A BIO-CHEMICAL COMPARATIVE STUDY OF THE
PLANKTON IN LAKE DALLAS AND PECAN CREEK

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A BIO-CHEMICAL COMPARATIVE STUDY OF THE
PLANKTON IN LAKE DALLAS AND PECAN CREEK

Thesis

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By

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CHAPTER I

PROBLEM AND METHODS

Introduction

The purpose of this investigation is to compare the dissolved and suspended organic material in Lake Dallas to that coming into the lake through Pecan Creek.

The plants and animals that inhabit the open waters of ponds, lakes, streams, and the oceans constitute what is commonly known as plankton and are subject to the action of the waves and currents.¹

No attempt was made to study the plankton from a quantitative standpoint until 1882 when Hensen² undertook such investigations on the Baltic Sea and on the Atlantic Ocean. His studies extended from 1882 to 1886 and the publication of the results he obtained in the latter part of 1887 stimulated a great interest in both marine and fresh-water investigations of this character. As a result voluminous literature upon this subject has appeared in the last three decades.

Morphometry of Lake Dallas

Lake Dallas is an artificial reservoir serving as the

²Ibid.
Lake Dallas
AND PART OF
Source Streams
water supply for the city of Dallas, Texas. It lies at about the latitude of 33° 32'; longitude 97° and was first filled in 1927. The maximum length of this lake is 11.07 miles and maximum breadth is 3.07 miles. It has 57.4 miles of irregular shoreline which is considered a beneficial factor in productivity. It is formed by the impounding waters of Big Elm Fork of Trinity River, Cooper Creek, and Pecan Creek. There is a part of the year when smaller streams feed the lake, but during the summer months these streams are dried up.

All of these feed streams together drain an area of approximately 1,100 square miles, most of which is under cultivation. This is largely clay soil of average fertility, so that these streams carry into the lake much dry silt as well as organic and inorganic substances.

**Facts Concerning Pecan Creek**

Pecan Creek originates three miles north of and flows through the city of Denton. It flows into Lake Dallas on the western shore and carries the sewage disposal of the city of Denton. The sewage is untreated save for bacterial action and aeration. Approximately one million gallons of sewage are emptied into Pecan Creek daily. Bacterial forces convert much of this into soluble organic and inorganic substances which doubtless enrich the water in nutrition.

**Methods of Collecting and Preparation of Samples**

Collecting samples.--The samples were collected from
three points: Station I, near the dam on Lake Dallas; Station II, at the mouth of Pecan Creek; and Station III, two miles up Pecan Creek. A Juday sampler, on a calibrated rope, was used to convey the water from the lake to metal containers designed for this purpose with a capacity of 47 liters.

Preparation of samples; centrifugal samples.--The water was run through a Sharples Super Centrifuge at the rate of 10 liters per minute. The centrifuge makes 50,000 revolutions per minute with a 9 g. force of gravity. Everything was removed from the water except dissolved and colloidal materials. The sample was removed from the centrifuge, placed in porcelain dishes, placed in electric ovens at 60° C., and allowed to dry. The dry material is then carefully removed and placed in a weighing dish. After standing in a desiccator for 48 hours, it is weighed and awaits chemical analysis.

Dissolved samples.--Five liters of the water that came through the centrifuge was caught and placed in a 5-liter evaporating dish. The water was then evaporated at 60° C. over large sand baths. The samples were carefully removed and placed in small porcelain dishes and drying completed in an electric oven at 60° C. Then the sample was placed in a weighing dish and allowed to stand in a desiccator for 24 hours; then weighed and set aside for chemical analysis.

Chemical Methods

In all instances the samples used for the analyses were dried in an electric oven at a temperature of 60° C. for a
period of 12 hours. The material was not dried at a higher temperature because it was feared that some of the oils might be lost by volatilization at a higher temperature. From 1/10 to 5/10 of a gram of the sample was used for chemical analyses.

Fats.—A weighed sample was placed in a Soxhlet Extraction apparatus and washed with anhydrous ether for 24 hours. The ether was allowed to evaporate spontaneously and the sample weighed again.

Crude fiber.—The amount of crude fiber was determined by the Juday method of digestion for half-hour periods with sulfuric acid and sodium hydroxide solutions of the specific gravity 1.25. The alkali was completely washed out with hot water and filtered through pure linen. After the residue was allowed to settle, the solution was decanted through a tared Gooch crucible.\(^3\)

Pentosans.—If the pentoses or pentosans are hydrolyzed to furfural, the latter can be distilled in a carbon dioxide atmosphere. The amount of pentose or pentosan can be estimated by comparison of color developed in the distillate with xylidene with that developed from a furfural standard. Aniline develops a similar color with furfural. Methyl pentoses and hexoses have no effect on the determination.\(^4\)

---


Carbohydrates.--The total available carbohydrates may be extracted from an enzyme. Takadiastase was the enzyme used in this case. After the separation of the residue of cellulose and hemicellulose, the carbohydrate may be hydrolyzed by acid to hemicellulose. This may be estimated by using Picric acid and comparing with a standard of glucose treated in the same manner as that of the unknown sample. Carbohydrates will give a mahogany color with indole or acetone and sulfuric acid.5

Ammonia nitrogen.--The ammonia nitrogen was determined by adding a phosphate buffer solution to the sample in a Kjeldahl flask. The mixture was distilled, the distillate caught, and the color compared with permanent ammonia standards made by dissolving 0.400 gram of potassium chloroplatinate in a small amount of distilled water, then adding 20 ml. of concentrated hydrochloric acid and diluting up to 200 ml.6

Organic nitrogen.--The residue in the Kjeldahl flask from the ammonia nitrogen was used to determine the organic nitrogen. A modified Kjeldahl method was used for the determination. Nessler's reagent was added to the distillate, and, after standing for 10 minutes, the color was compared to a permanent ammonia standard.7

5 Ibid.
6 Ibid., p. 325.
7 Frank Theroux, Edward Eldridge, and W. L. Mallman, Laboratory Manual for Chemical and Bacterial Analysis of Water and Sewage, 1936, p. 33.
**Protein nitrogen.**—The milligrams of organic nitrogen multiplied by the protein factor 6.25 gives the protein nitrogen.

**Nitrite nitrogen.**—The nitrite nitrogen was determined by placing a known volume of sample in a Nessler's tube. Sulfanilic and a-amthylamine acetate solution was added to the sample and, after ten minutes, the color was compared to permanent standard sodium nitrite solution.

**Nitrate nitrogen.**—The nitrate was determined colorimetrically by using sulfuric acid and pyrogallol sulphonic acid. 8

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CHAPTER II

PHYSICAL, CHEMICAL AND BIOLOGICAL FEATURES

It would be inadequate to consider only one aspect as complete for a limnological study of a lake. There is no doubt that physical, chemical and biological productivity must all be considered before any conclusions are drawn. One factor can not be changed unless all three are in some way affected.

Physical Features

Thermal conditions.—Thermal stratification has a profound influence upon the biological and chemical features of a lake. Lake Dallas has a complete circulation in fall, spring and winter; thermal stratification may occur during the summer. A fall turnover occurs in Lake Dallas, at which time the odor is obnoxious. Heavy summer rains often produce unusual conditions setting up various kinds of density currents.

The following cycle occurs annually in Lake Dallas: In spring the whole lake is homothermous and the density is the same throughout the lake. The winds cause the waters to mix from surface to bottom. As the air becomes warmer in early summer, the temperature of the surface water begins to rise, thereby decreasing its density. This condition continues until the temperature of the surface water is several degrees
above that of the underlying waters. Then, only surface waters can be circulated by the wind and a condition of thermal stratification comes into existence. The lake water separates into three distinct layers. The epilimnion, the upper layer, is the zone of summer circulation and uniform temperature. The thermocline, the next stratum, is a zone where there is a drop in temperature of one degree centigrade per meter. The hypolimnion, the lowermost region, is a stratum of nearly uniform temperature from its upper limit to the bottom.

When thermal stratification is established, the lake enters upon the summer stagnation period. The water of the hypolimnion during the summer becomes stagnated.

In early autumn the cool air begins to cool the surface of the lake. As the surface waters are cooled and become heavier, the denser water sinks and convection currents are set up, equalizing the temperature throughout the lake.

The lake remains homothermal throughout the winter. The lakes of the North on which Birge and Juday did their work have a winter stagnation period and a spring turnover, but lack of continuous temperature below 4 degrees prevents the former condition from occurring on Lake Dallas.

Turbidity.—The plant life in a lake is affected by the amount of light admitted, which is determined largely by the turbidity of the water. Lake Dallas may become exceedingly turbid in a few minutes if disturbed by a high wind. Another interesting phenomenon is that a part of the lake may be
exceedingly turbid and the rest clear. Suspended matters in the water cause it to be turbid, or any finely divided material contributes to turbidity. The most prominent among these materials are: (1) finely divided non-living substances of organic origin; (2) silt; (3) plankton organism. These substances have been divided into two groups; (1) the settling suspended matters, which in motionless water will sooner or later settle to the bottom, and (2) non-settling suspended materials whose specific gravities are less than water, and are in colloidal suspension and hence are permanently suspended.\(^1\) These materials in the water are the ones in which this paper particularly concerns itself.

Lake Dallas has annual turbidity of approximately 70 parts per million.\(^2\) The turbidity is highest during the season of the greatest rainfall.

**Color.**—The color of the water in Lake Dallas varies from 15 to 40 parts per million. The absence of excessive staining of the water indicates that the water-shed contains little iron and no regions of decaying vegetation.\(^3\)

### Chemical Features

The physical features of a lake have very little effect


\(^3\)Ibid.
on the chemical substances excepting, of course, dissolved gases. Warmer water will dissolve more solids and less gas, while cooler water will dissolve more gas and less solids.

**Dissolved oxygen.**—Reduction of dissolved oxygen near the bottom of Lake Dallas begins about the middle of July and continues to August when depletion is generally accomplished. As the late summer progresses, the volume of oxygen free water increases, reaching its maximum in the latter part of August. Rains during the early part of September cause a partial return. Under normal circumstances during the late fall, winter, and early spring months, Lake Dallas has an equal distribution of oxygen. If fall "bloom" of algae occurs in the lake, this distribution may be enhanced, or, if excessive silt occurs in the flow, there may be a reduction of oxygen. An adequate supply of dissolved oxygen is one of the prime requirements of most aquatic organisms; hence, the oxygen source of water is very important. The principal sources of dissolved oxygen in water are: (1) the atmosphere through the exposed surface, and (2) photo-synthesis of chlorophyll-bearing plants.

**Hydrogen-ion concentration.**—Some seem to think that small changes in hydrogen-ion concentration may result in very significant changes in the functions of animal mechanisms. Lake Dallas has a pH of from 7.7 to 8.0, which indicates an environment favorable to fish and other aquatic life.

**Alkalinity.**—The alkalinity of a lake is due largely to carbonates, bicarbonates, hydroxides, and occasionally borate,
silicate, and phosphate content. The alkalinity in Lake Dallas is produced by soluble bicarbonates and phosphates, mainly those of sodium, potassium, calcium, and magnesium. The bicarbonates vary from 120 to 192 parts per million.

**Phosphates.**—Phosphates are good buffers and have effects on the pH of water. Some think that phosphorus may be a limiting factor, but Birge and Juday on their work on the northern lakes found that the phosphorus became a limiting factor only when there is a total absence of phosphorus.

**Free carbon dioxide.**—Free carbon dioxide in water brings about conditions of acidity, alkalinity, or neutrality. The sources of carbon dioxide are: (1) air, (2) inflowing ground water, (3) decomposition of organic matter, and (4) respiration of plant and animals.

Carbon dioxide is necessary for photo-synthesis which makes it essential for practically all plant life. The carbon dioxide varies in Lake Dallas from 4 to 14 parts per million. During the summer months the carbon dioxide increases at the bottom of the lake and oxygen decreases.

**Inorganic materials.**—Lake Dallas has a mineral supply sufficient for various organisms to thrive. Calcium, magnesium, sulfur, phosphorus, aluminium, and iron are the most prevalent. Approximately twenty per cent of the centrifugal samples were found to be inorganic, while eighty per cent of the dissolved samples were of an inorganic nature.

**Organic materials.**—Organic materials are useful as food
for all life in water. Organic nitrogen, protein, fats, and crude fiber are all found in Lake Dallas. Approximately eighty per cent of the suspended materials are organic, while only twenty per cent of the dissolved materials are organic.

**Bacteriology.**—Bacteria have been recognized from the beginning of limnological research as the agents most active in bringing about the degradation and stabilization of organic matter. However, the bio-chemical function of bacteria in natural waters is not known. The prevalence of bacteria is an indication of the complexity of the protein molecule.\(^4\)

The enzymes secreted by the bacteria also cause the suspended materials in the water to decrease by digestion.

**Treatment of water.**—Lake Dallas was being treated with copper sulphate in order to kill the algae to which unpleasant tastes and odors in the Dallas water were attributed.

\(^4\text{Arthur M. Buswell, The Chemistry of Water and Sewage Treatment, p. 279.}\)
CHAPTER III

RESULTS AND DISCUSSION

Ammonia nitrogen was found to be present in very small quantities in both the centrifugal and dissolved samples. Very little information is available on the biological relations of gaseous ammonia in natural waters. Although some say that it can become toxic, the ammonia nitrogen in Lake Dallas is not found in large enough quantities to produce adverse conditions for biological productivity. The centrifugal sample varied from .04 to .06 parts per million on Lake Dallas and even less at the mouth of and up Pecan Creek. There was not enough change by May, June and July to make any marked difference on chemical and biological conditions in the lake.

Nitrate and nitrite nitrogen probably is formed from ammonium salts and no doubt contribute to the food relations of various organisms. Nitrogen becomes more usable by plant life when found in nitrate form. The trace of nitrate and nitrite nitrogen was found in Lake Dallas, which is doubtless beneficial to some organisms. Ammonia, nitrate and nitrite nitrogen comparisons are found in Table 1.

Organic nitrogen in both centrifugal and dissolved samples as shown on Figures 1 and 2 were higher in May and July than

\[1\text{Welch, op. cit., p. 186.}\]
<table>
<thead>
<tr>
<th>Location</th>
<th>Date</th>
<th>NH$_3$ p.p.m.</th>
<th>NO$_3$ as N</th>
<th>NO$_2$ as N</th>
<th>Organic Nitrogen</th>
<th>Protein Nitrogen</th>
<th>Fats</th>
<th>Crude Fiber</th>
<th>Dry Wt.</th>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Lake Dallas</td>
<td>27-39</td>
<td>.03</td>
<td>Trace</td>
<td>.001</td>
<td>.13</td>
<td>.813</td>
<td>.2</td>
<td>2.0</td>
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<td>27-39</td>
<td>.02</td>
<td>.04</td>
<td>.006</td>
<td>.60</td>
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<td>.3</td>
<td>2.7</td>
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<td>.01</td>
<td>.02</td>
<td>.012</td>
<td>.80</td>
<td>5.00</td>
<td>.5</td>
<td>3.0</td>
<td>16.0</td>
</tr>
<tr>
<td><strong>June</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
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<td>24-39</td>
<td>.1</td>
<td>.006</td>
<td>.008</td>
<td>.20</td>
<td>1.2</td>
<td>.20</td>
<td>2.0</td>
<td>11.2</td>
</tr>
<tr>
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<td>24-39</td>
<td>.12</td>
<td>.004</td>
<td>.006</td>
<td>.256</td>
<td>1.4</td>
<td>.20</td>
<td>2.75</td>
<td>13.50</td>
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<td>24-39</td>
<td>.2</td>
<td>.002</td>
<td>.095</td>
<td>.350</td>
<td>2.5</td>
<td>.30</td>
<td>3.2</td>
<td>13.75</td>
</tr>
<tr>
<td><strong>July</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
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</tr>
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<td>15-39</td>
<td>.01</td>
<td>.03</td>
<td>.003</td>
<td>.22</td>
<td>1.38</td>
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<td>15-39</td>
<td>.04</td>
<td>.97</td>
<td>.005</td>
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<td>3.44</td>
<td>.34</td>
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<td>14.5</td>
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<td>15-39</td>
<td>Trace</td>
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<td>.015</td>
<td>.72</td>
<td>4.50</td>
<td>.45</td>
<td>3.3</td>
<td>18.2</td>
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## TABLE 2

ORGANIC ANALYSIS OF DISSOLVED SAMPLES

<table>
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<th>Location</th>
<th>Date</th>
<th>Bacteria p.p.m.</th>
<th>NH$_3$ as N</th>
<th>NO$_3$ as N</th>
<th>NO$_2$ Nitrogen</th>
<th>Organic Nitrogen</th>
<th>Protein</th>
<th>Fats</th>
<th>Fiber Wt.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>May</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lake Dallas</td>
<td>27-39</td>
<td>55,000</td>
<td>Trace .001</td>
<td>Trace 1.25</td>
<td>.768</td>
<td>.034</td>
<td>1.2</td>
<td>151</td>
<td></td>
</tr>
<tr>
<td>Mouth Pecan Creek</td>
<td>27-39</td>
<td>300,000</td>
<td>Trace .04</td>
<td>Trace .41</td>
<td>2.56</td>
<td>.065</td>
<td>1.39</td>
<td>163</td>
<td></td>
</tr>
<tr>
<td>Upper Pecan Creek</td>
<td>27-39</td>
<td>*</td>
<td>Trace .01</td>
<td>.001</td>
<td>.76</td>
<td>4.75</td>
<td>.602</td>
<td>2.2</td>
<td>182</td>
</tr>
<tr>
<td><strong>June</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lake Dallas</td>
<td>24-39</td>
<td>1,000</td>
<td>.001</td>
<td>Trace Trace</td>
<td>.12</td>
<td>.75</td>
<td>.035</td>
<td>1.3</td>
<td>142</td>
</tr>
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<td>Mouth Pecan Creek</td>
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<td>114,000</td>
<td>.04 Trace</td>
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<td>2.69</td>
<td>.065</td>
<td>1.4</td>
<td>160</td>
<td></td>
</tr>
<tr>
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<td>.001 .01</td>
<td>Trace .79</td>
<td>4.94</td>
<td>.690</td>
<td>2.0</td>
<td>220</td>
<td></td>
</tr>
<tr>
<td><strong>July</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td>Lake Dallas</td>
<td>15-39</td>
<td>250,000</td>
<td>.003 .002</td>
<td>Trace 1.32</td>
<td>.825</td>
<td>.039</td>
<td>1.3</td>
<td>145</td>
<td></td>
</tr>
<tr>
<td>Mouth Pecan Creek</td>
<td>15-39</td>
<td>75,000</td>
<td>.001 .063</td>
<td>Trace .43</td>
<td>3.00</td>
<td>.068</td>
<td>1.5</td>
<td>161</td>
<td></td>
</tr>
<tr>
<td>Upper Pecan Creek</td>
<td>15-39</td>
<td>*</td>
<td>.001 .02</td>
<td>.001 .80</td>
<td>5.00</td>
<td>.302</td>
<td>2.5</td>
<td>227</td>
<td></td>
</tr>
</tbody>
</table>

*Uncountable
in June. This seems to correlate with other data secured at
the same time. We find the bacterial count was also lower in
June, as shown on Tables 3 and 4. The bacteria in the water
of Pecan Creek was in all cases uncountable.

Crude fiber is composed generally of chitin from the shells
of the Crustacea. A certain part of crude fiber may be diges-
ted by certain organisms, but no data is available to indicate
whether any portion of carbohydrates, if any, are present. In
the plankton crude fiber is utilized by organisms that feed
on this material. The chitin passes through the alimentary
canal of fishes without being affected by the digestive proces-
ses. Crude fiber varied from 1.1 to 1.3 parts per million in
the dissolved samples on Lake Dallas. The centrifugal sample
ran higher, ranging from between 2.0 to 2.5 parts per million.

As indicated in Table 5, we find a slight decrease during the
month of June; otherwise, the variations in all cases were
about the same between the centrifugal and dissolved samples.

The ether extract contained fats and more or less chloro-
phyll according to the amount of algae present in the water.
Fats in the centrifugal samples ran almost twice as much in
Pecan Creek as those in Lake Dallas, because by the time the
water has reached the Lake, it has become exceedingly diluted.
(Table 6) The dissolved fats were shown on Table 7 and run
about the same and a little less than the dissolved samples.
Fats, in all probability, vary with the amount of plant and
animal life present.
Fig. 2. -- The comparison of organic nitrogen and plankton in Lake Dallas.
Fig. 3.—The comparison of organic nitrogen and plankton in Mouth of Pecan Creek.
Fig. 4.—The comparison of plankton and organic nitrogen 1½ miles up Pecan Creek.
Fig. 5.--Suspended and dissolved crude fiber in Lake Dallas and Pecan Creek.
Fig. 6. -- Dissolved and suspended fats in Lake Dallas and Pecan Creek.
Fig. 7. — The comparison of plankton and bacteria in Lake Dallas.
Fig. 8.—The comparison of plankton and bacteria at Mouth Pecan Creek.
Carbohydrates and pentosans were totally absent in Lake Dallas. Samples were run consistently with negative results. Birge and Juday found pentosans present only in the autumn months on the lakes in Wisconsin. Blue-green algae and diatoms make up the principal sources of carbohydrates and pentosans, and, because the lake water was being treated to keep down the algae, it is entirely logical to assume that, if the algae were permitted to "bloom," positive results would have been obtained.
CHAPTER IV

SUMMARY AND CONCLUSIONS

1. Inorganic nitrogen seems to vary very little from Pecan Creek to Lake Dallas, and it also varies very little over long periods of time.

2. Organic nitrogen, fats and crude fibers all showed a definite decrease during the month of June, with increases in May and July.

3. Bacteria counts showed a decrease in June with increases in May and July.

4. The plankton count showed a definite increase during the month of June.

5. Various organisms in the water consume organic materials; therefore, all of them should not be destroyed by copper sulphating, because they are valuable in destroying organic materials that doubtless produce unpleasant tastes and odors in the water of Lake Dallas.
BIBLIOGRAPHY

Birge, Edward, and Juday, Chancey, *The Inland Lakes of Wisconsin*, Bulletin No. 64, Published by the State of Wisconsin, pp. 1-220.


