beyond that length.

It is recommended that additional devices be tried for attracting crappie, and further study be given to their habitat preference.

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Approved by: Marion Toole
Chief Aquatic Biologist

Date: April 9, 1958

Table 1. Number of Each Species of Fish Captured by Wire Traps, Lake Whitney, November 1956 through October 1957.

<u>Species</u>	<u>No. of Fish Trapped</u>	<u>Percent of Total Number Trapped</u>
White Crappie	1,727	29.85
Black Crappie	6	.10
L. M. Bass	89	1.54
White Bass	374	6.46
Bluegill	2,924	50.54
Carp	313	5.41
Channel Catfish	13	.22
Yellowbelly	9	.16
Warmouth	165	2.85
Gar	5	.09
Flathead Catfish	4	.07
Texas Gray Redhorse	1	.02
Shad	47	.81
Kentucky Spotted Bass	7	.12
Longear Sunfish	30	.52
Redear Sunfish	16	.28
Carp sucker	5	.09
Buffalo	1	.02
Green Sunfish	10	.17
Drum	32	.55
Black Bullhead	4	.07
Yellow Bullhead	3	.05
<u>Total</u>	<u>5,785</u>	<u>99.99</u>

Table 2. Tabulation of Data from Gill Net Collections from Lake Whitney, March 1956 - July 1957

Species	No. Caught	% of Total No.	Lbs. Caught	% of Total Wt.	Avg. Wt. Lbs.	No. Fish 100' Net	Lbs. Fish 100' Net
Spotted Gar	7	0.67	14.15	1.89	2.02	0.25	0.50
L. N. Gar	43	4.12	108.39	14.53	2.52	1.50	3.80
Gizzard Shad	588	56.32	207.85	27.86	0.35	20.63	7.29
Buffalo	34	3.26	112.98	15.14	3.32	1.19	3.96
Carp sucker	36	3.45	57.00	7.64	1.58	1.26	2.00
Carp	43	4.12	78.72	10.55	1.83	1.50	2.76
Channel Cat	53	5.08	55.75	7.48	1.05	1.85	1.96
White Bass	51	4.88	36.76	4.93	0.72	1.78	1.29
Black Bass	7	0.67	12.79	1.71	1.83	0.25	0.45
Redear Sunfish	5	0.48	1.35	0.18	0.27	0.17	0.05
Bluegill	55	5.27	12.98	1.74	0.24	1.92	0.46
White Crappie	29	2.78	11.15	1.50	0.38	1.01	0.39
Drum	93	8.90	36.19	4.85	0.39	3.26	1.27
Total	1044	100.00	746.06	100.00	—	36.57	26.18

2850 Feet of net used.

Approximately 24 stations trapped.

Table 3. Growth of White Crappie Fry, Lake Whitney, 1957

Date 1957	Number of Fish	Average total length millimeters	Average Weight Grams
6/27	10	70.14	5.43
7/2	1	86.00	9.00
7/15 -17	4	100.25	10.50
7/29 -31	34	125.23	24.85
8/6 -7	40	134.32	30.07
8/14	31	137.03	31.48
8/20 -21	33	141.90	30.12
9/10-12	20	140.65	32.45
9/17 -18	22	143.41	30.91
10/1	10	147.40	33.50
Total	<u>205</u>		

*Average gain per fish over 96 days was 0.8 millimeter and 0.29 gram per day.

Table 4. Tagged Crappie Captured in Lake Whitney, 1957

Tag. No.	Date Tagged	Where Tagged	Date Caught	Where Caught	Days of Freedom	Description of Travel
15	2-14-57	Cedar Cr Dock	3-22-57	Mouth Jun. Cv.	37	300 yards ✓
62	4-3-57	Above TL Dock	4-4-57	Same Place	1	No travel
63	4-3-57	Above TL Dock	4-18-57	Bl. Hole Ce. Cr.	15	1½ miles
73	4-4-57	Opp. Wanns Dock	4-5-57	Above Cher. Dk.	1	250 yards ✓
80	4-5-57	Juniper Cove	6-1-57	Mouth Big Rky.	58	9 3/4 mi. dn. lake ✓
90	4-5-57	Cher. Bt. Dock	4-22-57	Below Cher. Dk.	17	50 yards ✓
93	4-5-57	Cher. Bt. Dock	9-1-57	Bee Bluff	149 ✓	4½ miles ✓
97	4-5-57	Cher. Bt. Dock	6-1-57	Mouth Big Rky.	58	9 3/4 mi. dn. lake ✓
98	4-5-57	Cher. Bt. Dock	4-7-57	Below Ce. Cr. Dk.	2	3/4 mi. up lake
115	4-11-57	Waldocks Dock	4-11-57	Same Place	0	No travel
116	4-11-57	Waldocks Dock	4-11-57	Same Place	0	No travel
128	4-11-57	Above TL Dock	4-12-57	Same Place	0	No travel
130	4-11-57	Below Cher. Dock	4-23-57	Same Place	1	No travel
135	4-11-57	Below Cher. Dock	4-23-57	Wanns Dock	12	300 yards ✓
161	4-12-57	Juniper Cove	5-12-57	Juniper Cove	12	1 mi. up lake
163	4-12-57	Juniper Cove	4-22-57	Dp. Canyon Dk.	31	1¼ mi. dn. lake
174	4-12-57	Cher. Ramp	4-15-57	Waldocks Dk.	10	50 yards ✓
176	4-12-57	Cher. Ramp	4-15-57	Cher. Ramp	3	No travel
177	4-12-57	Cher. Ramp	4-24-57	Dp. Canyon Dk.	12	½ mi. dn. lake ✓
181	4-15-57	Wanns Canyon	4-15-57	Wanns Canyon	3	No travel
185	4-15-57	Juniper Cove	4-16-57	Same Place	1	No travel
203	4-17-57	Waldocks Ramp	4-22-57	Below Cher. Dk.	7	1 mi. dn. lake
219	4-22-57	Waldocks Ramp	4-24-57	Below Gays Dk.	7	200 yards ✓
225	4-22-57	Waldocks Ramp	4-23-57	Below Cher. Dk.	1	1 mile
306	7-22-57	Waldocks Ramp	8-7-57	Same Place	1	No travel
336	7-30-57	Cedar Cr. Dock	8-7-57	Waldocks Dk.	16	No travel
341	7-30-57	Above Cher. Dock	8-17-57	Same Place	9	100 - yards ✓
372	8-5-57	Wanns Boat Dock	8-22-57	Wanns Bt. Hse.	18	No travel
390	8-6-57	Bluff#8 Marker	8-22-57	Ce. Cr. Pier	17	200 yards ✓
391	8-6-57	Bluff#8 Marker	9-9-57	Ce. Cr. Pier	17	3/4 mi. up lake ✓
442	7-1-57	TL Boat Dock	8-13-57	Helm Cove	34	1¼ mi. across chan ✓
450	7-2-57	Waldocks Dock	7-12-57	Juniper Cove	8	300 yards ✓
537	8-7-57	Waldocks Dock	8-7-57	Waldocks Dk.	20	3/4 mile
600	8-19-57	Below Gays Dock	8-15-57	Bluff#8 Marker	36	50 yards ✓
			9-28-57	Ce. Cr. Dk.	8	3/4 mi. across chan. ✓
					40	500 yards ✓

Abbreviations--Cher.-Cherokee Dk.-Dock Ce.-Cedar Cr.-Creek Dp.-Deep Bl.-Blue Dn.-Down Mt.-Mile Jun.-Juniper Rky.-Rocky

Table 5. Changes in Surface Elevation of Lake Whitney. Normal Water Level is 520 Feet Above Mean Sea Level.

<u>Date</u>	<u>Lake Elevation</u>
11-7-56	510.08
11-14-56	510.27
11-21-56	510.31
11-28-56	510.27
12-5-56	510.33
12-12-56	510.38
12-19-56	510.69
12-26-56	510.82
1-2-57	513.94
1-9-57	513.66
1-16-57	513.14
1-23-57	512.95
1-30-57	512.88
2-6-57	512.52
2-13-57	514.29
2-20-57	513.99
2-27-57	513.77
3-6-57	513.39
3-13-57	513.19
3-20-57	512.45
3-27-57	512.36
4-3-57	512.30
4-10-57	512.04
4-17-57	511.26
4-24-57	516.44
5-1-57	538.11
5-8-57	560.03
5-15-57	564.10
5-22-57	566.81
5-29-57	570.24
6-5-57	567.29
6-12-57	561.94
6-19-57	552.13
6-26-57	536.88
7-2-57	524.94
7-10-57	519.73
7-17-57	520.01
7-24-57	520.08
7-31-57	520.32
8-14-57	519.65
8-21-57	519.33
8-28-57	519.03
9-4-57	519.36
9-11-57	519.35
9-18-57	519.13
9-25-57	519.17
10-2-57	518.75
10-9-57	518.71
10-16-57	521.88
10-23-57	519.89

Table 6. Effect of Organic Materials on Dissolved Gases at Three Netting Stations Located in Backwater of Flooded Area, June 19, 1957, Additional Description in Text, *

Depth Feet	Temp. F	Station # 1			Station # 2			Station # 3		
		Mouth of Flooded Draw ph	CO ₂	O ₂	One-Half Mile Up Draw ph	CO ₂	O ₂	One Mile Up Draw ph	CO ₂	O ₂
0	88	7.5	12	3.35	7.5	11	3.02	7.5	9	4.25
2										
4										
5	83				7.4	10	2.10	7.2	20 (Bottom)	0.65
8		7.5	8	4.95						
10	81				7.4	8	4.40			
20	80				7.5	13	2.40			
25	79				7.2	20	0.35			
33		(Bottom)			(Bottom)					

* Station # 1 96 fish captured, majority alive the following morning.
 Station # 2 32 fish captured, all dead the following morning.
 Station # 3 5 fish captured, all dead the following morning.

Lake elevation 25 feet above normal, falling.

Table 7. Physico-Chemical Field Records For Lake Whitney.

Location: Mid-Lake		Date: January 29, 1957		
Depth in Feet	Temp. o F	pH	Carbon Dioxide	Oxygen
0	44.8	7.9	1.5	9.92
2	44.8			
4	44.8			
6	44.8			
8	44.8			
10	44.8	7.9	1.5	10.50
12	44.8			
14	44.8			
16	44.8			
18	44.8			
20	44.8	7.9	1.5	10.20
22	44.8			
24	44.8			
26	44.8			
28	44.8			
30	44.8			
32	44.8	7.9	1.5	10.50
34	44.8			
36	44.8			
38	44.8			
40	44.8			
42	44.8	7.9	1.5	9.85
44	44.8			
46	44.8			
48	44.8			
50	44.8	7.9	1.5	9.50
52	44.8			
54	44.8			
56	45.7 (in mud)			

Location: Mid-Lake		Date: June 27, 1957		
Depth in Feet	Temp. o F	pH	Carbon Dioxide	Oxygen
0	83.0	7.8	.3	5.80
2	82.8			
4	82.6			
6	82.4			
8	82.4			
10	82.3	7.8	6	4.10
12	82.0			
14	82.0			
16	81.7			
18	81.2			
20	81.0	7.8	17	1.6
22	80.9			
24	80.8			
26	80.7			
28	80.6			
30	80.4			
32	80.2	7.3	17	0.6
34	80.0			
36	79.9			
38	79.8			
40	79.7			
42	79.3	7.2	19.5	0.0
44	78.9			
46	78.4			
48	78.0			
50	77.5	7.3	18.5	0.0
52	77.1			
54	76.9			
56	76.5			
58	76.2			
60	75.9	7.3	19	0.0
62	75.6			
64	75.3			
66	74.9			
68	74.6			
70	74.3	7.3	16	0.0
72	73.9			
74	73.5			
76	71.4 (in mud)			

Table 7. (Cont.) Physico-Chemical Field Records For Lake Whitney.

Location: Rock Bluff		Date: July 30, 1957		
Depth in Feet	Temp. ° F	pH	Carbon Dioxide	Oxygen
0	93.8			
2	93.4			
4	89.8			
6	89.5			
8	88.9			
10	88.2	8.5	0	8.15
12	87.8			
14	87.8			
16	87.7			
18	87.2	8.3	0	8.10
20	86.5	7.9	5.5	5.0
22	85.9	7.7	9.5	3.6
24	85.6			
26	85.6			
28	85.5			
30	85.5			
32	85.4			
34	85.3			
36	85.3			
38	85.3			
40	85.2			
42	85.1			
44	85.0			
46	84.9			
48	84.4			
50	83.6			
52	82.2			
54	81.9 (bottom)			

Location: Rock Bluff		Date: July 31, 1957		
Depth in Feet	Temp. ° F	pH	Carbon Dioxide	Oxygen
0	88.4	8.3	0	7.0
2	88.6			
4	88.6			
6	88.6			
8	88.6			
10	88.6	8.1	0	8.0
12	88.6			
14	86.3	7.9	4.0	5.8
16	86.1			
18	86.0	7.5	10.0	3.30
20	86.0	7.5	10.10	2.95
22	85.7	7.3	16.0	1.30
24	85.7			
26	85.7			
28	85.6			
30	85.6			
32	85.5			
34	85.5			
36	85.4			
38	85.3			
40	84.0			
42	83.5			
44	83.0			
46	82.6			
48	82.1			
50	81.7			
52	81.4			
54	80.8			
	80.6 (bottom)			

Table 7. (Cont.) Physico-Chemical Field Records For Lake Whitney.

<u>Location: Rock Bluff</u>				<u>Date: August 19, 1957</u>					
<u>Depth in Feet</u>	<u>Temp. ° F</u>	<u>pH</u>	<u>Carbon Dioxide</u>	<u>Oxygen</u>	<u>Depth in Feet</u>	<u>Temp. ° F</u>	<u>pH</u>	<u>Carbon Dioxide</u>	<u>Oxygen</u>
0	84.9	8.1	0	6.00	0	81.1	8.2	0	6.56
2	84.5				2	80.4			
4	84.2				4	79.1			
6	84.1	8.0	2.5	4.85	6	79.0			
8	84.1				8	78.7			
10	84.1	8.0	4.5	5.80	10	78.6			
12	84.1				12	78.6			
14	84.0	7.9	5.5	4.95	14	78.6	8.0	2.5	5.40
16	84.0				16	78.6			
18	84.0				18	78.6			
20	84.0	7.9	5.0	5.0	20	78.6	8.0	5.0	5.05
22	84.0				22	78.6			
24	84.0				24	78.6			
26	84.0				26	78.5			
28	83.9				28	78.5			
30	83.8	7.7	8.5	2.25	30	78.5	8.0	4.0	5.55
32	83.7				32	78.4			
34	83.5				34	78.4			
36	83.4				36	78.4			
38	83.1				38	78.3			
40	82.6				40	78.3			
42	82.2				42	78.3			
44	81.8	7.3	20.5	0	44	78.3	8.0	5.0	5.55
46	81.4				46	78.3			
48	81.3				48	78.3			
50	81.2				50	78.3			
52	80.9				52	78.3			
54	80.8 (bottom)				54	78.5 (bottom)			

Table 7. (Cont.) Physico-Chemical Field Records For Lake Whitney.

Location: Rock Bluff				Date: Sept. 24, 1957					
Depth in Feet	Temp. ° F	pH	Carbon Dioxide	Oxygen	Depth in Feet	Temp. ° F	pH	Carbon Dioxide	Oxygen
0	77.3	8.1	1.5	?	0	57.6			
2	77.2				2	57.4			
4	77.1				4	57.2			
6	77.0				6	57.2			
8	76.9				8	57.2			
10	76.9	8.1	1.0	6.0	10	57.3			
12	76.9				12	57.3			
14	76.9				14	57.2			
16	76.9				16	57.1			
18	76.9				18	57.0			
20	76.9	8.1	1.5	5.9	20	57.0			
22	76.9				22	57.0			
24	76.9				24	57.2			
26	76.9				26	57.2			
28	76.9				28	57.2			
30	76.9	8.1	1.5	6.5	30	57.2			
32	76.9				32	57.2			
34	76.8				34	57.2			
36	76.7				36	57.2			
38	76.7				38	57.2			
40	76.6				40	57.2			
42	76.5	8.1	1.5	6.0	42	57.2			
44	76.5				44	57.2			
46	76.5				46	57.2			
48	76.4				48	57.1			
50	76.6 (bottom)				50	57.1			
					52	57.2			
					54	57.1			
					56	57.1			
					58	57.2			
					60	57.2			
					62	58.0 (bottom)			

Table 8. Whitney Reservoir Chloride Tests--Volhard Method

Date: May 15, 1956
 Reservoir Elevation: 519.5 m.s.l.

Water Depth In Feet	PPM.		Cl- as NaCl	
	Station 1	Station 2	Station 3	Station 4
5				386
10	486	376		386
15				386
20	598	372		386
24				386
30	630	414		386
40	486	446		
50	512	492		
60	644	680		
70	668			
78	694			

June 11, 1956
 Res. Elev. 519.7

5	576	464		612
10				708
15	570	470	452	704
16				788
20			580	
23	564	502	584	852
30				850
34	548	570		
40			554	
50	548	554	732	
60	744	600		
70	636	658		

July 17, 1956
 Res. Elev. 516.4

Surface	562	584	622	620
5				748
10		582	666	778
15	554			972
20		594	684	970
23				978
30	562	674	874	
36			812	
40	562	824		
50	568	788		
60	612			
72	650			

Table 8. (Cont.) Whitney Reservoir Chloride Tests-Volhard Method

Date: August 15, 1956
Res. Elev. 514.09

Water Depth In Feet	PPM. Cl- as NaCl			
	<u>Station 1</u>	<u>Station 2</u>	<u>Station 3</u>	<u>Station 4</u>
Surface	656	660	734	776
5				802
10	626	668	782	868
15			842	882
20	640	700	824	860
23				890
30	632	726	858	
40	618	770		
50	636	798		
60	628			
70	640			

Sept. 25, 1956
Res. Elev. 512.36

Surface	624	748	670	606
5				608
10	732	746	726	664
15				734
20	706	748	744	744
30	716	742	698	
40	710	726		
50	694	746		
60	712			
70	716			

October 24, 1956
Res. Elev. 510.07

Surface	728	734	646	604
5				594
10	720	708	640	584
15				590
17				590
20	608	708	566	
30	592	660	612	
37			658	
40	620	668		
50	662	750		
60	692			

Table 8. (Cont.) Whitney Reservoir Chloride Tests-Volhard Method

Date: November 22, 1956
 Res. Elev. 510.31

<u>Water Depth In Feet</u>	<u>Station 1</u>	<u>Station 2</u>	<u>Station 3</u>	<u>Station 4</u>
Surface		642		
10		731		
20		670		
30		618		
40		664		
50		714		
60				
70				

Jan. 20, 1957
 Res. Elev. 512.81

Surface	578
10	596
20	596
30	598
40	642
50	658
60	
70	

June 27, 1957
 Res. Elev. 535.13

Surface	142
10	150
20	162
30	152
40	144
50	134
60	126
70	134
