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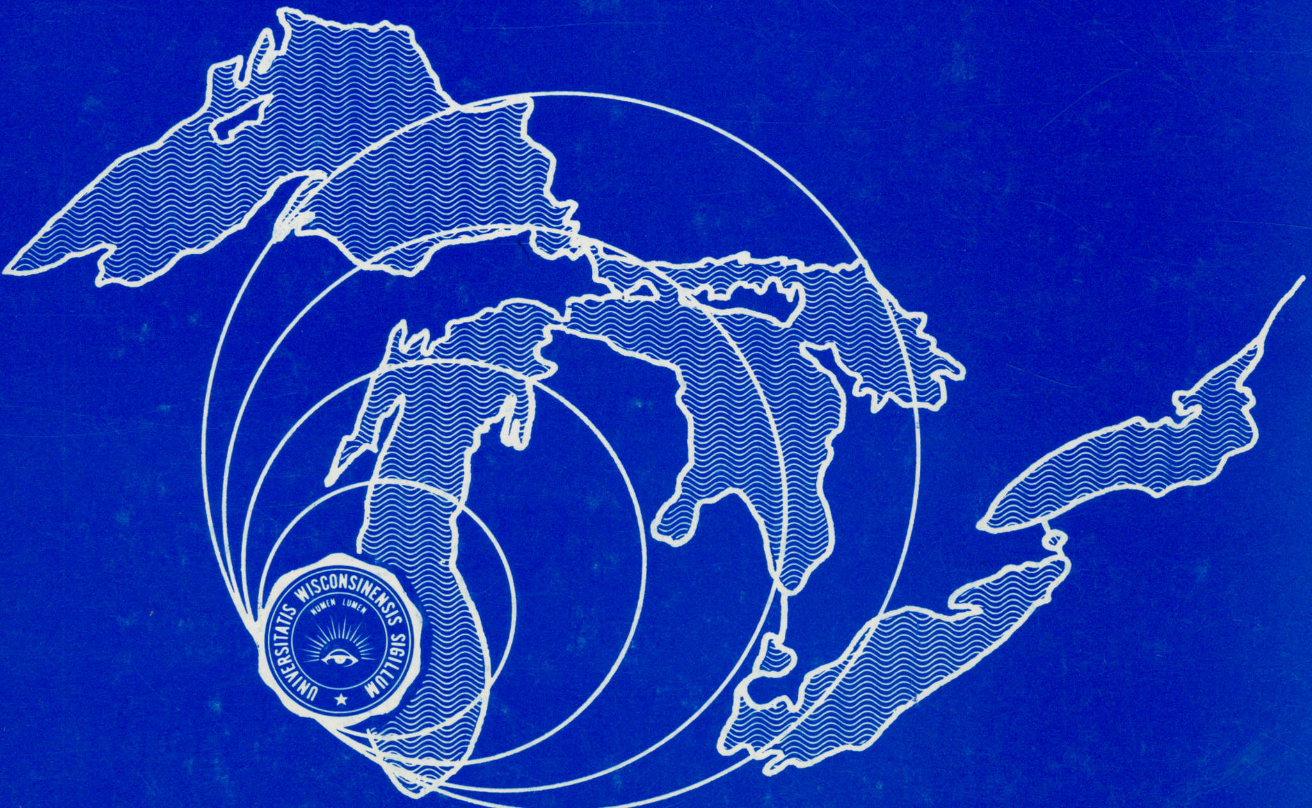

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Investigation of the Influence of Thermal Discharge from a Large Electric Power Station on the Biology and Near-Shore Circulation of Lake Michigan - Part A: Biology

by

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INVESTIGATION OF THE INFLUENCE OF THERMAL DISCHARGE FROM A LARGE ELECTRIC POWER STATION ON THE BIOLOGY AND NEARSHORE CIRCULATION OF LAKE MICHIGAN-- PART A: BIOLOGY

Final Report

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ABSTRACT

This study was undertaken to determine the environmental effects on Lake Michigan of a long-existent thermal discharge from the Oak Creek Power Plant (1760 MW) of the Wisconsin Electric Power Company.

Monthly sampling for temperature, chemicals, zooplankton, and phytoplankton was conducted near the plant and in a reference area. Cluster and factor analyses of plankton data indicate the thermal discharge had little effect on plankton distribution. Differences between inshore and offshore stations were much greater than differences between study areas. The primary variable was distance from shore. Analyses of chemical data did not produce any useful relationships and none were related to those established for plankton.

Results of two extensive synoptic and four near-plant surveys showed that water quality in the vicinity of the plant was a consequence of outflow from Milwaukee Harbor, sewage outfalls, and other point sources. These discharges resulted in high concentrations of chemicals nearshore, e.g. phosphorus was as much as 30 times greater nearshore than previously reported for the open lake. The power plant had no obvious influence on water quality or chlorophyll _a_ distributions.

Uptake of C-14 was measured in intake and discharge water of the power plant and various dilutions of the two to simulate effect of entrainment on phytoplankton productivity. Net entrainment, i.e. the difference in uptake rates between discharge and intake samples, resulted in a 64% increase in uptake. Increased temperatures and mechanical stress resulted in 24% and 9% increases in uptake.

INTRODUCTION

Much attention has been directed toward the study of thermal discharges and their potential environmental impact in the Great Lakes region. While a good deal of information concerning this subject is presently available, much of the work which has been reported, or is presently underway, has concerned itself with power generating stations yet to begin operation or those that have only recently come on-line. The present study was undertaken in an attempt to assess the environmental effects of a long-existent thermal discharge of a large power generating station. It was hoped that the results of such a study would aid in answering the critical question, what are the long-term effects of a large, thermal discharge into Lake Michigan?

Description of Wisconsin Electric Power Company Oak Creek Plant

The site chosen for study was Wisconsin Electric Power Company's Oak Creek, Wisconsin Plant. This coal-fired plant, which began operation in 1953, has a generating capacity of 1760 MW. It is situated on the western shore of Lake Michigan, about 20 km south of the main entrance to the harbor of the City of Milwaukee. The plant has an on-shore intake and discharge. At capacity, discharge rates can equal 5700 cubic meters per minute (1. 5 million gallons per minute). The temperature rise from intake to discharge ranges from 2 to 7 C, depending upon operating conditions and seasonal factors. The discharge water is released from five separate points with a 150 m distance. Each discharge is deflected south, the direction of the predominant currents along this shore.

Experimental Design

Original emphasis was placed on a monthly sampling routine along several experimental and control transects in the vicinity of the power plant. After some preliminary investigations, four such transects were chosen (Fig. 1, Table 1). The most northern transect, including stations 9, 10, 11, 12, and

13, was chosen to represent a control area removed not only from the effects of a thermal discharge, but also from the effects of the City of Milwaukee. The transect just north of the Oak Creek facility, including stations 1, 2, and 3, was chosen to represent a control area probably affected by discharges from the City of Milwaukee but not by a thermal discharge. The transect just south of the power plant, including stations 4, 5, and 6, was chosen to represent the prime experimental area -- that area where, if thermal effects were to exist, they would be most likely to occur. The two transects in the vicinity of the power plant shared two offshore stations, 7 and 8. The most southern transect, including stations 14, 15, 16, and 17, was chosen to represent the secondary experimental area -- that area where, if thermal effects were to exist, the extent of their down-current effects could be assessed. At each of these stations temperature and several chemical parameters were measured. In addition, the zooplankton and phytoplankton populations were sampled. Sampling began in September, 1971.

After following the sampling routine described above for six months, several modifications were made in the overall strategy being followed. It was decided to shift from monthly to seasonal sampling along these four transects. This decision was based on the quantity and quality of the information being gathered, as well as on the apparent need to investigate other problems directly related to answering the original question.

Two additional projects were initiated at that time. First, two synoptic chemical surveys were carried out in the vicinity of Milwaukee Harbor (Fig. 2). These surveys were undertaken to assess the extent to which other point source discharges in the study area, as well as the outflow of Milwaukee Harbor, could be detected in the vicinity of the Oak Creek Plant. The second project was a series of chemical and biological surveys of the area immediately surrounding the power plant (Figs. 3 and 4). This work was designed to give a more complete picture of the water quality near the power plant than was possible by sampling on the four original transects.

Included in the original experimental design was also the investigation of primary production rates in areas affected and unaffected by the thermal discharge. After encountering many logistical problems dealing with severe weather and incubator construction, a fundamental change in stratigy was formulated. It was decided to do all the incubation work on shore and use only intake and discharge water, collected at the plant, for primary production rate analysis. This change allowed data to be more easily collected, while still obtaining the same basic information.

The last experimental work which was carried out and will be discussed in this report involved periodic evaluations of chemical differences between intake and discharge water. This work was done in conjunction with the primary production measurements.

MATERIALS AND METHODS

Monthly Sampling

The stations shown in Figure 1 were sampled on the dates indicated in Table 2. The most northern transect was usually sampled on a separate day than the remaining stations. All sampling was conducted from the R/V NEESKAY.

Temperature measurements were made using a 30 m bathythermograph when stratification was evident. The only exception to this was September, 1971, when, because of equipment failure, only surface temperature measurements were made. When it became evident that the water column was homothermous at all stations, which was the case in January, February, and April, 1972, only surface temperatures were recorded.

Water chemistry samples were taken with a 9-l van Dorn bottle. A single sample from each station was collected at a 2 m depth. From this 9-l sample, 1-l was saved for subsequent analyses. On each sample, total phosphorus (Schmid and Ambuhl 1965), soluble reactive phosphrous (Ambuhl and Schmid 1965), nitrate-nitrogen (Muller and Widemann 1955), silica (AAWA 1965, heteropoly blue method), sulfate (AAWA 1965, turbidi matrix), chloride (AAWA 1965), and conductivity were measured. Only sulfate and chloride determinations were made on the September 1971 samples. Sulfate determinations were not made on November 1971 samples. Conductivity was not determined on the April 1972 samples. For those analyses which required filtered water, boiled 0.45 micron, HA, Millipore filters were used. Filtering took place 2 to 6 hours after sample collection.

On 28 November 1972 samples were collected to determine the degree of variability in the chemical results. At each of two locations east of Milwaukee, 1/4 and 10 miles offshore, ten replicate Van Dorn samples were collected. Each sample was processed like the single samples collected during the regular sampling program. Determinations of variability in results were made for these inshore and offshore waters (Table 3). Statistical methods used were those described by Sokal and Rohlf (1969).

Phytoplankton samples were collected from the same 2 m Van Dorn sample on which water chemistry determinations were made. One liter was collected and preserved in Uttermohl's preservative. This volume was then allowed to settle for 48 hours, after which time the cell-free supernatant was removed. Approximately 100 ml of concentrate remained. From this concentrate, two subsamples were removed with a micropipette; one 25 ml and one 10 ml. Both subsamples were allowed to settle in the counting cells for no less than 8 hours prior to counting.

Phytoplankton counts were made on a Zeiss inverted microscope. To count the 10 ml subsample, 320 X was used. For the 25 ml subsample, 1000 X was used. A variable transect method was used to determine the percentage of the subsample counted. Counting would cease for a particular organism when the number counted reached 100, at which point the length of the transect traversed would be recorded, or when the end of the 40 mm transect was reached. This method had the effect of making the error in the total concentrations reported for the various groups more equal to one another. Thirty-two taxonomic groups were identified from the samples using this method (Table 4).

Phytoplankton samples from six stations were not counted because they were lost or they failed to settle properly: November, 1971, station 10; December, 1971, station 7; February, 1972, station 8; and April, 1972, stations 4, 11, and 17.

In addition to this counting method, a separate method was used to more precisely identify the diatom portion of the phytoplankton population. This work is still underway and will be reported on in a subsequent report.

Zooplankton samples were collected at each station with a 1/2 m diameter, 153 micron (No. 10 mesh) plankton net towed vertically from the bottom to the surface with a 15 kg weight attached to the cod end. These samples were preserved in 10% formalin.

Prior to counting, each zooplankton sample was concentrated to 100 ml. From this volume, a 5 ml subsample was taken with a wide-mouth, pre-calibrated, automatic pipette. Two entire 5 ml subsamples were counted for each sample. These counts were averaged and converted to number of individuals per cubic meter. Thirty-five taxonomic groups were identified from the samples (Table 5). Two samples were lost: November, 1971, station 5; and February, 1972, station 7.

Two experiments to assess the reliability of the counting methods for the zooplankton were conducted. The first was simply to take five replicate subsamples of the same sample and determine the variability of each reported mean. The results of this experiment appear in Table 6. The second was to determine whether the counts were changed by increasing the percent of the total volume counted. Several samples from stations 1/4 mile from shore were counted. The results of these counts appear in Table 7. A paired t-test (Sokal and Rohlf 1969) was used to determine whether these counts produced significantly different totals. None of the counts were significantly different from one another at the 95 percent confidence level.

Computer assisted data reduction methods were used to analyze the chemical, phytoplankton, and zooplankton data. Cluster and factor analysis were used on each type of data to detect relative similarities between the stations. The clustering routine was taken from Ward (1963) and Veldman (1967) by the Social Science Research Facility, The University of Wisconsin--Milwaukee, and made available for use in this study. The factor analysis used was the image factoring procedure (Guttman 1953, Horst 1965, and Kaiser 1963) which is available as part of STATJOB, a statistical package made available by the Madison Academic Computing Center, The University of Wisconsin--Madison.

Primary Production Measurements

The effect of entrainment on the primary production rates of the near-shore phytoplankton population of Lake Michigan was examined through periodic comparative measurements of C-14 uptake by samples collected near the intake and discharge sources at the Oak Creek Plant. The intake samples were collected on the pressurized side of the pumps. The discharge samples were collected at the surface near the first of five discharge points with a 4-liter plastic bucket. Enough water was collected at each collection site to fill a single 19-liter carboy. Temperature measurements were made immediately. The carboys were then transported to a laboratory where incubations were begun immediately.

The incubations were carried out in 125 ml glass-stoppered bottles. The standard C-14, light-dark bottle method was followed (Strickland and Parsons 1968). Incubation bottles were placed in two Percival light and temperature controlled incubators. For each sample incubated at a single temperature, three 125 ml bottles were filled and inoculated with C-14, one dark and two light. Each bottle was inoculated with about 10 μC of previously standardized C-14. Incubations were for two hours. All samples incubated at the same time were removed from the incubator simultaneously and kept in the dark while the filtrations were taking place. Fifty ml of each sample was filtered through a 47 mm diameter Millipore HA filter. Following filtration, each filter was fumed over concentrated HCl for approximately three minutes. The filters were then placed in a liquid scintillation vial with 10 ml of Aquasol and put aside until counting was conducted. The counts were subsequently converted to mg C fixed/cubic meter/hour.

Additional measurements made on each sample consisted of determinations of the following parameters: total phosphorus, soluble reactive phosphorus, silica, nitrate-nitrogen, conductivity, and chlorophyll a (Yentsch and Menzel 1963). Methods used, except for chlorophyll a, were the same as those for the monthly samples.

On five of the sampling dates (Table 8), five types of samples were prepared for incubation. They were the following: 100% discharge; 67% discharge and 33% intake; 50% discharge and 50% intake; 33% discharge and 67% intake; and 100% intake. On the remaining sampling dates (Table 9), only 100% discharge and 100% intake samples were prepared. Each type of sample was incubated at both intake and discharge temperature, as measured at the time the samples were collected.

The 100% discharge and intake samples were used in a comparative way to assess various effects of the pumped entrainment process (Table 10). The mixed discharge-intake samples were compared to the intake samples incubated at intake temperature (the base-line primary production rate) to assess the down-current impact of entrainment on the phytoplankton production rates. Mixing of the samples was used to approximate the mixing process that occurs as the plume is discharged into the lake. The t-tests were used to make the necessary comparisons between two means, each of which was based on duplicate determinations.

Intake/Discharge Chemistry

On ten sampling dates (Table 11) intake and discharge waters were compared chemically. Sampling was conducted in the same manner as for the water for the primary production studies. Sulfate was measured on two of these dates; soluble reactive phosphorus, silica, nitrate-nitrogen, and chlorophyll a on eight; conductivity on six; and total phosphorus was measured on nine. Methods of determination were the same as those described above for the monthly samples.

Synoptic Surveys

The two synoptic surveys of the Milwaukee Harbor area were conducted on 12-14 April and 28 June 1972. On 12-14 April, a series of 101 stations north of Milwaukee and a series of 148 stations south of Milwaukee were sampled in addition to the harbor (Fig. 2). On 28 June only 148 stations south of Milwaukee were sampled. The distances from shore of the stations ranged from 1/4 mile to 5 miles. For the first two miles from shore on each transect, stations were 1/4 mile apart. The remaining stations on the transects were 1/2 mile apart.

Sampling was conducted from the R/V NEESKAY while underway. Sea chest samples were taken when the proper position was reached. The sea chest has its intake at 2 m and was continuously flushed to insure a rapid rate of exchange with the water of the immediate sampling location.

At each station, a 4 oz polyethylene bottle was filled for conductivity analysis. In addition, at all stations along several transects an additional 1-liter of water was collected for analysis of total phosphorus, soluble reactive phosphorus, silica, sulfate, nitrate-nitrogen, and chloride. Methods of analysis were identical to those described above for the monthly sampling routine. These complete analyses were used to determine the relationship between conductivity and other chemical parameters of interest. The conductivity results were then contour plotted in an attempt to show the extent to which Milwaukee Harbor water may flow into the sampling areas investigated in the course of this study.

Near-Field Surveys

Chemical and biological surveys of Lake Michigan in the immediate vicinity of the Oak Creek Plant were conducted on four occasions in the fall and winter of 1972-73. The four sampling dates were the following: 10 October 1972, 9 November 1972, 25 January 1973, and 28 February 1973. On the first two dates, 27 stations were sampled on three transects each three miles in length (Fig. 3). On the last two dates, 20 stations were sampled along four transects each three miles in length (Fig. 4).

At each station a 4-liter bucket was used to sample surface water. From this sample, temperature, chlorophyll a, total phosphorus, soluble reactive phosphorus, silica, nitrate-nitrogen, conductivity, and chloride were measured. Chlorophyll a was measured using the same method described for the primary production work. The other methods of determination were the same as those described for the monthly sampling routine.

The results of these determinations were then contour plotted to show the primary water quality characteristics of Lake Michigan in the immediate vicinity of the Oak Creek Plant.

RESULTS AND DISCUSSION

Monthly Sampling

Analysis of Figures 5-8 and Table 12 show that some differences in the temperature structure of the water columns did exist between the various stations on the four transects. Inshore-offshore seasonal variations are evident in Figures 5-8, since they all represent times of cooling or warming. In general, the offshore temperatures were higher during the colder months, whereas nearshore temperatures were highest in April and June. Some near-surface warming of the inshore stations was present near the power plant. This was usually the case for station 4, and occasionally at station 14. Presumably, these higher temperatures were due to the thermal discharge from the Oak Creek Plant and indicate that the thermal plume could be detected 5 miles from the Plant. During the remaining months, when homothermous conditions existed (Table 12), surface temperatures at stations 4 and 14 were the same or closely similar to those elsewhere near shore.

The concentrations of the zooplankton species and groupings, the phytoplankton species and groupings, the chemical parameters measured, as well as explanations for all the abbreviations used can be found in Tables 4, 5, and 13-17.

The results of the cluster analysis for the zooplankton and the phytoplankton collected during four months in 1971 and four months in 1972 are shown in Figures 9-10, 11, and 12, respectively. Throughout both of these sets of analyses, three types of stations usually clustered together. They are group A (stations 1, 4, 9, and 14) -- a predominantly inshore aggregation; group B (stations 7, 8, 11, 12, 13, and 17) -- a predominantly offshore aggregation; and group C (stations 2, 3, 5, and 6) -- an aggregation of stations an intermediate distance from shore. These groupings are indicated on each of the dendrograms in these figures except for the January and April phytoplankton, where the aggregations were unrelated to this pattern. The total make-up of these three groups was not constant. A few stations, especially 10, 15, and 16, tended to shift from one group to another from month to month. The general make-up of the groups, however, and the type of hydrographic conditions they represented, tended to be remarkably constant. While the statistical significance of these groupings has not been determined, the consistency of the patterns makes them quite credible.

Factor analysis of the zooplankton and phytoplankton data tended to produce results somewhat more difficult to interpret than those from the cluster analysis. In no case were contradictory patterns produced. In Figure 13, the first four zooplankton and phytoplankton factors produced by the November 1971 data are plotted in a fashion similar to that used by Hughes, et al. (1972). The first four factors account for 93 and 86 percent of the variability for the zooplankton and the phytoplankton for this month, respectively. In this figure the similarity to the cluster analysis grouping is quite striking.

Cluster and factor analysis of the chemical data did not produce any meaningful patterns. The patterns that emerged had no relationship to the zooplankton and phytoplankton patterns. In addition, they had no apparent relationship to the hydrographic conditions the various stations represent.

Two possible explanations exist for the nature of the chemical results. First, only seven chemical parameters were measured at each station, as compared to 35 and 32 for the zooplankton and phytoplankton, respectively. This fact affects not only the apparent reliability of the results, but also affects the numerical reliability of some of the mathematical manipulations used in both methods of analysis. Second, two types of chemical parameters were measured, those that are usually related to and those that are not highly correlated to biological factors. The first type would include total phosphorus, soluble reactive phosphorus, silica and nitrate-nitrogen.

The second type included conductivity and conservative ions such as sulfate and chloride. The different patterns produced by these two types of parameters could have obscured the final results.

The conclusion that can be drawn from the results of the zooplankton and phytoplankton analyses is that the primary variable affecting these organisms is the distance from shore. In all cases, all groups of stations clustered by both methods included stations from experimental and control transects. This is strong evidence that within the areas studied, little or no effect of the thermal discharge upon planktonic populations can be observed. Some differences between the area north of Milwaukee and that around the Oak Creek Plant was noticeable. For example, stations an intermediate distance from shore north of Milwaukee tended to be more similar to offshore stations in the Oak Creek vicinity than to stations a similar distance offshore on other transects. The differences between inshore stations and offshore stations, however, was in all cases much greater that this difference between study areas.

Representative plots of several major species of phytoplankton and zooplankton tend to substantiate this conslusion. In Figures 14-19, the concentrations of 11 major species of zooplankton and one juvenile group are plotted from two transects sampled in December, 1971. All show pronounced inshore-offshore trends and relative similarity between the two transects. Plot of eight phytoplankton groups (Figs. 20-23), show the same inshore-offshore trends. The inshore-offshore trends for both study areas are closely similar with the greatest concentrations inshore, except for certain groups. Although the trends are similar, in general, much higher concentrations usually occurred nearshore on the southern transect. This greater' abundance of plankton probably is due to the greater nutrient concentrations rather than any effect of the power plant.

Some representative plots of the chemical data indicate the same patterns (Figs. 24-26). Concentrations of phosphorus were much higher nearshore at the northern as well as the southern stations. Chloride and sulfate concentrations showed no pronounced inshore-offshore trend on the northern transect, but both ions were much higher near shore on the southern transect. This may reflect the flow of water from Milwaukee Harbor and the South Milwaukee sewage treatment plant. The lower silica near shore on the southern transect may represent increased diatom growth at this particular sampling time.

Primary Production Rates

The abbreviations used to denote the various types of samples and their incubation temperatures are listed in Tables 8 and 9. The results of the 100% intake and discharge samples, along with the appropriate comparisons (Table 10), appear in Table 9, Figure 27. The results of the mixed intake and discharge samples, along with comparisons of these rates with that from the IL sample from that same date, appear in Table 8, Figure 28.

The only consistent effect of pumped entrainment on primary production rates was observed in the net entrainment determinations (Table 10). This term is used to represent the difference between the rates of the DH and the IL samples. The average net entrainment effect was a 64% increase in the primary production rate (Table 9, Fig. 29). In eight of the nine determinations made, net entrainment was significant at the 95% confidence level. The effects of thermal elevation and mechanical stress alone were significant on only two occasions. The average effect of thermal elevation was a 24% increase in production rates, while that for mechanical stress was a 9% increase.

The fact that net entrainment was usually significant, while the individual effects that together should equal net entrainment are not significant, tends to indicate that it is not appropriate to term the IL-DH difference net entrainment. It is highly possible that retaining a parcel of water at discharge temperatures for two hours is not representative of ambient conditions. This would tend to overestimate the effects of entrainment. Until more details are known of the discharge plume and more reliable statistical comparisons can be made with this type of data, no firm conclusions can be drawn.

The same limitations apply to the down-current determinations of entrainment effects, which in most cases were limited to those samples which were incubated at discharge temperatures (Table 8). In general, those samples containing the larger properties of discharge water had significant uptakes of C-14, when incubated at discharge temperatures (Fig. 28). A decision as to the meaning of this finding will also have to await the detailed description of the discharge characteristics of this plant.

Intake-Discharge Chemistry

The results of the chemical comparisons of intake and discharge waters appear in Table 11. The sample design did not allow for any statistical comparison of the results. To give some indication of the relative size of the differences found, they were compared to the 95% confidence limits determined for inshore measurements (Table 3). Those differences in Table 11 which are greater than the appropriate confidence limit are marked with an asterisk.

In general, all the parameters, except silica and soluble reactive phosphorus, showed less than a 5% change. The average difference in the silica concentrations was +9%, with five of the eight determinations made showing differences greater than the 95% confidence limits for this determination. The average difference in the soluble reactive phosphorus concentrations was -14%, with four of the eight determinations made showing differences greater than the 95% confidence limits for this determination. The reasons for the significance of these differences is unknown. A possible explanation is that mechanical and thermal stress on the phytoplankton population was responsible. Mechanical agitation could damage diatom frustules, thus releasing silica. Increased temperatures may have induced increased phosphorus uptake. At this point, however, such suggestions are speculation.

Synoptic Surveys

Survey of April 12-14, 1972 -- Temperatures ranged from 2.3 to 4.3 C from the Milwaukee Harbor north (Fig. 29). Both the lowest and highest temperatures occurred about 15 miles north of the harbor. The maximum temperatures were in nearshore waters and the lowest temperatures occurred 3 miles offshore.

South of the transect extending eastward from the harbor, temperatures ranged from 3.0 to 4.9 C. The 3 C water occurred offshore 6 miles NE and 4.5 miles SE of the Oak Creek Power Plant.

Both north and south of the harbor the warmest water occurred nearshore, although the warm waters extended further from shore south of the harbor. The presence of warm water nearshore was probably due primarily to natural warming of these shallow waters. The presence of warmer waters south of the harbor suggests thermal inputs from the various outfalls. These outfalls may have made minor contributions but this evidently had little effect as indicated by temperatures near the Oak Creek Power Plant where temperatures were 3.5 C. Also, it appears that outflow from the harbor would have contributed little warm water since temperatures in the harbor were 3.2 C on April 12 and 3.7 C on April 14 in the harbor.

Conditions were suitable for development of a thermal bar, since temperatures were less than 4 C offshore and greater than 4 C at several locations nearshore (Fig. 29).

The significant differences and variability in distribution of temperatures within short distances, from South Milwaukee southward, suggests an area of extensive mixing. It should be noted, however, that stations were more closely spaced in this area and the variability in temperatures may represent a condition that was also present north and south of the harbor.

Conductivity of water samples collected from the Milwaukee Harbor area and north ranged from 263.3 to 352.2 μmhos/cm (Fig. 30). The lowest value was from station 69 (Fig. 2) 5 miles offshore. The highest value was from the main harbor entrance. Most of the values (74%) were in the range of 266-271 μmhos. Only 12% were higher than 271 μmhos.

Conductivity of samples from the area south of the harbor ranged from 262.4 to 437.1 μmhos/cm. The maximum lake value was at the harbor entrance. Figure 30 does not show this high value, since both the north and south surveys commenced with the common transect originating at the harbor entrance and results of only the north survey were plotted for this transect. Results were closely similar for stations on this transect sampled on April 12 (north survey) and April 14 (south survey), except for the two stations closest to the harbor entrance. The lowest value (262.4 μmhos) was at the furthest offshore station on this transect and also was not plotted. Whereas most of the values fell in a narrow range north of the harbor, this was not the situation south of the harbor. Only 36% of the values were in the range 266-271 μmhos and 61% of the conductivities were greater than 271 μmhos. Samples with very high conductivities, i.e. greater than 280 μmhos, were common and made up 24% of the samples. Only 3% of the samples from the north survey had values greater than 280 μmhos. The high conductivities so common south of the harbor undoubtedly reflect the altered chemical characteristics of lake water due to the discharge of industrial and municipal wastes into the harbor and directly to the lake south of the harbor.

The conductivity of the harbor sample was 357 μmhos on April 12 and 722.5 μmhos on April 14. Extreme changes of this magnitude are evidently due to extensive exchange between the harbor and the lake as a result of wind-driven currents and seiches. Changes in currents within the harbor could also result in movements of waters of very different characteristics in and out of a sampling site. Three rivers, Milwaukee's Jones Island Sewage Treatment Plant, and numerous other outfalls all enter Milwaukee Harbor.

The highest conductivities occurred nearshore both north and south of the harbor. The inshore-offshore gradient in conductivity was pronounced from the harbor southward. This was evidently due to the inputs of high conductivity waters in this area. Nearshore values were only 7 to 8 units higher nearshore than offshore north of the harbor. The water closest to the discharge of the Oak Creek Power Plant had a conductivity of 318 μmhos, whereas the nearshore waters north of the plant had values of 310 μmhos. The highest value may be a consequence of sampling closer to shore at the power plant, since it appears that the highest conductivity water was close to shore. Regardless, the distribution of conductivity does not show a unique situation at the Oak Creek Power Plant and suggests that water quality in this area was a function of inputs from Milwaukee Harbor and the outfalls north of the power plant.

Concentrations of chloride, sulfate, silica, nitrate, total phosphorus, and soluble reactive phosphorus were only determined for water samples collected on three transects (Figs. 31-36). For this reason the contoured distributions do not show the detail and variability shown by conductivity. Nevertheless, the results substantiate the conclusion based on the distribution of conductivity, i. e. the water quality in the vicinity of the Oak Creek Power Plant was a consequence of outflow from Milwaukee Harbor and discharges from sewer outfalls south of Milwaukee.

The highest chloride and sulfate concentrations occurred at the sampling points closest to shore. Chloride values were 9 mg/l nearshore and decreased to 4.5 mg/l offshore (Fig. 31). Sulfate was 23 mg/l nearshore and 19 to 20 mg/l offshore (Fig. 32).

Nitrates (Fig. 33) had a similar distribution to that of chloride and sulfate in the vicinity of the Oak Creek Power Plant, with the highest nitrate values nearshore. Some high nitrate values occurred offshore to the NE, however.

The highest concentrations of total (Fig. 34) and soluble reactive phosphorus (Fig. 35) were also nearshore. The fact that the highest concentrations occurred at station 81 (Fig. 2) north of the Oak Creek Power Plant suggests that the two sewer outfalls further north resulted in these unusually high phosphorus levels. As with the above chemicals, phosphorus decreased lakeward, but the magnitude of decrease was significantly greater for phosphorus than the other chemicals. Total phosphorus ranged from 65 μgP/l nearshore to 10 μgP/l offshore. Soluble reactive phosphorus decreased from 21 μgP/l nearshore to 1.5 μgP/l offshore. The nearshore phosphorus concentrations were within the range usually reported for Lake Erie and Green Bay.

Silica showed only slight inshore-offshore differences and ranged from 0.9 to 1.2 mg/l (Fig. 36). The highest value was nearshore.

Survey of June 28, 1972 -- Temperatures ranged from 12.6 to 17.2 C (Fig. 37). The lowest temperature was recorded at station 24 (Fig. 2). The maximum lake temperature was at the harbor entrance. The high temperature undoubtedly represented harbor water entering the lake, since the temperature of water in the harbor was 17.5 C.

Warm waters occurred nearshore from the harbor southward to the vicinity of South Milwaukee. Waters offshore were 13 to 14 C south of South Milwaukee. The lowest temperatures (13 C) were nearshore and the highest temperatures (16.5 C) were offshore. Sampling evidently was not close enough to the discharge of the Oak Creek Power Plant to detect any effect on the lake temperatures.

The warm waters extending from the harbor southward probably represent a situation that exists most of the time. Contrawise the low temperatures nearshore probably occur infrequently and may indicate upwelling.

Conductivity ranged from a high of 372.3 μmhos/cm at the harbor entrance to a low of 261.6 at station 47 (Fig. 2), 5 miles east of South Milwaukee (Fig. 38). The range values were less than observed on the April 12 survey south of the harbor, primarily because of the lower conductivity at the harbor entrance. The water sample from inside the harbor had a conductivity of 417.9 μmhos.

More of the samples had conductivity within the range of 266-271 μmhos (49%) as compared to April (36%); but only 32% of the samples had a conductivity greater than 271 μmhos -- in April 61% were above this value. Eleven percent had conductivities greater than 280 μmhos.

Nearshore waters north of South Milwaukee were generally in the highest conductivity range, i.e. values greater than 280 μmhos. South of South Milwaukee low conductivity water, 262 to 268 μmhos, was closest to shore and separated from offshore water by at least three distinct masses of water with conductivities between 270 and 283 μmhos (Fig. 38).

In general, the distribution of conductivity was closely similar to that of temperatures suggesting a movement of harbor water south to South Milwaukee and upwelling south of South Milwaukee.

Analyses for chloride, sulfate, nitrate, silica, total and soluble reactive phosphorus were made on water samples collected in the harbor and transects 1-15, 36-48, 71-83, and 108-120 (Fig. 2). Consequently, the same detail as shown in the distribution of conductivity (Fig. 38) is not possible in the plots of these chemicals.

Chloride concentrations ranged from 3.5 to 13 mg/l. The lowest concentrations were all offshore and the highest occurred at the harbor entrance (Fig. 39) indicating outflow of harbor water, since chloride at the harbor station was 16 mg/l. Chloride values nearshore off the power plant were 1.5 mg/l lower than nearshore values off Cudahy.

The distribution of sulfate was similar to that of chloride. The lowest concentrations (18 mg/l) were offshore and the highest (42 mg/l) was at the harbor entrance. The harbor value was 54 mg/l (Fig. 40). Sulfate concentrations were higher nearshore off of Cudahy than near the power plant.

The distribution of nitrate (Fig. 41) and silica (Fig. 42) showed some similarities in that the lowest concentrations occurred nearshore. The low nitrate values (0.12-0.13 mg/l) occurred nearshore off Cudahy and extended to just north of the power plant. The lowest silica values (0.2 mg/l) probably occurred nearshore from Milwaukee Harbor to north of the power plant. Offshore nitrate and silica concentrations were 0.18 and 0.7 mg/l. The highest nitrate value (0.29 mg/l) was at the harbor entrance. The high silica value (1.3 mg/l) occurred at the harbor station.

The distributions of total and soluble reactive phosphorus were closely similar (Figs. 43, 44). The lowest total (3 μg/l) and SRP (0.5 μg/l) values were offshore. Although concentrations of total (174 μg/l) and SRP (75 μg/l) were high at the harbor station, a mass of high phosphorus current water occurred off Cudahy (total P 99 and SRP 40 μg/l). Nitrate and conductivity values were relatively high in this same area (Figs. 41 and 38). Total phosphorus concentrations near the power plant ranged from 6 to 24 μg/l, SRP concentrations were 1.5 to 2 μg/l.

The distributions of these various chemicals did not closely reflect that of conductivity and therefore did not substantiate speculation on upwelling near the power plant. The low silica and nitrate concentrations nearshore were probably the result of uptake by diatoms and not caused by upwelling. Nevertheless, the conductivity reflects the concentrations of other chemicals in addition to those measured and the observed concentrations chloride, sulfate, and phosphorus, which are part of the sewage discharge, may have been low because of upwelling. In any case, the power plant had no obvious influence on water quality.

Near Field Surveys

Survey of October 10, 1972 -- Surface temperatures ranged from 10 C everywhere sampled, except at stations near the Oak Creek Plant and nearshore south of the plant (Fig. 45). The maximum temperature (16 C) was observed 0.5 mile south of the plant. Although this maximum temperature did not occur at the nearest sampling point to the plant, the distribution of temperatures indicates that the thermal plume extended over 1 mile offshore and at least 3 miles south of the plant.

The distribution of chloride was similar to that of temperature with the greatest concentrations (5.9 mg/l) nearshore south of the Oak Creek Plant (Fig. 46). The lowest concentrations (4 mg/l) were north and northwest of the plant. The low concentration, like the low temperatures, were nearshore north of the plant, but 1 to 2.5 miles offshore south of the plant.

Distributions of nitrate, sulfate, and total phosphorus were closely similar, and differed from that of chloride since the highest concentrations appeared to extend lakeward from a nearshore area about 1.5 miles south of the Oak Creek Plant (Figs. 47-49). Like chloride, concentrations of nitrate, sulfate, and total phosphorus were lower nearshore north of the plant than south of the plant. Nitrate concentrations ranged from 0.25 mg/l immediately north of the plant to a high of 0.30 mg/l south of the plant. The lowest sulfate concentration (17 mg/l) was offshore and the highest of 24 mg/l was nearshore south of the plant. Total phosphorus concentrations ranged from 50 μg/l north of the plant to a high of 290 μg/l south of the plant. Some relatively high phosphorus concentrations (100 μg/l) occurred near the sewer outfall. The reason for the very high phosphorus concentrations south of the plant is unknown, although, since concentrations of 250 μg/l or greater were all 1.5 to 2.5 miles from the plant, it appears the high values were not caused by the plant.

Silica concentrations ranged from 1.1 mg/l north and east of the plant, to 1.4 mg/l, 2.5 miles south of the plant (Fig. 50). The occurrence of the maximum value this distance south of the plant is similar to that of total phosphorus, but other aspects of the silica distribution are not closely similar to that of phosphorus.

Soluble reactive phosphorus (SRP) concentrated ranged from a low of 6 μg/l to a maximum of 30 μg/l (Fig. 51). The low value was from the furthest offshore sampling site. The high value was from nearshore 2 miles south of the plant. The highest soluble reactive phosphorus values also appeared to extend lakeward from the same area as for total phosphorus. Concentrations of SRP immediately north of and in the discharge water of the plant were closely similar. The lowest SRP concentrations north of the plant were nearshore and apparently increased offshore, although this is uncertain because only nearshore stations were sampled north of the plant.

The distribution of chlorophyll a (Fig. 52) appeared to resemble quite closely that of soluble reactive phosphorus (Fig. 51), but this resemblance was superficial, at least south of the power plant where chlorophyll a increased from shore lakeward and SRP decreased. North of the plant both chlorophyll a and SRP increased lakeward.

Total phosphorus (Fig. 49) and chlorophyll a had an inverse distribution both north and south of the plant. Chlorophyll a decreased from the shore lakeward and total phosphorus increased.

Maximum chlorophyll a concentrations (10.5 μg/l) occurred east of the plant. None of the chemical concentrations or temperatures were especially high in this area, which was at the edge of the thermal plume. Plots of all the chemical data, except chlorophyll a, indicate maximum concentrations nearshore about 2 miles south of the plant. The reason for this is uncertain, although a small stream enters the lake in this area. If this stream was the cause of the higher chemical concentrations, especially total phosphorus and SRP which are about 30 times greater than mid-lake values, the inflowing water must have had a temperature very close to that of nearshore waters as it had no apparent effect on distribution of temperatures. Chlorophyll a concentrations were low in this area, but this may be due to a diluting effect of inflowing water.

Survey of November 9, 1972 -- The distribution of surface temperatures (Fig. 53) was closely similar to that observed on October 10, 1972, and indicated the thermal plume from the plant fanned out and extended 3 miles or more from the plant. The lowest temperatures (8 C) were north and east of the plant. The highest temperature (14 C) was nearshore south of the plant.

Analyses of chloride, chlorophyll a, nitrate, total and soluble reactive phosphorus were made on all samples. No sulfate determinations were made. Silica was determined for one-third of the stations and were not plotted. These few values ranged from 0.5 to 0.9 mg/l.

The distribution of all the chemicals were not like that of temperature, but they were similar to each other since all, except chlorophyll a, had areas of high concentrations about 3 miles north and south of the Oak Creek Plant. Concentrations at the power plant were lower than at the aforementioned north and south locations. It appeared that offshore waters came closest to shore in the vicinity of the plant.

Chloride concentrations ranged from 7 mg/l offshore to 11.5 mg/l near the northern sewer outfall and 3 miles south of the plant (Fig. 54). Concentrations in the vicinity of the power plant intake and discharge were approximately 10 mg/l.

The distributions of nitrate, total phosphorus, and soluble reactive phosphorus (Figs. 55-57), were closely similar. Nitrate concentrations ranged from a low of 0.24 mg/l, about 1 mile east of the plant, to 0.34 near the sewer outfall. Concentrations in the immediate vicinity of the plant were 0.27 mg/l. The lowest concentrations of total phosphorus (30 μg/l) and SRP (10 μg/l) were about 1 miles east of the plant. The highest concentrations of total phosphorus (180 μg/l) was 3 miles south of the plant -- SRP was 29 μg/l. The maximum SRP (45 μg/l) occurred near the sewer outfall. Total phosphorus was 90-100 μg/l immediately north of the plant and 75-80 μg/l in the discharge area. SRP concentrations were around 25 μg/l at the plant.

The reasons for the observed distributions of chemicals north of and in the vicinity of the plant are obvious. It is uncertain as to why high concentrations occurred 3 miles south of the plant. It is possible for high chemical content waters from the Root River and Racine to move northward around Wind Point. Lack of more sampling locations near Wind Point precludes verification of this possibility.

The distribution of chlorophyll a (Fig. 58) differed from the above chemicals in that the lowest concentrations were nearshore. The lowest concentration (1.6 μg/l) occurred 2 miles south of the plant. Highest concentrations (5.75 μg/l) were over 1 mile east of the plant. Low concentrations occurred nearshore where concentrations of the above chemicals were high. The reason is unknown, although a greater turbidity nearshore would supress algal growth and result in higher concentrations of chemicals.

Survey of January 25, 1973 -- Surface temperatures ranged from 0.8 C at the outside stations, approximately one-half mile from shore, to 9 C in the discharge plume (Fig. 59). The highest temperatures were all in the vicinity of the discharge. Temperatures were 2 C or less, 1 mile from the plant indicating that the plume was sinking as it cooled to 4 C. Nearshore temperatures north and south of the plant did not exceed 1.5 C.

The distributions of chloride, nitrate, and silica were closely similar and did not indicate any influence of discharge from the plant on the nearshore waters (Figs. 60-62). The discharge waters could not be detected by the distributions of any of these. Lowest concentrations were offshore and concentrations were higher at the nearshore stations. Maximum concentrations all occurred in the vicinity of the sewer outfall.

Total phosphorus and SRP distributions showed slightly higher concentrations than expected, based on phosphorus content of adjacent nearshore waters, in the vicinity of the plant discharge (Figs. 63, 64). The lowest total phosphorus values (20 μg/l) were offshore. Nearshore concentrations ranged from 55 to 170 μg/l. The high concentrations were in the vicinity of the sewer outfall.

Chlorophyll a concentrations ranged from 3.5 to 8.75 μg/l (Fig. 65). The lowest concentration coincided with the maximum concentrations of all the chemicals just north of the sewer outfall. The maximum chlorophyll a occurred where concentrations of other chemicals were not especially low or high. Chlorophyll a content in water from the immediate vicinity of the plant showed no unusual levels that would indicate any effect of the plant.

Survey of February 28, 1973 -- The distribution of surface temperatures (Fig. 66) was similar to that of January. The lowest temperatures (0.2 C) were at the outside stations. Nearshore temperatures ranged from 0.5 to 1.2 C, except in the thermal plume where the maximum temperature was 7 C. The plume was sinking below the surface within one-half mile of the plant, since temperatures had decreased to 3 C at station 2.

The distributions of the chemicals did not indicate the presence of the thermal plume or any influence of the plant on the water quality. Considerable variability existed in the distributions and only for major features was there agreement among the distributions. In general, the highest concentrations were in the vicinity of the sewer outfall and concentrations were low in the vicinity of the power plant and southward.

Chloride concentrations ranged from a low of 7 mg/l nearshore north of the plant to a high of 19 mg/l, also nearshore only 1 mile further north (Fig. 67). Chloride levels were lower at the furthest north outside stations, whereas the reverse occurred just north of the plant. The chloride content of samples taken near the plant and to the south was around 10 mg/l.

Nitrate concentrations ranged from 0.26 to 0.40 mg/l (Fig. 68). The maximum concentrations were near the sewer outfall and decreased lakeward and toward the power plant. Near and south of the plant the lowest concentrations (0.27 mg/l) were nearshore and increased to 0.30 mg/l offshore.

Total phosphorus concentrations ranged from 38 μg/l, at the farthest south station, to 94 μg/l the first station south of the sewer outfall (Fig. 69). North of the power plant phosphorus decreased from shore lakeward. A similar situation existed one-half mile south of the plant. Two miles south of the plant low phosphorus concentrations were nearest shore and increased offshore. Nitrate distribution was similar in this area. Phosphorus in the thermal plume was lower than in adjacent waters.

The distribution of SRP was similar to nitrate, since the maximum concentration (33.6 μg/l) was near the sewer outfall (Fig. 70). Concentrations decreased toward the plant and lakeward to a low of 5 μg/l. Near the plant and southward SRP was 6 μg/l nearshore and 5 μg/l offshore.

Silica concentrations varied little from station to station and ranged from a low of 1 mg/l at the furthest southern outside station, to a high of 1.2 mg/l near the sewer outfall (Fig. 71).

Chlorophyll a concentrations were 3 μg/l in the thermal plume and 1 mile north nearshore (Fig. 72). The highest concentrations (4 μg/l) were offshore near the plant and nearshore at stations north and south. Any trend in chlorophyll a values in relationship to other chemical data was not apparent.

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Table 1. Station coordinates from far-field survey of Lake Michigan in the vicinity of Wisconsin Electric Power Company's Oak Creek, Wisconsin power generating station.

Station Number	Latitude, N.	Longitude, W.
1	42° 51' 36"	87° 49' 07"
2	42° 51' 42"	87° 49' 02"
3	42° 52' 06"	87° 47' 03"
4	42° 50' 12"	87° 49' 00"
5	42° 50' 18"	87° 48' 05"
6	42° 50' 42"	87° 47' 02"
7	42° 52' 00"	87° 43' 09"
8	42° 53' 06"	87° 38' 01"
9	43° 15' 12"	87° 54' 03"
10	43° 15' 12"	87° 53' 05"
11	43° 15' 12"	87° 52' 02"
12	43° 15' 06"	87° 48' 06"
13	43° 14' 48"	87° 42' 07"
14	42° 48' 37"	87° 47' 04"
15	42° 48' 42"	87° 47' 03"
16	42° 49' 06"	87° 45' 09"
17	42° 50' 06"	87° 42' 02"

Table 2. Dates on which monthly sampling took place, 1971-72.

Month	Days
September	13, 14
October	4, 5
November	3, 8
December	6, 7
January	19, 31
February	21, 24
April	12, 13
June	26, 27

Table 3. Results of chemical and chlorophyll variability analysis. Parameters measured are shown with their respective means, standard deviations (S.D.), coefficients of variation (C.V.), and 95 percent confidence limits (± .95) for both inshore (1/4 mile east of Milwaukee) and offshore (10 miles east of Milwaukee) locations. Ten replicate samples collected on 28 November, 1972 were used to determine each mean.

INSHORE

Parameter	Units	Mean	S.D.	C.V.(%)	±.95(%)
total phosphorus	μg P/l	16.82	3.66	21.8	15.6
soluble reactive phosphorus	μg P/l	4.85	1.38	28.4	20.0
nitrate nitrogen	mg N/l	0.25	0.01	4.3	4.0
silica	mg SiO_2/l	0.99	0.06	6.4	5.6
sulfate	mg SO_4/l	18.40	0.77	4.2	2.9
chloride	mg Cl^-/l	9.38	0.93	9.9	7.0
conductivity	μmhos/cm	272.10	5.02	1.8	1.4
chlorophyll *a*	mg chlorophyll *a*/m^3	2.66	0.42	15.7	10.9

OFFSHORE

Parameter	Units	Mean	S.D.	C.V.(%)	±.95(%)
total phosphorus	μg P/l	7.82	3.22	41.1	29.5
soluble reactive phosphorus	μg P/l	1.61	1.27	79.1	55.9
nitrate nitrogen	mg N/l	0.23	0.01	4.1	4.3
silica	mg SiO_2/l	0.89	0.07	8.3	5.6
sulfate	mg SO_4/l	17.70	1.09	6.1	4.4
chloride	mg Cl^-/l	7.06	1.99	28.2	20.1
conductivity	μmhos/cm	259.51	5.92	2.3	1.6
chlorophyll *a*	mg chlorophyll *a*/m^3	1.76	0.31	17.9	13.1

Table 4. Phytoplankton group abbreviations used in Table 14 and the names of the taxonomic categories they represent.

ABBREVIATION	TAXONOMIC NAME
ANKIST	*Ankistrodesmus* spp.
CHLLIK	*Chlorella* spp.
CLOSTE	*Closterium* spp.
COSMAR	*Cosmarium* spp.
CRUCGI	*Crucigenia* spp.
GREFIL	Green filaments
COLENK	*Colenkinia* spp.
OCYSTA	*Oocystis* sp. A
OCYSTB	*Oocystis* sp. B
PEDIAS	*Pediastrum* spp.
SCENED	*Scenedesmus* spp.
SELENA	*Selenastrum* spp.
STARAS	*Starastrum* spp.
TETRAS	*Tetrastrum* spp.
TETRAE	*Tetraedron* spp.
ANABAE	*Anabaena* spp.
CHROOC	*Chroococcus* spp.
COLONY	Blue green colonies
BGRFIL	Blue green filaments
CHRYSO	*Chrysochromulina* spp.
DINOBR	*Dinobryon* spp.
MALLOM	*Mallomonas* spp.
CRYPTO	*Cryptomonas* spp.
RHODOM	*Rhodomonas* spp.
CERATM	*Ceratium* spp.
GYMNOD	*Gymnodinium* spp.
ASTFOR	*Asterionella formosa*
CENTRI	Centrics other than *Melosira* spp.
MELOSI	*Melosira* spp.
NEEDLE	Needle shaped diatoms (*Fragilaria*, *Synedra*)
OTHPEN	Other Pennales (*Achnanthes*, *Cocconeis*, *Amphipora*)
TABELL	*Tabellaria* spp.

Table 5. Zooplankton group abbreviations used in Tables 6, 7, and 13 and the names of the taxonomic categories they represent.

ABBREVIATION	TAXONOMIC NAME
ALOAFF	*Alona affinis*
BOSMIN	*Bosmina longirostris*
CERLAC	*Ceriodaphnia lacustris*
CERQUA	*Ceriodaphnia quadrangula*
CHYSPH	*Chydorus sphaericus*
DAPGAL	*Daphnia galeata-mendotae*
DAPLON	*Daphnia longiremis*
DAPRET	*Daphnia retrocurva*
DAPSCH	*Daphnia schodleri*
DIALEU	*Diaphanosoma leuchtenbergianum*
EUBOSM	*Eubosmina coregoni*
HOLGIB	*Holopedium gibberum*
LEPTKI	*Leptodora kindtii*
POLYPE	*Polyphemus pediculus*
CANTRO	*Canthocamptus robertcokeri*
COPNAU	*Copepoda nauplii*
CYCBIC	*Cyclops bicuspidatus*
CYCIMM	immature *Cyclops* spp.
DIAASH	*Diaptomus ashlandi*
DIAIMM	immature *Diaptomus* spp.
DIAMIN	*Diaptomus minutus*
DIAORG	*Diaptomus oregonensis*
DIASIC	*Diaptomus sicilis*
EPILAC	*Epischura lacustris*
EURAFF	*Eurytemora affinis*
LIMCAL	*Limnocalanus macrurus*
MESEDA	*Mesocyclops edax*
SENCAL	*Senecella calanoides*

Table 5 (continued).

ABBREVIATION	TAXONOMIC NAME
TROPRA	*Tropocyclops prasinus*
HYDRAS	*Hydra* spp.
INSECT	Insecta
MYSREL	*Mysis relicta*
NEMTOD	Nematoda
OLIGCH	Oligochaeta
OSTRAC	Ostracoda

Table 6. Variability of zooplankton counts from five, five-percent subsamples (sub 1-sub 5) from a zooplankton sample taken at station 1 (Fig. 1) on 8 November 1971, with standard deviation (S.D.), the coefficient of variation (C.V.), and the 95 percent confidence limits (±.95), shown for each taxonomic group. Refer to Table 5 for abbreviations for taxonomic groups.

Taxonomic Group	Number of Individuals/Cubic Meter								
	sub 1	sub 2	sub 3	sub 4	sub 5	mean	S.D.	C.V. (%)	±.95(%)
ALOAFF	20	21	41	0	0	16	17	107	133
BOSMIN	6630	6569	5712	7772	7242	6785	7473	110	137
CHYSPH	41	82	61	82	41	61	20	33	41
DAPRET	1326	1714	1326	1469	1448	1457	159	11	14
EUBOSM	816	1204	816	1367	1183	1077	249	23	29
HOLGIB	20	143	122	224	163	134	74	55	69
CYCBIC	12,791	11,914	11,954	14,851	12,587	12,819	1199	9	12
CYCIMM	245	163	204	0	0	122	115	95	117
DIAASH	449	408	408	469	571	461	489	106	132
DIAIMM	122	82	122	0	82	82	50	61	76
DIAMIN	0	82	61	143	102	78	53	68	84
DIAORG	367	224	245	327	306	294	59	20	25
DIASIC	61	41	20	143	82	70	47	67	83
EPILAC	0	82	20	0	0	20	36	178	223
EURAFF	102	0	0	0	0	20	46	228	285
LIMCAL	0	0	0	0	41	8	18	229	279
NEMTOD	41	0	0	0	0	8	18	229	279

Table 7. Concentrations of zooplankton produced by duplicate counts of five samples, all collected at stations one-quarter mile from shore, with the percentage of the sample counted indicated above each column. Refer to Table 5 for abbreviations for taxonomic groups.

Taxonomic Group	Station 4 September 1971		Station 1 December 1971		Station 4 December 1971		Station 14 April 1972		Station 9 June 1972	
	10%	5%	10%	5%	10%	5%	10%	5%	10%	5%
BOSMIN	10,931	12,172	453	599	551	734			17	17
CERLAC	34	51								
CHYSPH	9	34			10					
DAPGAL		17	29		112	102				
DAPLON			7		61					
DAPRET	248	2091	358	263	235	490				
EUBOSM	748	969	504	496	724	918				
HOLGIB	476	408			10					
LEPTKI	9									
POLYPE	119	17								
CANTRO	9				10		2			
COPNAU	1420		124		194				428	442
CYCBIC	927	1530	3708	4935	6824	9241	46	84	9	
CYCIMM	1275	1904	883	58	1601	592			1134	1173
DIAASH	51	119	737	876	734	898	1			
DIAIMM	1122	1122	394		490	61			595	680
DIAMIN	9		161	131	133	41				
DIAORG	17	34	358	409	163	245				
DIASIC				175	10	82				
EPILAC	9		22	15	10	41				
EURAFF	26	102	22	15	51	41				
MESEDA		102								
TROPRA	26		124	88	143	102			9	17
INSECT									9	17

Table 8. Primary production rates of intake water incubated at intake temperature (IL) and various combinations of intake and discharge water incubated at intake and discharge temperatures on the indicated sampling dates with the comparisons between the mixed samples and the IL sample shown. The averages of each comparison are shown at the bottom of the column. Differences are expressed as percent deviations from IL. The intake and discharge temperature are in Table 9. Asterisks indicate the percent deviation is significant at the 95% confidence level.

DATE	IL	2/1-H	2/1-L	1/1-H	1/1-L	1/2-H	1/2-L	%dev. IL-2/1-H	%dev. IL-2/1-L	%dev. IL-1/1-H	%dev. IL-1/1-L	%dev. IL-1/2-H	%dev. IL-1/2-L
	mg C fixed/cubic meter/hour												
24 Nov. 72	3.63	4.96	4.22	5.80	4.57	5.36	5.30	37*	16	60*	26	48*	46*
31 Jan. 73	4.82	7.43	5.04	10.50	3.83	7.08	8.08	54	6	118*	-21	47	68*
27 Feb. 73	2.09	3.55	2.55	2.93	2.55	2.85	2.28	70*	22	40	22	36	9
28 Mar. 73	5.17	5.38	5.57	6.12	6.04	5.97	4.58	4	8	18*	17*	15	-11*
30 May 73	8.94	12.97	10.05	13.44	8.86	11.37	11.31	45*	12*	50*	-1	27*	27
							Average =	42	13	57	9	35	28

Abbreviation	Meaning
IL	Intake sample incubated at intake (or low) temperature.
IH	Intake sample incubated at discharge (or high) temperature.
DL	Discharge sample incubated at intake (or low) temperature.
DH	Discharge sample incubated at discharge (or high) temperature.
2/1-H	Sample composition = 2 parts discharge water; 1 part intake water; incubated at discharge (or high temperature.
2/1-L	Sample composition = 2 parts discharge water; 1 part intake water; incubated at intake (or low) temperature.
1/1-H	Sample composition = 1 part discharge water; 1 part intake water; incubated at discharge (or high) temperature.
1/1-L	Sample composition = 1 part discharge water; 1 part intake water; incubated at intake (or low) temperature.
1/2-H	Sample composition = 1 part discharge water; 2 parts intake water; incubated at discharge (or high) temperature.
1/2-L	Sample composition = 1 part discharge water; 2 parts intake water; incubated at intake (or low) temperature.

Table 9. Primary production rates of intake and discharge waters incubated at intake and discharge temperatures on the indicated sampling dates. Table 10 presents the comparisons used to assess power plant impact. The averages of each comparison are shown at the bottom of the column. Differences are expressed as percent deviations from the production rate of intake water incubated at intake temperature (IL). Asterisks indicate the percent deviation is significant at the 95% confidence level.

Date	Intake temp (°C)	Discharge temp (°C)	IL	IH	DL	DH	IL-IH % dev.	IL-DH % dev.	IL-DL % dev.
			mg C fixed/cubic meter/hour						
18 Oct. 72	9.0	14.0	9.69			10.55		9	
24 Oct. 72	11.0	14.0	5.48	6.36		15.19	16	177*	
30 Oct. 72	9.2	13.4	10.02	11.37	10.63	12.55	13	25*	6
24 Nov. 72	6.5	10.2	3.63	4.96	4.29	4.69	37*	29*	18*
18 Dec. 72	2.5	5.5	2.62	3.71	2.57	4.25	42*	62*	-2
13 Jan. 73	5.9	10.0	4.82	6.43	4.36	10.17	33	111*	-10
22 Feb. 73	2.5	5.5	2.09	2.75	2.56	3.74	32	79*	22
28 Mar. 73	8.0	11.0	5.17	6.66	5.70	7.00	29	35*	10
30 Mar. 73	11.6	15.5	8.94	8.32	10.56	13.39	-7	50*	18*
					Average =		24	64	9

Table 10. Explanation of sample manipulations and comparisons used to assess the effects of the power plant on rates of primary production (adapted from Brooks 1972).

Effect Measured	Sample Collected at		Incubation Temperature	Compared with	Sample Collected at		Incubation Temperature
Net entrainment (temp., pressure, pumps, turbulence)	Intake	(IL)	Intake	-----	Discharge	(DH)	Discharge
Mechanical (pumping, pressure, turbulence)	Intake	(IL)	Intake	-----	Discharge	(DL)	Intake
Temperature (thermal elevation)	Intake	(IL)	Intake	-----	Intake	(IH)	Discharge

Table 11. Results of chemical and chlorophyll analysis of intake and discharge waters on ten sampling dates indicated with the percent deviation (dev. %) of the discharge (D) from the intake (I) water shown for each parameter measured. Asterisks near the percent deviation figures indicate that the deviation is greater than the inshore 95% confidence limit determined for that parameter (Table 3).

	16 November 71			30 November 71			24 October 72			30 October 72			24 November 72		
	I	D	dev(%)	I	D	dev(%)	I	D	dev(%)	I	D	dev(%)	I	D	dev(%)
total phosphorus (μg P/l)	46	50	10	139	114	-18*	428	428	0	87	88	1	--	--	--
soluble reactive phosphorus (μg P/l)	--	--	--	2.1	0.7	-67*	19	14	-26*	21.5	16	-26*	--	--	--
nitrate-nitrogen (mg N/l)	--	--	--	0.29	0.29	0	0.37	0.37	0	0.29	0.29	0	--	--	--
silica (mg SiO_2/l)	--	--	--	0.8	0.8	0	1.4	1.5	7*	0.8	0.7	-13*	--	--	--
conductivity (μmhos/cm)	--	--	--	--	--	--	331.8	330.0	-1*	291.9	296.4	2*	275.5	270.0	1
sulfate (mg SO_4/l)	19.5	19.5	0	22	22.5	2	--	--	--	--	--	--	--	--	--
chlorophyll <u>a</u> (mg/m)	--	--	--	--	--	--	7.59	7.79	3	3.67	4.01	9	2.68	2.53	-6

Table 11. Continued

	18 December 72			31 January 72			27 February 72			28 March 72			30 May 73		
	I	D	dev(%)	I	D	dev(%)	I	D	dev(%)	I	D	dev(%)	I	D	dev(%)
total phosphorus (μg P/l)	42	45	7	295	340	15	85	83.5	-2	50	51	2	231	231	0
soluble reactive phosphorus (μg P/l)	8.1	8.1	0	14.8	21	42*	12.3	9.8	-20	7	6.4	-9	7.2	8.1	13
nitrate-nitrogen (mg N/l)	0.25	0.24	-4	0.32	0.33	3	0.23	0.24	4	0.27	0.27	0	0.4	0.4	0
silica (mg SiO_2/l)	1.1	1.1	0	0.7	0.7	0	1.0	1.1	10*	0.7	0.8	14*	0.2	0.3	50*
conductivity (μmhos/cm)	275.5	277	1	302	307.5	2*	266	267.5	1	--	--	--	--	--	--
chlorophyll _a_ (mg/m)	3.65	3.62	-1	12.9	8.98	-30*	4.41	3.96	-10	5.6	5.38	-4	14.28	13.84	-3

Table 12. Surface temperatures (°C) on sampling dates when bathythermograph was not used.

Station	September 1971	January 1972	February 1972	April 1972
1	19.5	1.5	0.2	4.8
2	19.9	1.7	0.2	4.1
3	19.4	1.5	0.2	3.3
4	----	2.0	0.2	4.4
5	19.7	1.6	0.2	4.6
6	19.5	2.5	0.2	3.6
7	19.6	1.5	0.2	2.7
8	19.2	2.0	0.5	2.5
9	18.8	1.5	2.0	3.2
10	18.7	1.8	0.6	2.8
11	19.0	3.8	1.0	2.5
12	19.0	4.5	1.0	2.6
13	19.3	5.5	1.3	2.7
14	----	1.3	0.2	4.0
15	----	1.3	0.2	5.0
16	----	1.3	0.2	3.5
17	----	1.5	0.5	2.7

Table 13. ZOOPLANKTON CONCENTRATIONS FROM OAK CREEK, WISCONSIN POWER PLANT STUDY
(NUMBER OF INDIVIDUALS / CUBIC METER)
LOCATIONS OF STATIONS ARE INDICATED IN FIGURE 1
MEANINGS OF SPECIES ABBREVIATIONS ARE INDICATED IN TABLE 5.

SEPTEMBER, 1971

SPECIES ABBREVIATIONS	STATION NUMBERS 1	2	3	4	5	6	7	8	9	10	11	12	13
ALOAFF	20	46	0	0	0	0	0	0	0	0	0	0	0
BOSMIN	23882	5150	1643	12158	1732	1087	1980	117	24778	16153	1436	267	353
CERLAC	82	65	32	51	28	34	0	3	20	9	5	2	6
CERQUA	0	0	6	0	0	0	0	0	0	0	0	0	0
CHYSPH	143	120	32	34	19	34	13	16	0	9	14	4	5
DAPGAL	0	0	38	17	56	34	22	6	41	0	19	0	6
DAPLON	0	0	0	0	0	0	0	0	0	0	0	0	8
DAPRET	2160	3112	8539	2099	5363	5726	1861	629	1060	2612	1111	189	660
DAPSCH	0	0	0	0	0	0	0	0	0	0	0	0	0
DIALEU	0	0	0	0	0	0	0	3	0	0	0	0	0
EUBOSM	1121	1806	2445	969	1676	1694	660	129	958	1630	1181	104	248
HOLGIB	224	722	2312	408	3483	1943	514	165	143	565	468	41	221
LEPTKI	0	111	51	0	37	7	9	9	0	19	5	0	6
POLYPE	0	46	6	17	0	7	0	1	0	0	0	2	0
CANTRO	0	0	0	0	0	0	0	0	0	0	0	0	0
COPNAU	0	806	1089	0	639	992	275	322	0	2112	301	117	0
CYCBIC	5196	945	745	1528	750	591	509	243	3444	380	625	76	208
CYCIMM	4014	7595	6361	1902	2834	7118	1736	1952	11493	9355	2524	1156	1758
DIAASH	408	278	529	119	222	285	97	180	204	65	88	44	359
DIAIRM	1100	2121	8195	1121	2167	9102	3632	1834	2914	4187	1644	561	1766
DIAMIN	0	74	64	0	83	61	18	3	0	9	0	0	2
DIAORG	0	65	280	34	222	20	124	25	0	9	14	4	21
DIASIC	0	232	0	0	19	109	0	19	0	0	0	0	12
EPILAC	0	46	0	0	74	0	0	6	0	0	5	0	1
EURAFF	0	157	13	102	120	0	4	3	0	0	0	0	0
LIMCAL	0	0	0	0	0	0	0	6	0	0	0	2	44
MESEDA	0	0	0	102	0	0	0	0	0	0	0	0	0
SENCAL	0	0	0	0	0	0	0	0	0	0	0	0	0
TROPRA	0	74	414	0	120	98	173	87	102	102	9	4	18
HYDRAS	0	0	0	0	0	0	0	0	0	0	0	0	0
INSECT	0	0	0	0	0	7	0	0	0	0	0	0	0
MYSREL	0	0	0	0	0	20	0	0	0	0	0	0	3
NEMTOD	0	28	0	0	0	0	0	0	0	0	0	0	0
OLIGCH	0	0	0	0	0	0	0	0	0	0	0	0	0
OSTRAC	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 13. ZOOPLANKTON CONCENTRATIONS FROM OAK CREEK, WISCONSIN POWER PLANT STUDY
(NUMBER OF INDIVIDUALS / CUBIC METER)
LOCATIONS OF STATIONS ARE INDICATED IN FIGURE 1
MEANINGS OF SPECIES ABBREVIATIONS ARE INDICATED IN TABLE 5.

OCTOBER, 1971

SPECIES ABBREVIATIONS	STATION NUMBERS																
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
ALOAFF	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
BOSMIN	4218	4149	3704	3810	8642	5158	1169	89	815	417	641	191	283	4832	1231	3315	713
CERLAC	0	0	7	0	9	6	0	0	0	0	4	0	2	29	0	8	0
CERQUA	0	0	0	41	0	0	0	0	0	0	0	0	0	0	0	0	0
CHYSPH	0	28	29	82	28	13	13	2	0	9	13	4	15	0	8	8	8
DAPGAL	0	28	22	0	0	0	27	0	0	9	0	2	7	0	17	8	0
DAPLON	61	37	7	0	0	0	0	2	0	0	0	0	1	0	0	0	13
DAPRET	3057	1751	1550	2201	1287	1350	1745	418	73	333	1019	731	250	2824	2768	799	1562
DAPSCH	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DIALEU	0	0	29	0	0	0	4	11	0	0	0	5	2	15	8	16	30
EUBOSM	1467	797	1259	408	417	732	602	121	262	398	233	284	490	262	535	588	442
HOLGIB	82	9	22	41	9	19	31	24	0	0	0	44	8	0	8	24	8
LEPTKI	0	28	7	0	0	0	9	4	0	9	8	4	2	0	0	8	13
POLYPE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CANTRO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
COPNAU	0	4946	1834	0	1454	3343	983	271	0	1315	819	451	32	1834	1138	1677	934
CYCBIC	25247	1037	560	32929	1751	713	744	115	7700	1121	310	222	166	684	2420	647	1265
CYCIMM	4198	11068	6885	1793	11411	8507	8496	2007	1310	4631	3124	3806	1182	23535	8406	5275	8839
DIAASH	10841	445	175	2221	185	153	173	100	1194	157	115	140	36	15	323	188	250
DIAIMM	1977	10494	7670	1019	9197	7438	3978	2913	146	8030	4534	4730	614	2052	7132	7179	8588
DIAMIN	41	0	0	245	0	0	9	2	29	0	0	0	1	0	0	0	4
DIAORG	795	120	15	346	74	32	13	7	116	28	0	42	4	15	17	24	51
DIASIC	571	46	73	224	46	32	49	39	15	74	98	58	13	0	25	86	174
EPILAC	41	28	36	20	28	64	84	24	0	9	21	38	2	44	76	78	81
EURAFF	0	0	44	0	28	13	13	0	0	0	4	0	0	15	0	0	0
LIMCAL	0	0	0	0	0	0	0	48	0	0	55	7	60	0	0	0	0
MESEDA	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0
SENCAL	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
TROPRA	1752	1223	1237	1039	389	936	1338	59	509	74	191	571	47	3246	433	580	391
HYDRAS	0	9	0	0	0	6	0	0	0	0	0	0	0	0	8	8	0
INSECT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MYSREL	0	0	0	0	0	0	0	0	0	0	0	0	0	15	0	0	0
NEMTOD	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
OLIGCH	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
OSTRAC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 13. ZOOPLANKTON CONCENTRATIONS FROM OAK CREEK, WISCONSIN POWER PLANT STUDY
(NUMBER OF INDIVIDUALS / CUBIC METER)
LOCATIONS OF STATIONS ARE INDICATED IN FIGURE 1
MEANINGS OF SPECIES ABBREVIATIONS ARE INDICATED IN TABLE 5.

NOVEMBER, 1971

SPECIES ABBREVIATIONS	STATION NUMBERS 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
ALOAFF	20	0	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0
BOSMIN	8355	5474	771	19780	0	2023	219	170	7820	1111	1167	228	153	6979	6363	1295	340
CERLAC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CERQUA	0	0	0	0	0	0	0	0	0	0	0	0	0	51	0	0	0
CHYSPH	41	65	22	87	0	51	20	15	0	0	4	9	4	17	37	22	10
DAPGAL	0	93	560	73	0	36	290	75	0	130	25	90	112	34	56	196	568
DAPLON	0	19	15	0	0	0	25	10	0	0	0	1	5	0	19	36	58
DAPRET	1752	3575	3420	902	0	1652	678	856	815	1334	620	719	372	3413	1936	2271	1213
DAPSCH	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DIALEU	0	9	0	0	0	7	5	5	0	0	0	1	1	0	0	7	15
EUBOSM	1100	2575	2809	2795	0	1616	1528	1375	204	398	170	578	391	391	1852	2009	1921
HOLGIB	143	111	218	466	0	124	194	92	153	120	34	40	53	34	102	146	227
LEPTKI	0	9	0	0	0	0	0	0	0	9	0	4	2	17	9	15	5
POLYPE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CANTRO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
COPNAU	0	509	786	0	0	495	382	335	0	954	149	309	52	0	343	160	0
CYCBIC	15344	2640	1033	3741	0	968	382	109	739	2103	467	163	333	33096	852	735	805
CYCIMM	509	7669	11076	204	0	8114	1223	3326	2725	6928	4801	1094	860	2887	5747	7256	1232
DIAASH	306	176	611	291	0	226	683	230	0	157	144	106	75	1749	398	335	776
DIAIMM	632	2945	4599	306	0	2402	5283	3399	178	1945	1286	1654	1182	475	2649	3530	6205
DIAMIN	20	37	29	0	0	73	10	7	0	19	4	9	5	0	139	51	24
DIAORG	183	408	502	44	0	153	214	99	25	389	187	76	101	119	611	437	291
DIASIC	61	0	15	15	0	320	87	32	0	65	34	33	36	204	19	15	184
EPILAC	41	74	182	58	0	58	10	15	0	56	17	12	2	68	28	0	59
EURAFF	20	46	7	160	0	0	10	0	0	0	17	0	0	34	28	0	5
LIMCAL	0	0	7	15	0	0	5	5	0	0	0	96	80	0	0	0	5
MESEDA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SENCAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TROPRA	265	565	619	189	0	815	530	213	25	93	30	114	87	2802	287	480	398
HYDRAS	0	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
INSECT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MYSREL	0	0	0	0	0	7	0	0	0	0	0	0	0	0	0	0	0
NEMTOD	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
OLIGCH	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
OSTRAC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 13. ZOOPLANKTON CONCENTRATIONS FROM OAK CREEK, WISCONSIN POWER PLANT STUDY
(NUMBER OF INDIVIDUALS / CUBIC METER)
LOCATIONS OF STATIONS ARE INDICATED IN FIGURE 1
MEANINGS OF SPECIES ABBREVIATIONS ARE INDICATED IN TABLE 5.

DECEMBER, 1971

SPECIES ABBREVIATIONS	STATION NUMBERS 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
ALOAFF	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
BOSMIN	597	889	55	734	491	8	0	5	224	148	13	8	8	932	315	37	11
CERLAC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CERQUA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CHYSPH	0	0	8	0	9	0	0	0	0	0	0	0	0	29	19	0	0
DAPGAL	0	65	16	102	74	8	0	15	41	0	0	3	11	306	130	56	0
DAPLON	0	9	0	0	74	0	0	0	0	0	0	0	0	0	65	0	0
DAPRET	262	611	149	489	102	63	5	2	204	130	4	3	2	830	176	56	11
DAPSCH	0	0	0	0	28	0	0	0	0	0	0	0	0	0	0	0	0
DIALEU	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
EUBOSM	495	1093	384	917	1204	110	11	10	61	19	13	8	36	1106	982	426	32
HOLGIB	0	0	0	0	0	0	0	2	0	0	0	0	0	0	9	9	5
LEPTKI	0	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
POLYPE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CANTRO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
COPNAU	0	56	423	0	241	400	174	104	0	176	381	110	152	0	176	361	204
CYCBIC	4920	1584	1097	9231	2705	329	188	7	591	204	84	95	123	4527	797	639	193
CYCIMM	58	2899	4820	591	6965	2868	1995	1489	856	1149	1183	1223	1027	12459	4214	5706	1539
DIAASH	873	1297	1019	897	769	627	611	425	285	324	465	440	495	1266	1028	1019	327
DIAIMM	0	843	572	61	1056	384	327	374	102	343	133	564	637	0	611	963	418
DIAMIN	131	74	149	41	65	47	54	49	41	37	40	30	25	247	130	74	32
DIAORG	408	500	243	245	102	118	32	49	611	250	62	53	38	815	185	185	64
DIASIC	175	19	47	82	28	63	80	61	61	9	40	99	72	116	65	120	38
EPILAC	15	9	16	41	9	16	5	15	102	46	18	3	1	44	0	9	0
EURAFF	15	19	0	41	0	16	0	0	0	28	4	2	0	29	9	9	0
LIMCAL	0	0	8	0	9	24	78	87	0	37	9	5	32	0	9	9	11
MESEDA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SENCAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TROPRA	87	111	94	102	111	55	21	17	41	28	22	16	34	131	139	148	39
HYDRAS	0	9	0	0	0	0	0	0	0	0	0	0	0	0	9	9	0
INSECT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MYSREL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NEMTOD	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
OLIGCH	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
OSTRAC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 13. ZOOPLANKTON CONCENTRATIONS FROM OAK CREEK, WISCONSIN POWER PLANT STUDY
(NUMBER OF INDIVIDUALS / CUBIC METER)
LOCATIONS OF STATIONS ARE INDICATED IN FIGURE 1
MEANINGS OF SPECIES ABBREVIATIONS ARE INDICATED IN TABLE 5.

JANUARY, 1972

SPECIES ABBREVIATIONS	STATION NUMBERS 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
ALOAFF	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
BOSMIN	0	0	0	0	19	0	0	2	0	0	5	2	1	0	0	0	0
CERLAC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CERQUA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CHYSPH	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DAPGAL	0	0	0	0	0	0	0	0	0	0	0	3	1	0	0	0	0
DAPLON	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DAPRET	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0
DAPSCH	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DIALEU	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
EUBOSM	0	0	8	0	28	0	5	5	0	0	0	0	2	0	0	0	0
HOLGIB	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0
LEPTKI	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
POLYPE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CANTRO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CCPNAU	0	0	0	0	56	9	175	145	0	111	102	58	33	0	143	124	184
CYCBIC	1732	242	823	1630	111	93	131	229	34	65	73	70	136	543	82	29	330
CYCIMM	170	726	964	68	491	797	1679	2063	85	593	965	1849	952	781	886	1921	2178
DIAASH	374	331	721	272	287	408	514	1460	51	157	500	961	758	221	275	667	1106
DIAIMM	0	51	259	68	46	102	53	86	0	74	121	241	124	153	82	196	165
DIAMIN	0	140	141	0	46	74	73	120	0	19	102	90	105	0	71	87	136
DIAORG	102	51	212	102	9	56	49	125	17	19	82	46	61	17	31	73	73
DIASIC	34	25	94	34	0	0	39	97	17	0	5	73	88	34	31	80	78
EPILAC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
EURAFF	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
LIMCAL	0	76	118	68	19	37	24	66	68	19	92	19	3	17	41	187	39
MESEDA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SENCAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TROPRA	34	25	55	0	9	56	15	41	17	28	44	32	47	34	51	65	44
HYDRAS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
INSECT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MYSREL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NEMTOD	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
OLIGCH	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
OSTRAC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 13. ZOOPLANKTON CONCENTRATIONS FROM OAK CREEK, WISCONSIN POWER PLANT STUDY
(NUMBER OF INDIVIDUALS / CUBIC METER)
LOCATIONS OF STATIONS ARE INDICATED IN FIGURE 1
MEANINGS OF SPECIES ABBREVIATIONS ARE INDICATED IN TABLE 5.

FEBRUARY, 1972

SPECIES ABBREVIATIONS	STATION NUMBERS 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
ALOAFF	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
BOSMIN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CERLAC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CERQUA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CHYSPH	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DAPGAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DAPLON	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DAPRET	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DAPSCH	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DIALEU	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
EUBOSM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
HOLGIB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
LEPTKI	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
POLYPE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CANTRO	82	61	36	102	28	22	0	0	306	9	0	0	0	119	51	109	5
COPNAU	0	0	0	0	46	29	0	54	0	0	204	57	74	0	0	15	63
CYCBIC	143	112	262	306	46	109	0	37	245	352	150	33	132	543	25	15	194
CYCIMM	61	224	640	127	1260	488	0	1806	143	593	1674	1672	1095	509	1766	1230	1538
DIAASH	61	255	240	255	556	364	0	1061	509	658	1344	700	907	340	688	458	1116
DIAIMM	41	143	65	25	139	36	0	128	143	93	233	191	132	136	178	87	121
DIAMIN	0	31	124	25	93	95	0	115	20	65	160	118	50	0	221	107	136
DIAORG	0	20	36	25	111	36	0	74	550	74	107	57	56	34	102	73	78
DIASIC	41	41	59	25	46	51	0	44	61	37	63	48	71	17	34	58	53
EPILAC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
EURAFF	0	0	0	0	0	0	0	0	0	0	0	0	0	17	0	0	0
LIMCAL	41	112	167	102	380	51	0	17	82	65	87	19	18	68	365	87	15
MESEDA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SENCAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TROPRA	0	10	15	0	19	36	0	33	61	28	63	38	23	0	8	15	34
HYDRAS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7	0
INSECT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MYSREL	0	0	0	0	0	0	0	0	61	9	0	0	0	0	0	0	0
NEMTOD	0	0	0	0	0	7	0	0	0	0	0	0	0	0	0	7	0
OLIGCH	0	0	0	0	0	7	0	0	0	0	0	0	0	0	0	0	0
OSTRAC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 13. ZOOPLANKTON CONCENTRATIONS FROM OAK CREEK, WISCONSIN POWER PLANT STUDY
(NUMBER OF INDIVIDUALS / CUBIC METER)
LOCATIONS OF STATIONS ARE INDICATED IN FIGURE 1
MEANINGS OF SPECIES ABBREVIATIONS ARE INDICATED IN TABLE 5.

APRIL, 1972

SPECIES ABBREVIATIONS	STATION NUMBERS 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
ALOAFF	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
BOSMIN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CERLAC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CERQUA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CHYSPH	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DAPGAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DAPLON	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0
DAPRET	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0
DAPSCH	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DIALEU	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
EUBOSM	0	0	0	0	0	0	5	0	0	0	0	0	1	0	0	9	0
HOLGIB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
LEPTKI	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
POLYPE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CANTRO	41	0	0	41	10	0	0	5	20	9	0	0	0	0	0	9	0
COPNAU	0	0	251	0	183	238	177	120	0	621	374	194	61	0	146	213	129
CYCBIC	408	479	394	530	153	425	209	92	998	685	158	294	83	87	437	157	311
CYCIMM	102	316	1148	122	357	1053	1174	2073	143	945	832	1278	454	0	524	769	2628
DIAASH	2853	1712	1773	3342	1651	1511	1040	1442	713	2001	1296	869	818	0	1674	1473	1180
DIAIMM	448	173	136	143	214	51	156	122	82	120	170	78	17	0	204	278	70
DIAMIN	0	408	177	0	418	153	370	425	0	176	238	149	59	0	349	232	214
DIAORG	0	82	109	0	10	17	11	71	41	56	62	115	79	0	44	37	188
DIASIC	204	61	34	122	10	68	48	56	0	74	74	42	14	0	58	37	139
EPTLAC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
EURAFF	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
LIMCAL	122	41	27	41	41	0	16	38	41	56	17	15	3	0	29	93	38
MESEDA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SENCAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TROPRA	0	10	14	0	10	68	11	41	20	9	23	32	20	0	0	19	21
HYDRAS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
INSECT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MYSREL	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0
NEMTOD	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
OLIGCH	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
OSTRAC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 13. ZOOPLANKTON CONCENTRATIONS FROM OAK CREEK, WISCONSIN POWER PLANT STUDY
(NUMBER OF INDIVIDUALS / CUBIC METER)
LOCATIONS OF STATIONS ARE INDICATED IN FIGURE 1
MEANINGS OF SPECIES ABBREVIATIONS ARE INDICATED IN TABLE 5.

JUNE, 1972

SPECIES ABBREVIATIONS	STATION NUMBERS 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
ALOAFF	0	0	0	0	8	0	0	0	0	0	0	0	0	0	0	0	0
BOSMIN	0	83	57	0	59	14	23	0	17	71	15	3	0	25	73	45	4
CERLAC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CERQUA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CHYSPH	0	0	0	0	8	0	0	0	0	0	0	0	0	0	0	0	0
DAPGAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DAPLON	0	0	6	0	0	7	0	2	0	0	0	0	0	0	0	0	0
DAPRET	0	0	0	0	8	0	0	0	0	0	0	3	0	0	0	0	0
DAPSCH	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DIALEU	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
EUBOSM	0	0	6	0	0	7	0	0	0	0	0	0	0	0	34	0	0
HOLGIB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
LEPTKI	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
POLYPE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CANTRO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
COPNAU	3729	5483	0	1895	2564	2975	4335	2682	442	3658	2183	2084	4189	560	1098	4215	3969
CYCBIC	0	0	1121	183	934	693	1362	371	0	31	534	909	560	0	68	509	496
CYCIMM	3872	10550	10074	3546	18815	11954	16876	4320	1172	2527	14143	2398	962	942	7709	7361	5542
DIAASH	20	9	6	0	110	54	125	72	0	10	87	227	500	0	0	32	159
DIAIMM	2588	9577	8991	1528	12039	12430	10494	4151	679	1895	8806	3862	2622	688	2513	4617	5431
DIAMIN	0	0	19	0	8	7	19	4	0	0	15	79	71	0	0	6	62
DIAORG	0	0	0	0	0	0	14	7	0	0	19	33	48	0	0	0	0
DIASIC	0	0	0	0	0	0	0	4	0	0	5	5	33	0	0	0	0
EPILAC	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0
EURAFF	0	0	0	0	17	0	5	0	0	0	0	0	0	0	0	0	0
LIMCAL	0	0	0	0	0	0	5	9	0	0	0	8	30	0	0	0	0
MESEDA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SENCAL	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
TROPRA	0	74	38	0	42	54	51	2	17	20	24	32	5	0	11	32	31
HYDRAS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
INSECT	41	0	0	41	0	0	0	0	17	0	0	0	0	0	0	0	0
MYSREL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NEMTOD	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
OLIGCH	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
OSTRAC	0	0	0	0	17	0	0	0	0	0	0	0	0	0	0	0	0

Table 14. PHYTOPLANKTON CONCENTRATIONS FROM OAK CREEK, WISCONSIN POWER PLANT STUDY
(NUMBER OF CELLS / ML)
LOCATIONS OF STATIONS ARE INDICATED IN FIGURE 1
MEANINGS OF SPECIES ABBREVIATIONS ARE INDICATED IN TABLE 4
SEPTEMBER, 1971

SPECIES ABBREVIATIONS	STATION NUMBERS 1	2	3	4	5	6	7	8	9	10	11	12	13
ANKIST	11	8	13	5	9	5	3	4	7	13	5	5	6
CHLLIK	0	172	450	70	371	141	289	607	32	205	328	156	387
CLOSTE	0	0	0	0	0	0	0	0	0	0	0	0	0
COSMAR	2	3	2	3	1	1	1	2	1	6	5	3	2
CRUCGI	0	27	54	0	79	72	39	31	41	94	37	73	80
GREFIL	0	0	0	0	0	0	11	11	0	11	0	0	0
GOLENK	0	0	0	0	1	1	1	0	0	0	0	3	0
OCYSTA	0	4	5	0	17	6	6	4	0	22	14	3	1
OCYSTB	36	40	151	42	120	100	175	183	106	145	147	146	177
PEDIAS	1	0	0	0	0	0	0	0	0	0	0	0	0
SCENED	34	23	22	17	26	10	29	20	7	29	33	29	41
SELENA	0	1	0	0	1	2	1	0	0	1	0	0	0
STARAS	1	1	0	0	0	0	0	1	0	0	1	0	0
TETRAE	0	3	5	3	3	1	0	4	2	3	5	5	0
TETRAS	0	0	0	0	0	0	0	0	0	0	0	0	0
ANABAE	11	84	92	8	39	49	77	64	28	16	142	107	19
CHROOC	30	39	245	11	64	130	177	75	82	103	78	231	44
COLONY	19	1	55	1	2	31	19	68	95	25	134	25	31
BGRFIL	0	0	0	0	0	8	0	0	0	0	0	0	0
CHRYSO	95	177	80	265	393	47	114	69	233	198	111	249	52
DINOBR	4	3	19	7	3	9	6	17	10	17	8	16	11
MALLOM	0	1	0	2	0	0	0	1	0	0	0	0	0
CRYPTO	304	99	32	215	69	7	25	63	42	57	55	34	25
RHODOM	289	292	178	234	419	42	422	288	148	424	207	161	181
CERATM	1	0	0	1	1	0	1	2	1	0	0	1	1
GYMNOD	0	3	1	0	2	2	4	3	3	1	4	0	1
ASTFOR	3	9	5	3	12	10	11	11	4	9	8	2	5
CENTRI	336	287	9	583	117	14	24	27	27	33	25	39	23
MELOSI	0	1	0	4	4	0	0	0	2	1	1	0	0
NEEDLE	352	291	49	343	447	29	89	72	95	82	43	46	24
OTHPEN	2	2	0	12	2	1	2	0	10	2	1	0	0
TABELL	195	174	35	78	327	19	57	92	163	89	62	63	14

Table 14. PHYTOPLANKTON CONCENTRATIONS FROM OAK CREEK, WISCONSIN POWER PLANT STUDY
(NUMBER OF CELLS / ML)
LOCATIONS OF STATIONS ARE INDICATED IN FIGURE 1
MEANINGS OF SPECIES ABBREVIATIONS ARE INDICATED IN TABLE 4
OCTOBER, 1971

SPECIES ABBREVIATIONS	STATION NUMBERS 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
ANKIST	7	14	32	10	11	14	20	22	25	4	35	54	0	14	12	17	28
CHLLIK	0	7	8	22	12	8	57	88	16	5	228	253	118	10	59	74	117
CLOSTE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
COSMAR	0	2	1	0	0	1	3	1	1	0	0	2	1	0	1	1	3
CRUCGI	0	9	2	0	17	8	10	18	0	0	14	17	3	4	5	16	30
GREFIL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
GOLENK	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0
OCYSTA	53	26	26	27	33	22	27	39	40	0	111	14	1	32	36	33	27
OCYSTB	65	39	113	24	46	61	77	72	13	0	4	59	53	20	29	32	91
PEDIAS	0	0	1	0	0	0	1	0	0	0	0	1	0	0	0	1	0
SCENED	0	1	1	0	1	0	11	5	3	0	8	15	4	5	2	6	9
SELENA	0	1	3	0	0	1	0	0	0	1	3	1	1	0	1	0	0
STARAS	0	0	0	0	1	1	1	0	0	0	0	0	1	0	0	1	0
TETRAE	12	1	1	5	1	1	4	3	0	0	1	5	2	0	1	1	3
TETRAS	0	0	0	0	0	0	0	0	0	0	0	1	3	0	0	0	0
ANABAE	0	54	7	0	30	55	41	0	7	0	22	0	46	32	28	0	43
CHROOC	137	34	94	52	16	82	131	317	27	1	36	204	60	53	22	70	70
COLONY	0	121	32	0	1	1	3	7	0	6	15	406	214	1	149	66	36
BGRFIL	0	79	180	2	24	68	12	0	35	41	5	9	0	0	0	3	41
CHRYSO	61	66	187	33	10	54	357	481	40	3	42	505	108	122	44	326	215
DINOBR	1	1	2	1	0	1	5	16	1	0	2	20	3	0	1	4	5
MALLOM	0	1	1	0	0	0	0	0	3	0	0	1	0	6	0	0	1
CRYPTO	23	72	30	75	52	20	44	44	7	23	22	43	27	44	35	55	44
RHODOM	412	509	233	201	419	341	333	695	58	17	190	390	164	527	1830	615	586
CERATM	0	0	1	0	1	1	1	0	0	0	0	1	2	0	1	0	0
GYMNOD	0	4	2	0	5	1	0	1	1	1	1	1	1	4	2	0	0
ASTFOR	6	6	21	6	8	7	11	29	4	0	8	28	9	10	4	9	20
CENTRI	71	56	49	91	74	90	156	329	62	12	15	48	15	275	11	27	23
MELOSI	15	47	1	33	47	20	5	5	36	26	31	1	0	14	37	9	1
NEEDLE	109	116	76	110	115	111	135	78	45	14	111	146	52	104	153	155	154
OTHPEN	1	1	5	0	4	5	4	4	1	1	0	9	1	1	1	3	2
TABELL	49	184	59	150	109	116	63	60	18	18	58	190	13	50	78	94	86

Table 14. PHYTOPLANKTON CONCENTRATIONS FROM OAK CREEK, WISCONSIN POWER PLANT STUDY
(NUMBER OF CELLS / ML)
LOCATIONS OF STATIONS ARE INDICATED IN FIGURE 1
MEANINGS OF SPECIES ABBREVIATIONS ARE INDICATED IN TABLE 4
NOVEMBER, 1971

SPECIES ABBREVIATIONS	STATION NUMBERS																
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
ANKIST	52	119	22	36	1	112	28	11	10	0	9	12	5	48	7	39	13
CHLLIK	4	233	104	4	139	375	62	64	13	0	65	57	78	10	60	129	83
CLOSTE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
COSMAR	1	1	1	1	1	1	0	0	0	0	0	1	3	2	1	0	1
CRUCGI	7	18	3	2	0	4	4	0	2	0	0	0	5	7	16	16	4
GREFIL	0	5	0	0	0	0	0	0	0	0	0	0	0	33	0	0	0
GOLENK	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
OCYSTA	0	60	36	0	27	43	36	32	0	0	41	2	17	0	9	22	33
OCYSTB	22	37	21	38	45	71	24	24	27	0	10	29	45	22	25	51	23
PEDIAS	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SCENED	9	12	7	5	2	20	5	0	2	0	0	3	1	9	0	9	7
SELENA	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
STARAS	1	0	0	1	0	0	0	0	1	0	0	2	2	0	0	0	0
TETRAE	0	0	3	2	3	2	1	1	0	0	1	0	0	0	0	0	0
TETRAS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ANABAE	0	14	85	20	3	26	0	0	9	0	0	56	50	37	0	57	0
CHROOC	14	85	65	25	22	111	67	50	9	0	12	59	108	22	14	77	53
COLONY	121	5	50	85	9	326	1	2	36	0	1	1	0	60	0	32	4
BGRFIL	32	6	0	66	0	0	8	54	52	0	11	16	0	71	0	7	11
CHRYSO	54	75	32	42	67	60	16	24	45	0	32	8	39	82	38	73	21
DINOBR	29	89	41	34	42	77	25	15	5	0	8	14	11	50	14	106	23
MALLOM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CRYPTO	54	75	32	42	67	60	16	24	45	0	32	8	39	82	38	73	21
RHODOM	250	605	571	129	255	456	275	186	104	0	114	75	338	210	67	546	149
CERATM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
GYMNOD	0	0	2	0	1	3	1	0	0	0	0	0	0	0	0	3	3
ASTFOR	5	3	8	14	5	6	14	29	19	0	5	14	8	21	0	13	13
CENTRI	35	67	29	79	39	55	21	44	49	0	22	21	42	177	13	55	20
MELOSI	20	21	19	24	41	26	5	4	24	0	5	3	6	26	20	36	29
NEEDLE	444	368	305	343	214	226	59	59	81	0	35	48	83	468	69	321	61
OTHPEN	0	1	5	2	0	4	2	0	3	0	2	3	0	1	0	0	1
TABELL	137	248	125	175	185	142	19	17	47	0	22	11	26	275	156	259	82

Table 14. PHYTOPLANKTON CONCENTRATIONS FROM OAK CREEK, WISCONSIN POWER PLANT STUDY
(NUMBER OF CELLS / ML)
LOCATIONS OF STATIONS ARE INDICATED IN FIGURE 1
MEANINGS OF SPECIES ABBREVIATIONS ARE INDICATED IN TABLE 4
DECEMBER, 1971

SPECIES ABBREVIATIONS	STATION NUMBERS 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
ANKIST	0	53	45	0	4	10	0	7	1	5	19	14	11	1	20	10	8
CHLLIK	0	8	21	0	3	13	0	50	0	47	41	17	7	0	14	12	28
CLOSTE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
COSMAR	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
CRUCGI	0	11	7	0	0	0	0	19	0	42	0	0	0	4	23	7	0
GREFIL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
GOLENK	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
OCYSTA	0	34	37	0	9	47	0	59	0	76	56	32	17	0	36	30	60
OCYSTB	9	21	14	1	3	39	0	21	3	42	35	7	31	1	27	15	15
PEDIAS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SCENED	4	11	1	0	8	6	0	5	0	0	4	4	0	10	7	0	0
SELENA	0	0	0	0	1	0	0	0	0	0	2	0	0	0	0	0	0
STARAS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1
TETRAE	0	0	0	0	1	0	0	0	0	0	0	0	1	1	1	1	1
TETRAS	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0
ANABAE	0	0	0	0	0	0	0	0	0	0	0	0	0	12	0	17	0
CHROOC	1	3	10	1	4	10	0	6	2	3	7	0	12	1	7	9	2
COLONY	0	0	0	0	0	2	0	0	15	5	0	0	0	21	1	1	1
BGRFIL	89	0	9	23	0	0	0	17	82	0	15	0	8	23	0	0	23
CHRYSO	2	5	93	1	1	62	0	118	2	8	62	58	56	1	5	54	95
DINOBR	0	3	5	0	3	10	0	5	1	10	1	2	0	0	9	3	3
MALLOM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CRYPTO	13	24	46	10	22	17	0	13	15	26	18	14	18	13	26	17	19
RHODOM	3	98	210	1	25	212	0	233	17	86	330	233	186	17	74	215	204
CERATM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
GYMNOD	0	0	2	0	0	2	0	8	0	5	0	0	1	1	3	1	4
ASTFOR	2	2	2	1	3	6	0	3	1	0	2	0	1	3	2	4	11
CENTRI	516	1529	428	331	857	330	0	49	49	134	94	24	30	577	1230	289	397
MELOSI	69	44	52	93	76	46	0	42	38	32	37	16	26	41	35	25	42
NEEDLE	59	75	164	115	118	120	0	37	34	39	51	61	37	112	173	160	95
OTHPEN	3	2	17	0	3	9	0	7	1	12	20	6	10	2	6	6	16
TABELL	75	67	61	127	94	55	0	8	22	34	18	2	10	132	103	65	30

Table 14. PHYTOPLANKTON CONCENTRATIONS FROM OAK CREEK, WISCONSIN POWER PLANT STUDY
(NUMBER OF CELLS / ML)
LOCATIONS OF STATIONS ARE INDICATED IN FIGURE 1
MEANINGS OF SPECIES ABBREVIATIONS ARE INDICATED IN TABLE 4
JANUARY, 1972

SPECIES ABBREVIATIONS	STATION NUMBERS 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
ANKIST	31	22	25	32	15	8	12	14	30	15	8	24	2	44	14	6	2
CHLLIK	38	21	46	24	34	31	21	37	26	28	59	15	5	50	13	17	11
CLOSTE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
COSMAR	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CRUCGI	0	0	4	0	0	0	12	0	0	0	4	0	0	0	0	0	0
GREFIL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
GOLENK	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
OCYSTA	33	71	40	28	60	22	40	43	41	50	45	37	6	46	56	48	15
OCYSTB	7	4	11	7	0	7	11	8	5	20	11	7	2	8	17	3	5
PEDIAS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SCENED	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
SELENA	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0
STARAS	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0
TETRAE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TETRAS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ANABAE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CHROOC	0	4	0	0	5	7	8	4	36	13	2	6	0	0	8	0	0
COLONY	1	0	0	0	0	0	1	0	0	0	1	1	0	0	0	0	0
BGRFIL	75	0	30	97	7	0	40	50	0	0	0	0	12	0	38	23	0
CHRYSO	98	63	82	121	68	34	59	36	88	116	57	92	20	126	39	36	50
DINOBR	1	0	1	0	0	1	0	0	0	0	0	0	0	1	0	1	0
MALLOM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CRYPTO	8	19	10	4	6	5	19	15	8	21	23	18	6	12	23	27	16
RHODOM	157	350	401	125	267	197	255	185	181	358	223	326	69	230	220	210	103
CERATM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
GYMNOD	2	4	2	0	1	2	1	0	1	0	0	0	0	1	1	3	1
ASTFOR	3	3	2	7	2	2	0	1	4	4	2	0	0	5	2	1	2
CENTRI	442	431	188	445	137	128	56	68	166	61	51	25	17	292	93	98	62
MELOSI	54	115	30	72	22	92	71	49	70	60	80	40	22	80	77	23	64
NEEDLE	68	48	39	62	37	24	37	32	62	35	22	22	21	92	34	27	25
OTHPEN	4	17	7	4	3	4	10	11	8	13	10	1	2	1	3	3	2
TABELL	14	23	5	19	2	7	9	8	13	6	2	6	4	9	11	9	11

Table 14. PHYTOPLANKTON CONCENTRATIONS FROM OAK CREEK, WISCONSIN POWER PLANT STUDY
(NUMBER OF CELLS / ML)
LOCATIONS OF STATIONS ARE INDICATED IN FIGURE 1
MEANINGS OF SPECIES ABBREVIATIONS ARE INDICATED IN TABLE 4
FEBRUARY, 1972

SPECIES ABBREVIATIONS	STATION NUMBERS 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
ANKIST	0	3	2	8	22	13	31	0	0	21	7	8	20	1	1	6	13
CHLLIK	18	44	16	88	102	48	37	0	10	58	35	34	24	2	27	32	33
CLOSTE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
COSMAR	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0
CRUCGI	0	0	0	0	0	0	0	0	0	0	5	4	5	0	0	0	0
GREFIL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
GOLENK	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
OCYSTA	6	15	19	40	42	54	40	0	3	43	39	37	37	0	12	26	28
OCYSTB	0	12	2	5	7	7	29	0	1	14	8	5	9	0	4	7	15
PEDIAS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SCENED	0	0	0	0	0	4	0	0	0	0	5	0	0	0	1	0	0
SELENA	0	0	0	0	2	0	1	0	0	0	0	0	0	0	0	0	0
STARAS	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TETRAE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TETRAS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ANABAE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CHROOC	1	0	0	0	0	0	1	0	2	0	0	0	2	0	1	0	9
COLONY	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
BORFIL	0	0	0	0	0	0	0	0	0	0	6	0	35	0	0	0	2
CHRYSO	5	18	15	35	50	91	94	0	1	66	106	78	108	0	6	29	45
DINOBR	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0
MALLOM	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0
CRYPTO	2	6	4	3	15	10	7	0	2	5	6	9	18	1	8	4	15
RHODOM	25	41	48	134	185	292	195	0	17	161	159	242	216	6	53	140	169
CERATM	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
GYMNOD	0	0	0	0	0	4	4	0	0	3	2	2	2	0	0	4	2
ASTFOR	0	2	9	0	1	6	4	0	0	4	4	5	2	2	4	3	2
CENTRI	64	548	520	542	390	168	123	0	39	218	99	136	40	62	315	150	63
MELOSI	56	115	116	91	65	62	53	0	34	57	56	40	44	56	126	57	46
NEEDLE	11	70	90	36	42	49	55	0	20	56	53	55	29	44	103	73	42
OTHPEN	3	15	14	11	36	13	16	0	13	31	10	13	9	5	19	13	14
TABELL	11	49	31	19	24	13	5	0	6	5	1	4	7	29	63	20	2

Table 14. PHYTOPLANKTON CONCENTRATIONS FROM OAK CREEK, WISCONSIN POWER PLANT STUDY
(NUMBER OF CELLS / ML)
LOCATIONS OF STATIONS ARE INDICATED IN FIGURE 1
MEANINGS OF SPECIES ABBREVIATIONS ARE INDICATED IN TABLE 4
APRIL, 1972

SPECIES ABBREVIATIONS	STATION NUMBERS																
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
ANKIST	0	13	4	0	17	8	14	10	5	15	0	1	8	10	4	9	0
CHLLIK	16	36	30	0	65	29	45	75	57	52	0	18	28	69	45	46	0
CLOSTE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
COSMAR	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
CRUCGI	0	4	0	0	0	17	0	0	0	0	0	0	4	0	0	0	0
GREFIL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
GOLENK	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
OCYSTA	10	19	6	0	17	8	37	38	13	8	0	7	27	18	27	7	0
OCYSTB	0	0	0	0	0	0	0	0	1	0	0	0	3	0	2	0	0
PEDIAS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SCENED	10	4	0	0	0	4	0	4	4	0	0	0	0	10	4	0	0
SELENA	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
STARAS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TETRAE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
TETRAS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ANABAE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CHROOC	3	1	1	0	0	1	1	1	0	0	0	0	2	0	0	0	0
COLONY	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
GERFIL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CHRYSO	3	43	16	0	32	19	43	57	40	20	0	18	29	28	29	22	0
DINOBR	0	2	0	0	2	2	0	0	1	1	0	2	1	0	3	1	0
MALLOM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CRYPTO	39	16	5	0	30	18	13	16	12	6	0	4	19	3	12	15	0
RHODOM	158	264	131	0	353	249	275	321	134	238	0	97	133	261	502	190	0
CERATM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
GYMNOD	0	3	5	0	2	2	3	0	0	0	0	1	2	0	3	0	0
ASTFOR	0	14	5	0	2	35	22	21	7	32	0	4	3	4	50	32	0
CENTRI	890	853	57	0	1624	279	191	258	440	433	0	44	95	883	1053	872	0
MELOSI	125	133	86	0	158	89	41	35	118	119	0	23	65	77	108	164	0
NEEDLE	57	82	35	0	68	65	41	67	77	63	0	39	25	38	126	88	0
OTHPEN	9	26	7	0	21	14	10	22	14	8	0	0	14	14	21	29	0
TABELL	5	17	4	0	8	4	3	4	2	4	0	3	6	3	6	5	0

Table 14. PHYTOPLANKTON CONCENTRATIONS FROM OAK CREEK, WISCONSIN POWER PLANT STUDY
(NUMBER OF CELLS / ML)
LOCATIONS OF STATIONS ARE INDICATED IN FIGURE 1
MEANINGS OF SPECIES ABBREVIATIONS ARE INDICATED IN TABLE 4
JUNE, 1972

SPECIES ABBREVIATIONS	STATION NUMBERS 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
ANKIST	19	17	11	17	9	26	24	33	21	31	38	84	33	6	9	34	27
CHLLIK	558	257	392	428	154	481	89	102	344	425	114	87	3	175	431	1330	204
CLOSTE	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
COSMAR	0	0	0	1	0	1	0	0	0	0	1	1	1	0	0	0	0
CRUCGI	4	0	0	8	0	9	0	18	4	4	4	0	0	0	0	7	0
GREFIL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
GOLENK	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
OCYSTA	18	10	27	31	18	32	68	54	101	116	53	73	50	28	32	37	77
OCYSTB	8	4	10	15	5	19	14	12	9	18	17	16	3	3	16	21	14
PEDIAS	1	0	0	0	0	1	0	0	0	0	0	0	0	2	0	0	0
SCENED	44	14	6	76	15	47	0	1	0	13	24	4	0	127	161	104	0
SELENA	12	4	1	2	5	6	1	1	0	0	2	8	0	2	1	5	1
STARAS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TETRAE	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
TETRAS	3	1	1	15	[illegible]	3	1	4	10	19	7	5	1	22	15	6	10
ANABAE	0	0	0	8	0	0	0	0	0	0	0	4	0	0	0	0	0
CHROOC	1	3	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0
COLONY	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0
BERFIL	16	31	34	0	71	22	45	52	0	60	128	138	288	0	0	0	42
CHRYSO	55	16	33	21	22	41	96	130	90	118	92	129	50	13	27	42	99
DINOBR	17	5	6	8	6	11	33	93	21	40	49	111	36	1	2	6	40
MALLOM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CRYPTO	23	3	2	13	9	10	1	9	8	4	2	1	4	27	43	16	2
RHODOM	131	83	53	260	116	92	71	78	267	374	69	156	59	163	356	373	50
CERATM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
GYMNOD	4	4	9	8	3	5	18	8	5	3	5	10	12	1	1	7	9
ASTFOR	8	1	2	12	7	11	1	2	3	3	2	2	6	7	3	3	2
CENTRI	519	164	83	1230	216	500	64	48	51	45	50	33	66	1650	2060	923	42
MELOSI	3	5	1	32	0	2	2	3	10	7	10	22	22	9	4	5	0
NEEDLE	99	67	70	171	80	105	103	118	113	217	96	139	131	120	97	114	115
OTHPEN	28	15	27	23	20	21	33	81	65	49	46	111	162	16	8	11	41
TABELL	16	12	2	84	47	14	4	6	29	53	23	7	6	98	95	27	2

Table 15. Concentrations of chemical parameters from Oak Creek, Wisconsin Power Plant Study. Locations of stations are indicated in Figure 1. *

NOVEMBER, 1971

PARAMETER ABBREVIATIONS	STATION NUMBERS 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
TOPHOS	25.30	17.00	10.70	22.10	7.70	12.20	7.70	8.30	10.30	9.90	9.30	7.80	6.70	20.60	16.40	11.80	8.10
SRPHOS	1.60	1.30	1.40	1.90	1.70	1.40	1.40	1.30	1.90	1.30	1.30	1.10	1.10	1.60	1.30	1.20	.80
SILICA	.60	.40	.80	.60	.60	.60	1.10	1.30	1.70	1.60	1.90	.90	.70	.60	.50	.60	1.00
SULFAT	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
NITRAT	.20	.19	.19	.19	.19	.19	.20	.23	.25	.26	.26	.19	.19	.19	.19	.20	.21
CONDUC	238.10	243.80	262.20	264.40	264.20	260.70	263.70	259.90	201.20	264.00	263.70	258.00	255.70	264.00	263.90	258.10	263.80
CHLORI	14.00	11.00	7.80	7.40	7.40	7.40	6.50	7.80	6.20	8.60	7.20	6.80	6.50	6.10	6.10	6.10	6.50

DECEMBER, 1971

PARAMETER ABBREVIATIONS	STATION NUMBERS 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
TOPHOS	57.40	36.00	13.20	69.60	32.00	16.00	11.40	6.10	32.00	33.40	17.30	6.00	7.50	63.00	36.00	20.00	10.00
SRPHOS	1.70	1.30	.90	2.20	1.50	.90	1.10	1.20	2.00	1.30	1.20	1.40	1.40	2.10	1.70	1.10	1.50
SILICA	.70	.70	1.10	.70	.70	1.20	1.20	1.10	1.10	1.10	1.20	1.10	1.00	.60	.60	.90	1.10
SULFAT	23.50	20.50	19.50	25.00	28.50	19.50	19.50	23.00	19.00	19.00	19.00	19.00	19.50	22.50	26.00	21.00	19.00
NITRAT	.27	.27	.23	.27	.27	.25	.26	.26	.25	.26	.24	.23	.23	.26	.24	.23	.27
CONDUC	268.10	266.60	258.10	271.50	265.80	261.80	254.20	.00	264.30	264.00	259.10	.00	.00	270.40	261.20	254.50	254.60
CHLORI	6.70	6.40	6.00	6.00	6.40	5.50	5.20	5.20	5.50	5.20	5.20	5.50	5.20	6.70	6.00	6.00	5.20

*Chemical parameter abbreviations:

Abbreviation	Full Name	Units
TOPHOS	total phosphorus	µg p/l
SRPHOS	soluble reactive phosphorus	µg p/l
SILICA	silica	mg SiO_2/l
SULFAT	sulfate	mg SO_4/l
NITRAT	nitrate-nitrogen	mg N/l
CONDUC	conductivity	µmhos/cm
CHLORI	chloride	mg Cl-/l

Table 15. Concentrations of chemical parameters from Oak Creek, Wisconsin Power Plant Study. Locations of stations are indicated in Figure 1.*

SEPTEMBER, 1971

PARAMETER ABBREVIATIONS	STATION NUMBERS 1	2	3	4	5	6	7	8	9	10	11	12	13
TOPHOS	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
SRPHOS	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
SILICA	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
SULFAT	18.00	18.50	18.00	18.50	17.50	16.50	19.00	17.00	16.50	15.50	15.50	15.50	17.00
NITRAT	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
CONDUC	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
CHLORI	9.70	9.30	8.90	9.30	8.40	8.30	8.60	8.60	9.00	8.30	8.60	7.60	7.60

OCTOBER, 1971

PARAMETER ABBREVIATIONS	STATION NUMBERS 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
TOPHOS	11.50	4.30	3.40	7.00	4.20	2.70	8.10	9.10	8.10	9.60	15.70	9.00	2.70	6.00	9.10	3.80	5.00
SRPHOS	1.00	.60	.80	.80	.60	.50	1.20	1.30	1.20	1.10	.80	.80	.80	1.00	1.00	1.80	1.30
SILICA	2.60	1.90	.90	1.50	1.40	1.50	1.10	1.20	1.80	1.90	1.60	.60	.50	1.40	1.40	1.30	1.00
SULFAT	18.00	18.50	19.00	19.50	18.00	18.50	18.00	19.00	19.00	19.50	18.50	18.00	18.50	18.50	18.00	18.00	18.00
NITRAT	.26	.25	.20	.26	.25	.23	.22	.20	.27	.28	.27	.15	.12	.25	.26	.22	.18
CONDUC	262.80	262.30	262.10	264.00	263.80	261.50	260.10	262.00	263.20	259.10	236.00	259.80	256.10	264.10	264.50	263.00	262.40
CHLORI	8.40	8.00	8.00	7.20	7.20	7.60	6.80	7.60	7.60	7.20	7.20	6.60	6.80	8.00	7.20	7.60	8.00

*Chemical parameter abbreviations:

Abbreviation	Full Name	Units
TOPHOS	total phosphorus	μg p/l
SRPHOS	soluble reactive phosphorus	μg p/l
SILICA	silica	mg SiO_2/l
SULFAT	sulfate	mg SO_4/l
NITRAT	nitrate-nitrogen	mg N/l
CONDUC	conductivity	μmhos/cm
CHLORI	chloride	mg Cl^-/l

Table 15. Concentrations of chemical parameters from Oak Creek, Wisconsin Power Plant Study. Locations of stations are indicated in Figure 1.*

JANUARY, 1972

PARAMETER ABBREVIATIONS	STATION NUMBERS 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
TOPHOS	35.50	24.80	15.20	46.50	23.50	13.80	9.00	9.80	26.80	12.80	11.10	8.70	7.00	17.10	11.80	10.10	8.40
SRPHOS	5.00	4.00	2.00	6.30	3.30	3.20	2.20	1.20	2.60	1.90	2.00	2.00	2.40	1.70	2.00	1.50	.80
SILICA	1.80	1.60	1.70	1.70	1.70	1.70	1.40	1.40	1.40	1.40	1.50	1.40	1.30	1.30	1.40	1.40	1.40
SULFAT	22.00	22.00	20.00	21.50	21.50	19.00	18.50	19.50	20.50	18.50	19.50	19.50	18.50	19.00	20.00	18.50	17.50
NITRAT	.30	.28	.27	.31	.28	.26	.24	.24	.26	.24	.24	.24	.24	.26	.25	.24	.24
CONDUC	.00	285.00	273.00	288.50	283.00	276.00	264.00	261.50	273.50	273.00	265.00	263.00	265.00	268.00	270.00	263.50	265.00
CHLORI	6.20	6.20	5.80	6.20	5.80	5.30	5.00	4.80	5.30	4.80	5.00	5.00	5.00	5.60	5.60	5.30	5.00

FEBRUARY, 1972

PARAMETER ABBREVIATIONS	STATION NUMBERS 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
TOPHOS	79.60	55.20	13.50	87.30	35.20	13.50	5.60	4.90	28.00	11.50	7.80	6.00	5.40	67.20	41.40	17.40	7.80
SRPHOS	14.50	5.10	1.20	11.20	2.50	1.30	1.40	1.30	2.70	1.70	1.30	1.20	1.10	5.50	2.60	1.30	1.00
SILICA	1.40	1.20	1.40	1.40	1.50	1.50	1.40	1.40	1.40	1.70	1.60	1.40	1.60	1.60	1.60	1.60	1.40
SULFAT	22.50	21.00	20.00	19.50	22.00	19.00	19.00	19.00	19.50	19.00	19.00	18.50	18.50	21.00	20.50	19.50	19.00
NITRAT	.26	.29	.28	.30	.28	.26	.25	.26	.27	.26	.27	.26	.26	.29	.26	.25	.25
CONDUC	306.20	292.00	275.70	300.00	282.50	267.10	262.20	263.10	274.20	265.80	262.40	262.50	262.00	287.80	275.80	268.50	262.20
CHLORI	8.60	7.70	6.00	7.70	8.60	6.00	4.70	4.20	4.20	4.20	4.20	3.80	4.20	6.00	5.00	4.20	4.20

*Chemical parameter abbreviations:

Abbreviation	Full Name	Units
TOPHOS	total phosphorus	µg p/l
SRPHOS	soluble reactive phosphorus	µg p/l
SILICA	silica	mg $Si0_2$/l
SULFAT	sulfate	mg $S0_4$/l
NITRAT	nitrate-nitrogen	mg N/l
CONDUC	conductivity	µmhos/cm
CHLORI	chloride	mg C1-/l

Table 15. Concentrations of chemical parameters from Oak Creek, Wisconsin Power Plant Study. Locations of stations are indicated in Figure 1.*

APRIL, 1972

PARAMETER ABBREVIATIONS	STATTON NUMBERS 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
TOPHOS	87.20	45.60	17.60	121.00	107.50	20.90	12.00	18.70	44.20	19.10	16.20	10.10	9.40	94.00	62.40	29.00	13.50
SRPHOS	11.30	2.70	1.70	16.50	11.50	2.20	3.60	2.70	6.80	2.60	2.90	9.40	2.00	12.20	10.90	2.50	3.40
SILICA	1.30	1.10	1.30	1.50	1.50	1.20	1.10	1.20	1.30	1.10	1.00	1.20	1.40	1.00	1.20	1.10	1.20
SULFAT	24.50	25.50	19.00	23.50	22.00	18.50	19.50	20.00	20.00	19.00	17.50	19.00	19.50	20.00	21.50	19.00	18.50
NITRAT	.33	.30	.21	.30	.30	.22	.22	.21	.25	.23	.24	.22	.23	.26	.24	.24	.23
CONDUC	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
CHLORI	14.00	10.50	6.50	11.50	11.00	6.80	6.50	5.60	5.90	5.60	5.60	5.60	5.60	7.60	7.60	6.50	5.90

JUNF, 1972

PARAMETER ABBREVIATIONS	STATTON NUMBERS 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
TOPHOS	13.10	9.40	6.60	25.20	11.20	9.40	4.90	5.60	13.20	9.40	5.70	4.90	6.00	42.40	35.20	19.80	4.90
SRPHOS	2.40	3.10	1.90	4.10	2.10	2.40	1.30	1.40	2.40	2.90	1.30	1.30	1.60	3.40	3.00	1.70	1.60
SILICA	.40	.50	.60	.30	.40	.50	.70	.70	.50	.60	.60	.70	.70	.10	.20	.30	.70
SULFAT	20.50	19.50	18.50	21.00	20.00	19.50	19.00	20.50	20.50	20.50	20.50	21.00	20.00	23.50	22.50	21.50	20.00
NITRAT	.13	.16	.16	.14	.15	.16	.18	.18	.16	.16	.16	.18	.22	.14	.15	.15	.18
CONDUC	268.30	266.20	267.70	275.00	269.00	267.20	255.50	263.90	265.70	263.70	265.50	264.20	264.00	279.40	277.50	272.10	264.70
CHLORI	5.00	4.50	3.90	4.20	3.90	3.70	3.70	3.70	3.70	3.70	3.70	3.50	3.50	4.70	5.40	4.50	3.70

*Chemical parameter abbreviations:

Abbreviation	Full Name	Units
TOPHOS	total phosphorus	μg p/l
SRPHOS	soluble reactive phosphorus	μg p/l
SILICA	silica	mg SiO_2/l
SULFAT	sulfate	mg SO_4/l
NITRAT	nitrate-nitrogen	mg N/l
CONDUC	conductivity	μmhos/cm
CHLORI	chloride	mg Cl-/l

Table 16. TOTAL AND MAJOR GROUP CONCENTRATIONS OF ZOOPLANKTON FROM OAK CREEK, WISCONSIN POWER PLANT STUDY
(NUMBER OF INDIVIDUALS / CUBIC METER)
LOCATIONS OF STATIONS ARE INDICATED IN FIGURE 1*

NOVEMBER, 1971

GROUP ABBREVIATIONS	STATION NUMBERS 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
TOTALS	28792	27008	27288	29126	0	19140	11778	10368	12664	15811	9156	5336	3906	52370	21471	18996	14336
CLADOC	11411	11930	7822	24103	0	5509	2959	2598	8992	3102	2020	1670	1093	10936	10374	5997	4353
COPEPO	17381	15069	19466	5023	0	13624	8819	7770	3692	12709	7136	3666	2813	41434	11097	12999	9983
NONCRU	0	9	0	0	0	7	0	0	0	0	0	0	0	0	0	0	0
DAPHNI	1752	3687	3995	975	0	1688	993	541	815	1464	645	810	489	3447	2011	2503	1839
BOSMNI	9455	8049	3580	22575	0	3639	1747	1545	8024	1509	1337	806	544	7370	8215	3304	2261
CYCLPO	16118	10874	12728	4134	0	9697	2135	3648	3469	9124	5298	1371	1280	38785	6882	8471	2435
CALANO	1263	3686	5952	889	0	3232	6302	3787	203	2631	1689	1986	1481	2649	3872	4368	7549
DIAPTO	1202	3566	5756	656	0	3174	6277	3767	203	2575	1655	1678	1399	2547	3816	4368	7480

DECEMBER, 1971

GROUP ABBREVIATIONS	STATION NUMBERS 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
TOTALS	8036	10096	9100	13574	14042	5136	3501	2711	3220	2928	2471	2662	2693	22837	9068	9835	2923
CLADOC	1354	2676	612	2242	1982	189	16	34	530	297	30	22	57	3203	1696	594	59
COPEPO	6682	7411	8488	11332	12060	4947	3485	2677	2690	2631	2441	2640	2636	19634	7363	9242	2864
NONCRU	0	9	0	0	0	0	0	0	0	0	0	0	0	0	9	9	0
DAPHNI	262	685	165	591	278	71	5	17	245	130	4	6	13	1136	371	112	11
BOSMNI	1092	1982	439	1651	1695	118	11	15	285	167	26	16	44	2038	1297	463	43
CYCLPO	5065	4594	6011	9924	9781	3252	2204	1513	1468	1381	1289	1334	1184	17117	5150	6493	1770
CALANO	1617	2761	2054	1408	2038	1295	1147	1060	1232	1074	771	1196	1300	2517	2037	2388	990
DIAPTO	1587	2733	2030	1326	2020	1239	1104	958	1100	963	740	1186	1267	2444	2019	2361	879

*Zooplankton grouping abbreviations:

ABBREVIATION	TAXONOMIC GROUP NAME
CLADOC	Cladocera
COPEPO	Copepoda
NONCRU	non-crustaceans
DAPHNI	Daphnidae
BOSMI	Bosminidae
CYCLPO	Cyclopoida
CALANO	Calanoida
DIAPTO	Diaptomus spp.
TOTALS	total of all groups

Table 16. TOTAL AND MAJOR GROUP CONCENTRATIONS OF ZOOPLANKTON FROM OAK CREEK, WISCONSIN POWER PLANT STUDY
(NUMBER OF INDIVIDUALS / CUBIC METER)
LOCATIONS OF STATIONS ARE INDICATED IN FIGURE 1*

SEPTEMBER, 1971

GROUP ABBREVIATIONS	STATION NUMBERS 1	2	3	4	5	6	7	8	9	10	11	12	13
TOTALS	38350	23599	32794	20650	19644	28945	11627	5758	45157	37216	9449	2573	5705
CLADOC	27632	11178	15134	15742	12394	10556	5359	1078	27000	20997	4239	609	1513
COPEPO	10718	12393	17690	4908	7250	18366	6568	4680	18157	16219	5210	1964	4189
NONCRU	0	28	0	0	0	27	0	0	0	0	0	0	3
DAPHNI	2160	3112	8577	2106	5419	5760	1833	635	1101	2612	1130	189	674
BOSMNI	25003	6956	4088	13126	3408	2771	2640	246	25736	17783	2617	371	601
CYCLPO	9210	8614	7520	3532	3704	7797	2418	2282	15039	9837	3158	1236	1924
CALANO	1508	2973	9081	1376	2907	9577	3875	2076	3118	4270	1751	611	2205
DIAPTO	1508	2770	9068	1274	2713	9577	3871	2061	3118	4270	1746	609	2160

OCTOBER, 1971

GROUP ABBREVIATIONS	STATION NUMBERS 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
TOTALS	54368	36243	25165	46419	24553	34955	28515	19480	6258	12169	16614	11189	11330	3218	39417	20512	23366
CLADOC	8905	6827	6636	6583	4575	10392	7278	3600	671	1150	1175	1918	1265	1060	7962	4774	2789
COPEPO	45463	29407	18529	39836	19970	24563	21231	15880	5587	11019	15439	9271	10065	2158	31440	15730	20577
NONCRU	0	9	0	0	8	0	6	0	0	0	0	0	0	0	15	8	0
DAPHNI	3118	1816	1579	2201	2785	1287	1332	1772	420	73	342	1019	733	258	2824	807	1575
BOSMNI	5685	4946	4963	4218	1766	9059	5890	1771	210	1077	815	874	475	773	5094	3903	1155
CYCLPO	31197	13328	8682	35761	11259	13531	10156	10578	2183	9519	5826	3625	4599	1395	27465	6498	10495
CALANO	14266	11133	8013	4075	7573	9558	7732	4319	3133	1500	8298	4827	5015	731	2141	7555	9148
DIAPTO	14225	11105	7933	4055	7497	9502	7655	4222	3761	1500	8289	4747	4970	668	2092	7477	9067

*Zooplankton grouping abbreviations:

ABBREVIATION	TAXONOMIC GROUP NAME
CLADOC	Cladocera
COPEPO	Copepoda
NONCRU	non-crustaceans
DAPHNI	Daphnidae
BOSMI	Bosminidae
CYCLPO	Cyclopoida
CALANO	Calanoida
DIAPTO	Diaptomus spp.
TOTALS	total of all groups

Table 16. TOTAL AND MAJOR GROUP CONCENTRATIONS OF ZOOPLANKTON FROM OAK CREEK, WISCONSIN POWER PLANT STUDY
(NUMBER OF INDIVIDUALS / CUBIC METER)
LOCATIONS OF STATIONS ARE INDICATED IN FIGURE 1*

JANUARY, 1972

GROUP ABBREVIATIONS	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
TOTALS	2446	1667	3395	2242	1121	1632	2757	4441	239	1085	2096	3444	2311	1800	1693	3419	4333
CLADOC	0	0	8	0	47	0	5	9	0	0	10	5	4	0	0	0	0
COPEPO	2446	1667	3387	2242	1074	1632	2752	4432	269	1085	2086	3439	2307	1800	1693	3419	4333
NONCRU	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DAPHNI	0	0	0	0	0	0	0	0	0	0	5	3	1	0	0	0	0
BOSMNI	0	0	8	0	47	0	5	7	0	0	5	2	3	0	0	0	0
CYCLPO	1936	993	1842	1698	611	946	1825	2333	136	696	1082	1951	1135	1358	1019	2015	2552
CALANO	510	674	1545	544	407	577	752	1954	153	238	902	1430	1139	442	531	1280	1597
DIAPTO	510	598	1427	476	388	640	728	1888	65	269	810	1411	1136	425	490	1098	1558

FEBRUARY, 1972

GROUP ABBREVIATIONS	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
TOTALS	470	1009	1643	992	2724	1331	0	3369	2131	1983	4085	2933	2558	1783	3438	2263	3353
CLADOC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
COPEPO	470	1009	1643	992	2724	1317	0	3369	2120	1974	4085	2933	2558	1783	3438	2249	3353
NONCRU	0	0	0	0	0	14	0	0	61	9	0	0	0	0	0	14	0
DAPHNI	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
BOSMNI	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CYCLPO	204	346	917	433	1325	633	0	1876	449	973	1887	1743	1250	1052	1799	1260	1766
CALANO	184	602	690	457	1325	633	0	1439	1365	992	1994	1133	1234	612	1588	865	1519
DIAPTO	143	490	523	355	945	532	0	1422	1283	927	1907	1114	1216	527	1223	778	1504

*Zooplan kton grouping abbreviations:

ABBREVIATION	TAXONOMIC GROUP NAME
CLADOC	Cladocera
COPEPO	Copepoda
NONCRU	non-crustaceans
DAPHNI	Daphnidae
BOSMI	Bosminidae
CYCLPO	Cyclopoida
CALANO	Calanoida
DIAPTO	Diaptomus spp.
TOTALS	total of all groups

Table 16. TOTAL AND MAJOR GROUP CONCENTRATIONS OF ZOOPLANKTON FROM OAK CREEK, WISCONSIN POWER PLANT STUDY
(NUMBER OF INDIVIDUALS / CUBIC METER)
LOCATIONS OF STATIONS ARE INDICATED IN FIGURE 1*

APRIL, 1972

GROUP ABBREVIATIONS	STATION NUMBERS 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
TOTALS	4178	3282	4063	4341	3057	3584	3217	4493	2958	4752	3244	3028	1609	87	3465	3326	4918
CLADOC	0	0	0	0	0	0	5	3	0	0	0	2	1	0	0	9	0
COPEPO	4178	3282	4063	4341	3057	3584	3212	4485	2958	4752	3244	3026	1608	87	3465	3317	4918
NONCRU	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0
DAPHNI	0	0	0	0	0	0	0	3	0	0	0	2	0	0	0	0	0
BOSMNI	0	0	0	0	0	0	5	0	0	0	0	0	1	0	0	9	0
CYCLPO	510	805	1556	652	520	1546	1394	2200	1161	1639	1013	1604	557	87	961	945	2960
CALANO	3627	2477	2256	3648	2344	1800	1641	2154	877	2483	1857	1228	990	0	2358	2150	1829
DIAPTO	3505	2436	2229	3607	2303	1600	1625	2116	836	2427	1840	1213	987	0	2329	2057	1791

JUNE, 1972

GROUP ABBREVIATIONS	STATION NUMBERS 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
TOTALS	10250	25776	20318	7193	34629	28195	33314	11624	2344	8212	25831	9643	9021	2215	11456	16817	15694
CLADOC	0	83	69	0	83	28	23	2	17	71	15	6	0	25	57	45	4
COPEPO	10209	25693	20249	7152	34529	28167	33291	11622	2310	8141	25816	9637	9021	2190	11399	16772	15690
NONCRU	41	0	0	41	17	0	0	0	17	0	0	0	0	0	0	0	0
DAPHNI	0	0	6	0	8	7	0	2	0	0	0	3	0	0	0	0	0
BOSMNI	0	83	63	0	59	21	23	0	17	71	15	3	0	25	57	45	4
CYCLPO	3872	10624	11233	3729	19791	12701	18239	4693	1189	2578	14701	3339	1527	942	7788	7902	6069
CALANO	2608	9586	9016	1528	12174	12491	10667	4247	679	1905	8932	4214	3305	688	2513	4655	5652
DIAPTO	2608	9586	9016	1528	12157	12491	10652	4238	679	1905	8932	4206	3274	688	2513	4655	5652

*Zooplankton grouping abbreviations:

ABBREVIATION	TAXONOMIC GROUP NAME
CLADOC	Cladocera
COPEPO	Copepoda
NONCRU	non-crustaceans
DAPHNI	Daphnidae
BOSMI	Bosminidae
CYCLPO	Cyclopoida
CALANO	Calanoida
DIAPTO	*Diaptomus* spp.
TOTALS	total of all groups

Table 17. TOTAL AND MAJOR GROUP CONCENTRATIONS OF PHYTOPLANKTON FROM OAK CREEK, WISCONSIN POWER PLANT STUDY
(NUMBER OF CELLS / ML)
LOCATIONS OF STATIONS ARE INDICATED IN FIGURE 1
MEANINGS OF GROUP ABBREVIATIONS ARE INDICATED IN TABLE 6 *

NOVEMBER, 1971

GROUP ABBREVIATIONS	STATION NUMBERS 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
GREENS	97	485	198	89	218	628	160	132	55	0	127	106	156	131	118	266	164
BLGREN	167	110	200	196	34	463	76	106	136	0	24	132	158	190	14	173	69
CHRSPH	154	203	359	93	86	367	166	98	40	0	36	27	210	140	26	440	154
CRYTPH	304	680	603	171	322	516	291	210	149	0	146	83	377	292	105	619	169
PYRPHY	0	0	2	0	1	3	1	0	0	0	0	0	0	0	0	3	3
DIATOM	641	708	491	637	484	459	120	153	223	0	91	100	165	968	258	684	206
TOTALS	1363	2186	1853	1186	1059	2436	834	699	[illegible]	0	424	448	1066	1721	495	2185	764

DECEMBER, 1971

GROUP ABBREVIATIONS	STATION NUMBERS 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
GREENS	13	138	126	1	29	116	0	161	5	212	157	74	67	17	129	76	113
BLGREN	90	3	18	24	4	12	0	23	59	8	22	0	20	57	8	27	26
CHRSPH	2	8	98	1	4	72	0	123	3	18	63	60	56	1	14	57	98
CRYTPH	16	122	256	11	47	229	0	246	32	112	348	247	204	30	100	232	223
PYRPHY	0	0	2	0	0	2	0	8	0	5	0	0	1	1	3	1	4
DIATOM	724	1719	724	667	1151	566	0	146	145	251	222	109	114	867	1549	549	581
TOTALS	845	1990	1224	704	1235	997	0	707	230	606	812	490	462	973	1803	942	1045

*Phytoplankton grouping abbreviations:

ABBREVIATION	TAXONOMIC GROUP NAME
GREENS	Chlorophyta
BLGREN	Cyanophyta
CHRSPH	Chrysophyta
CRYTPH	Cryptophyta
PYRPHY	Pyrrhophyta
DIATOM	Diatoms
TOTALS	total of all groups

Table 17. TOTAL AND MAJOR GROUP CONCENTRATIONS OF PHYTOPLANKTON FROM OAK CREEK, WISCONSIN POWER PLANT STUDY
(NUMBER OF CELLS / ML)
LOCATIONS OF STATIONS ARE INDICATED IN FIGURE 1
MEANINGS OF GROUP ABBREVIATIONS ARE INDICATED IN TABLE 6 *

SEPTEMBER, 1971

GROUP ABBREVIATIONS	STATION NUMBERS 1	2	3	4	5	6	7	8	9	10	11	12	13
GREENS	85	282	703	140	628	339	555	867	196	529	575	423	694
BLGREN	60	124	392	20	105	218	273	207	205	144	354	363	94
CHRSPH	99	181	99	274	396	56	120	87	243	215	119	265	63
CRYTPH	593	391	210	449	488	49	447	351	190	481	262	195	206
PYRPHY	1	3	1	1	3	2	5	5	4	1	4	1	2
DIATOM	888	764	98	1023	909	73	183	202	292	216	140	150	66
TOTALS	1726	1745	1503	1907	2529	737	1583	1719	1130	1586	1454	1397	1125

OCTOBER, 1971

GROUP ABBREVIATIONS	STATION NUMBERS 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
GREENS	137	100	189	97	122	118	236	297	98	10	408	427	187	85	147	230	429
BLGREN	137	288	313	54	71	206	187	324	69	48	78	619	320	86	199	139	190
CHRSPH	62	68	190	34	10	55	362	497	44	3	44	526	111	128	45	330	221
CRYTPH	435	581	263	276	471	161	377	739	65	40	212	352	191	571	1865	670	630
PYRPHY	0	4	3	0	6	2	1	1	1	1	1	2	3	4	3	0	0
DIATOM	251	410	211	380	357	339	374	505	166	71	223	422	89	454	284	297	286
TOTALS	1022	1451	1169	841	1037	1081	1537	2363	443	173	967	2348	899	1328	2543	1666	1756

*Phytoplankton grouping abbreviations:

ABBREVIATION	TAXONOMIC GROUP NAME
GREENS	Chlorophyta
BLGREN	Cyanophyta
CHRSPH	Chrysophyta
CRYTPH	Cryptophyta
PYRPHY	Pyrrhophyta
DIATOM	Diatoms
TOTALS	total of all groups

Table 17. TOTAL AND MAJOR GROUP CONCENTRATIONS OF PHYTOPLANKTON FROM OAK CREEK, WISCONSIN POWER PLANT STUDY
(NUMBER OF CELLS / ML)
LOCATIONS OF STATIONS ARE INDICATED IN FIGURE 1
MEANINGS OF GROUP ABBREVIATIONS ARE INDICATED IN TABLE 6*

JANUARY, 1972

GROUP ABBREVIATIONS	STATION NUMBERS 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
GREENS	109	118	126	91	109	68	36	103	103	113	127	84	15	149	100	75	37
BLGREN	76	4	30	97	12	7	49	54	36	13	3	7	12	0	46	23	0
CHRSPH	99	63	83	121	68	35	59	36	88	116	57	82	20	127	39	37	50
CRYTPH	165	369	411	129	273	202	274	200	189	379	246	344	75	242	243	232	119
PYRPHY	2	4	2	0	1	2	1	0	1	0	0	0	0	1	1	3	1
DIATOM	585	637	271	609	203	257	132	169	323	179	167	94	66	479	220	161	166
TOTALS	1036	1195	923	1047	666	571	661	502	740	800	600	611	188	998	649	531	373

FEBRUARY, 1972

GROUP ABBREVIATIONS	STATION NUMBERS 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
GREENS	24	74	39	141	175	126	135	0	20	136	99	88	97	3	45	71	89
BLGREN	1	0	0	0	0	0	1	0	2	0	6	0	37	0	1	0	11
CHRSPH	5	18	16	35	50	91	94	0	1	67	107	79	108	0	6	29	45
CRYTPH	27	47	52	137	200	302	203	0	19	166	165	251	234	7	61	144	194
PYRPHY	0	0	0	0	0	4	4	0	0	3	2	2	2	1	0	4	2
DIATOM	145	799	780	699	558	311	256	0	112	371	223	253	131	198	629	316	169
TOTALS	202	938	887	1012	983	834	693	0	154	743	602	673	609	209	742	564	500

*Phytoplankton grouping abbreviations:

ABBREVIATION	TAXONOMIC GROUP NAME
GREENS	Chlorophyta
BLGREN	Cyanophyta
CHRSPH	Chrysophyta
CRYTPH	Cryptophyta
PYRPHY	Pyrrhophyta
DIATOM	Diatoms
TOTALS	total of all groups

Table 17. TOTAL AND MAJOR GROUP CONCENTRATIONS OF PHYTOPLANKTON FROM OAK CREEK, WISCONSIN POWER PLANT STUDY
(NUMBER OF CELLS / ML)
LOCATIONS OF STATIONS ARE INDICATED IN FIGURE 1
MEANINGS OF GROUP ABBREVIATIONS ARE INDICATED IN TABLE 6*

APRIL, 1972

GROUP ABBREVIATIONS	STATION NUMBERS 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
GREENS	36	76	40	0	99	67	96	127	60	75	0	27	70	107	82	63	0
BLGREN	3	1	1	0	0	1	1	1	0	0	0	0	2	0	0	0	0
CHRSPH	3	45	16	0	34	21	43	57	41	21	0	20	30	28	32	23	0
CRYTPH	197	280	136	0	383	267	288	337	146	244	0	101	152	264	514	205	0
PYRPHY	0	3	5	0	2	2	3	0	0	0	0	1	2	0	3	0	0
DIATOM	1086	1125	194	0	1881	486	308	407	678	659	0	113	208	1019	1364	1190	0
TOTALS	1325	1530	392	0	2399	844	739	929	925	999	0	262	464	1418	1995	1481	0

JUNE, 1972

GROUP ABBREVIATIONS	STATION NUMBERS 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
GREENS	667	308	448	593	211	626	197	226	469	626	260	278	91	365	665	1545	333
BLGREN	17	34	37	8	71	26	45	52	0	60	128	142	288	0	0	0	42
CHRSPH	72	21	39	29	28	52	129	223	111	158	141	240	86	14	29	48	139
CRYTPH	154	86	55	273	125	102	72	87	275	378	71	157	63	190	399	389	52
PYRPHY	4	4	9	8	3	5	18	8	5	3	5	10	12	1	1	7	8
DIATOM	673	264	135	1552	370	653	207	258	271	374	227	314	393	1900	2267	1083	202
TOTALS	1587	717	773	2463	808	1464	668	854	1131	1599	832	1141	933	2470	3361	3072	776

*Phytoplankton grouping abbreviations:

ABBREVIATION	TAXONOMIC GROUP NAME
GREENS	Chlorophyta
BLGREN	Cyanophyta
CHRSPH	Chrysophyta
CRYTPH	Cryptophyta
PYRPHY	Pyrrhophyta
DIATOM	Diatoms
TOTALS	total of all groups

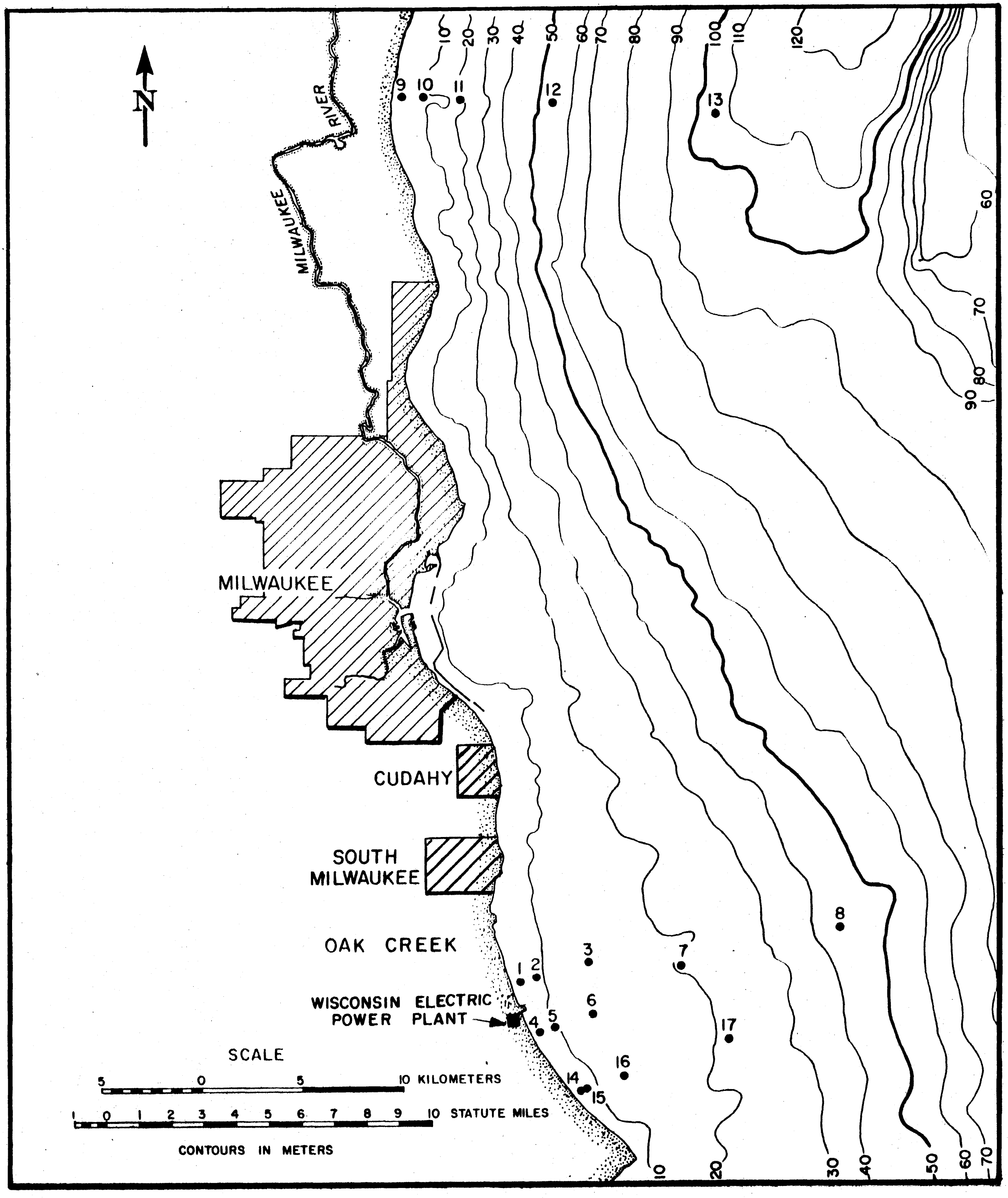

Figure 1. Sampling locations for Oak Creek, Wisconsin power plant study. For station coordinates see Table 1.

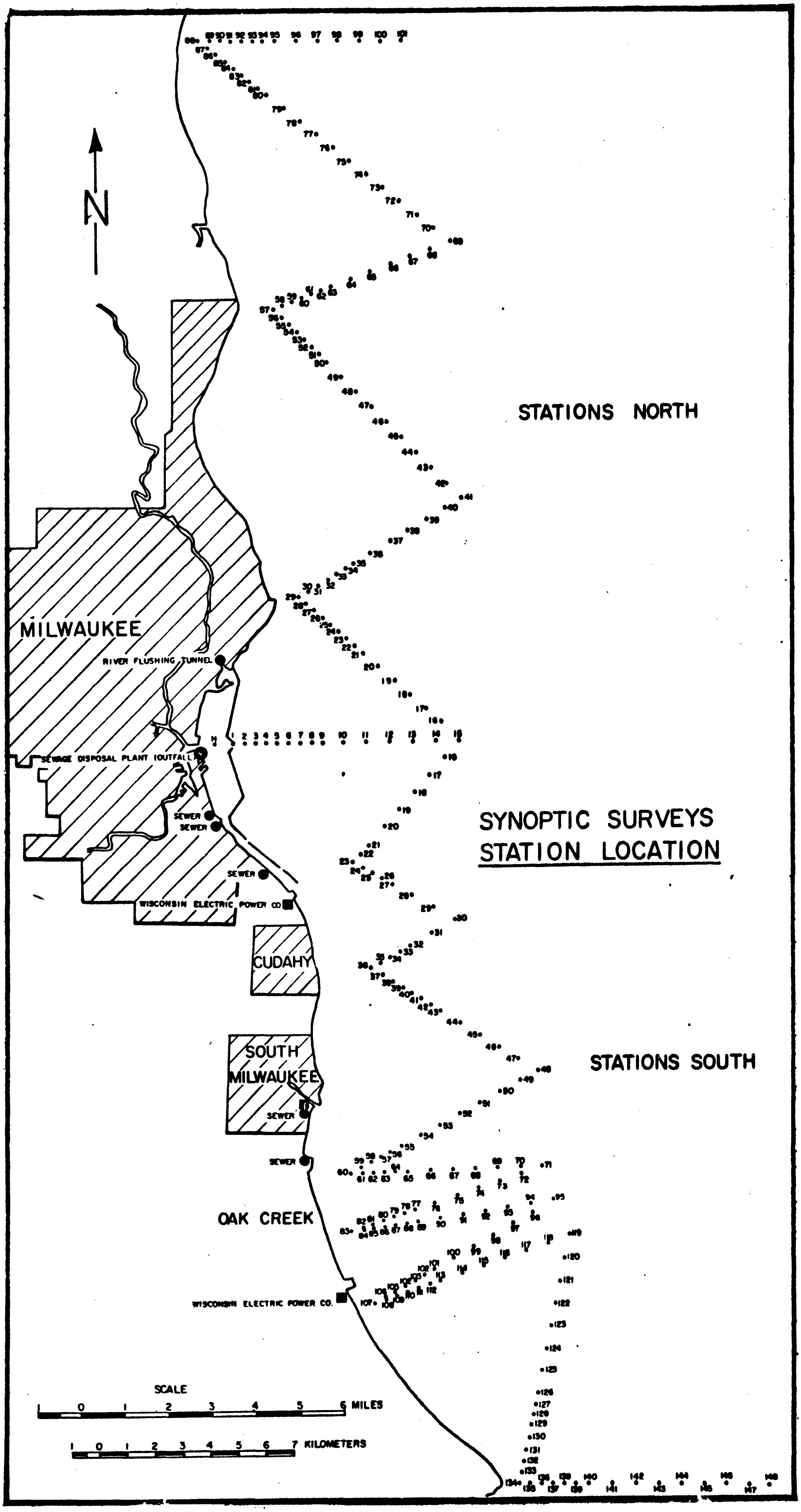

Figure 2. Sampling locations for synoptic surveys, April and June 1972 (only stations south were sampled in June).

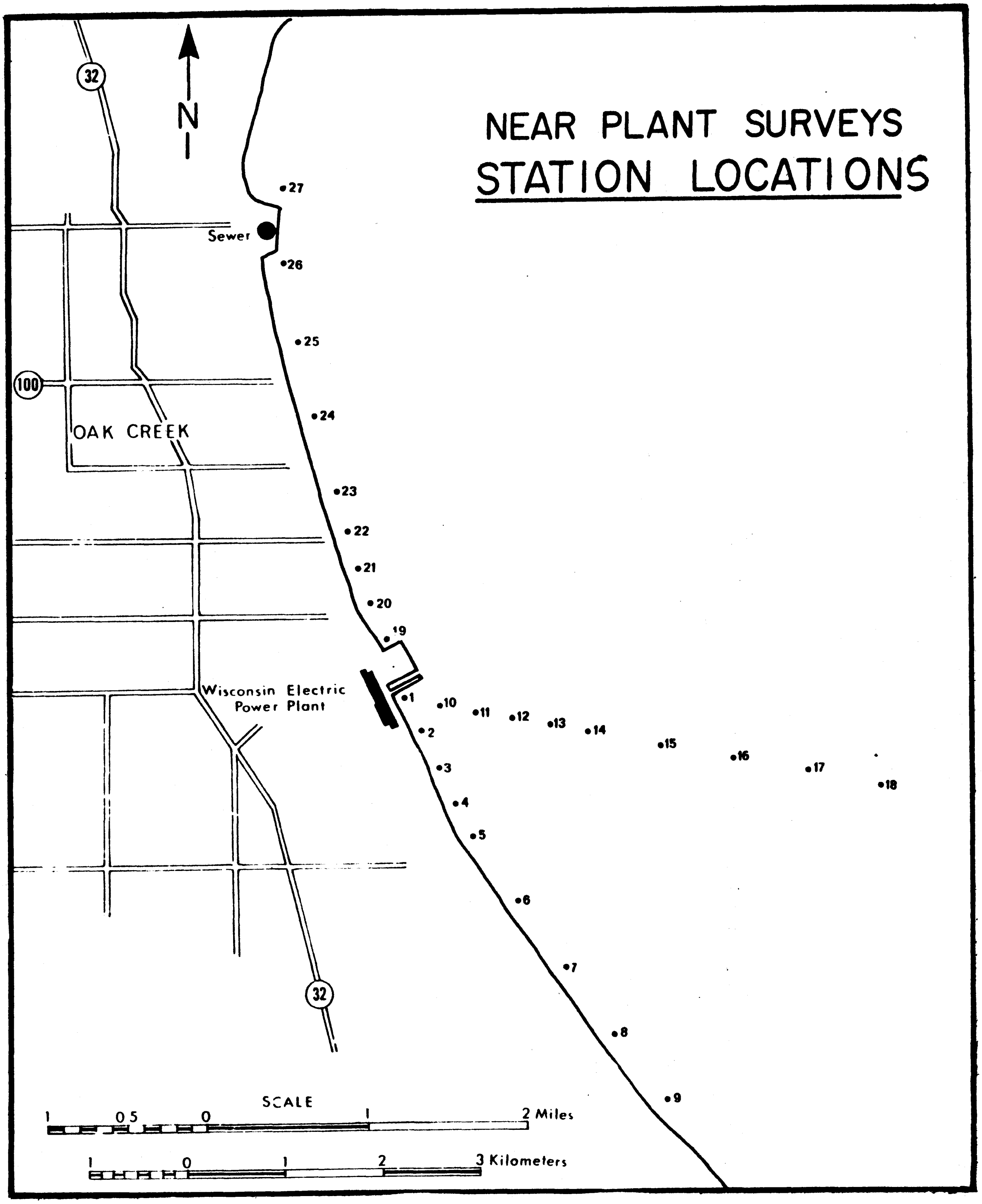

Figure 3. Sampling locations for near-plant surveys, October and November 1972.

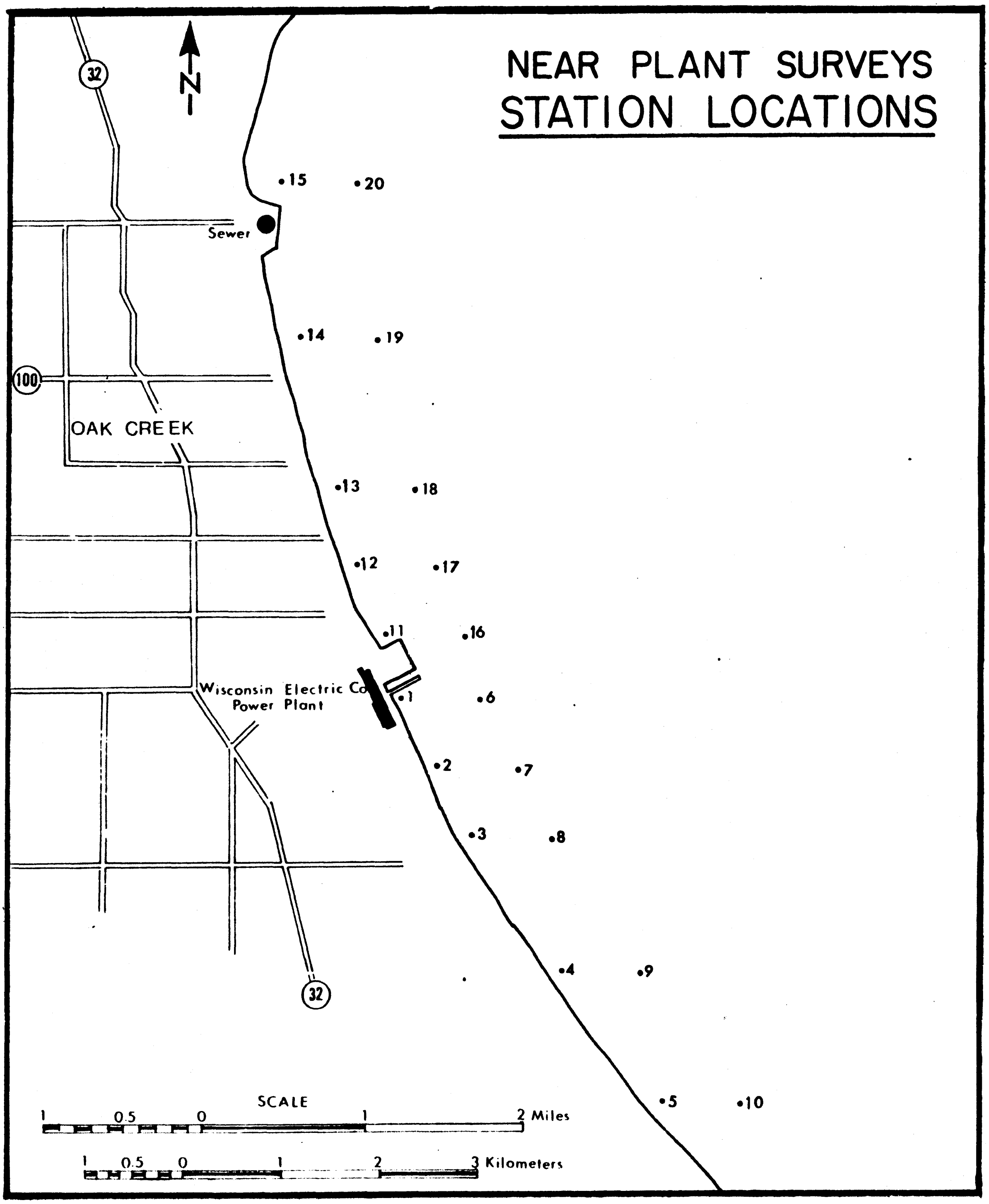

Figure 4. Sampling locations for near-plant surveys, January and February 1972.

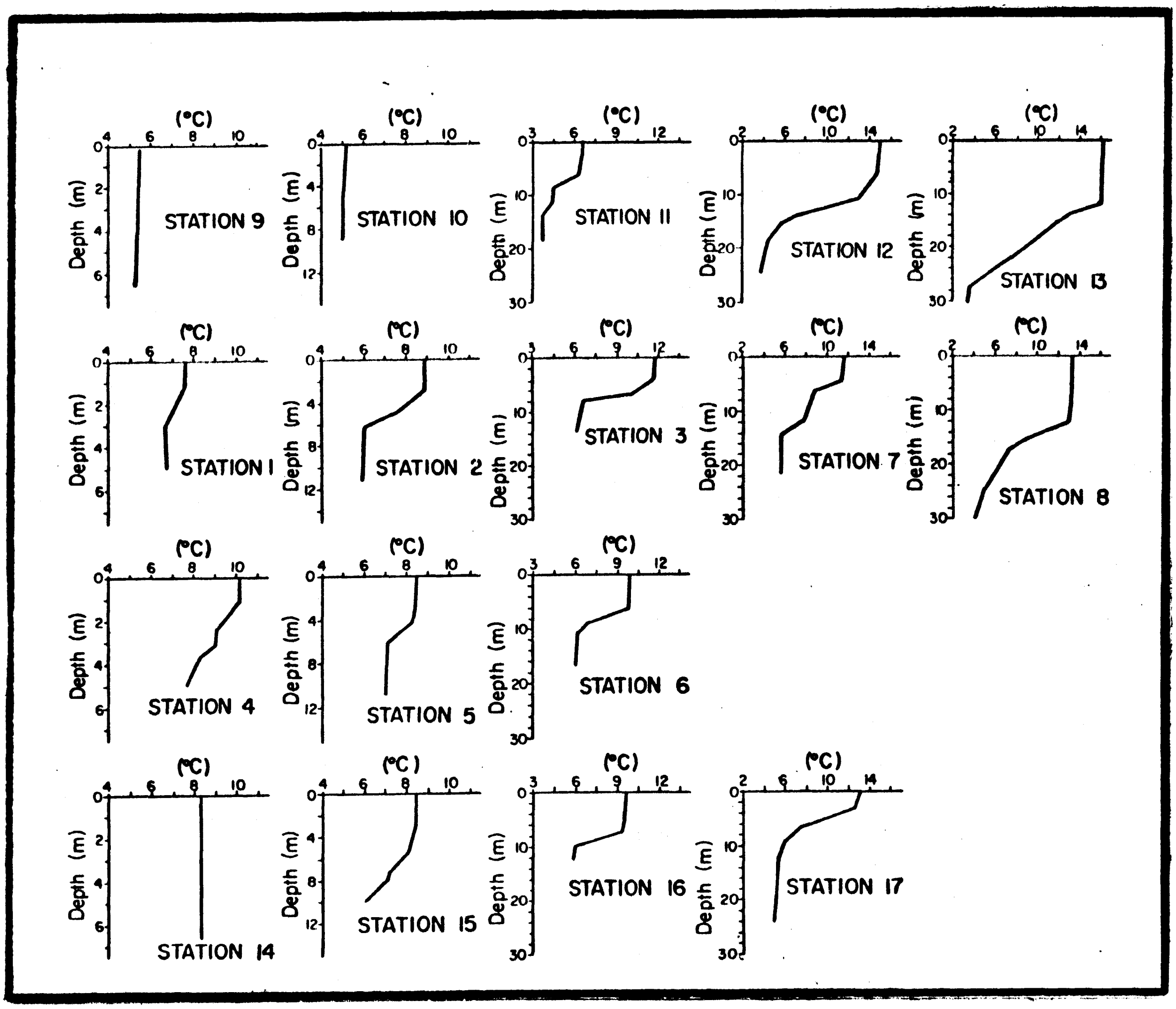

Figure 5. Temperature profiles for stations sampled in October, 1971.

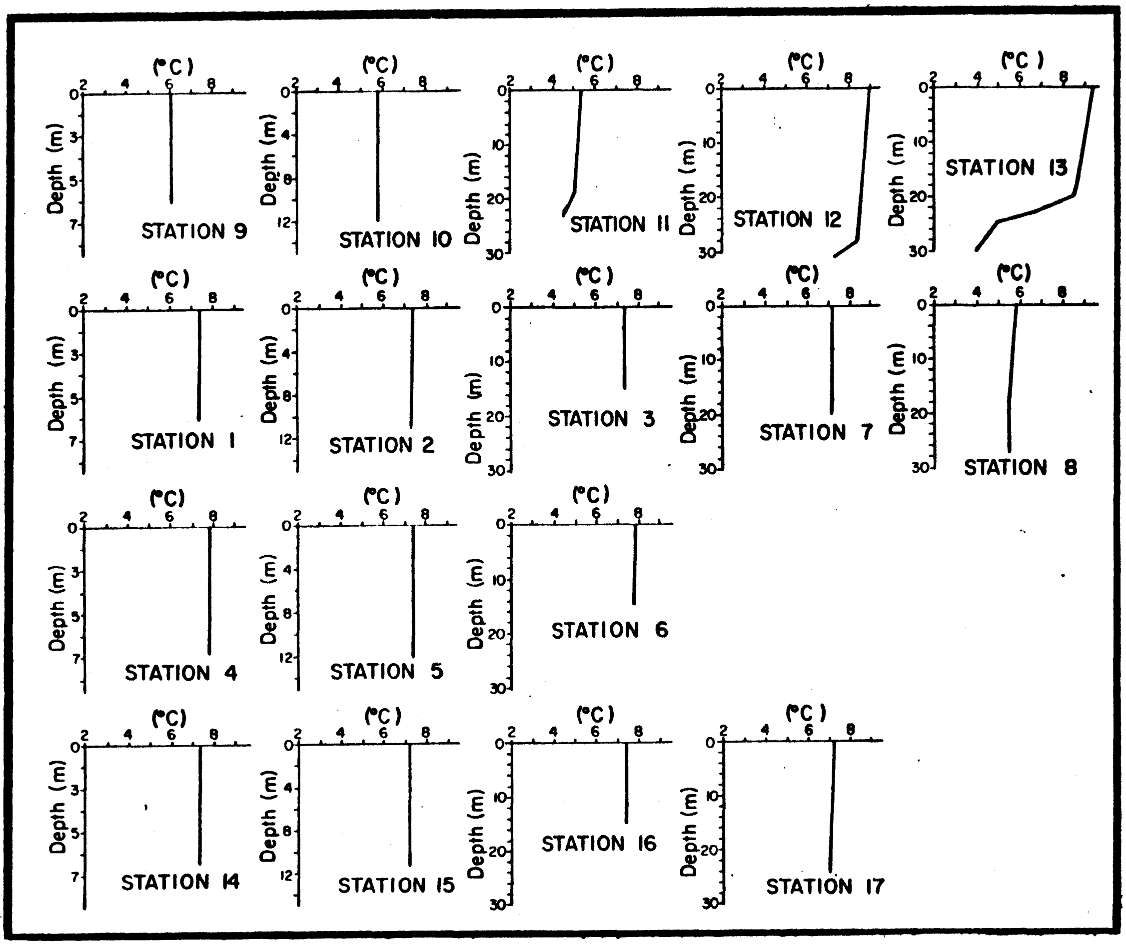

Figure 6. Temperature profiles for stations sampled in November, 1971.

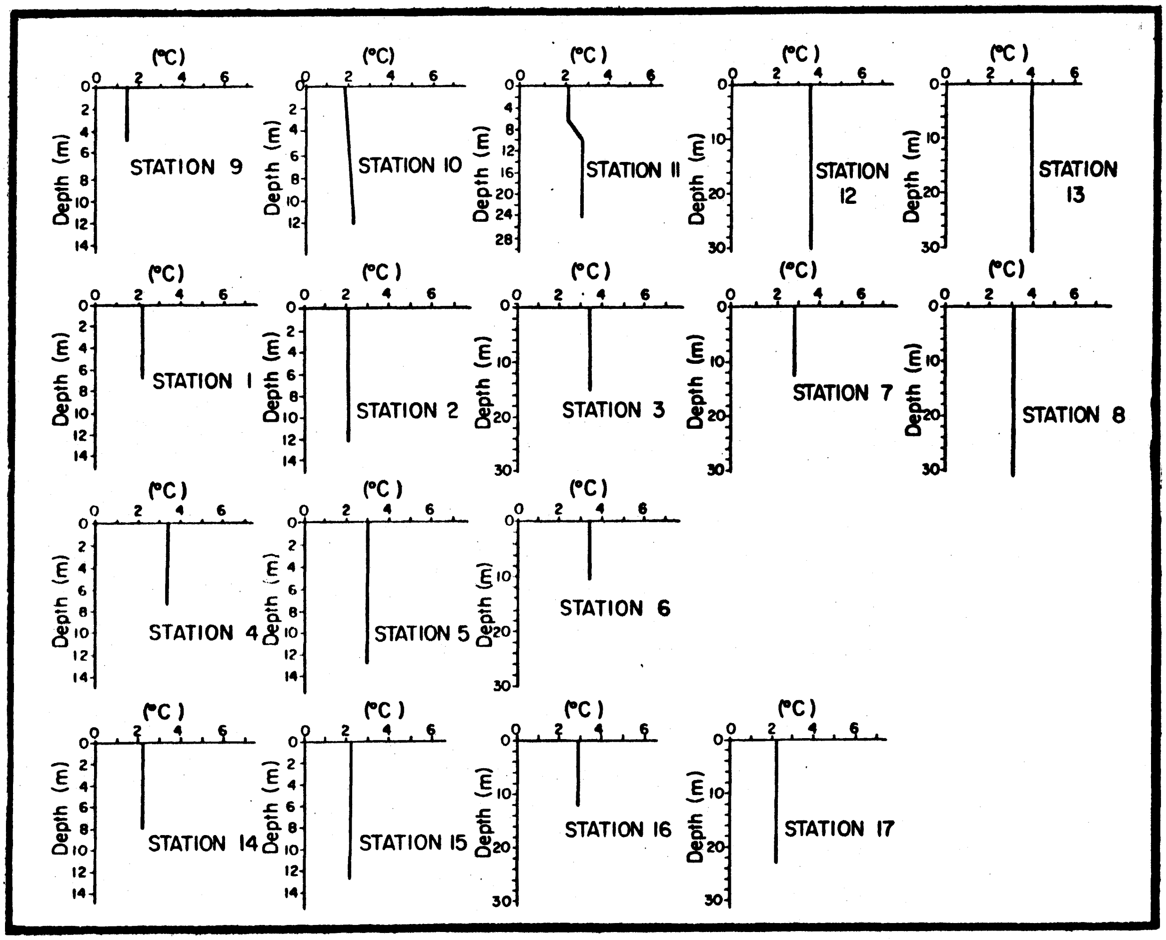

Figure 7. Temperature profiles for stations sampled in December, 1971.

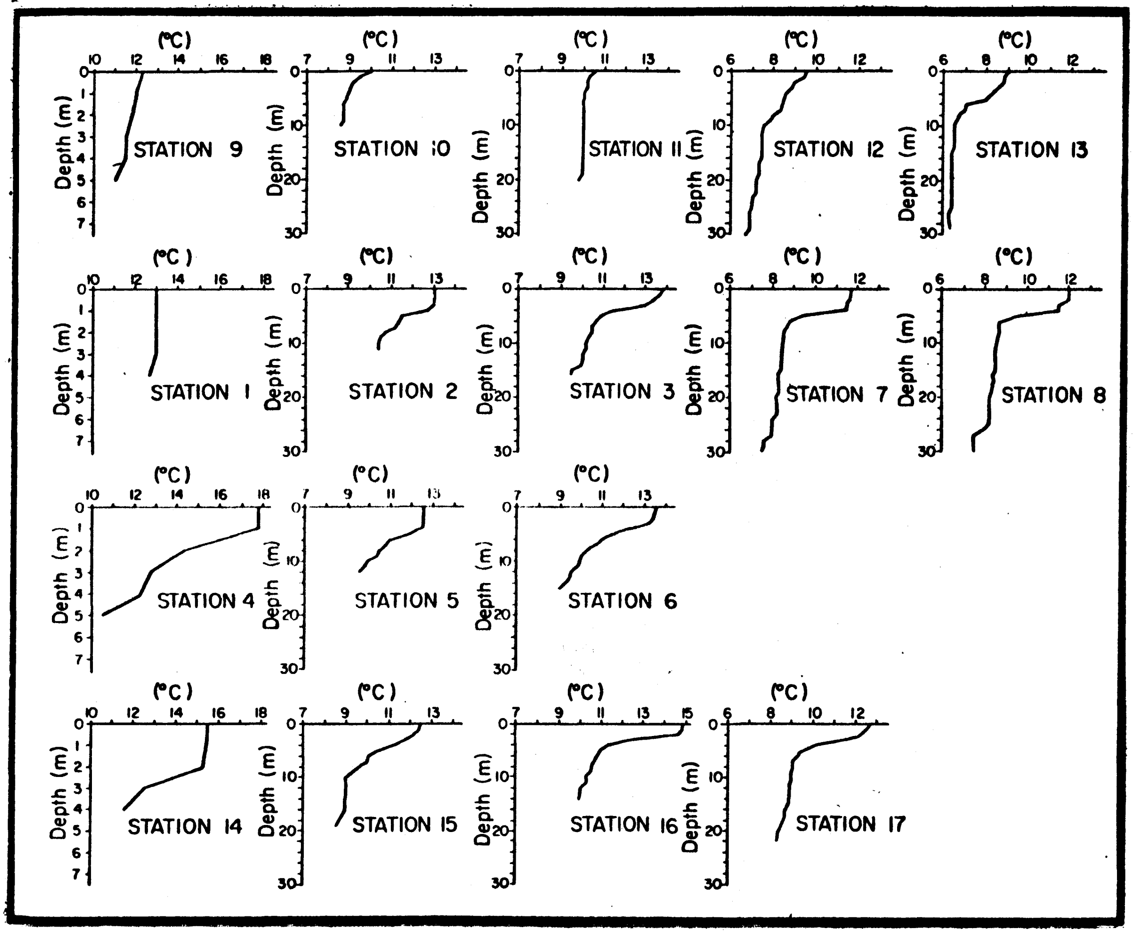

Figure 8. Temperature profiles for stations sampled in June, 1972.

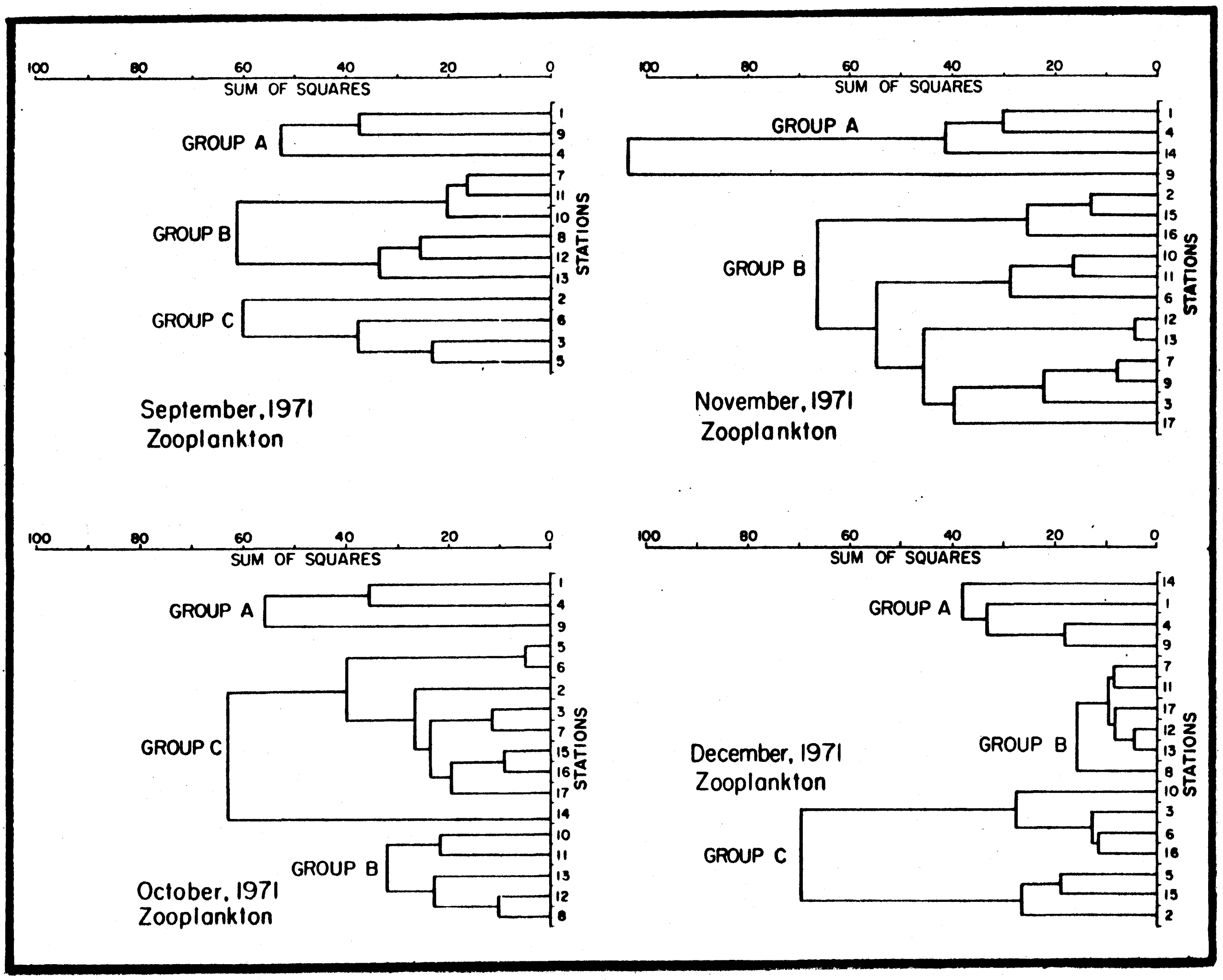

Figure 9. Zooplankton dendrograms for September through December, 1971, showing relative similarity of groups of stations.

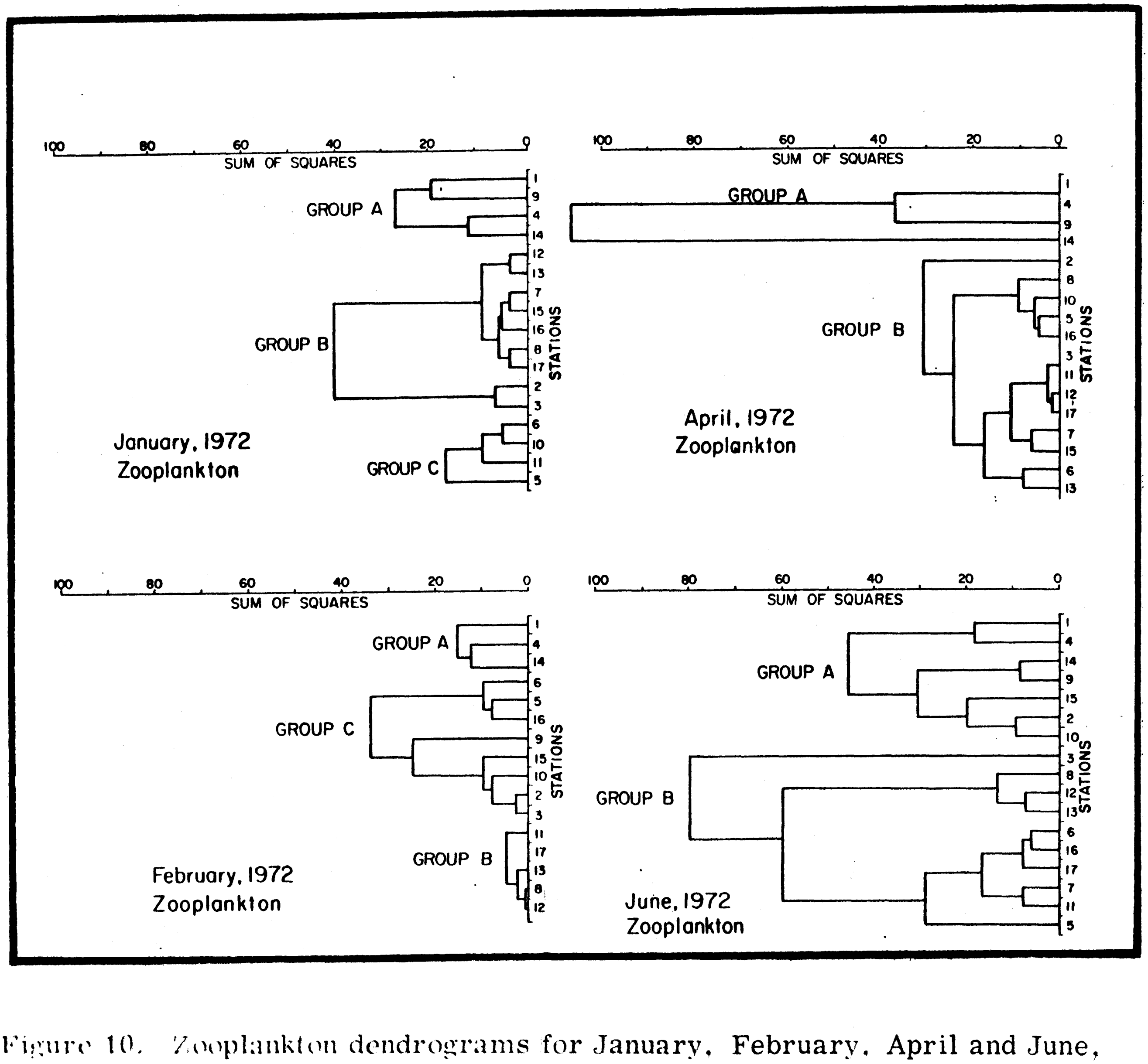

Figure 10. Zooplankton dendrograms for January, February, April and June, 1972, showing relative similarity of groups of stations.

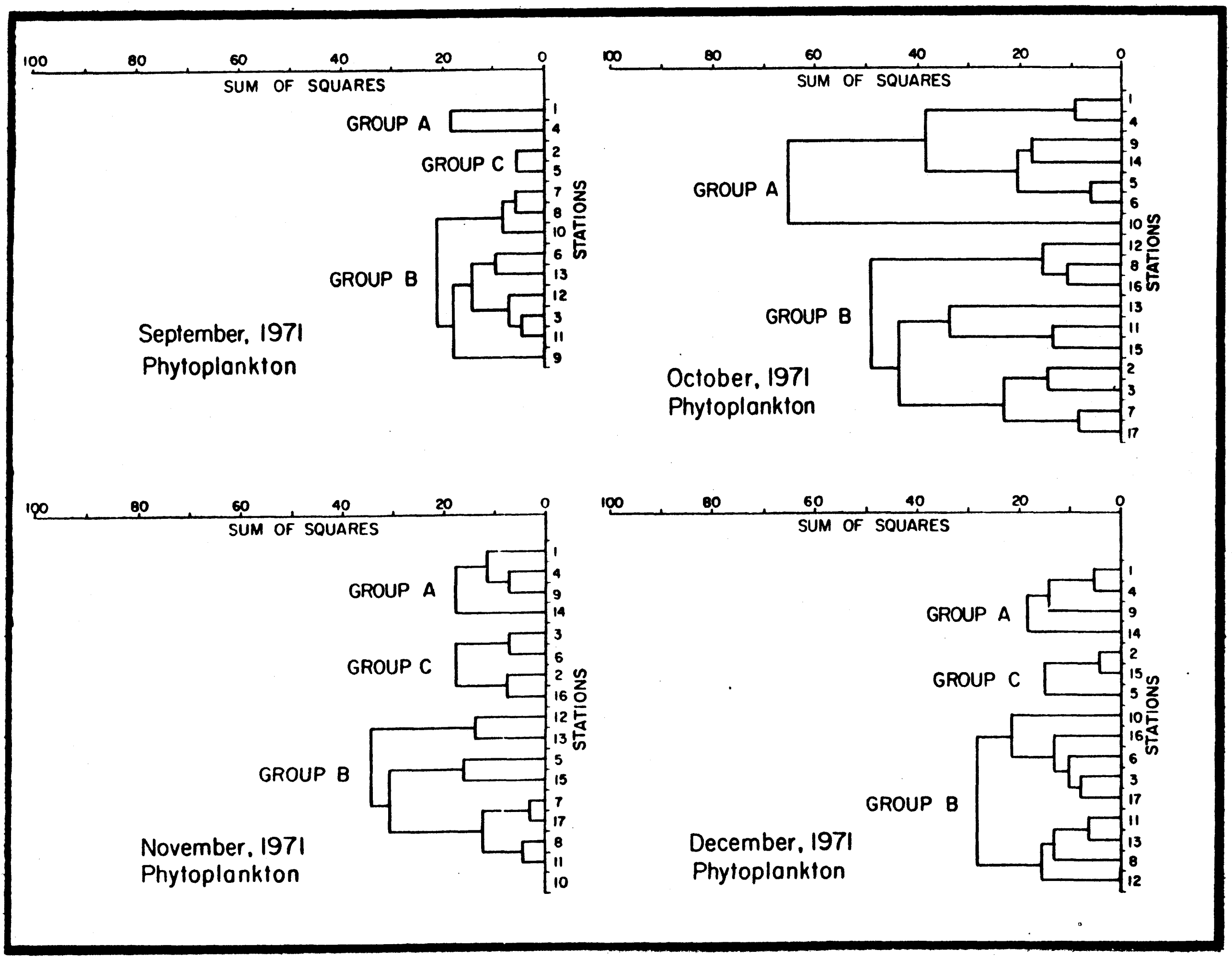

Figure 11. Phytoplankton dendrograms for September through December, 1971, showing relative similarity of groups of stations.

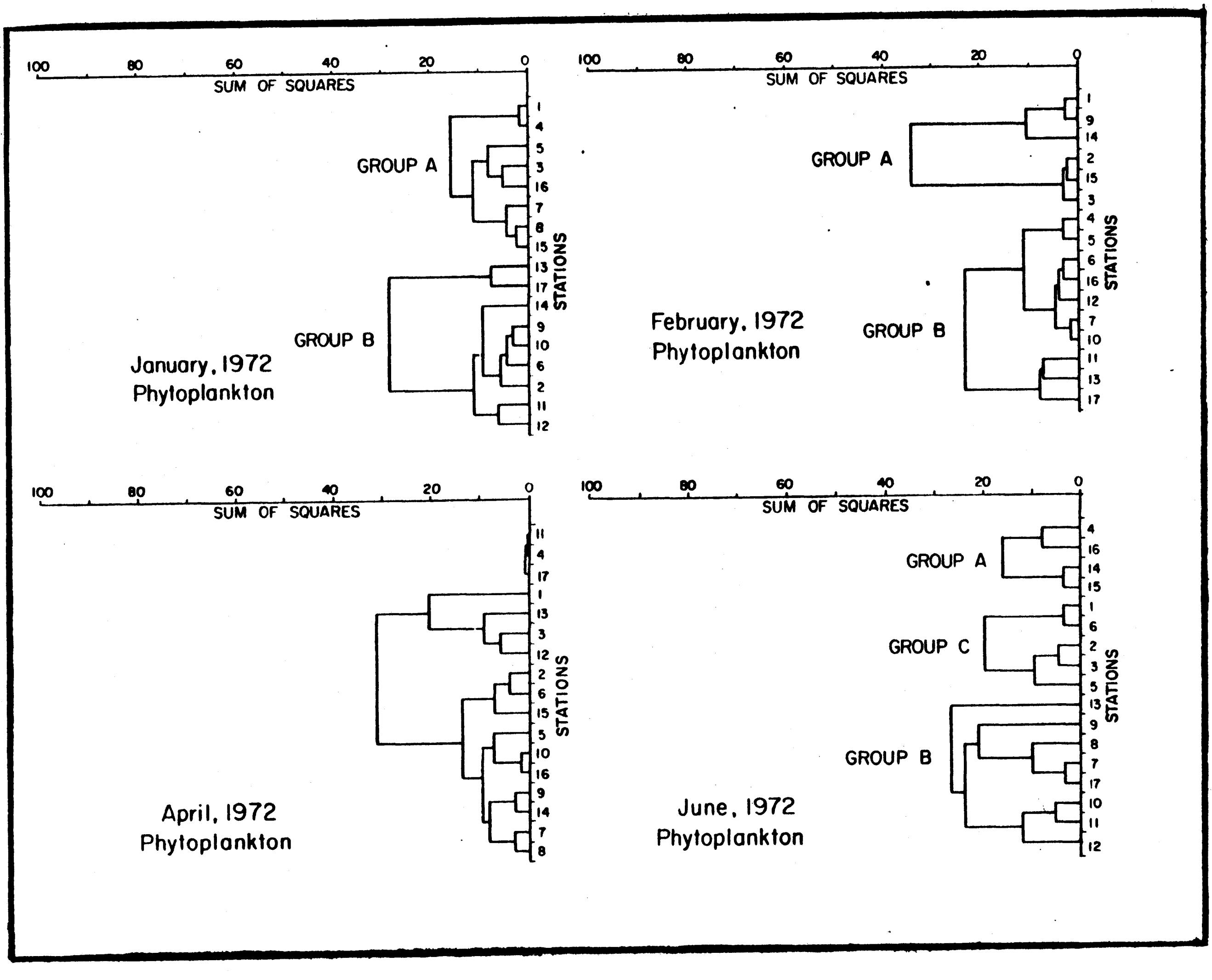

Figure 12. Phytoplankton dendrograms for January, February, April, and June, 1972, showing relative similarity of groups of stations.

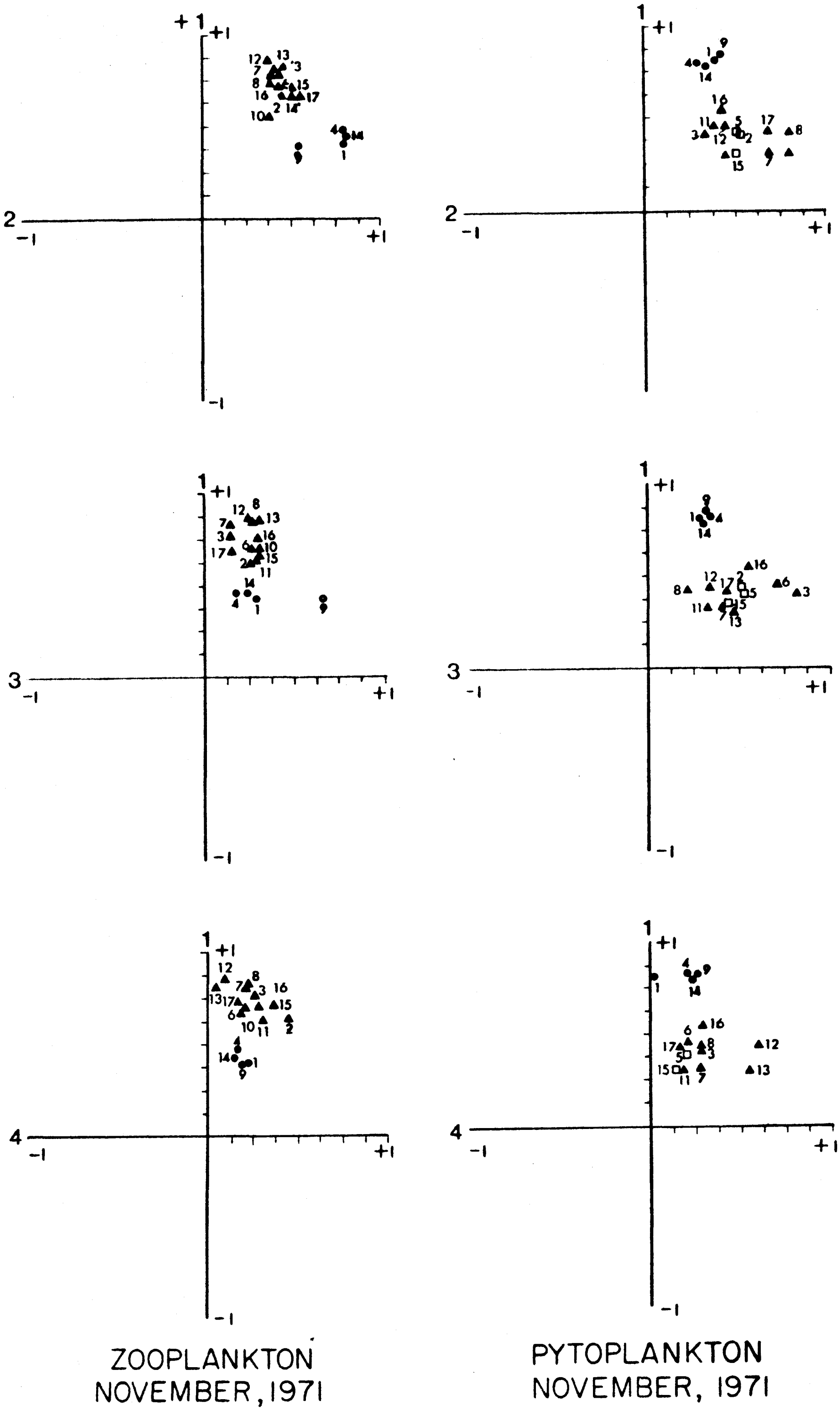

Figure 13. Station positions on rotated axes 1 through 4 produced by the image factoring procedure for phytoplankton and zooplankton data collected in November, 1971. For phytoplankton = group A of cluster analysis, = group B, and = group C. For zooplankton, = group A, and = groups B and C combined.

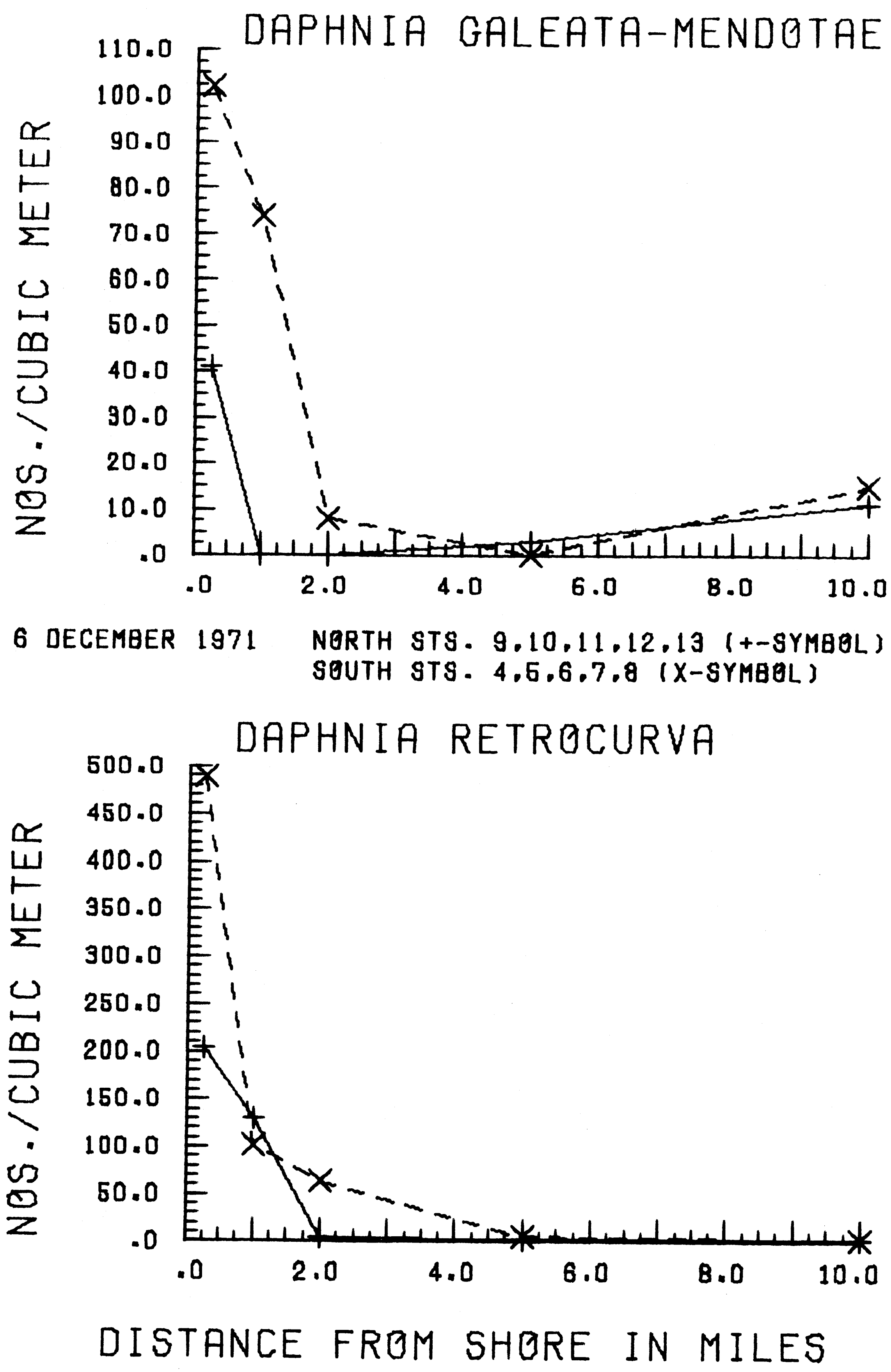

Figure 14. Concentrations of Daphnia galeata-mendotae and D. retrocurva as a function of distance from shore.

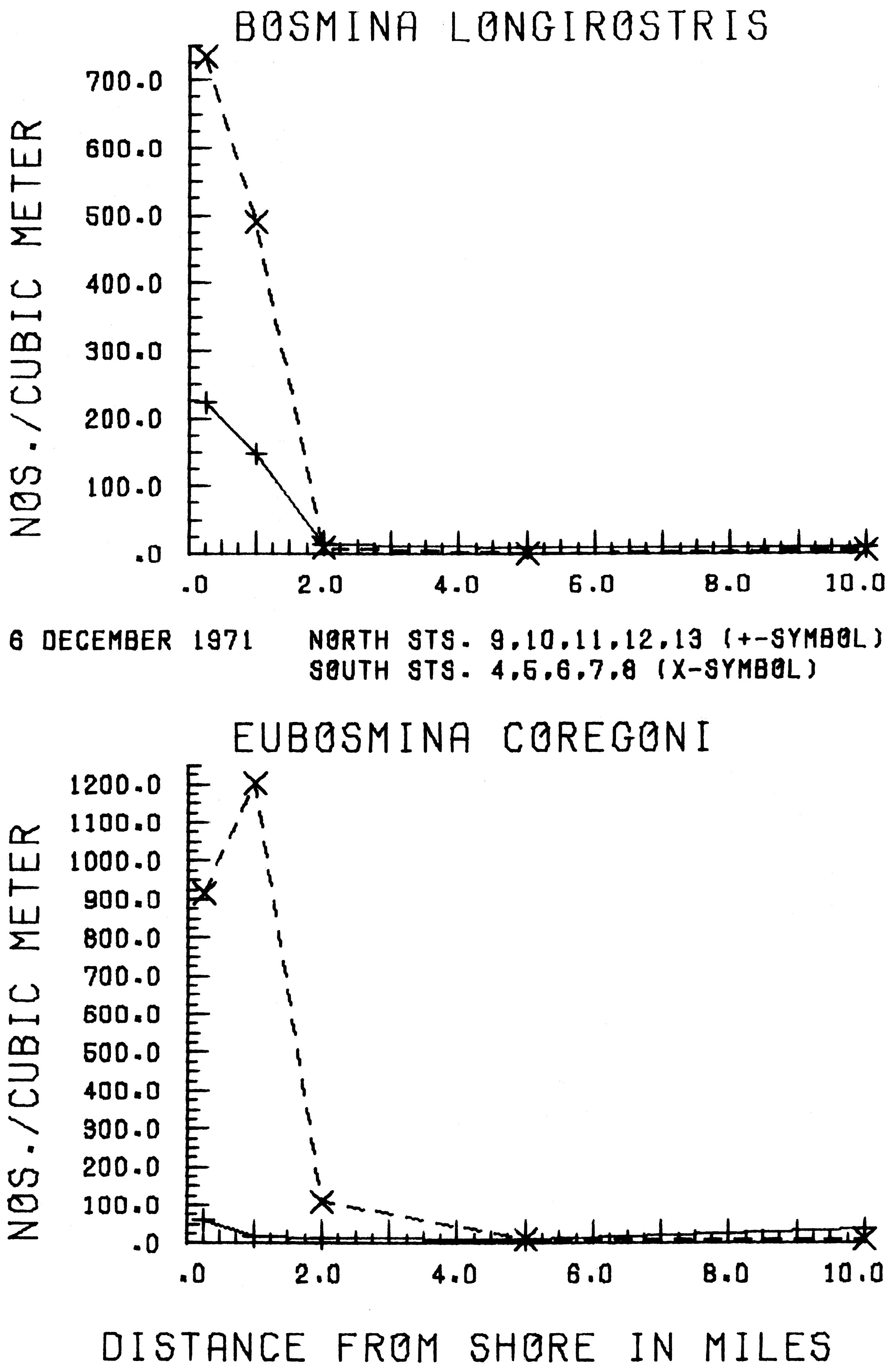

Figure 15. Concentrations of Bosmina longirostris and Eubosmina coregoni as a function of distance from shore.

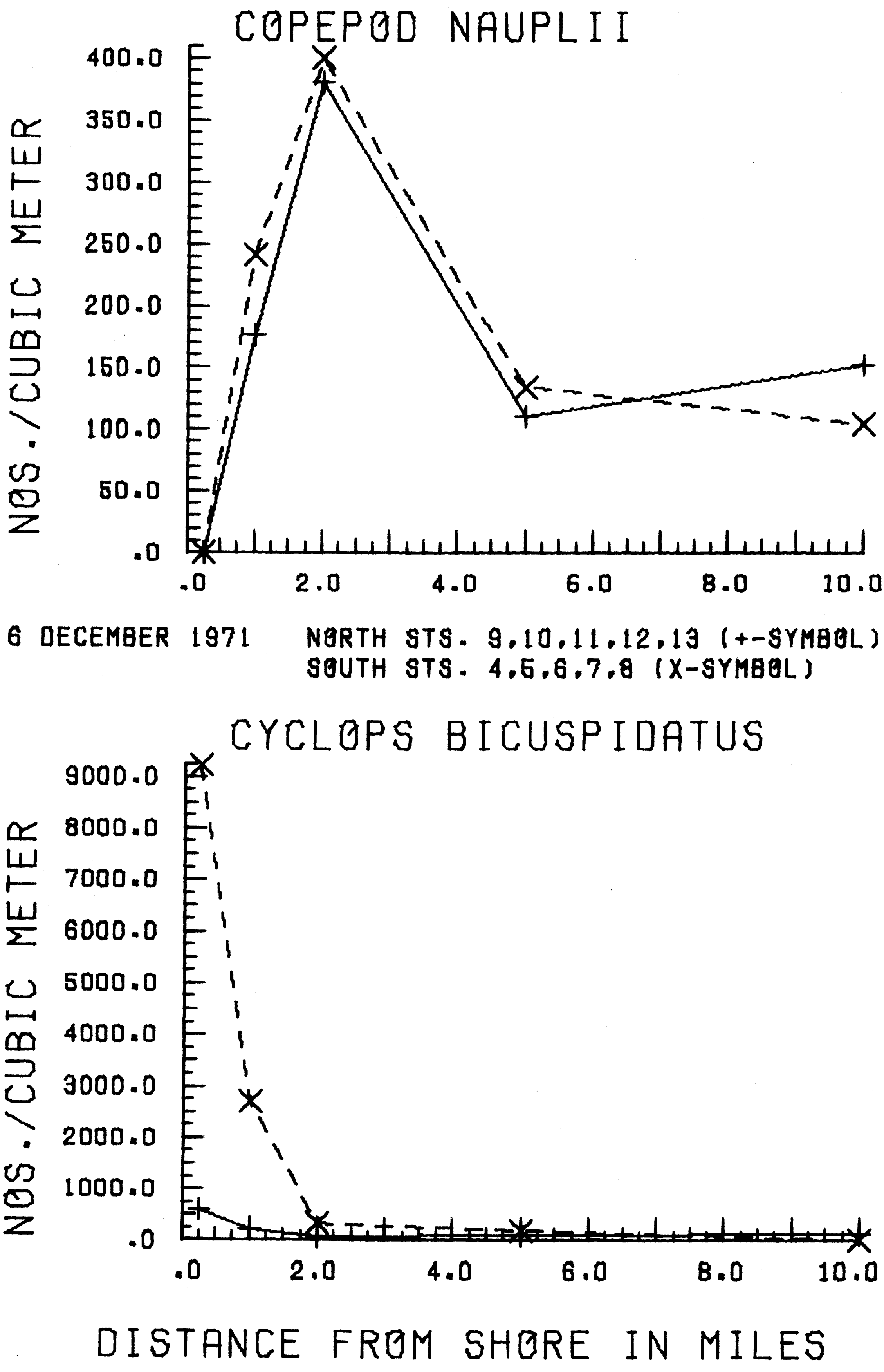

Figure 16. Concentrations of Copepod nauplii and <u>Cyclops</u> <u>bicuspidatus</u> as a function of distance from shore.

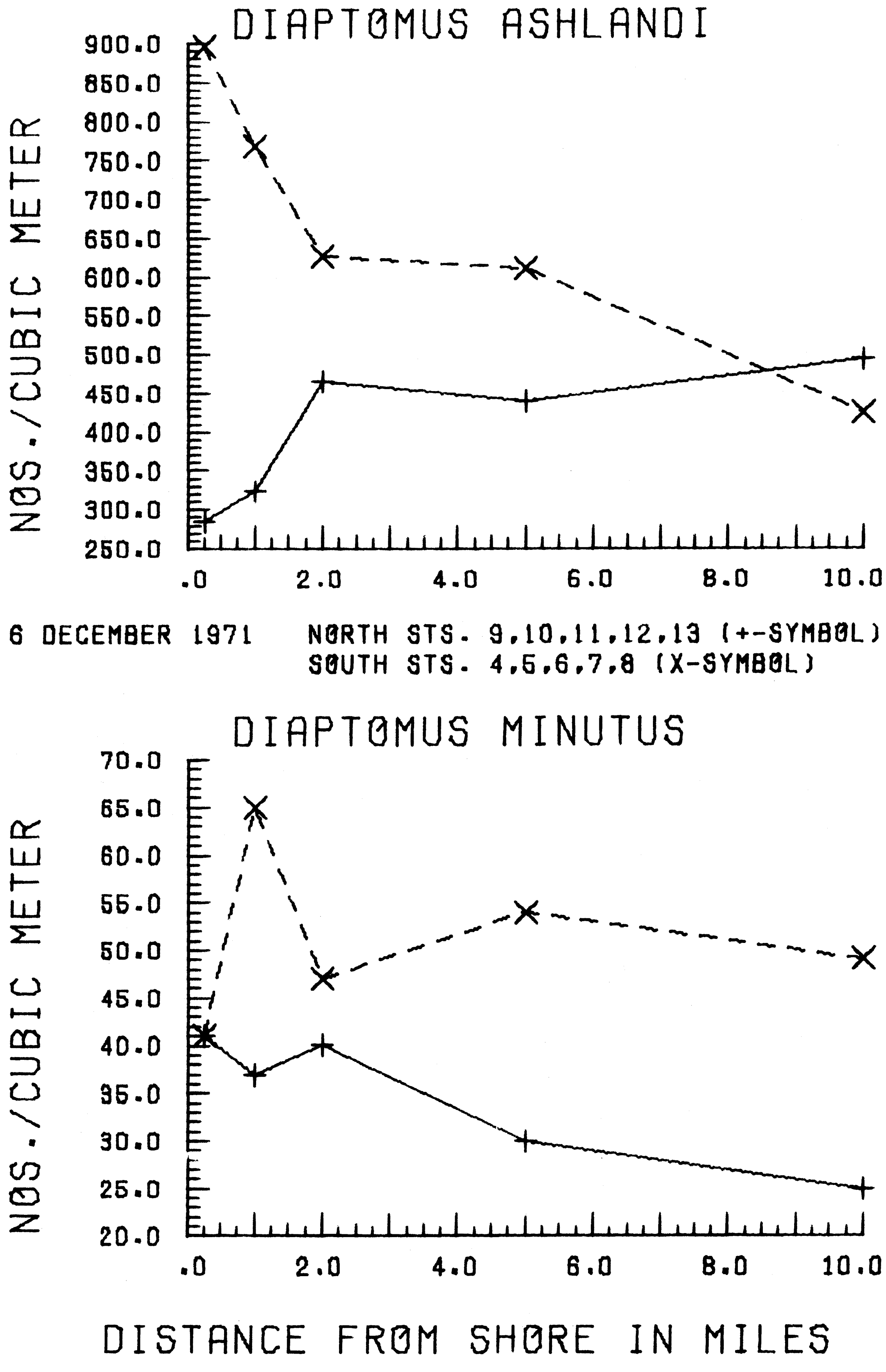

Figure 17. Concentrations of Diaptomus ashlandi and D. minutus as a function of distance from shore.

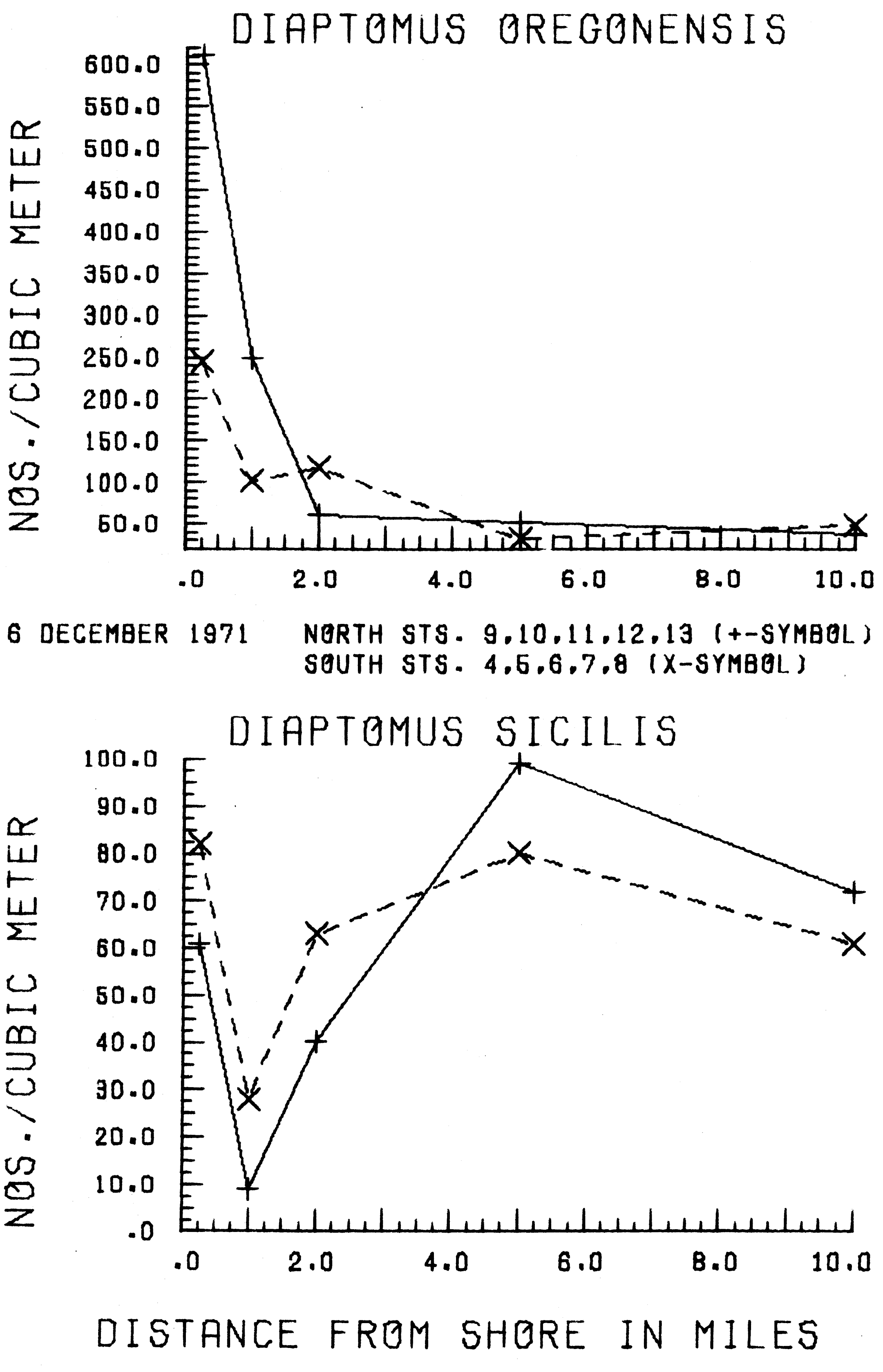

Figure 18. Concentrations of Diaptomus oregonensis and D. sicilis as a function of distance from shore.

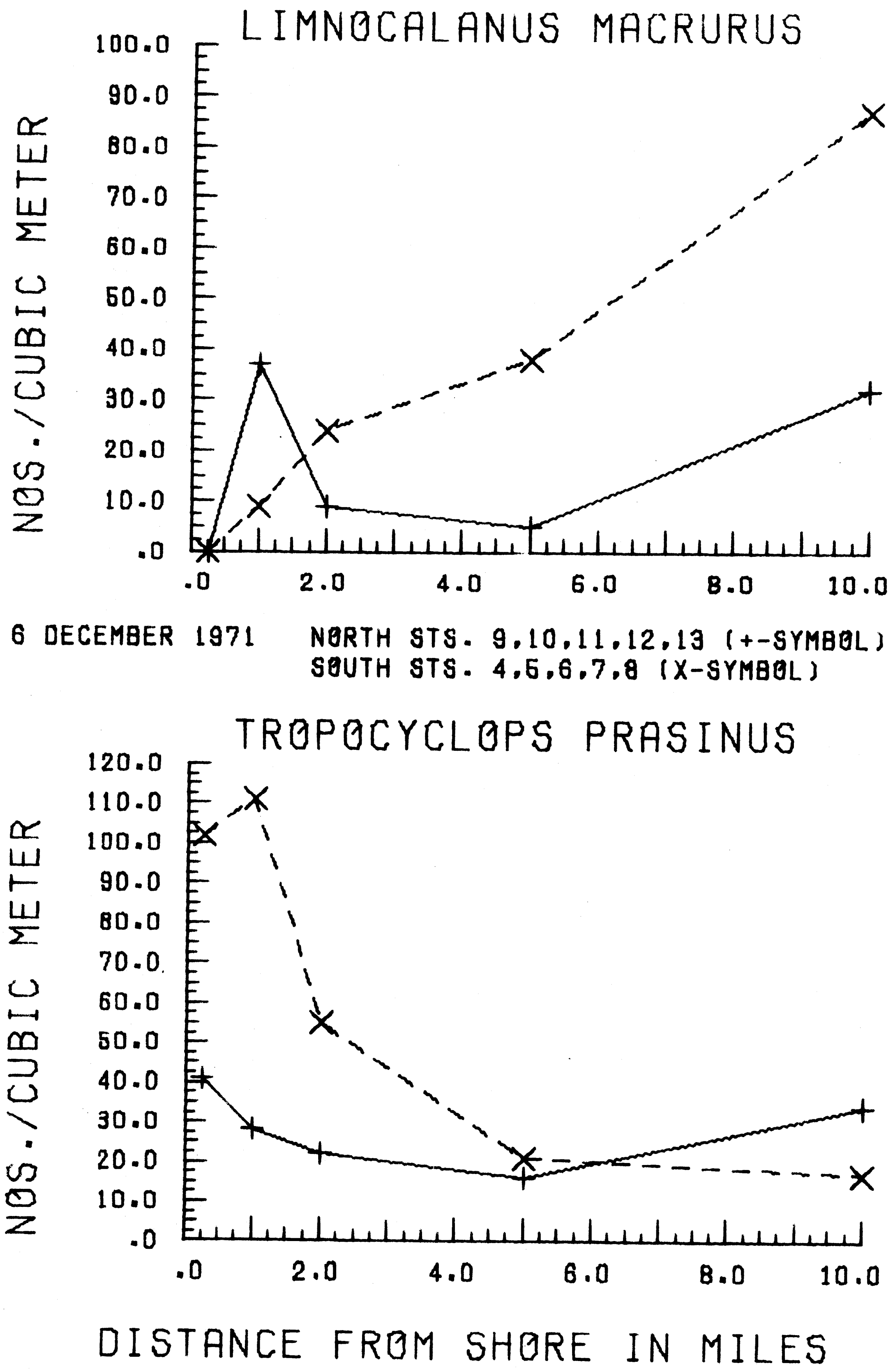

Figure 19. Concentrations of Limnocalanus macrurus and Tropocyclops prasinus as a function of distance from shore.

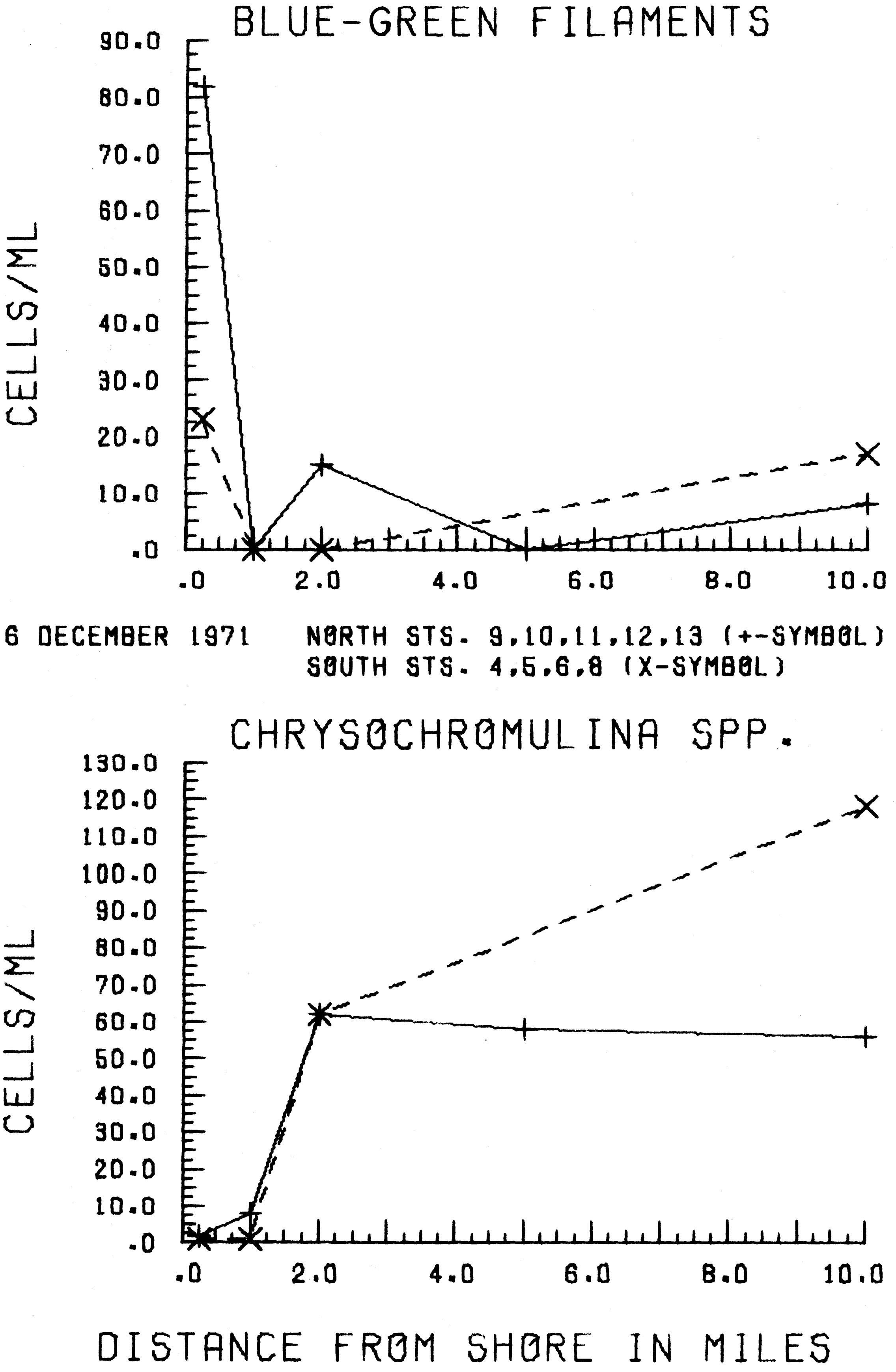

Figure 20. Concentrations of blue-green filaments and Chrysochromulina spp. as a function of distance from shore.

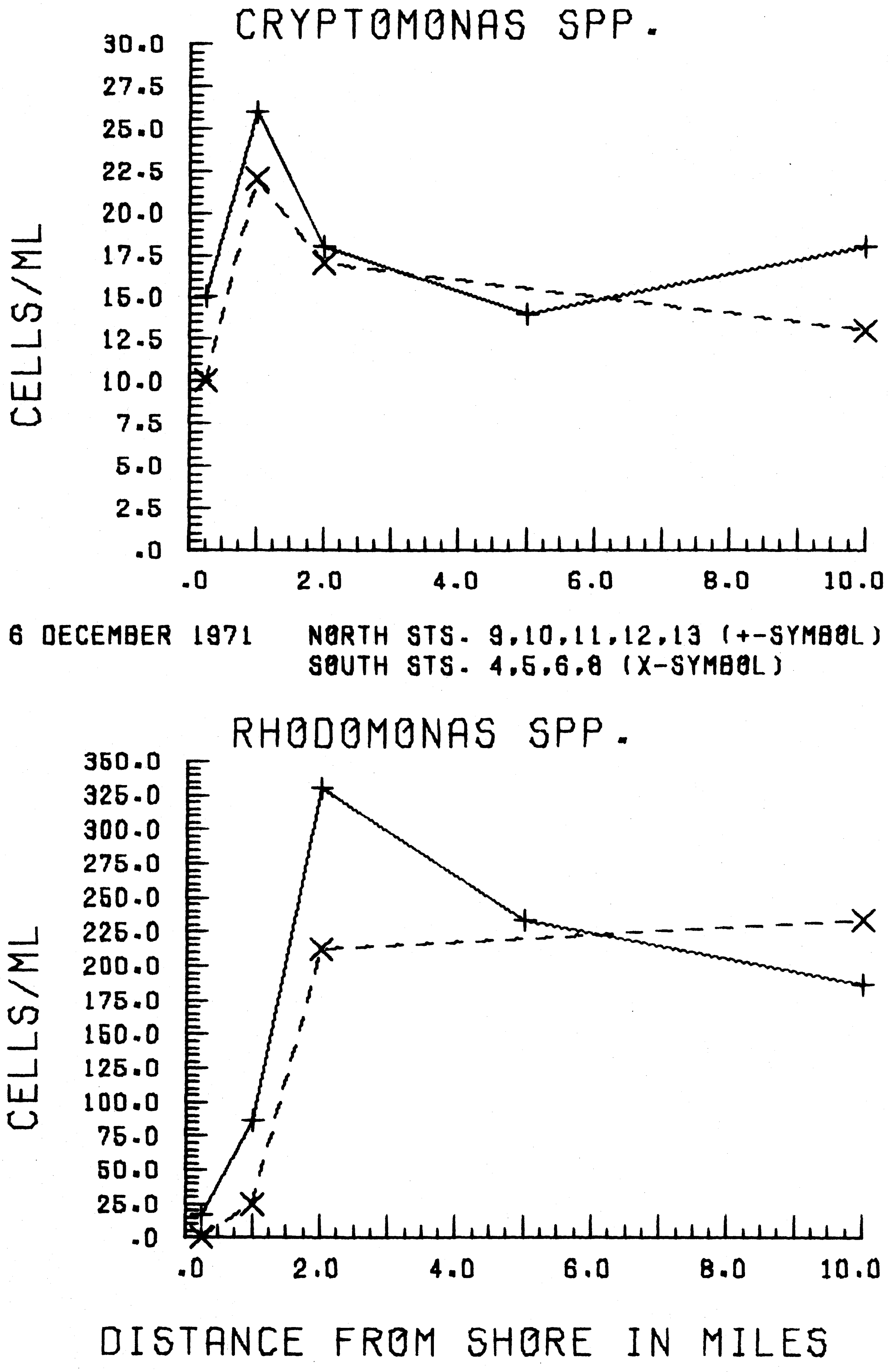

Figure 21. Concentrations of Cryptomonas spp. and Rhodomonas spp. as a function of distance from shore.

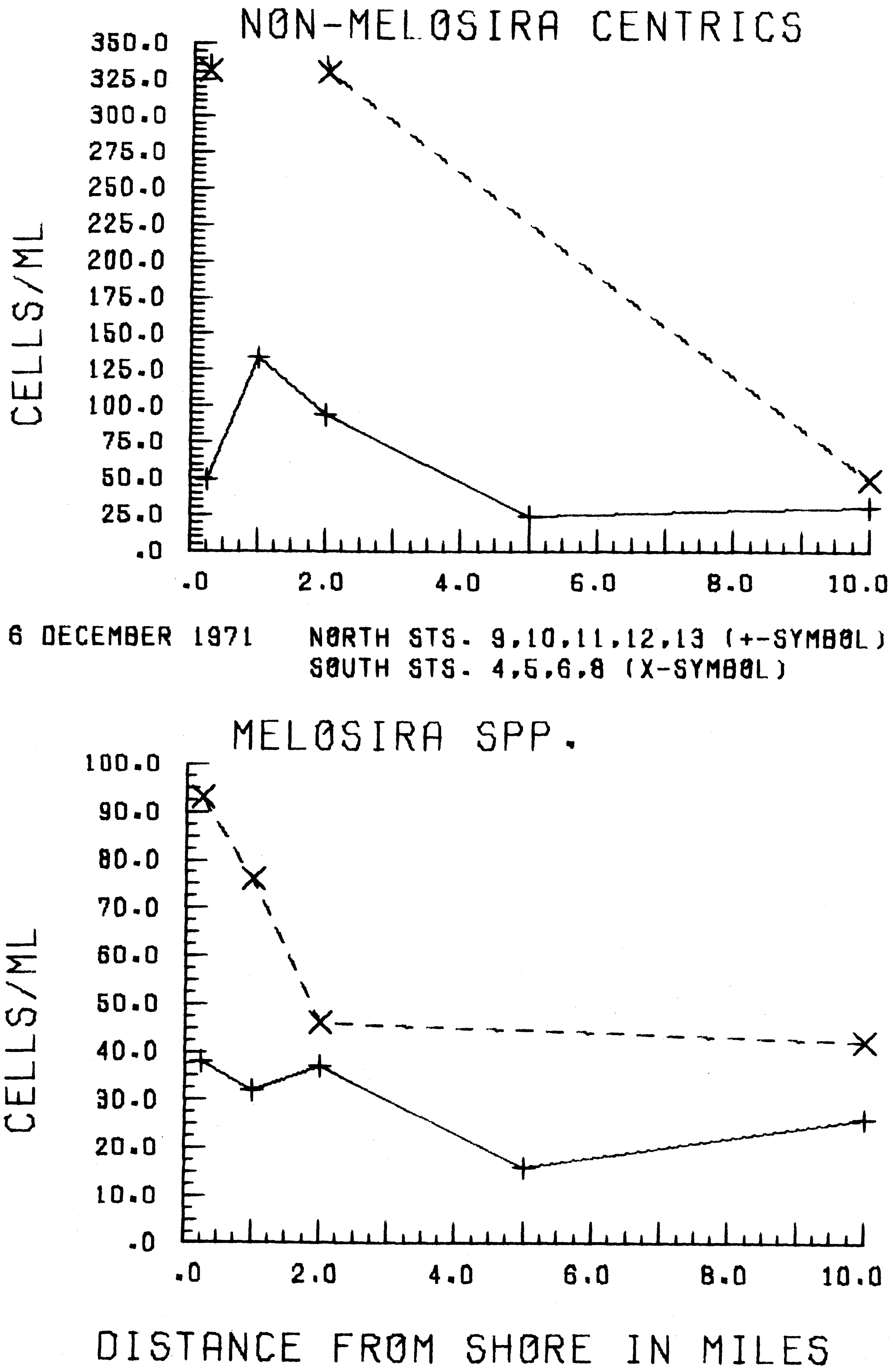

Figure 22. Concentration of non-melosira centric diatoms and *Melosira* spp. as a function of distance from shore.

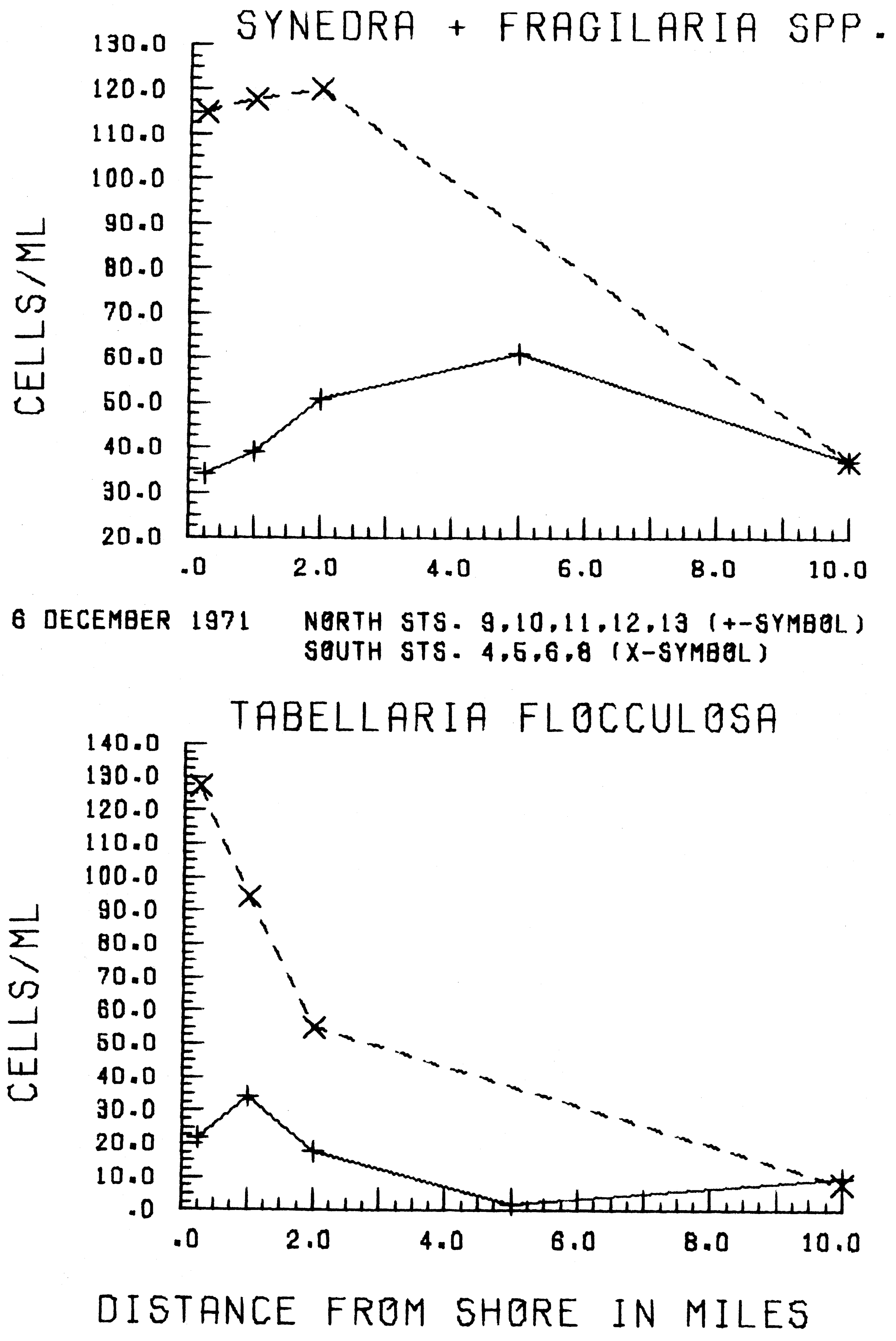

Figure 23. Concentrations of Synedra and Fragilaria spp. and Tabellaria flocculosa as a function of distance from shore.

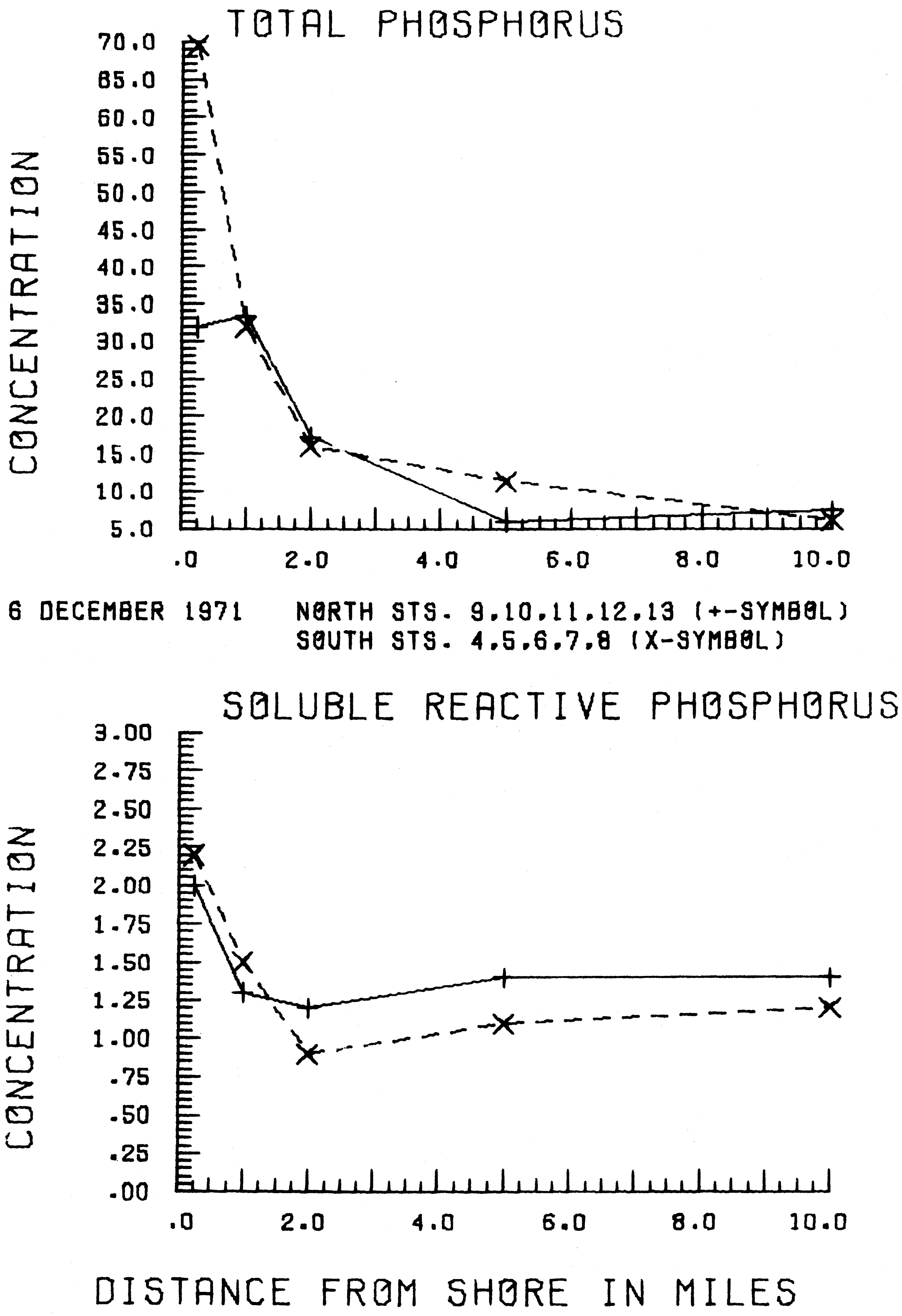

Figure 24. Concentrations of total and soluble reactive phosphorus ($\mu g/l$) as a function of distance from shore.

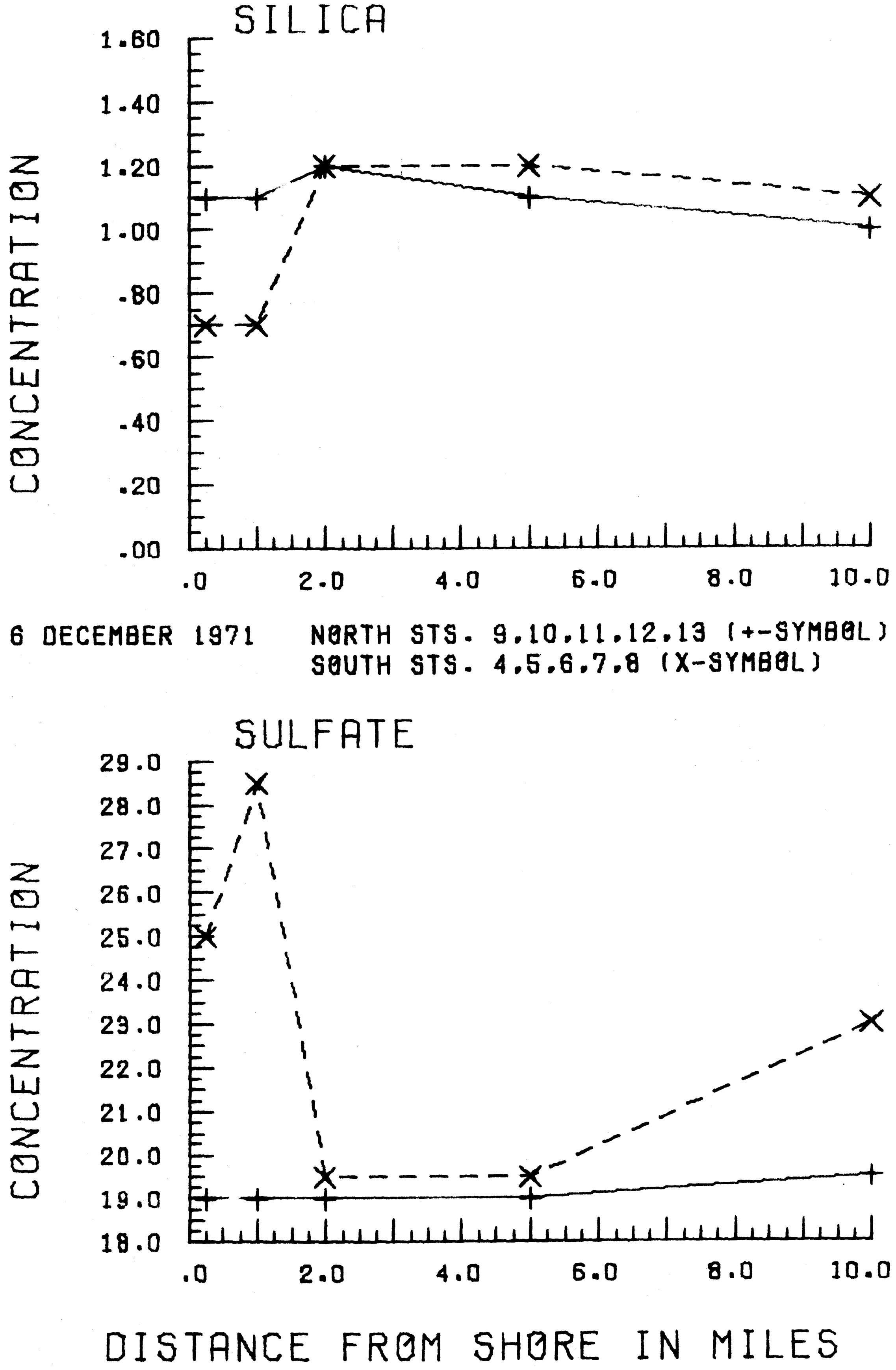

Figure 25. Concentrations of silica and sulfate (mg/l) as a function of distance from shore.

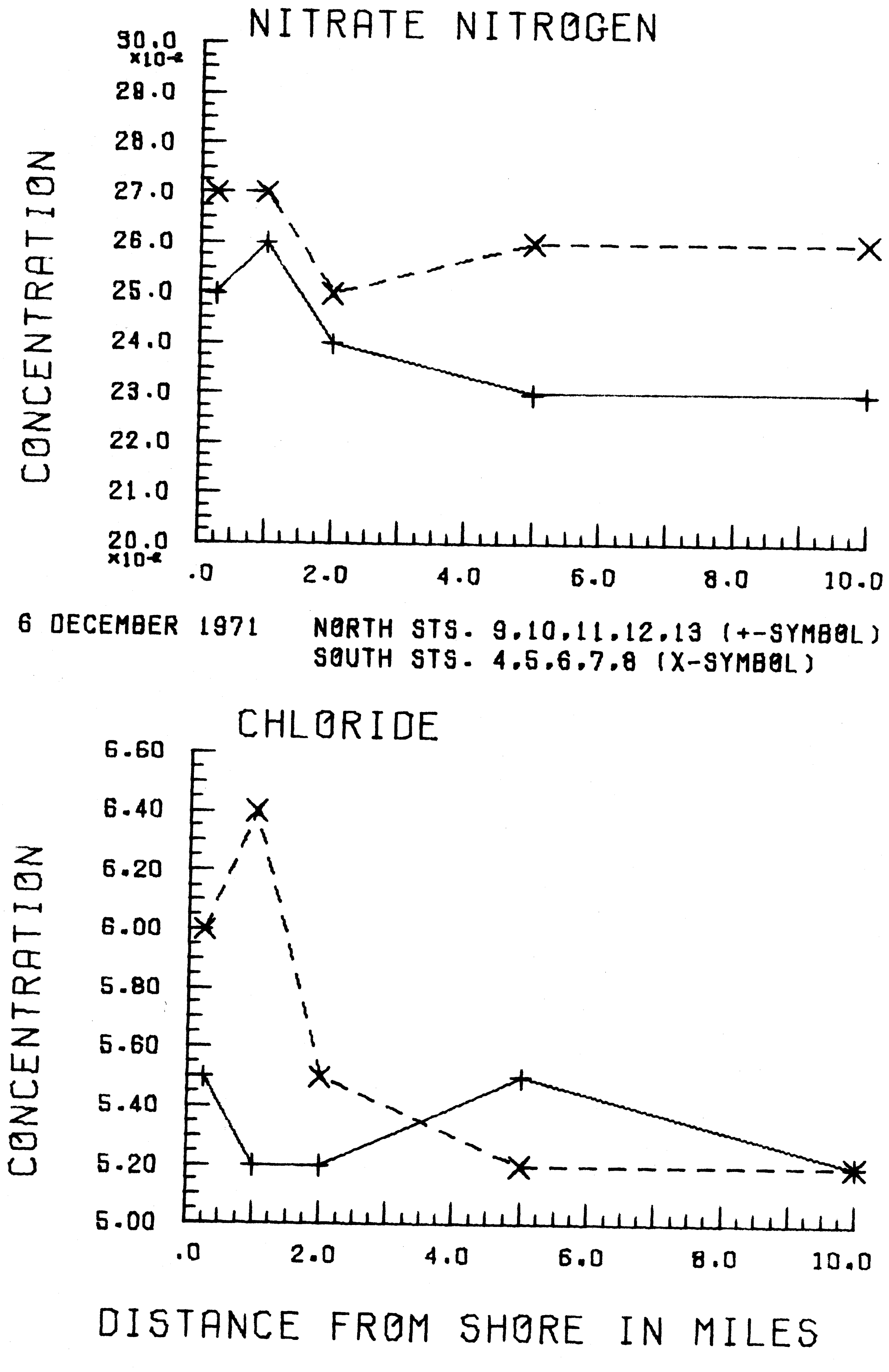

Figure 26. Concentrations of nitrate-nitrogen and chloride (mg/l) as a function of distance from shore.

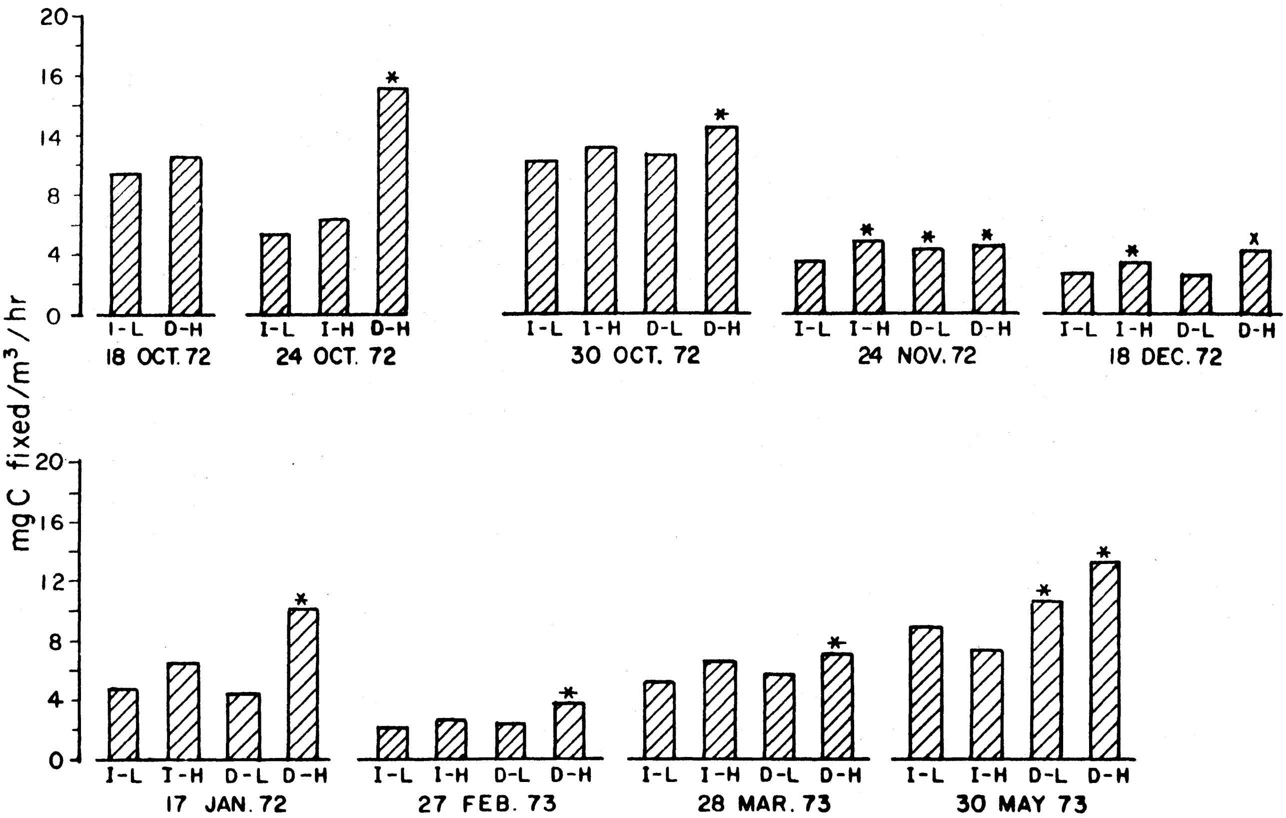

Figure 27. Primary production rates of intake and discharge water incubated at intake and discharge temperatures on dates indicated. Asterisks indicate that that rate is significantly different from the IL rate on that date. For abbreviation meanings, see Table 8.

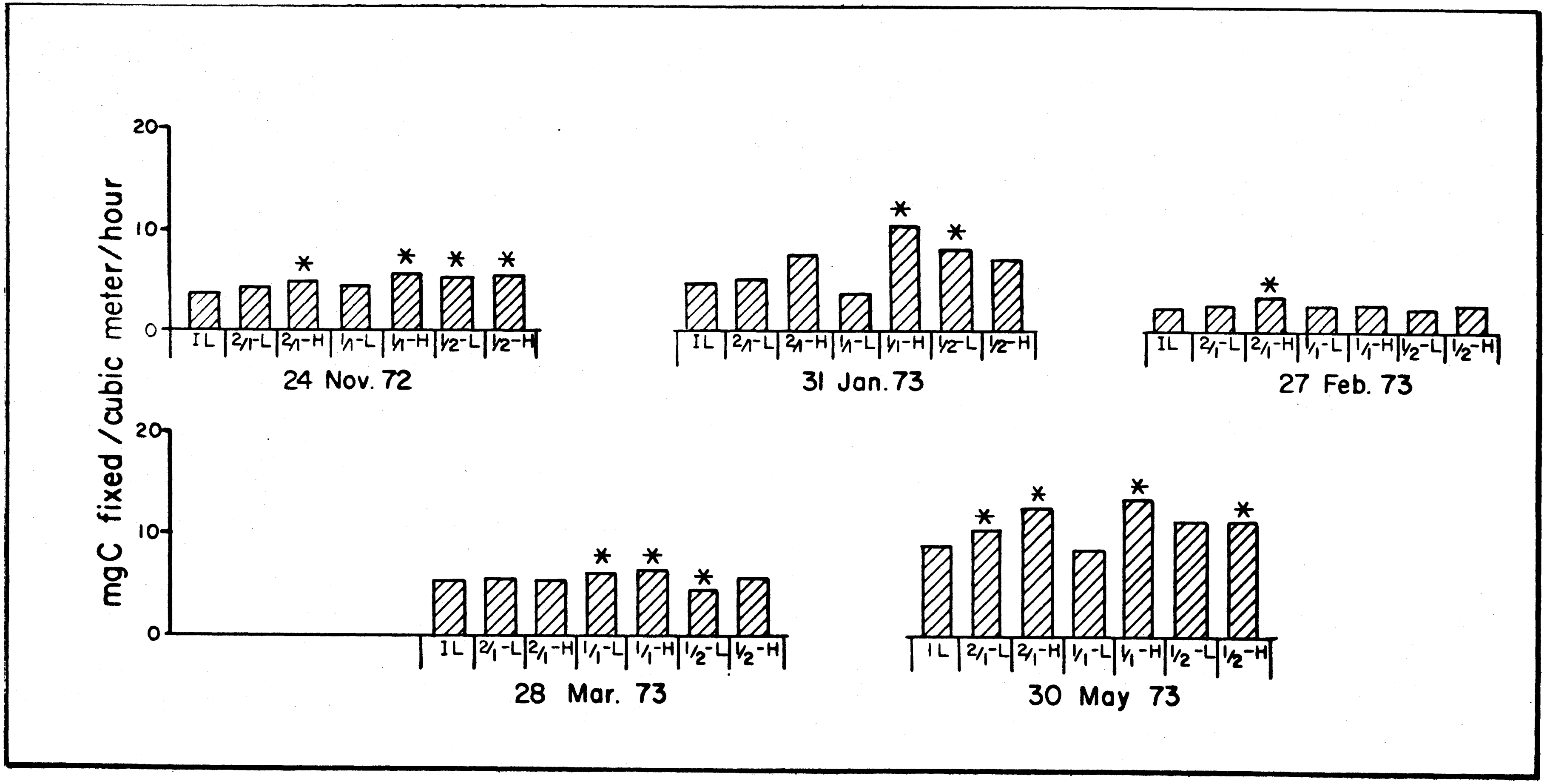

Figure 28. Primary production rates of IL sample and various mixtures of intake and discharge waters incubated at intake and discharge temperatures on dates indicated. Asterisks indicate that that rate is significantly different from the IL rate on that same date. For abbreviation meanings, see Table 8.

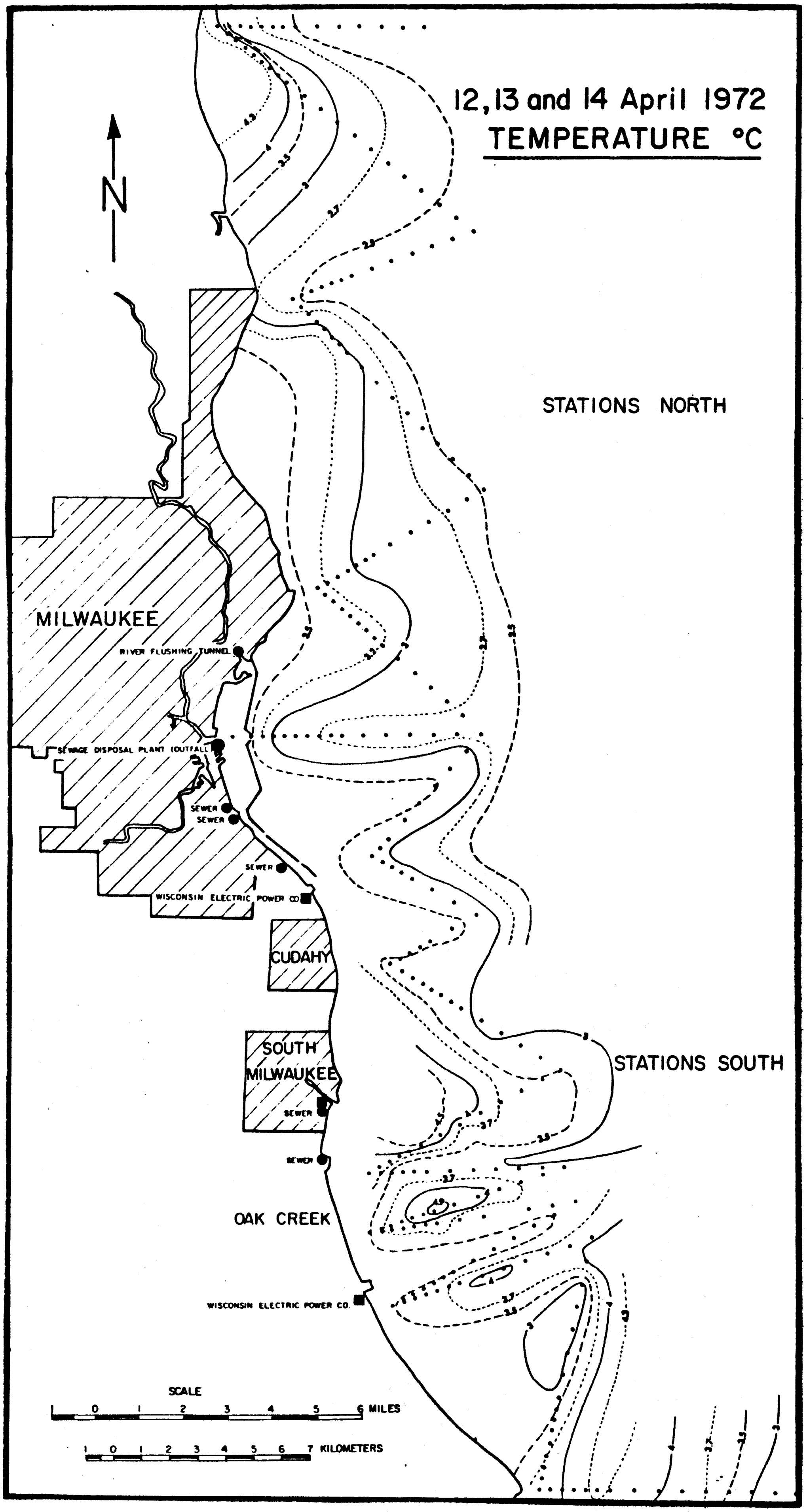

Figure 29. Distribution of surface temperatures (°C) on April 12-14, 1972.

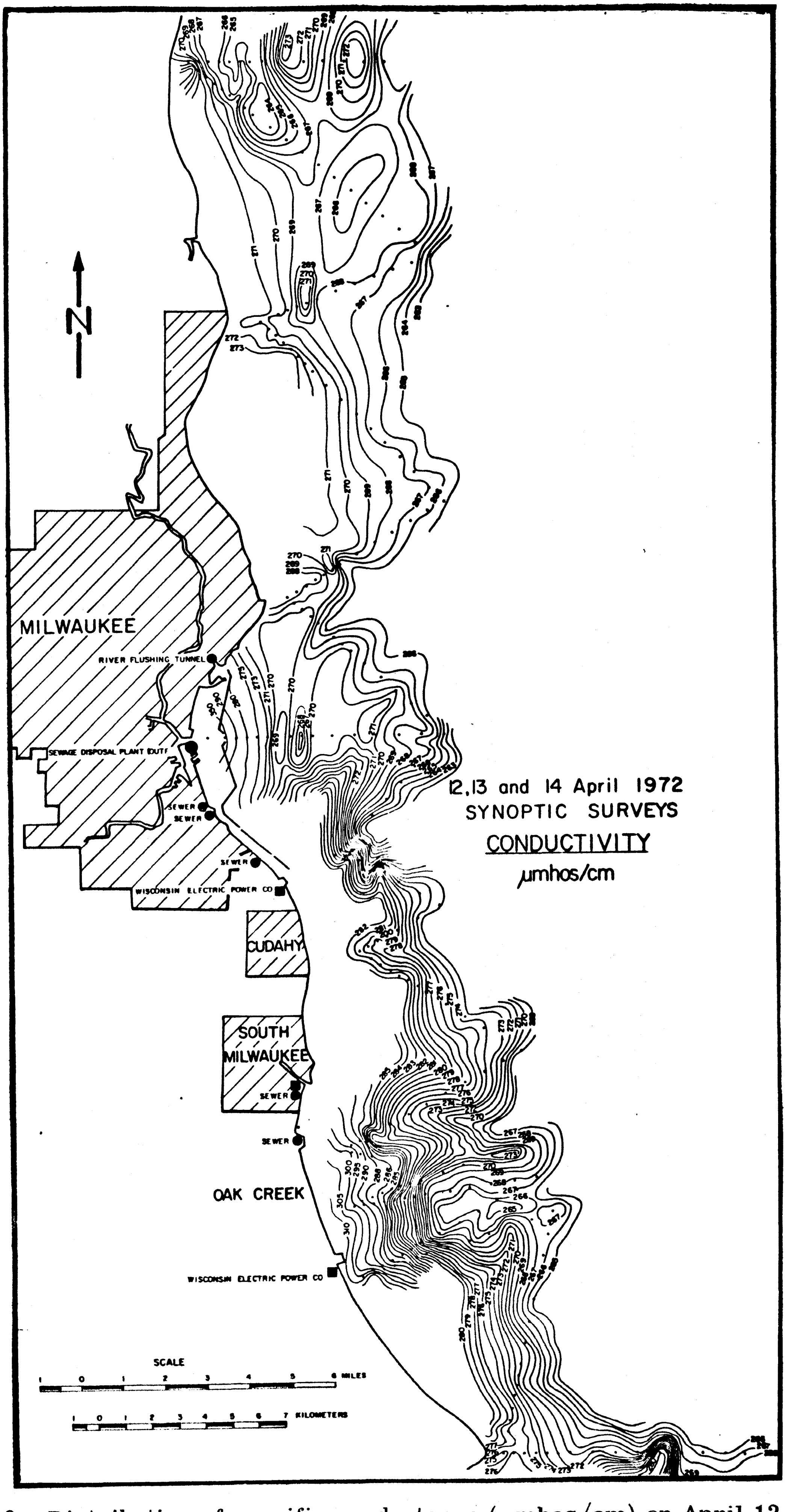

Figure 30. Distribution of specific conductance (μmhos/cm) on April 12-14, 1972.

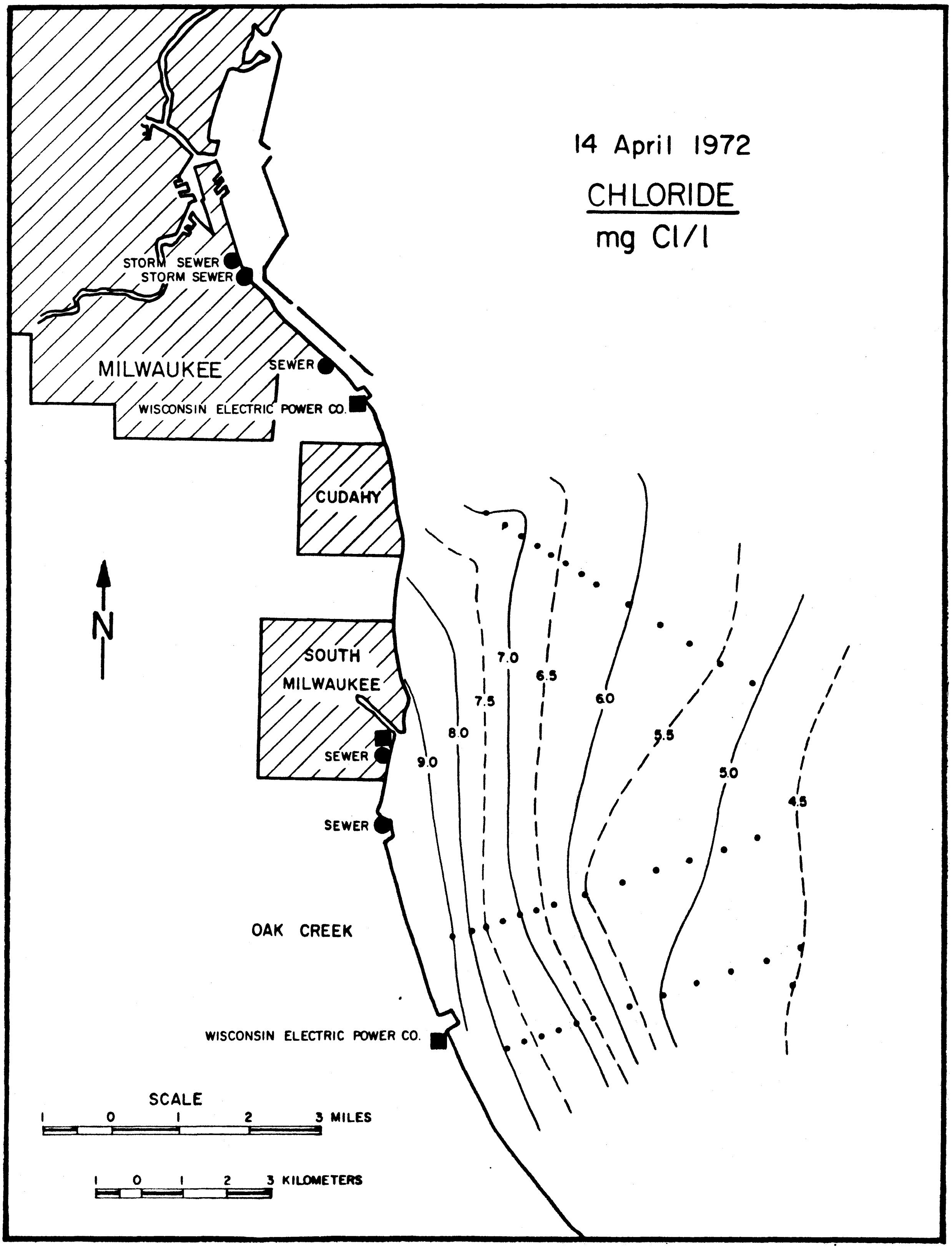

Figure 31. Distribution of chloride (mg/l) on April 14, 1972.

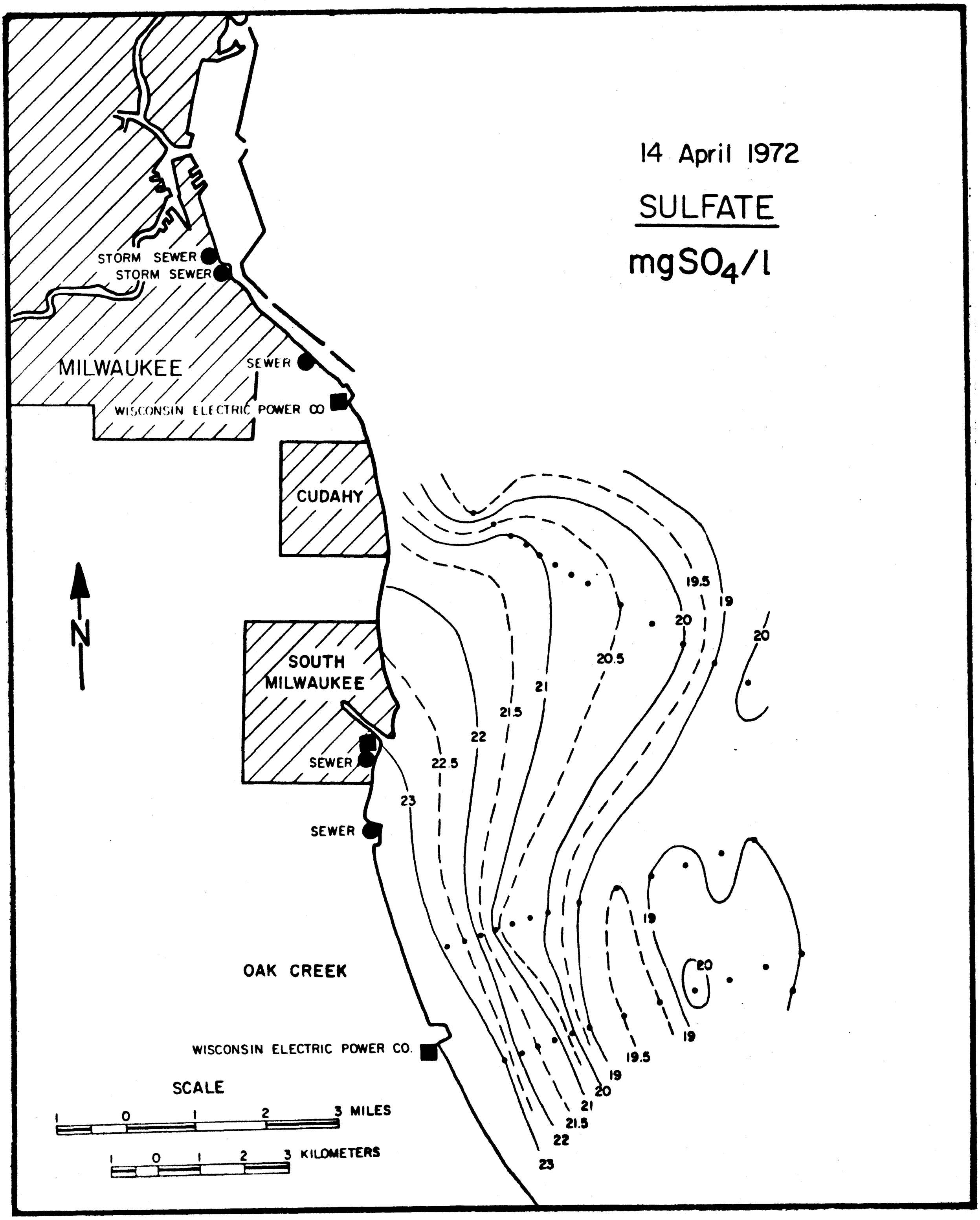

Figure 32. Distribution of sulfate (mg/l) on April 14, 1972.

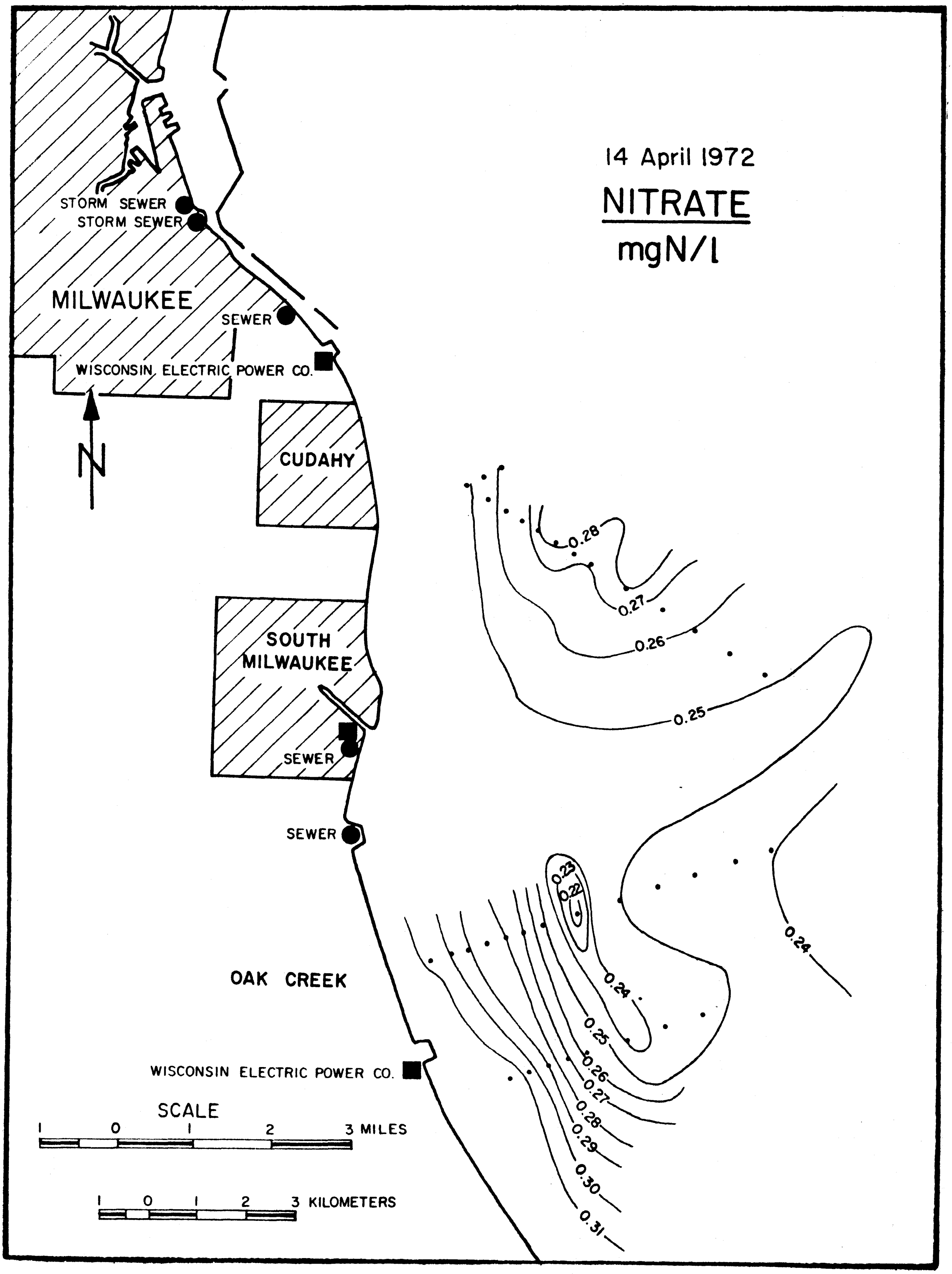

Figure 33. Distribution of nitrate (mg/l) on April 14, 1972.

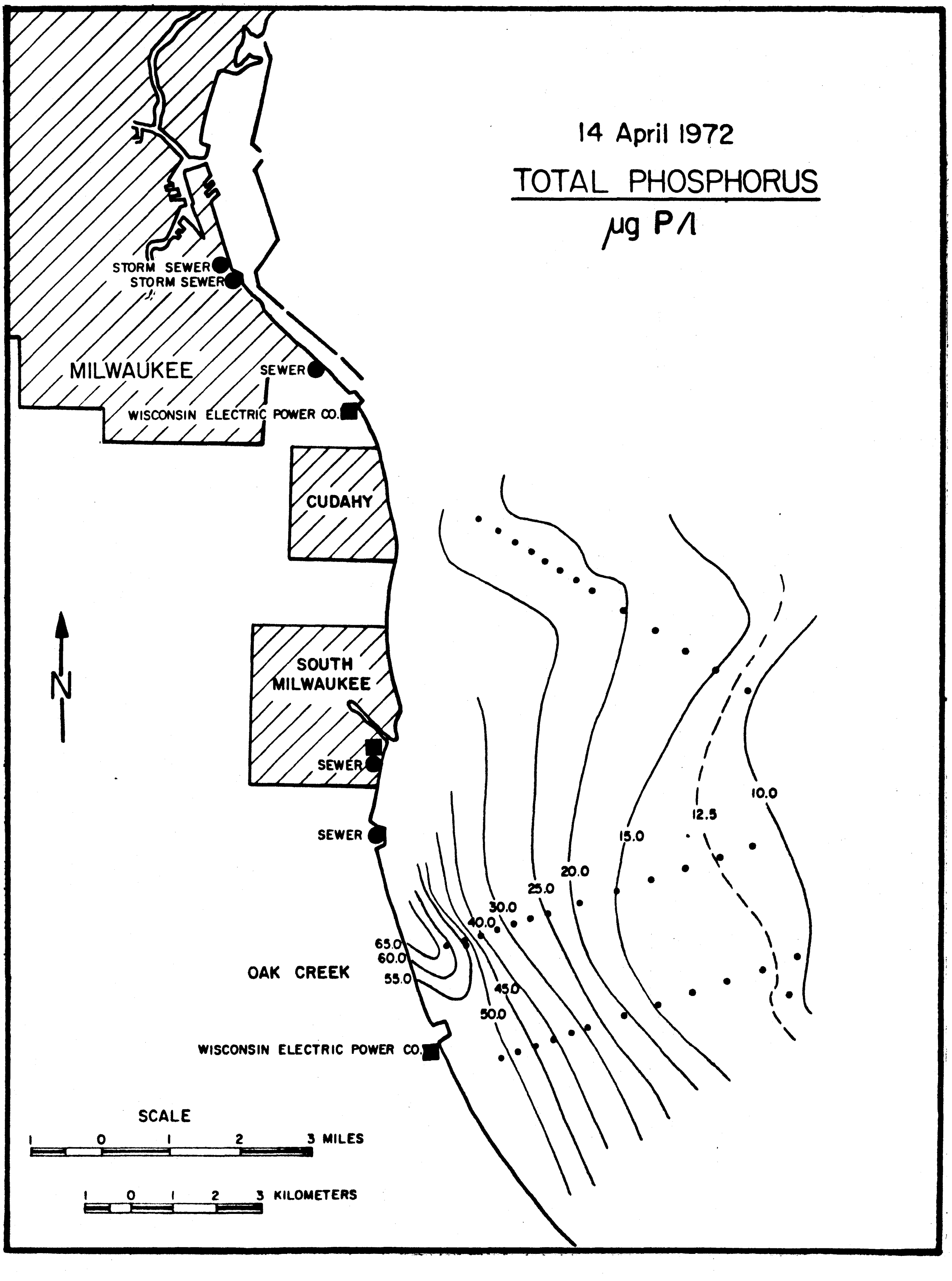

Figure 34. Distribution of total phosphorus (μg/l) on April 14, 1972.

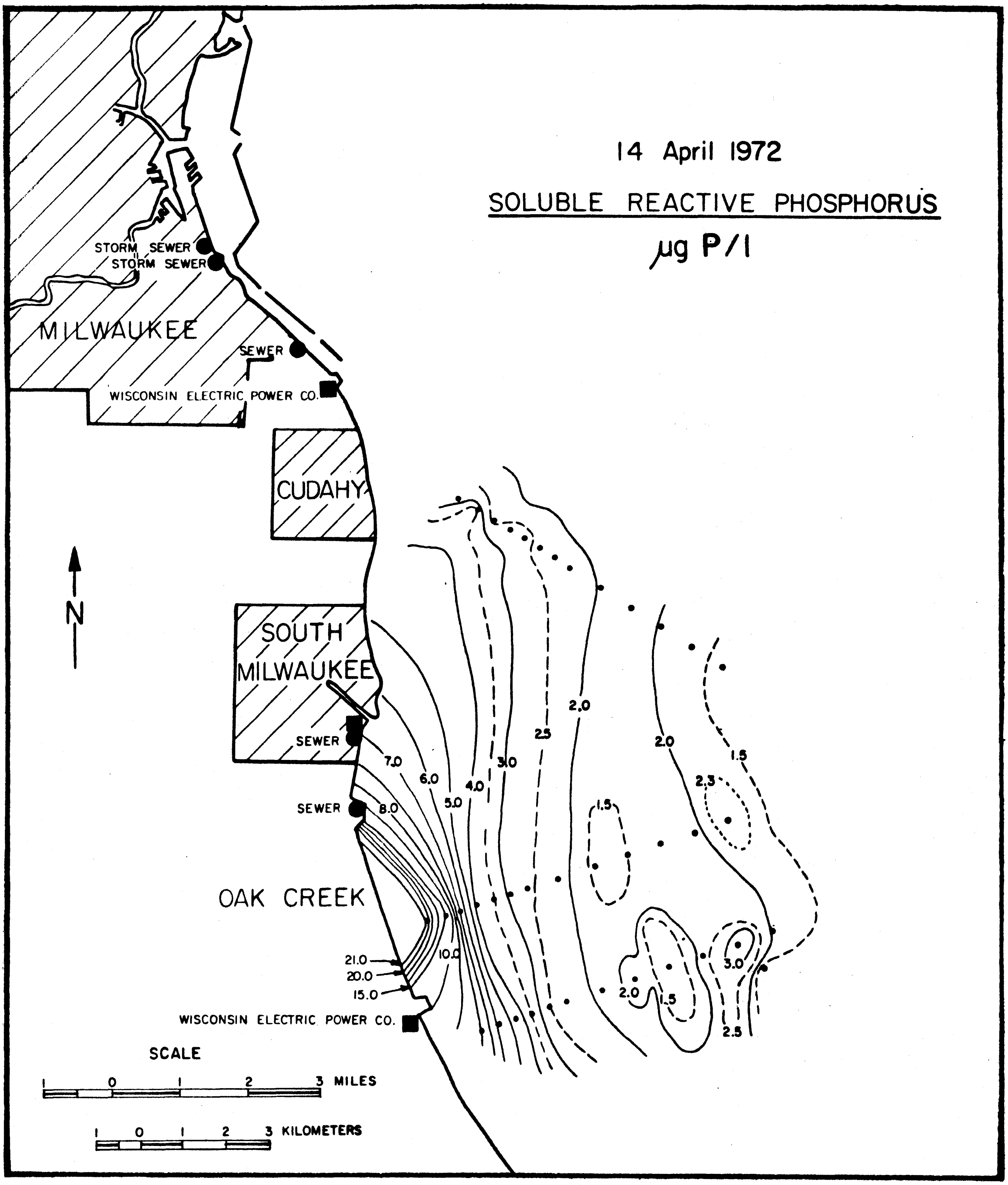

Figure 35. Distribution of soluble reactive phosphorus (μg/l) on April 14, 1972.

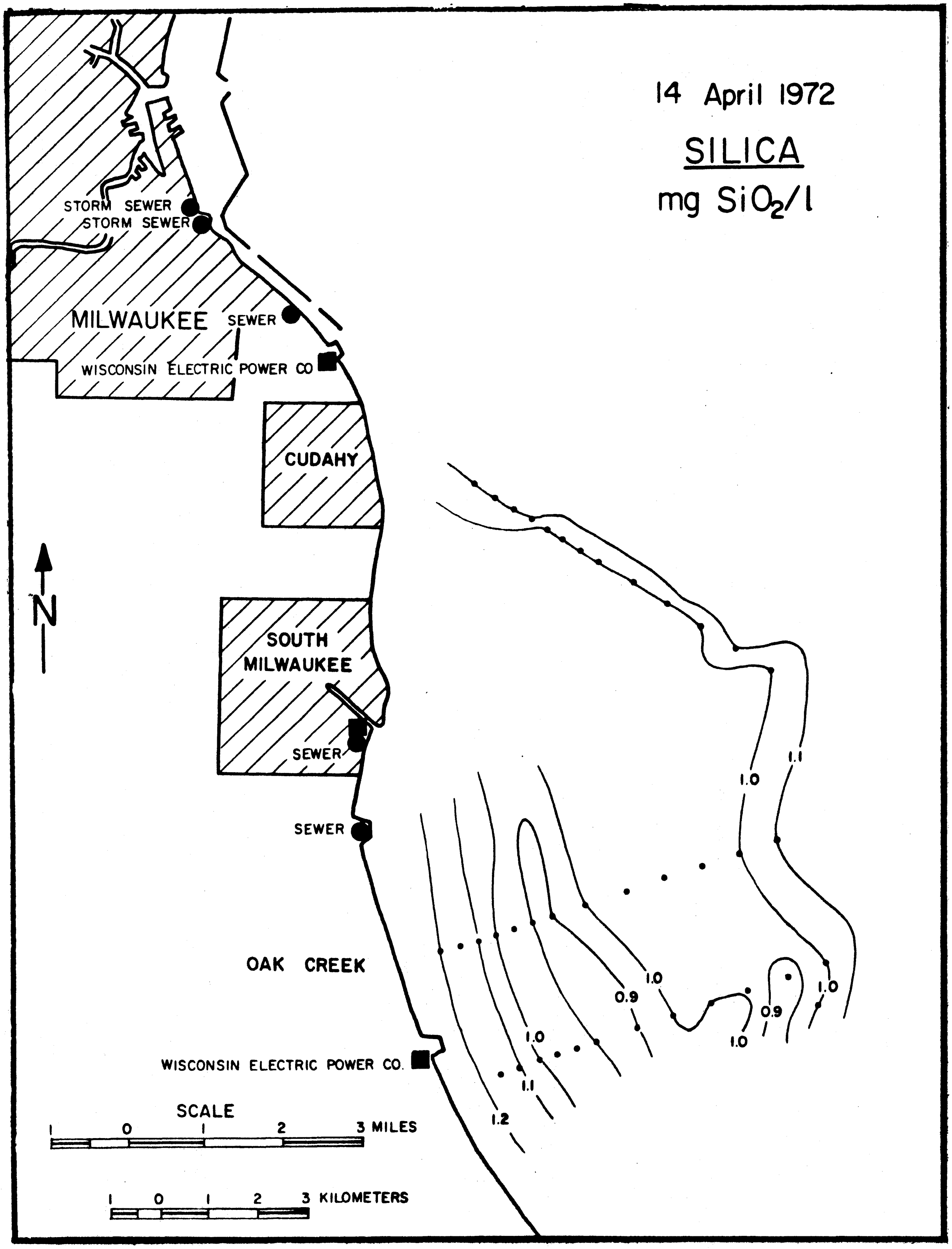

Figure 36. Distribution of silica (mg/l) on April 14, 1972.

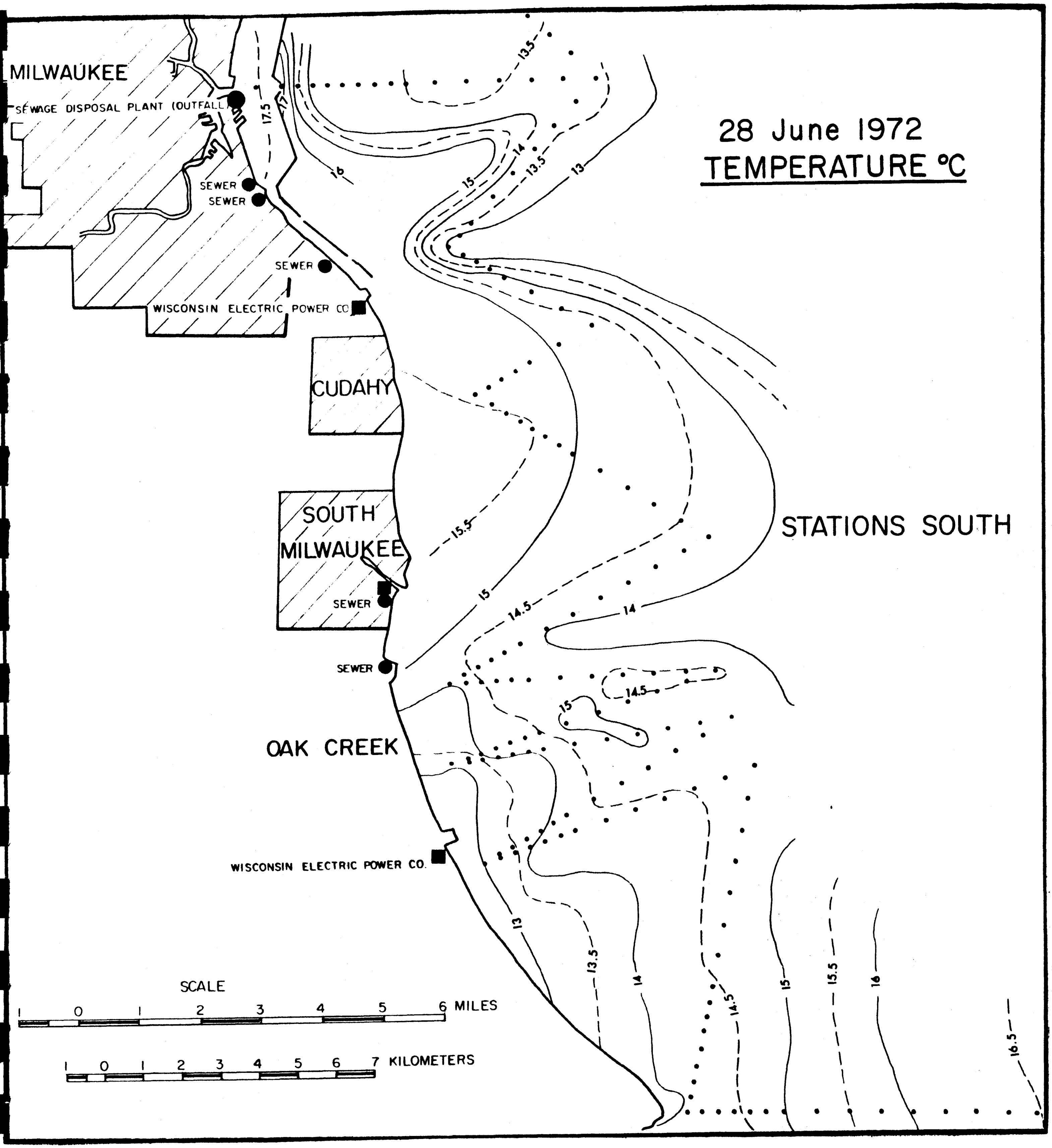

Figure 37. Distribution of surface temperature (°C) on June 28, 1972.

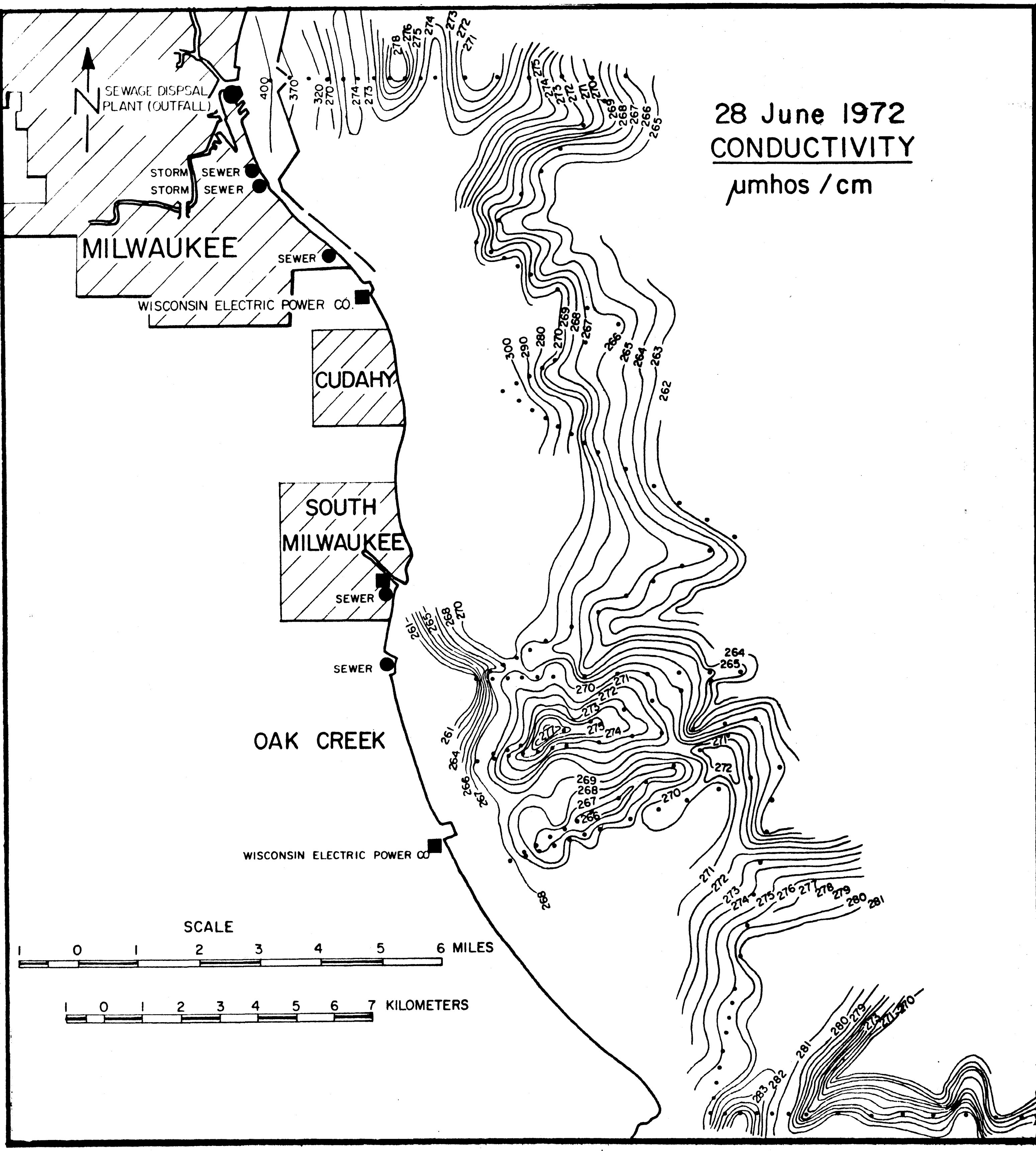

Figure 38. Distribution of specific conductance (µmhos/cm) on June 28, 1972.

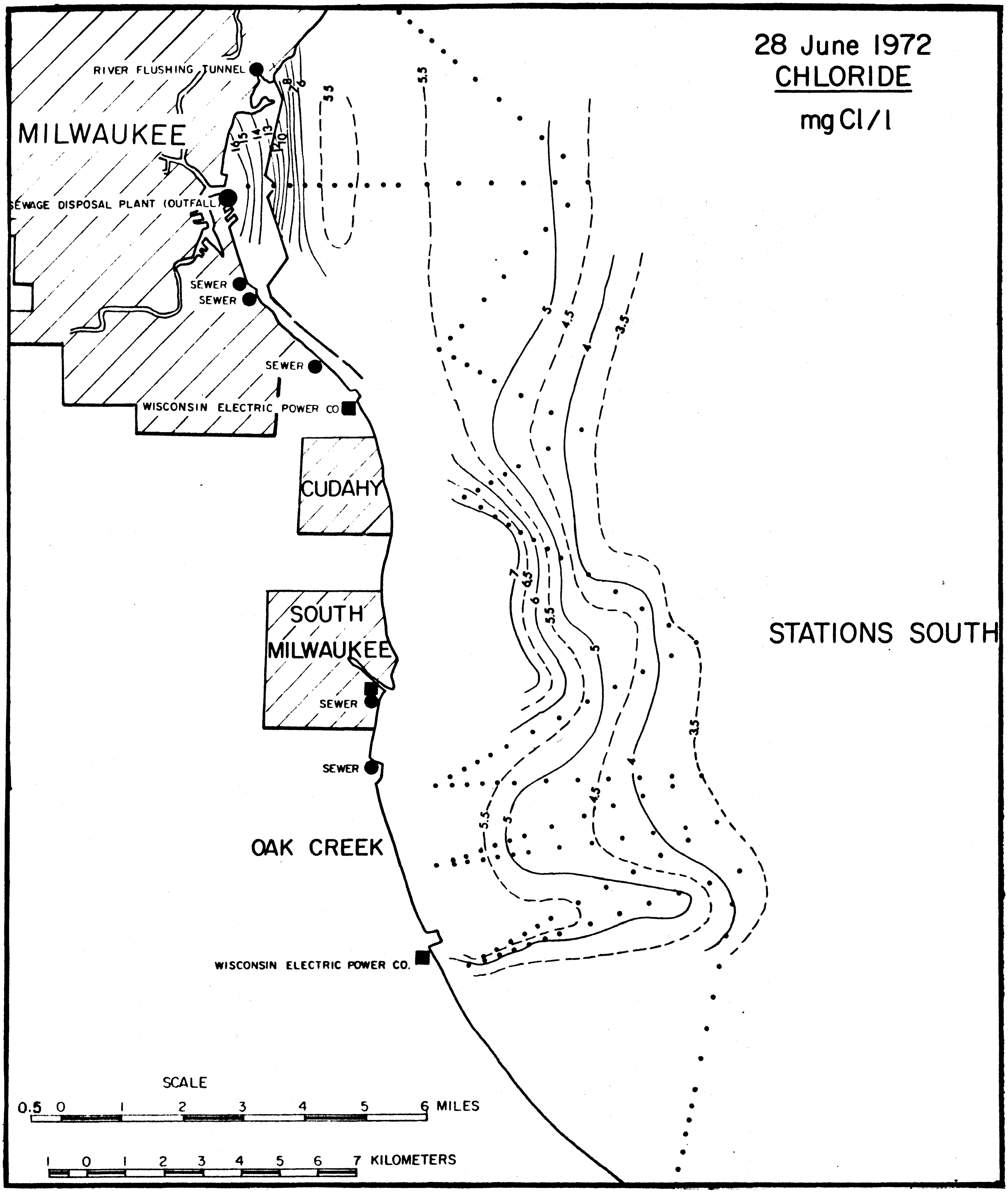

Figure 39. Distribution of chloride (mg/l) on June 28, 1972.

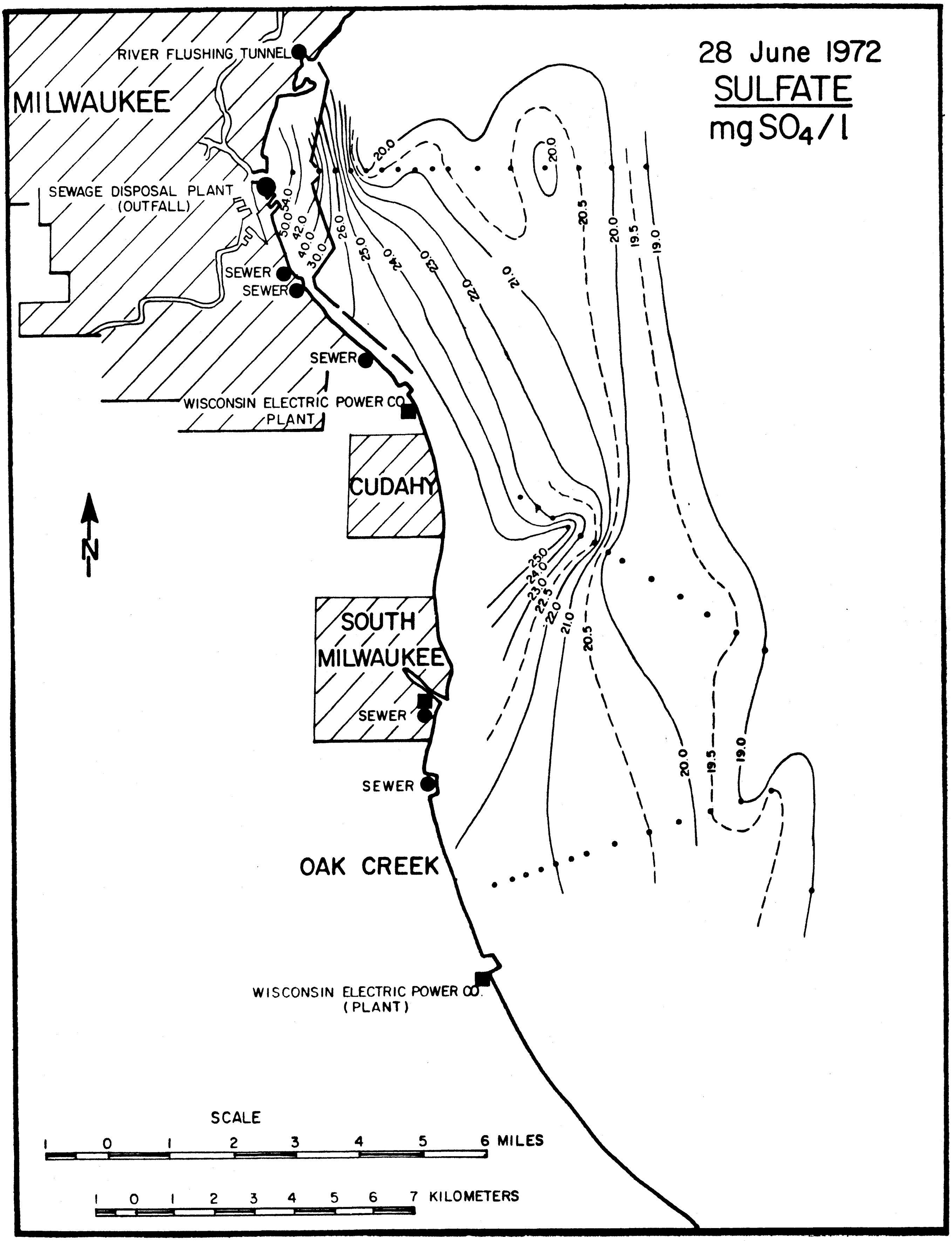

Figure 40. Distribution of sulfate (mg/l) on June 28, 1972.

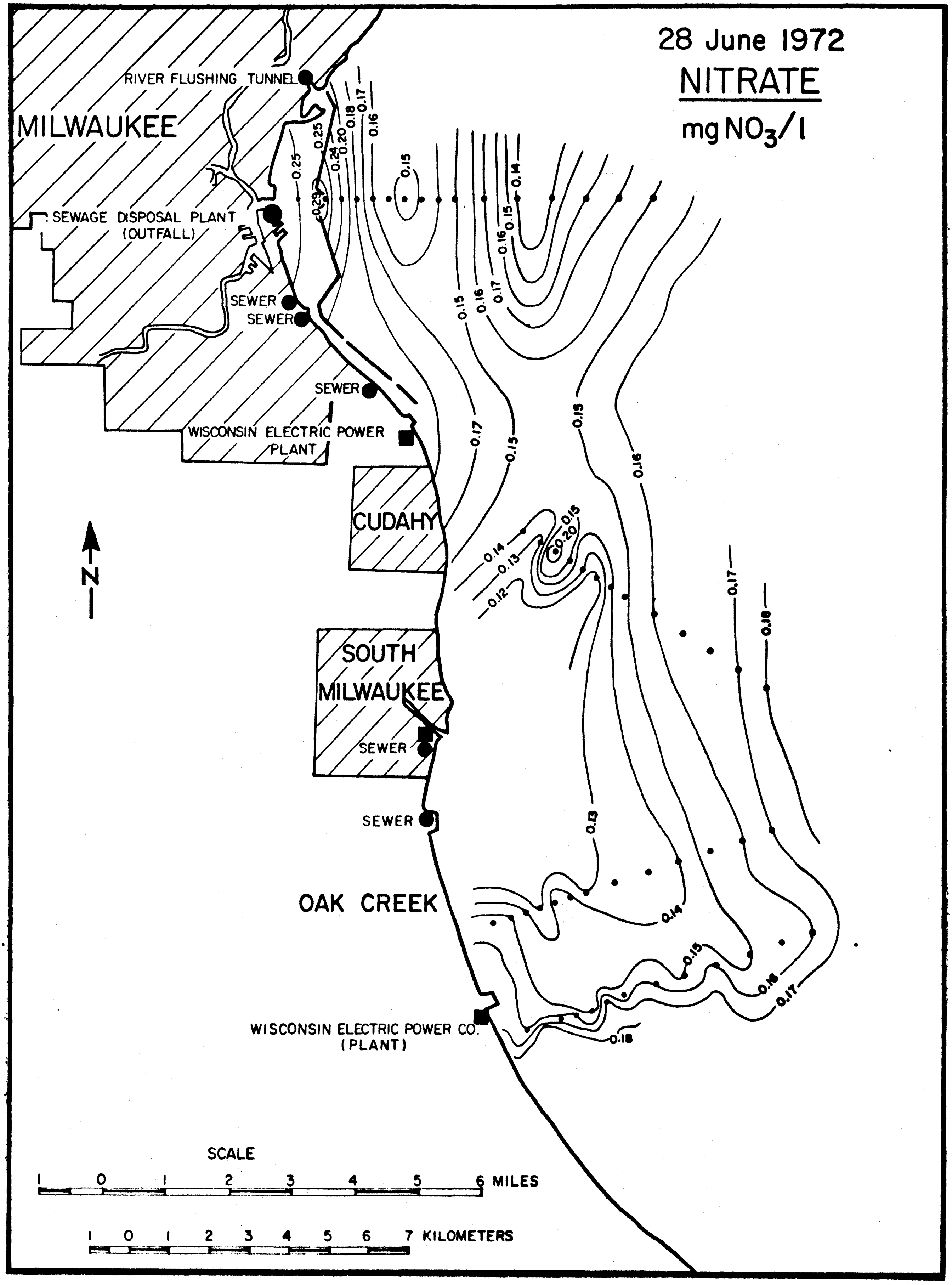

Figure 41. Distribution of nitrate (mg/l) on June 28, 1972.

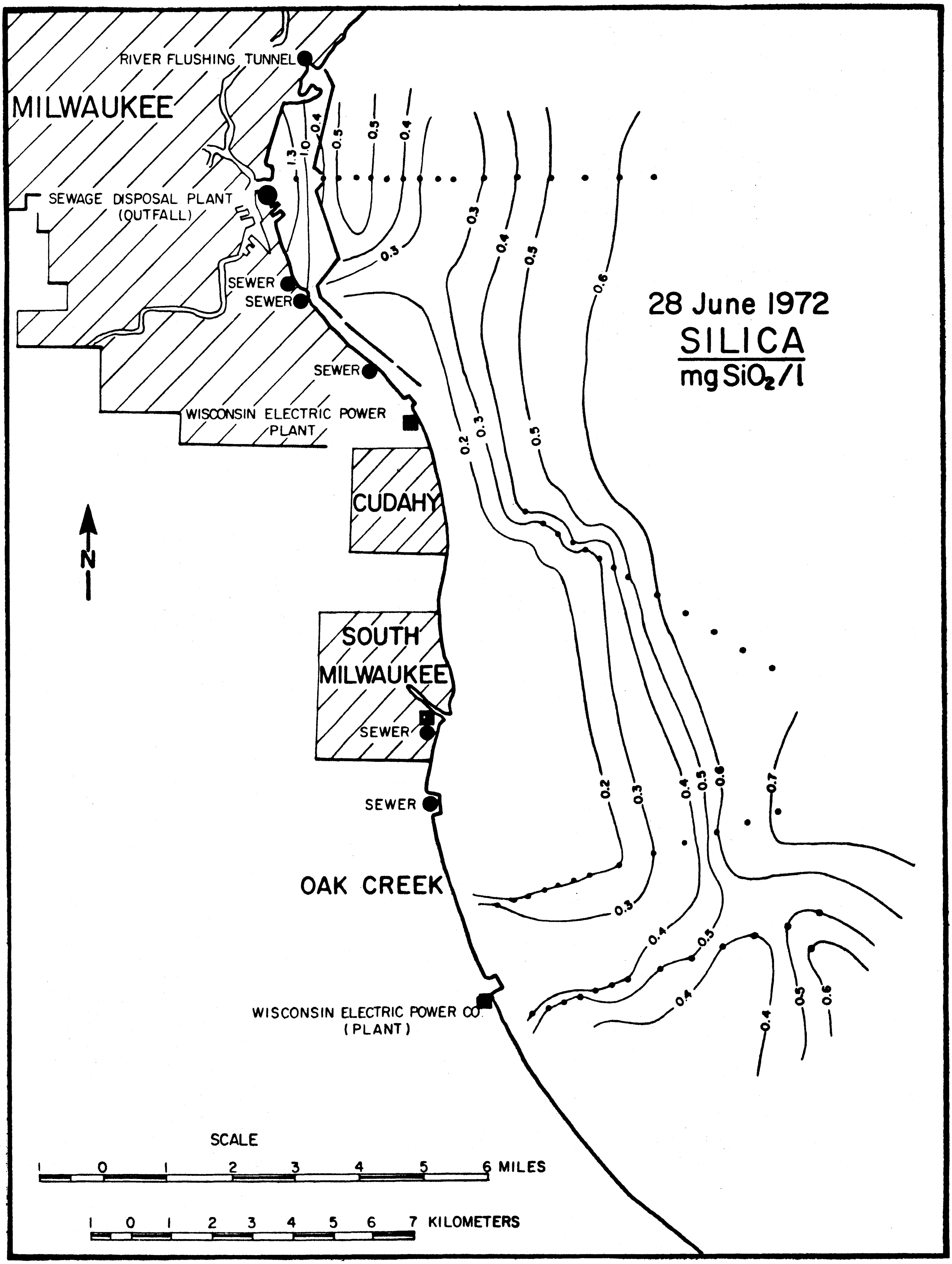

Figure 42. Distribution of silica (mg/l) on June 28, 1972.

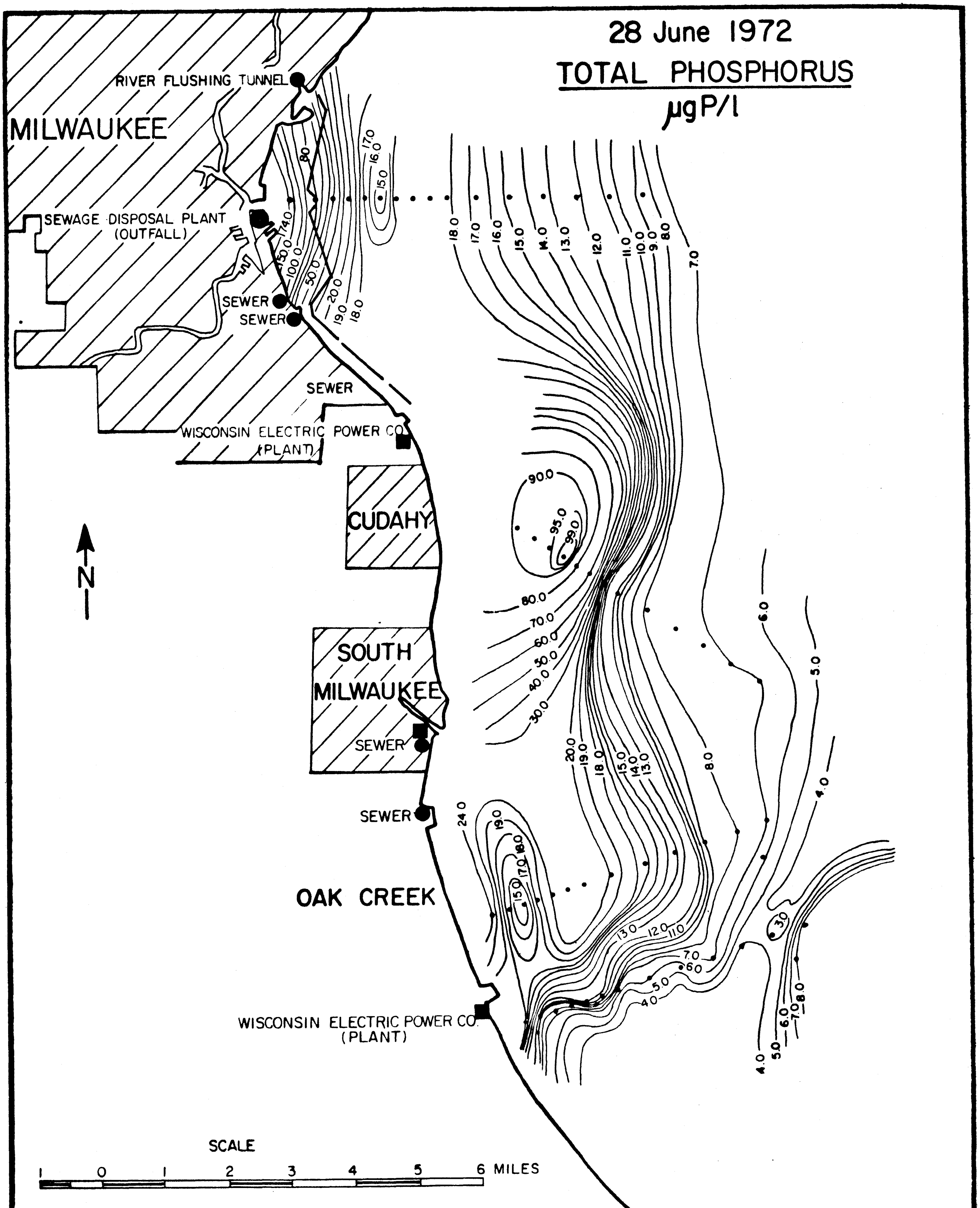

Figure 43. Distribution of total phosphorus (μg/l) on June 28, 1972.

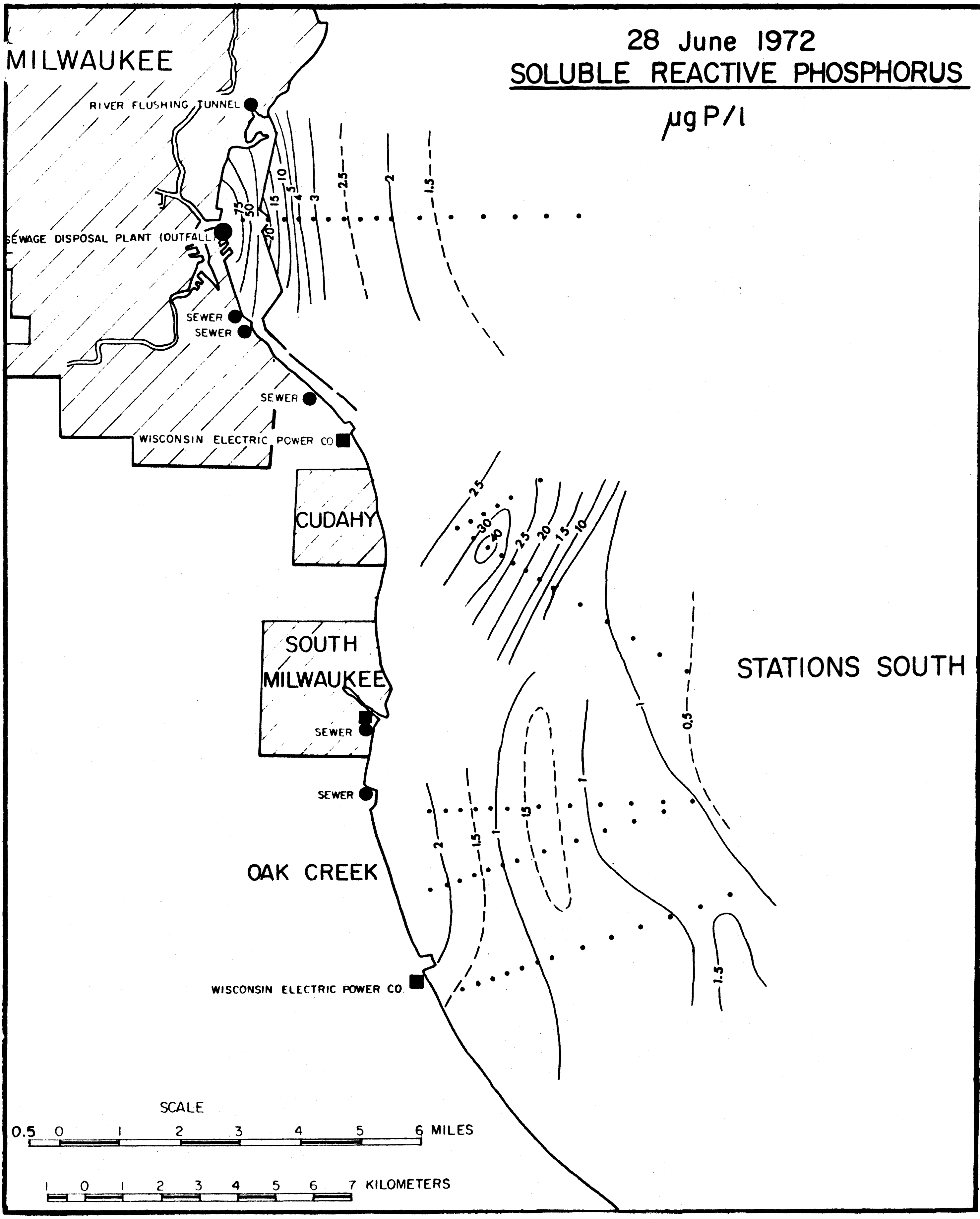

Figure 44. Distribution of soluble reactive phosphorus (μg/l) on June 28, 1972.

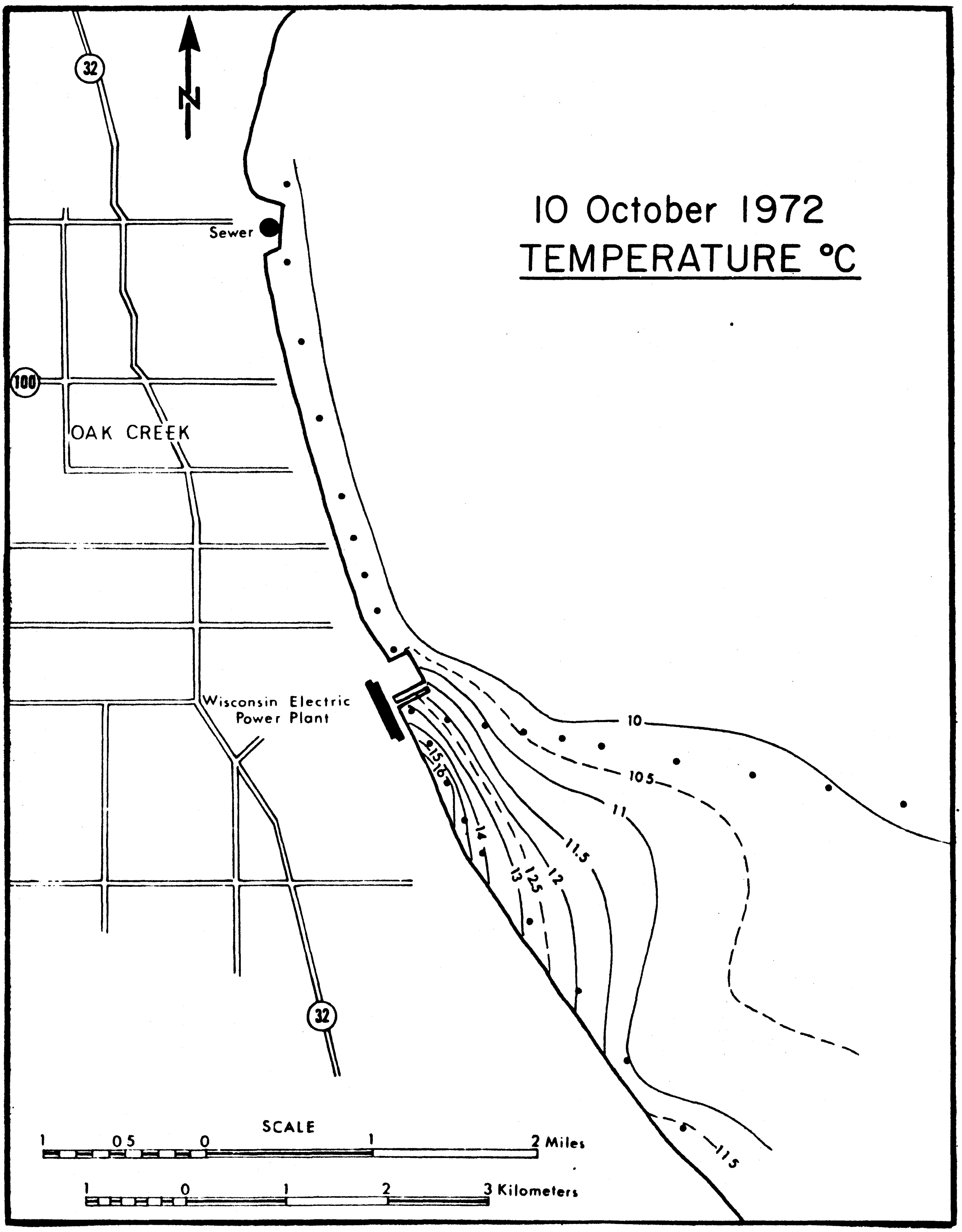

Figure 45. Distribution of surface temperatures (°C) on October 10, 1972.

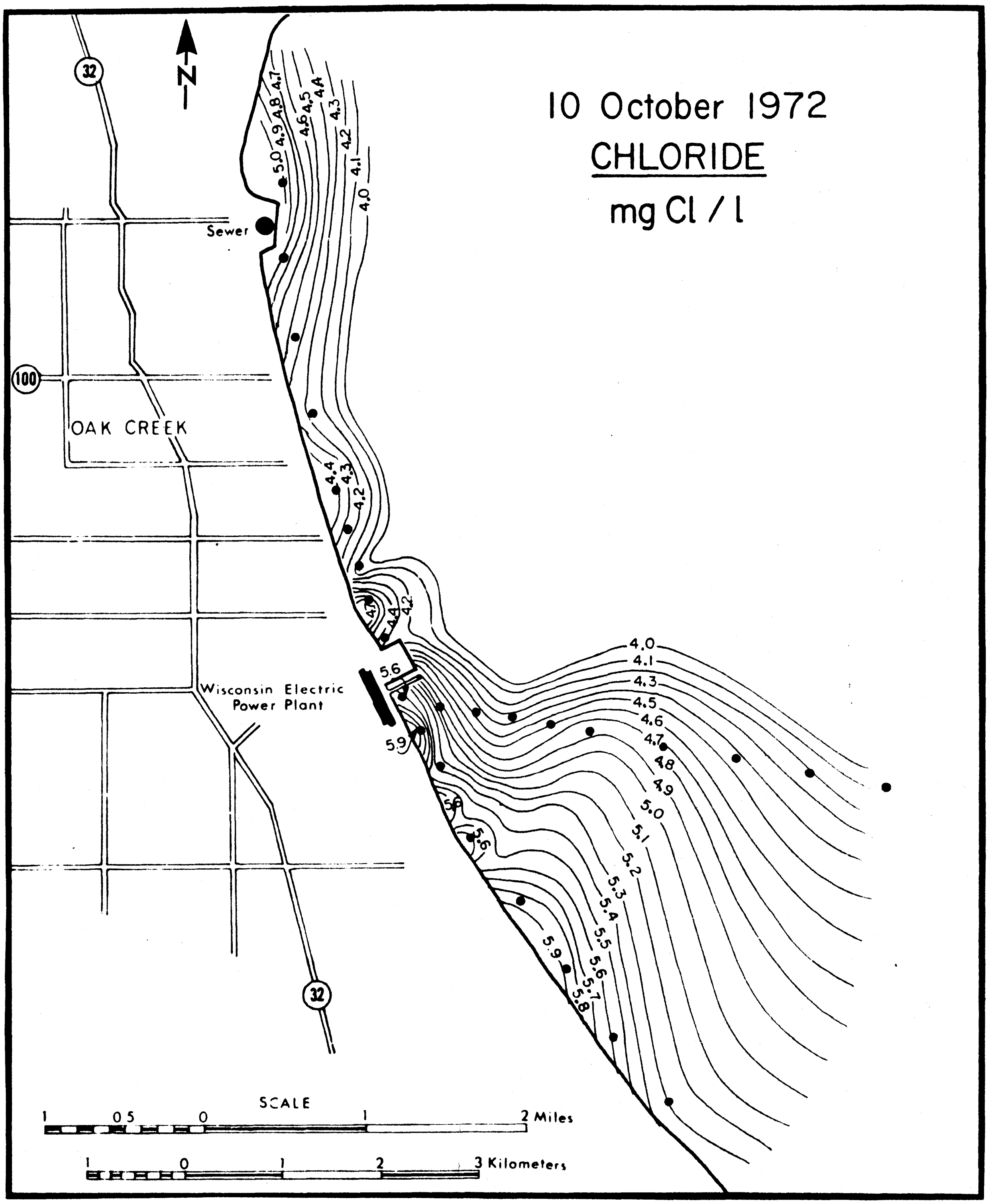

Figure 46. Distribution of chloride (mg/l) on October 10, 1972.

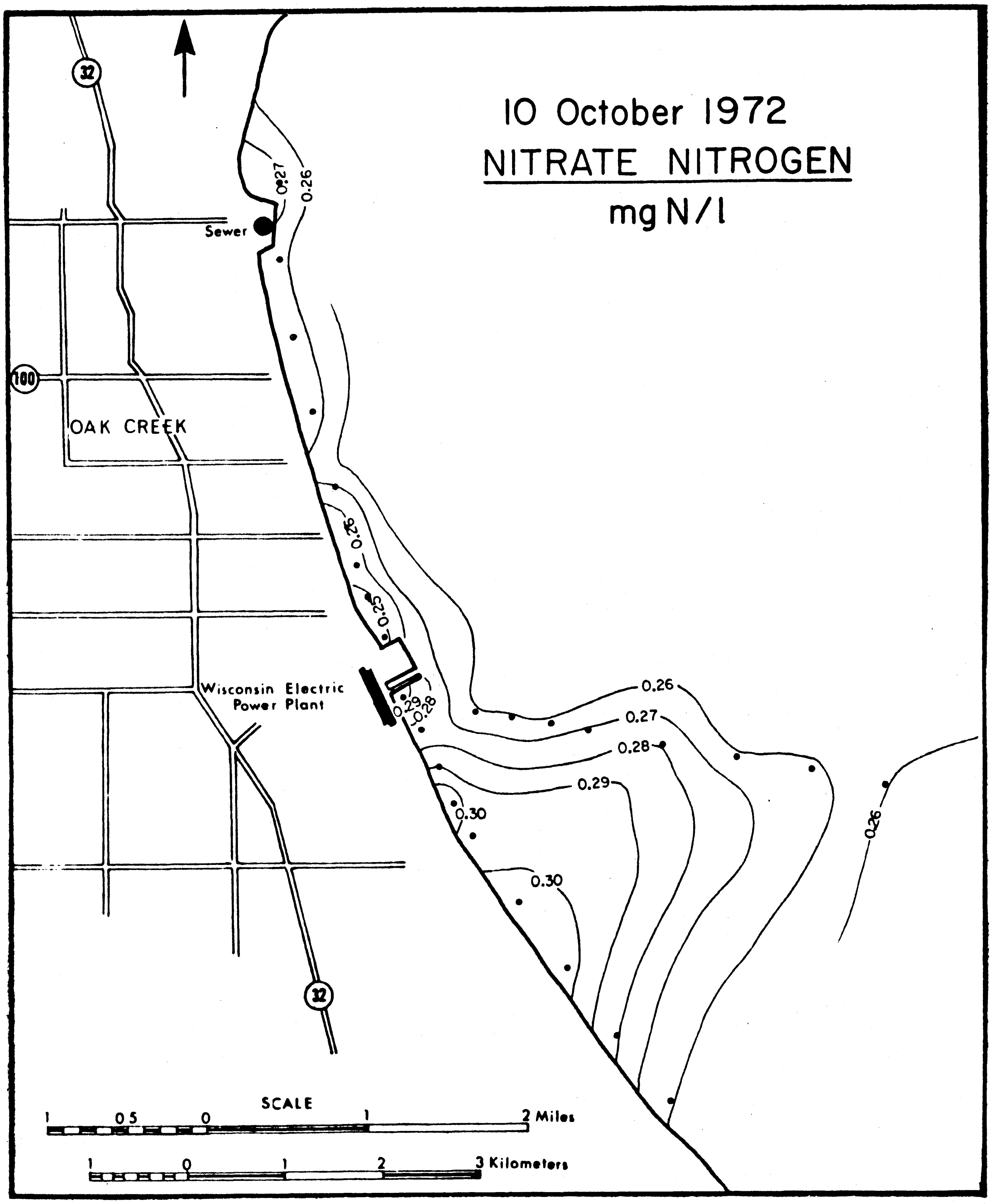

Figure 47. Distribution of nitrate (mg/l) on October 10, 1972.

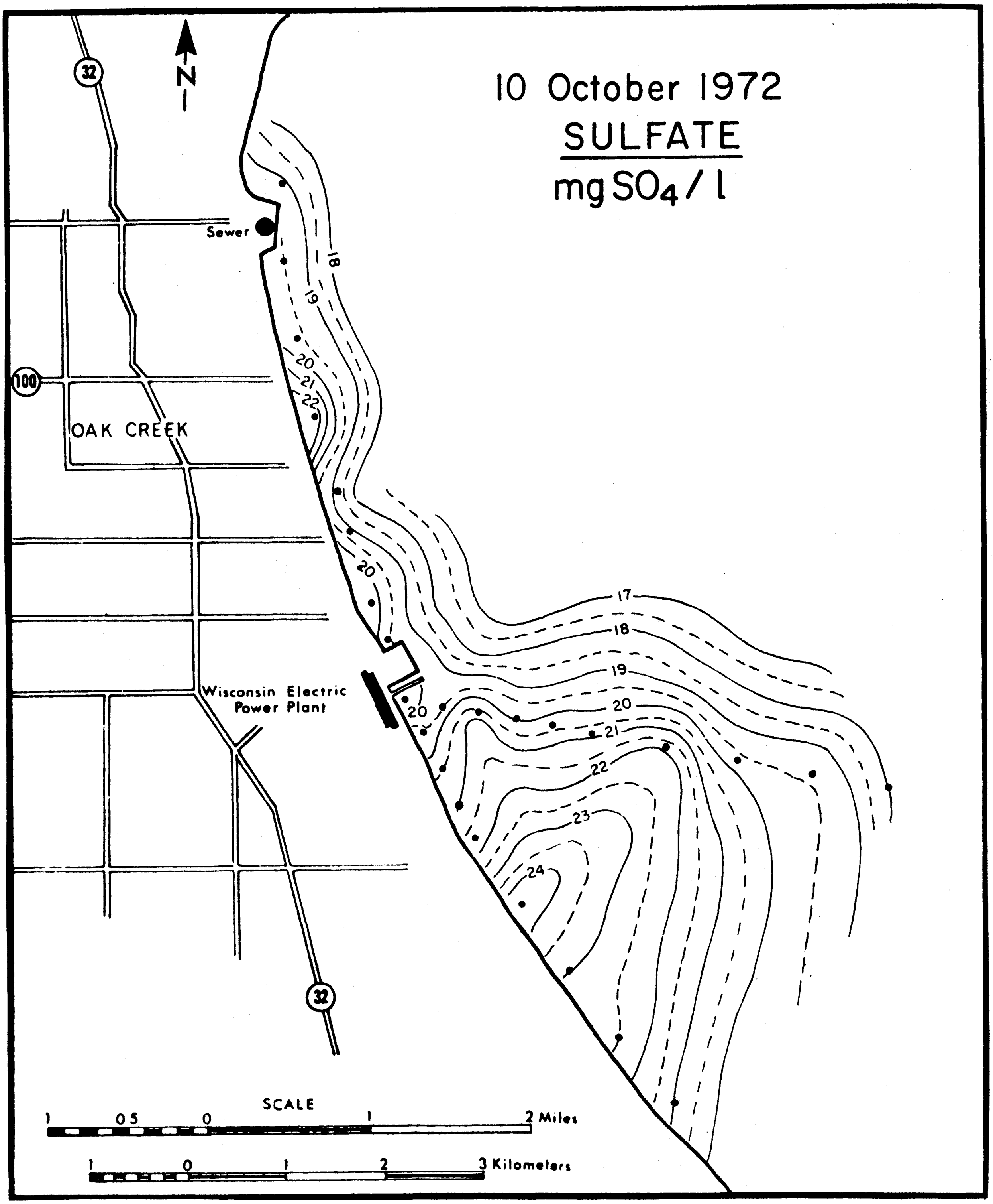

Figure 48. Distribution of sulfate (mg/l) on October 10, 1972.

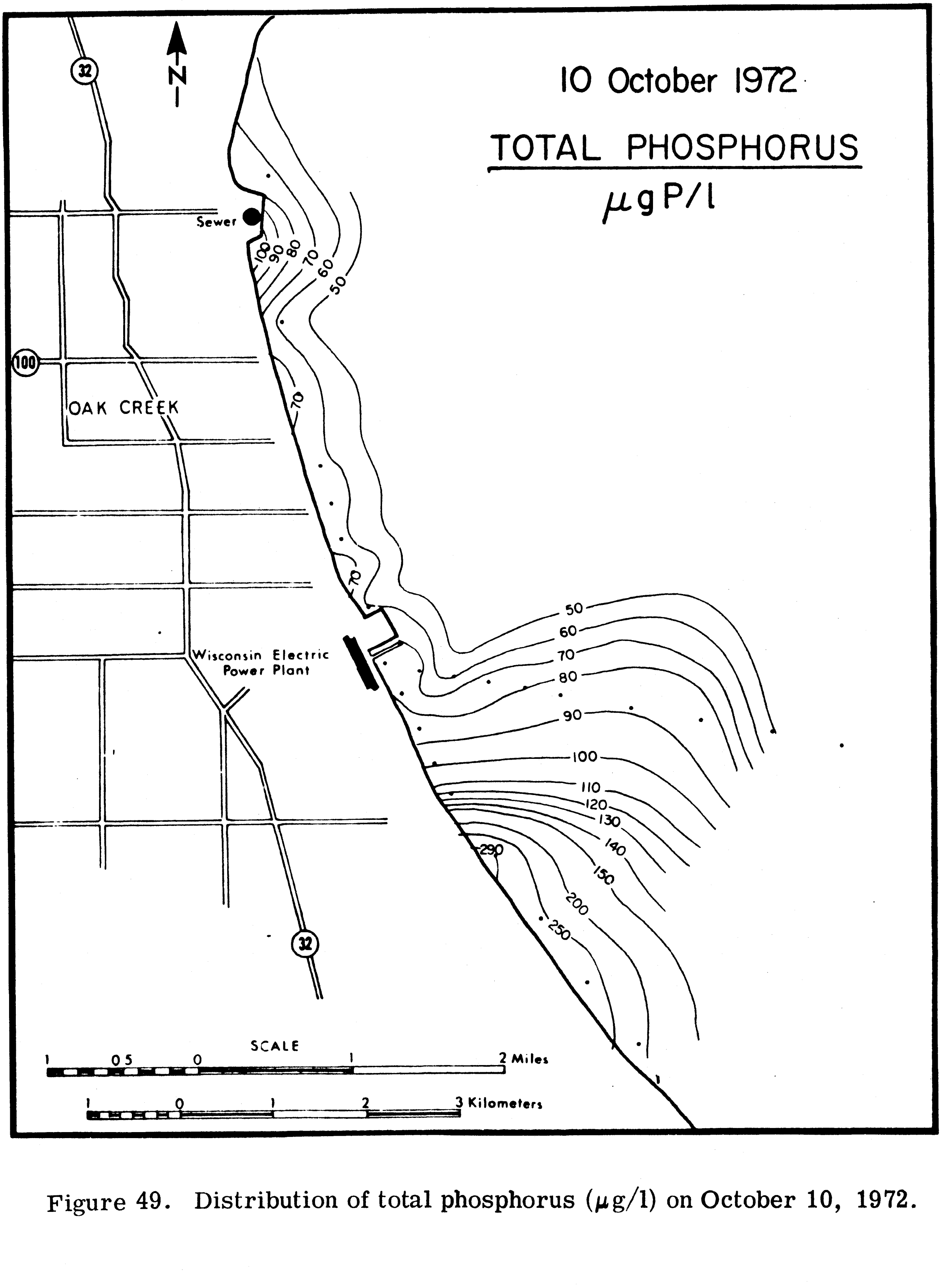

Figure 49. Distribution of total phosphorus (µg/l) on October 10, 1972.

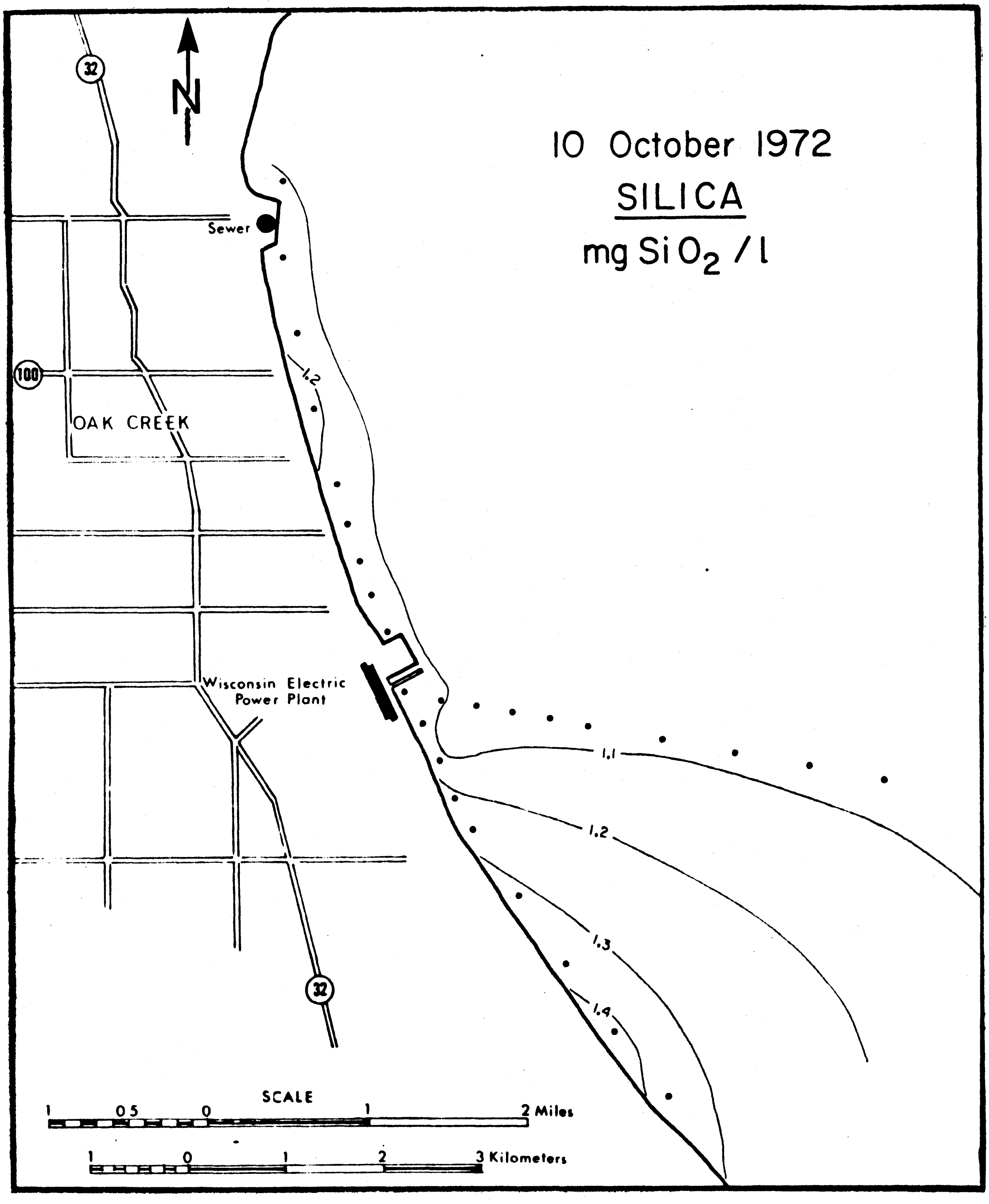

Figure 50. Distribution of silica (mg/l) on October 10, 1972.

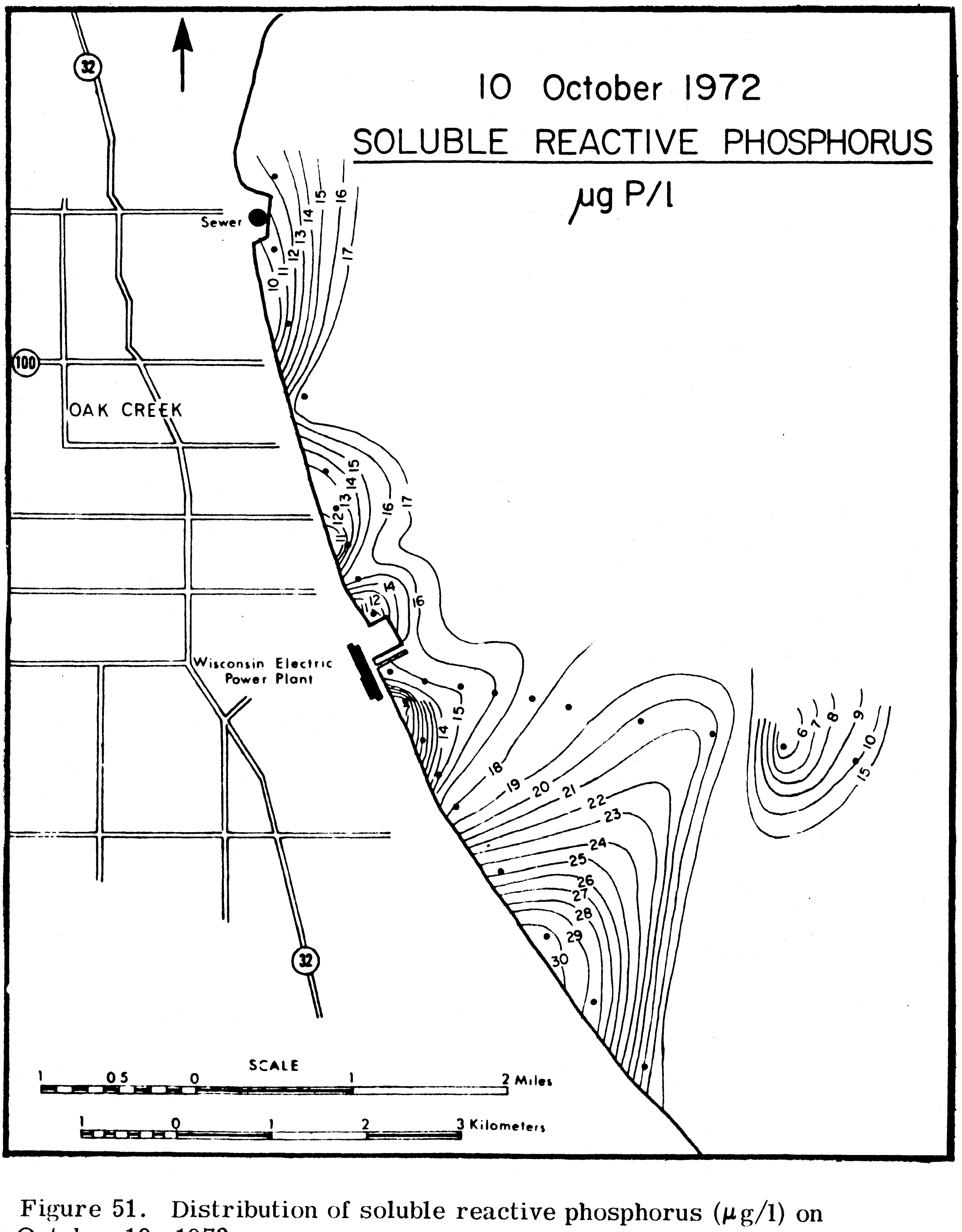

Figure 51. Distribution of soluble reactive phosphorus (μg/l) on October 10, 1972.

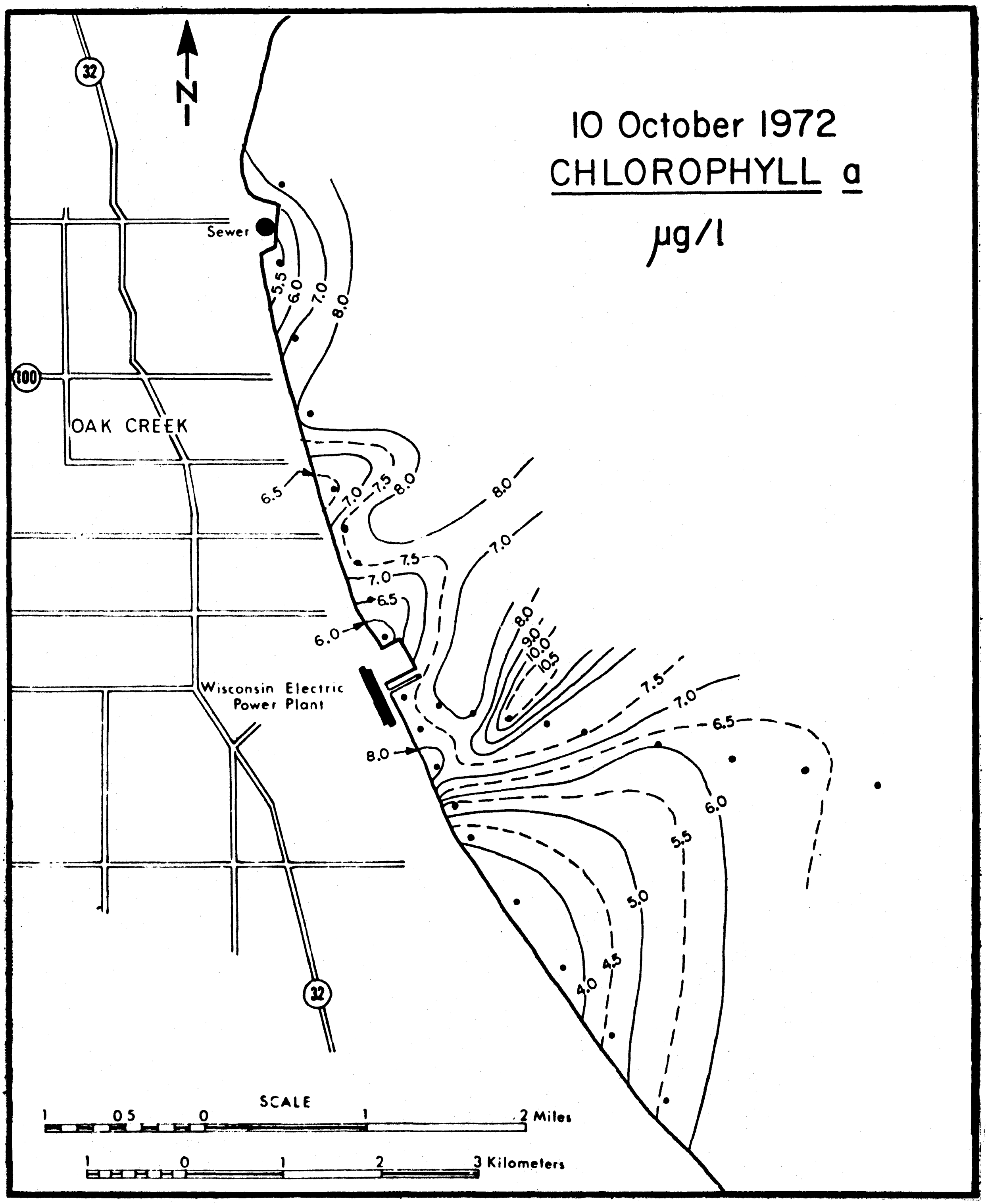

Figure 52. Distribution of chlorophyll a (µg/l) on October 10, 1972.

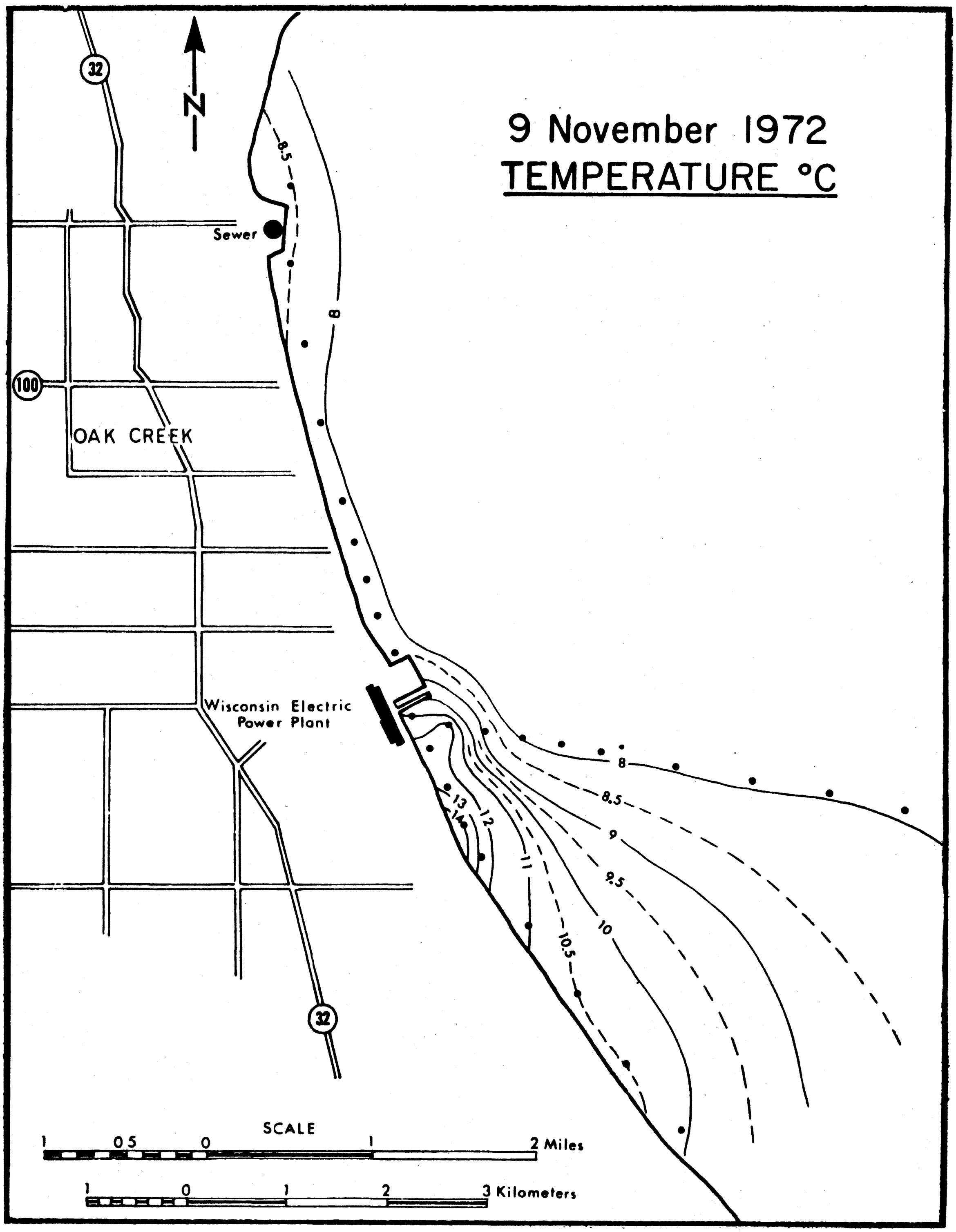

Figure 53. Distribution of surface temperatures (°C), November 9, 1972.

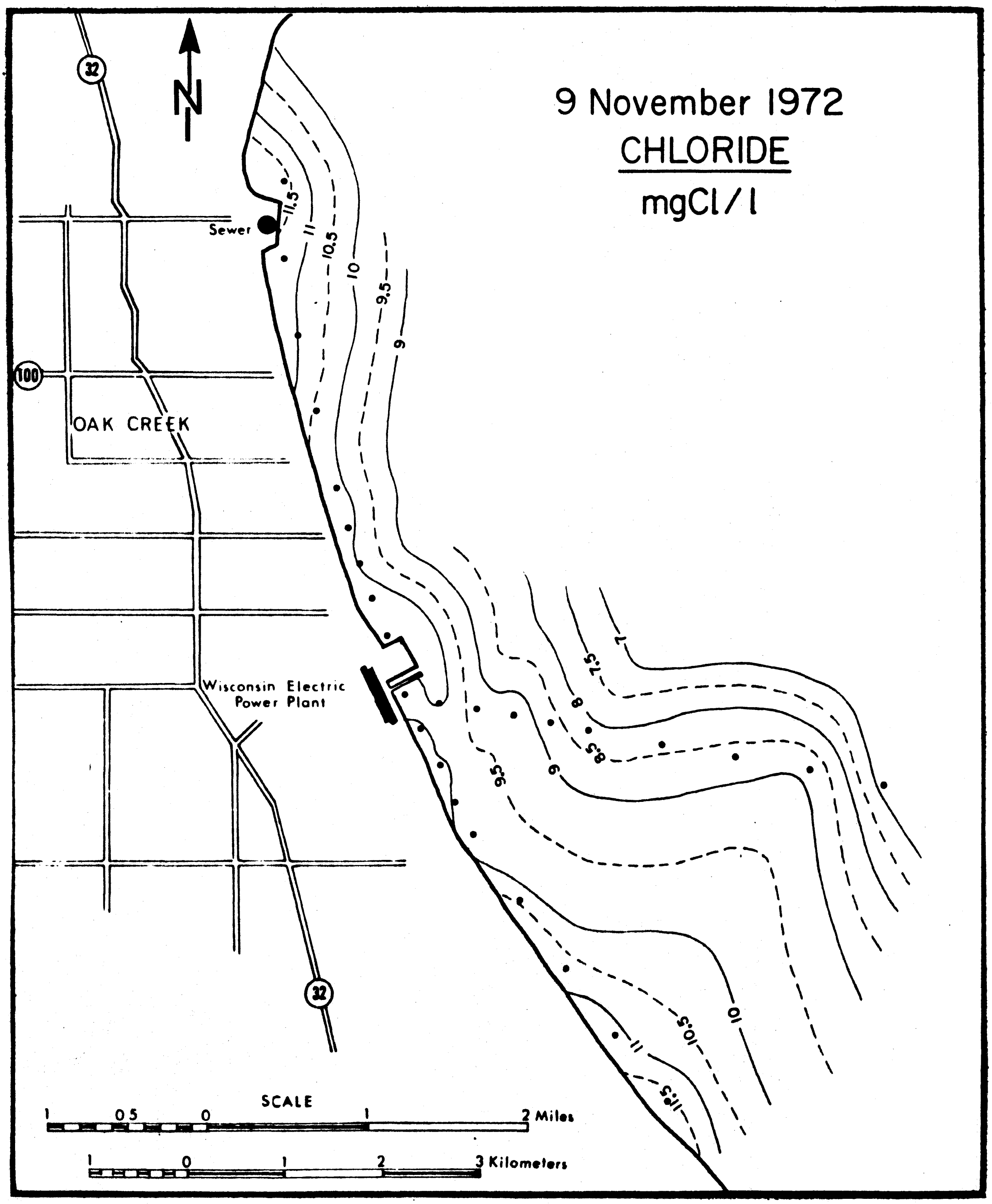

Figure 54. Distribution of chloride (mg/l) on November 9, 1972.

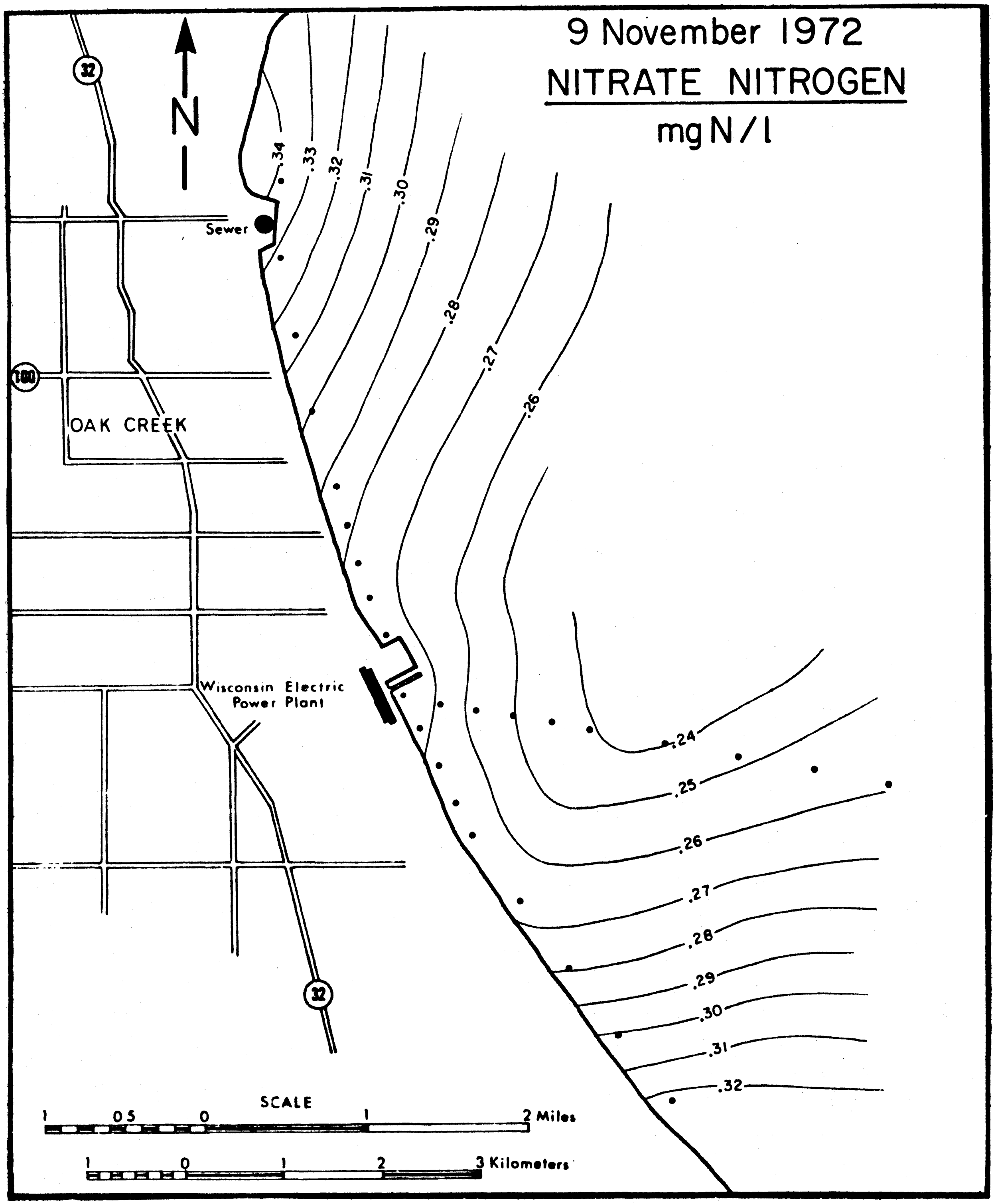

Figure 55. Distribution of nitrate (mg/l) on November 9, 1972.

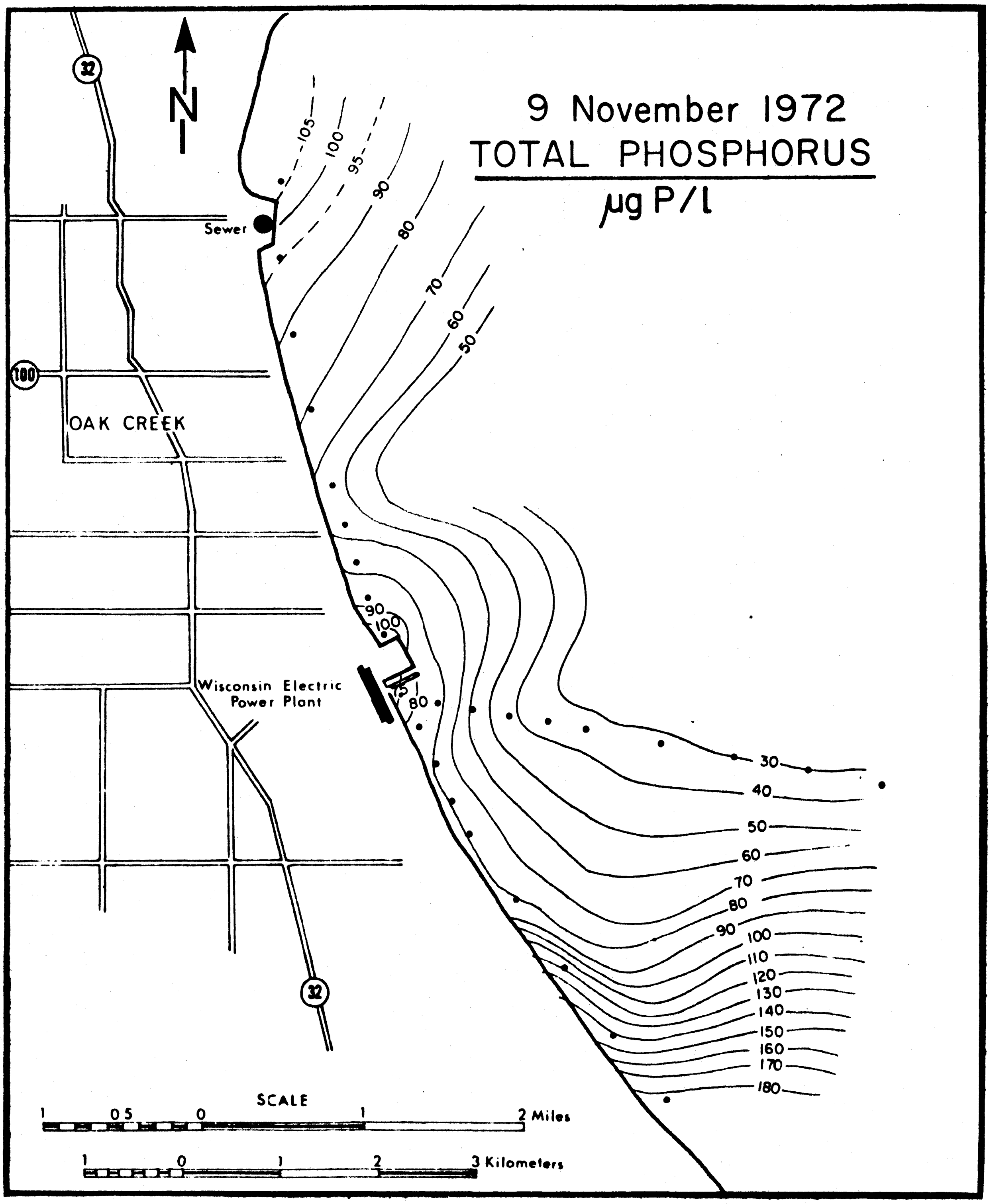

Figure 56. Distribution of total phosphorus ($\mu g/l$) on November 9, 1972.

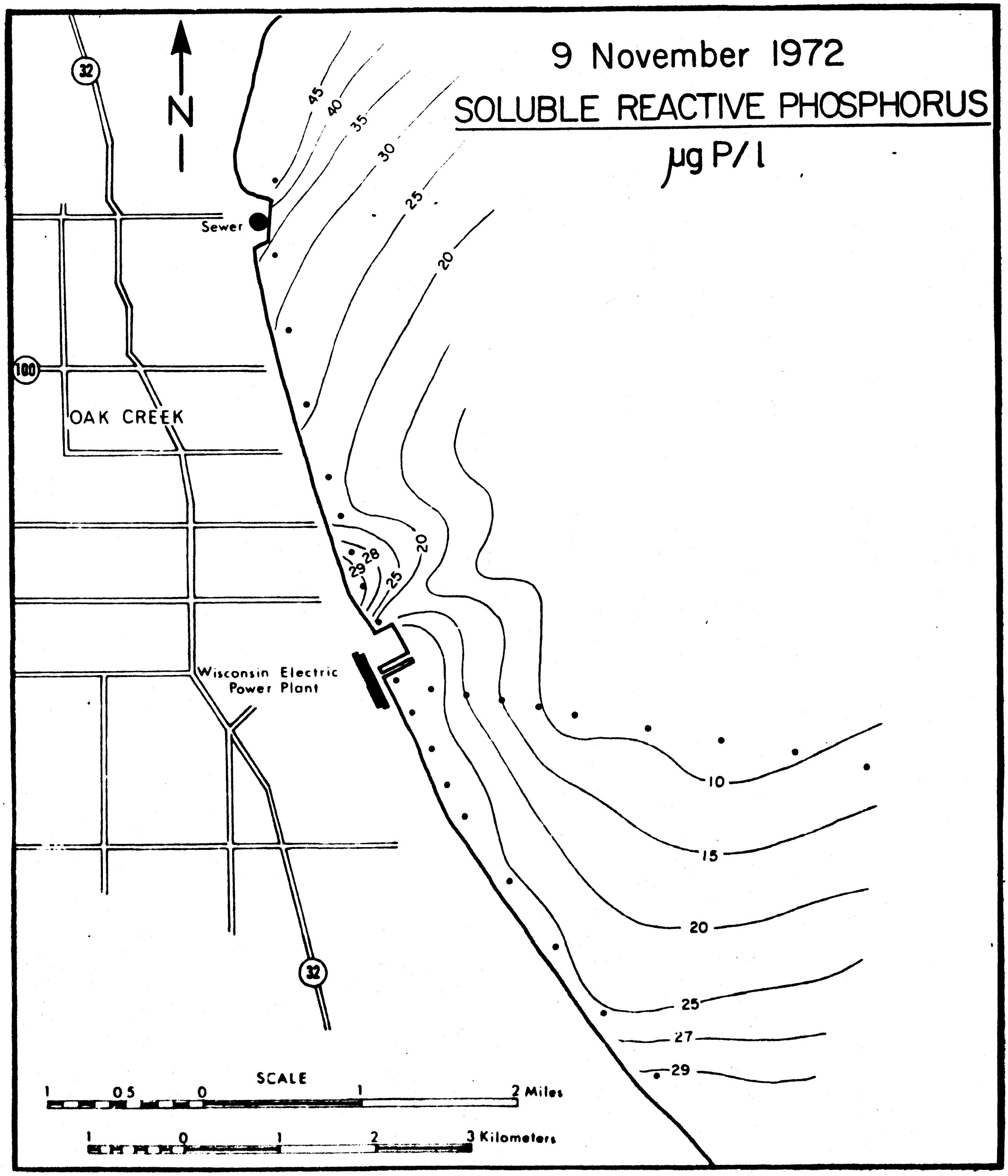

Figure 57. Distribution of soluble reactive phosphorus (μg/l) on November 9, 1972.

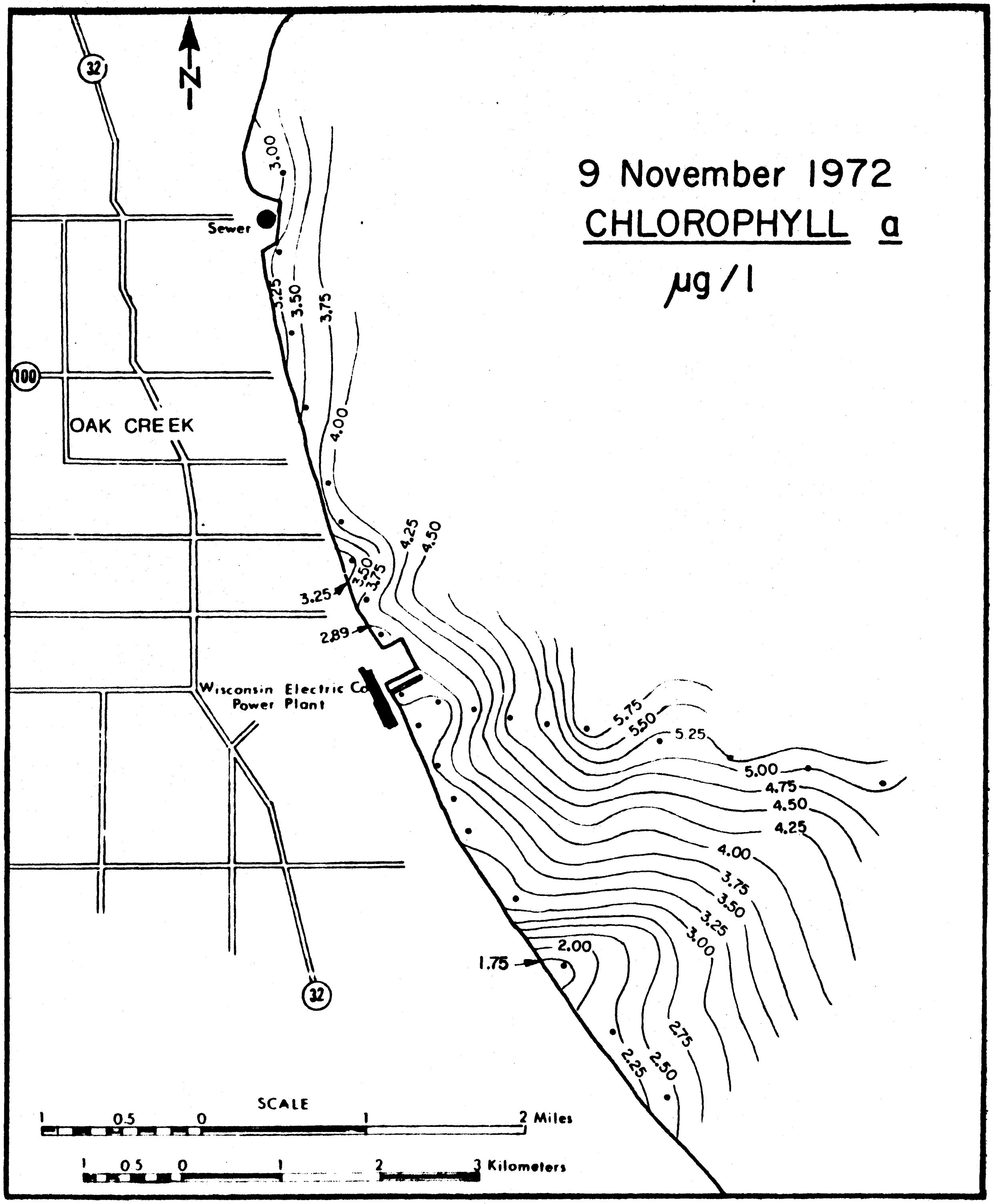

Figure 58. Distribution of chlorophyll a (µg/l) on November 9, 1972.

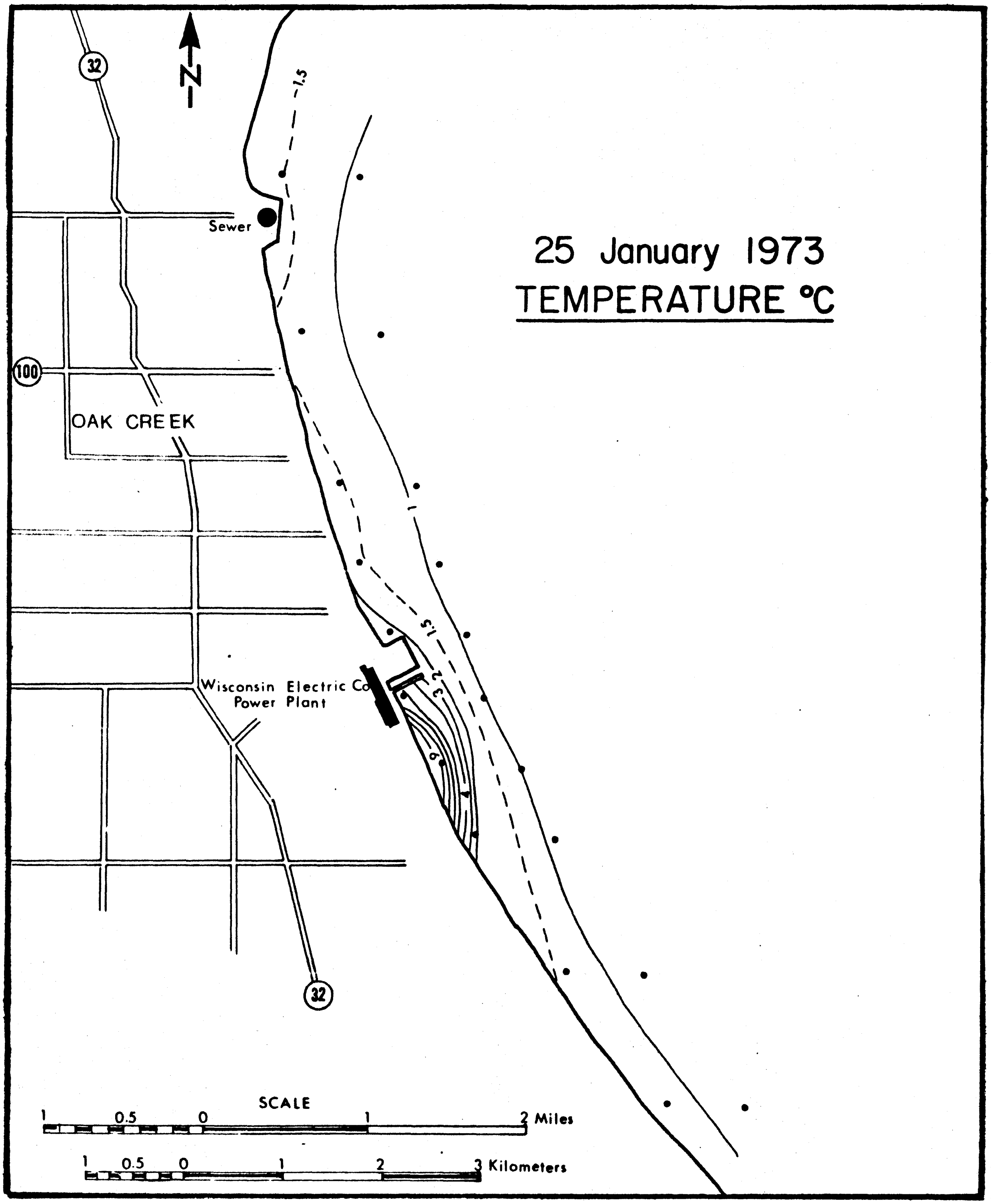

Figure 59. Distribution of surface temperatures (°C) on January 25, 1973.

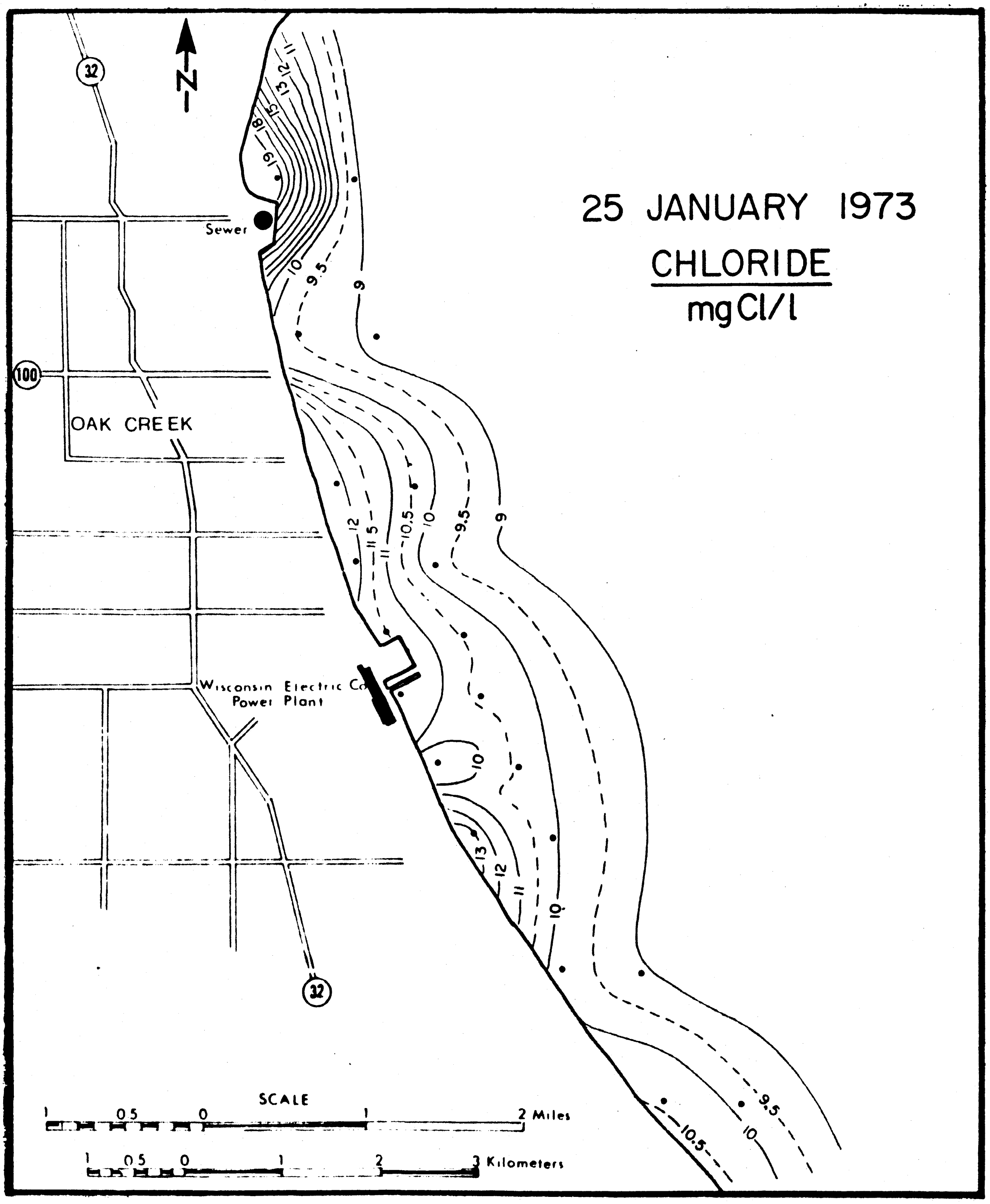

Figure 60. Distribution of chloride (mg/l) on January 25, 1973.

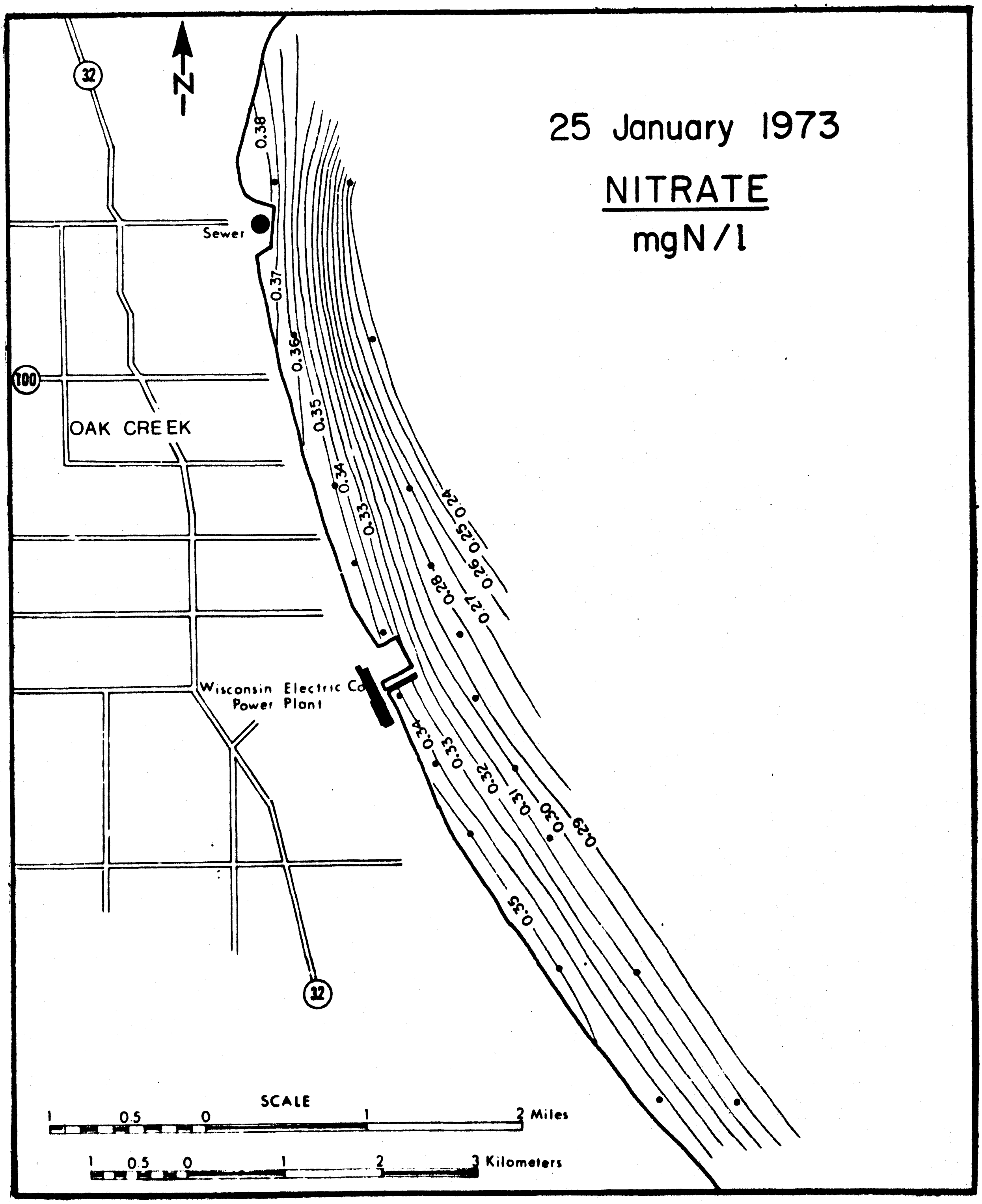

Figure 61. Distribution of nitrate (mg/l) on January 25, 1973.

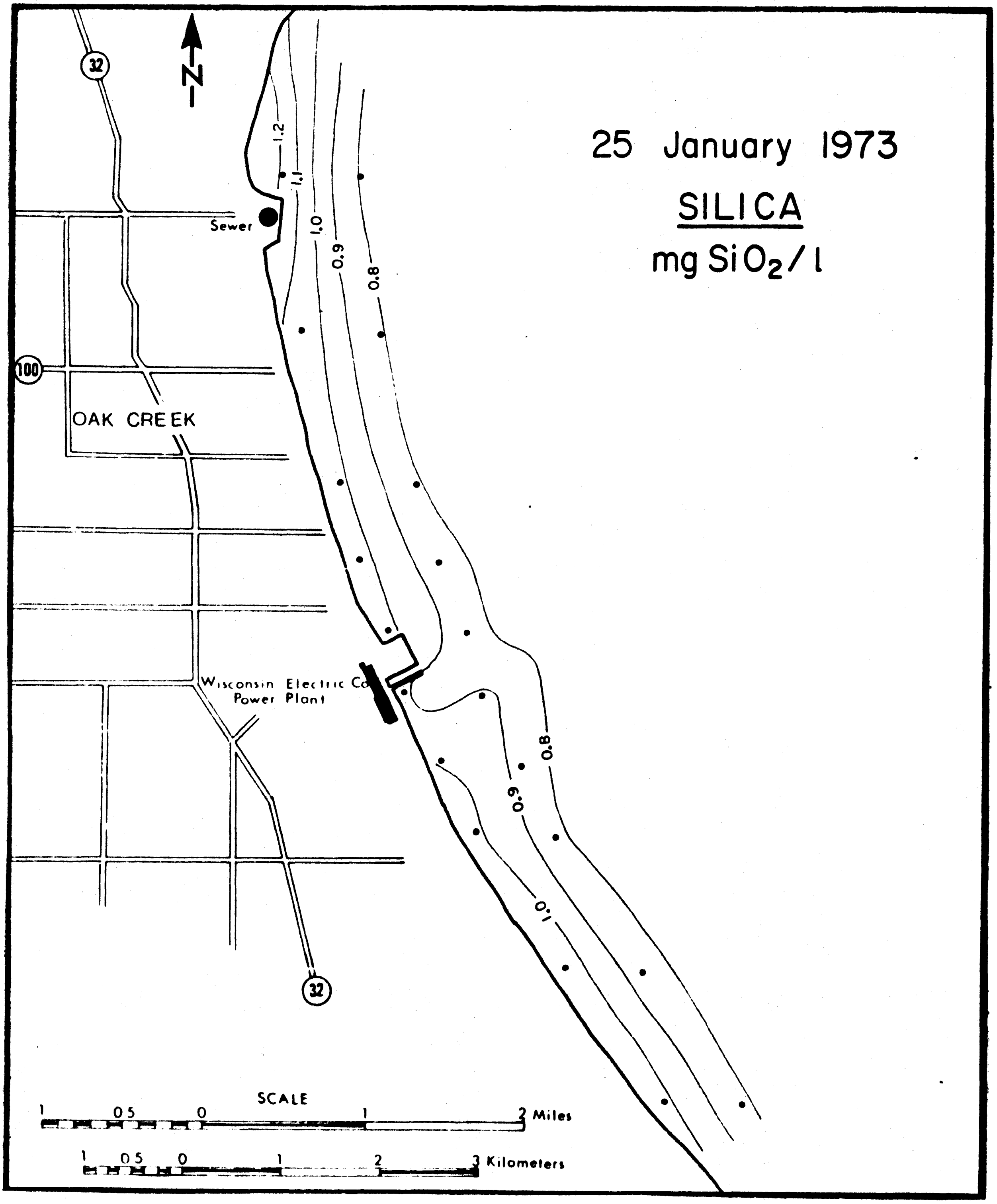

Figure 62. Distribution of silica (mg/l) on January 25, 1973.

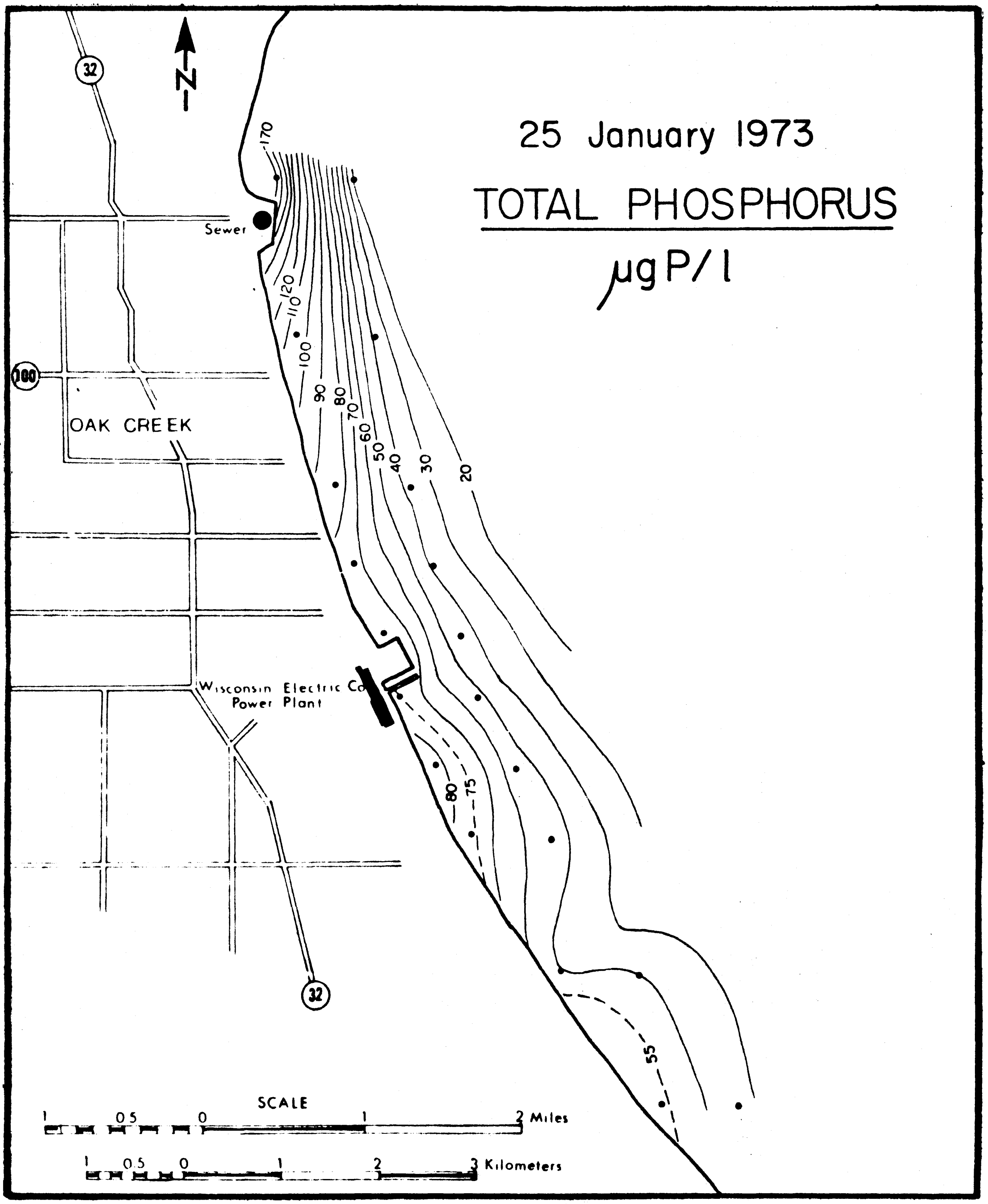

Figure 63. Distribution of total phosphorus (µg/l) on January 25, 1973.

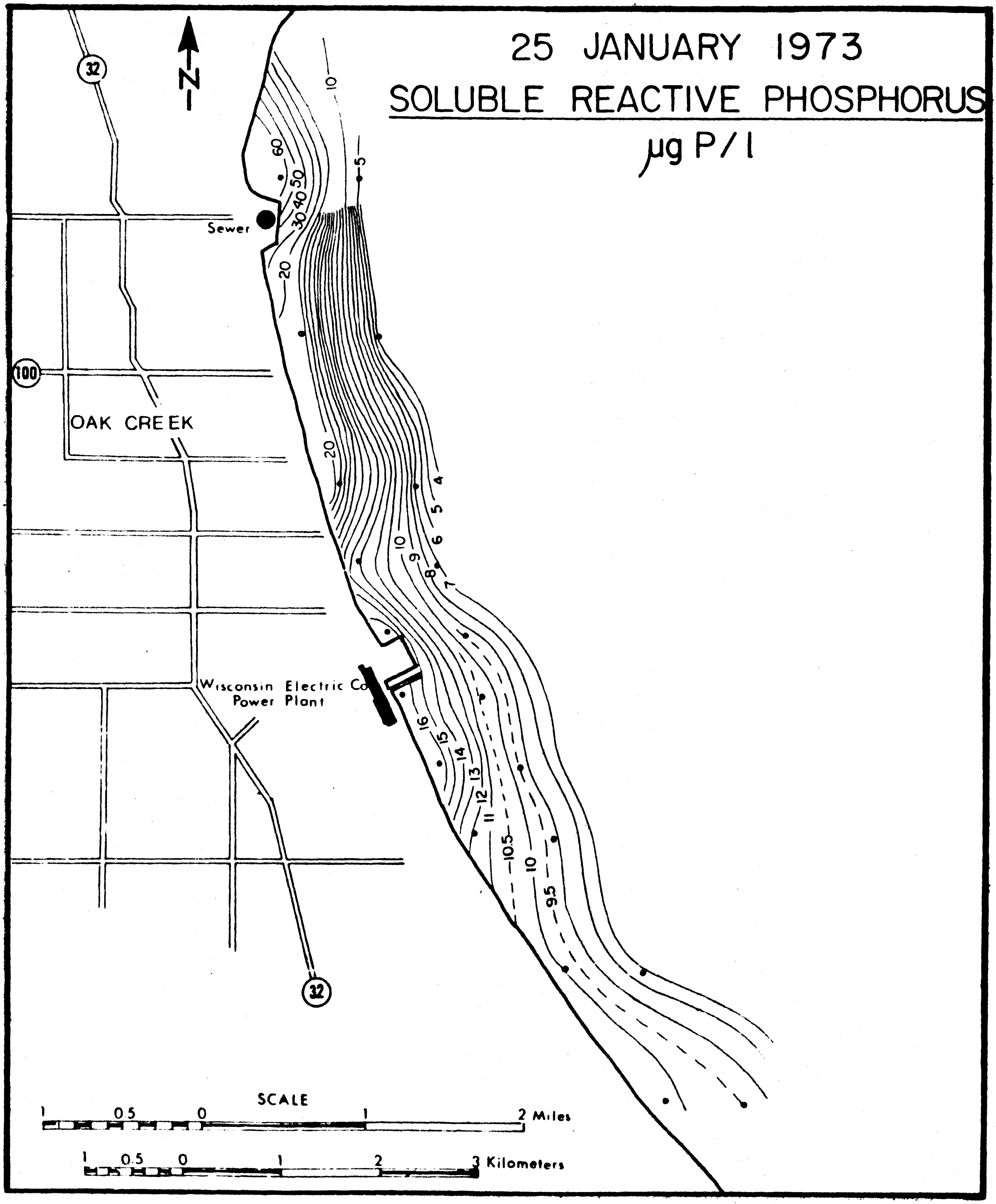

Figure 64. Distribution of soluble reactive phosphorus ($\mu g/l$) on January 25, 1973.

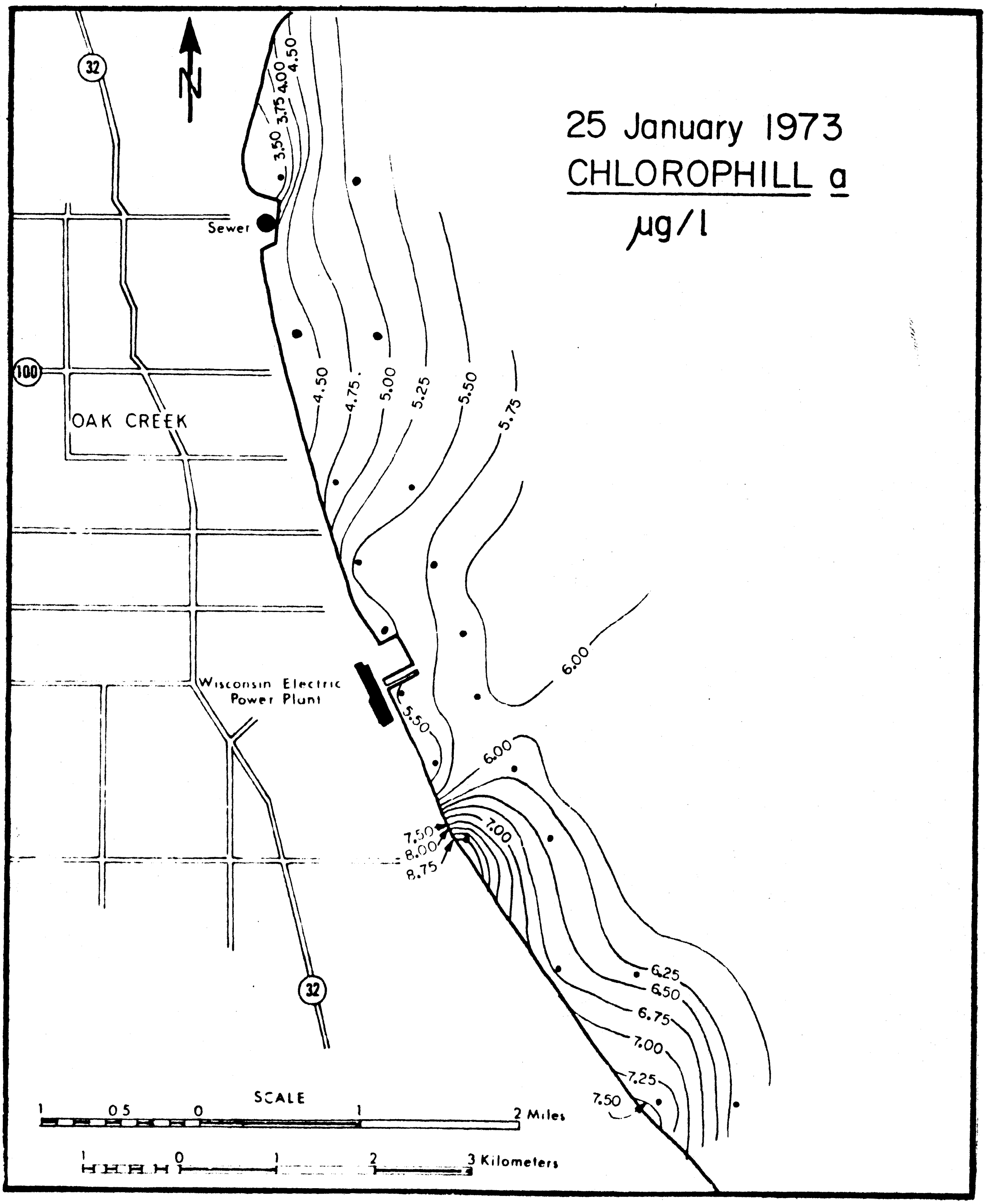

Figure 65. Distribution of chlorophyll a (μg/l) on January 25, 1973.

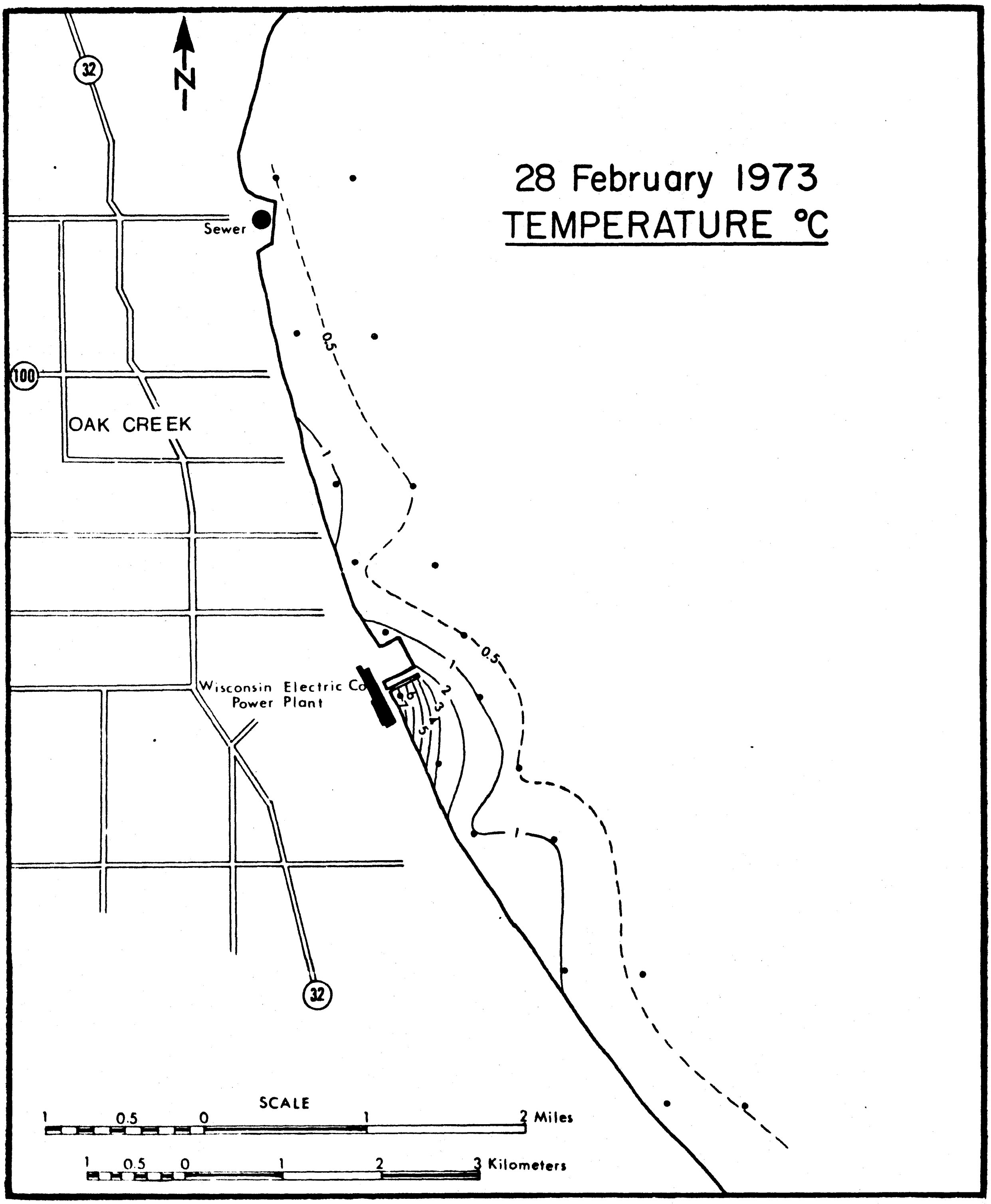

Figure 66. Distribution of surface temperatures (°C) on February 28, 1973.

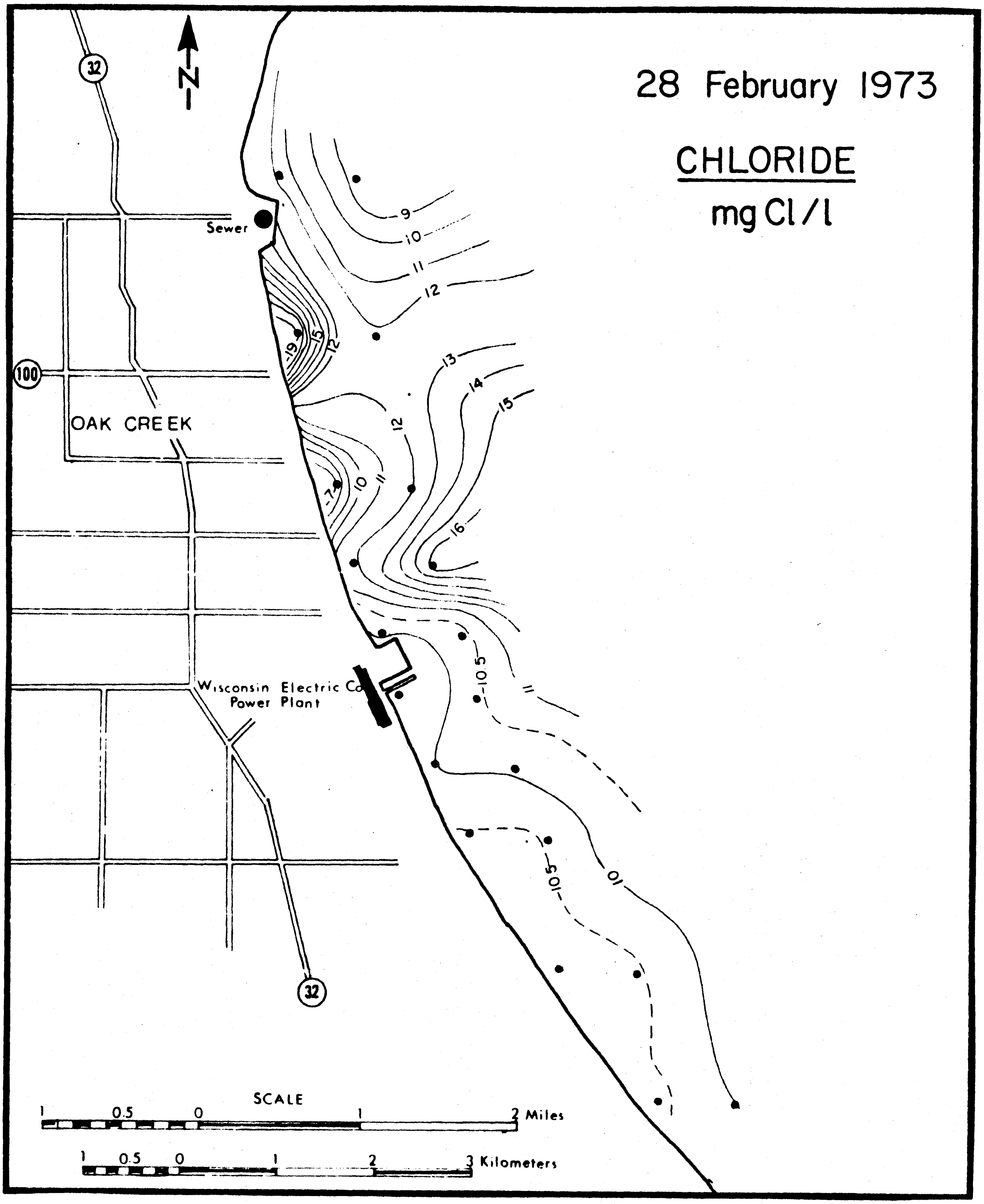

Figure 67. Distribution of chloride (mg/l) on February 28, 1973.

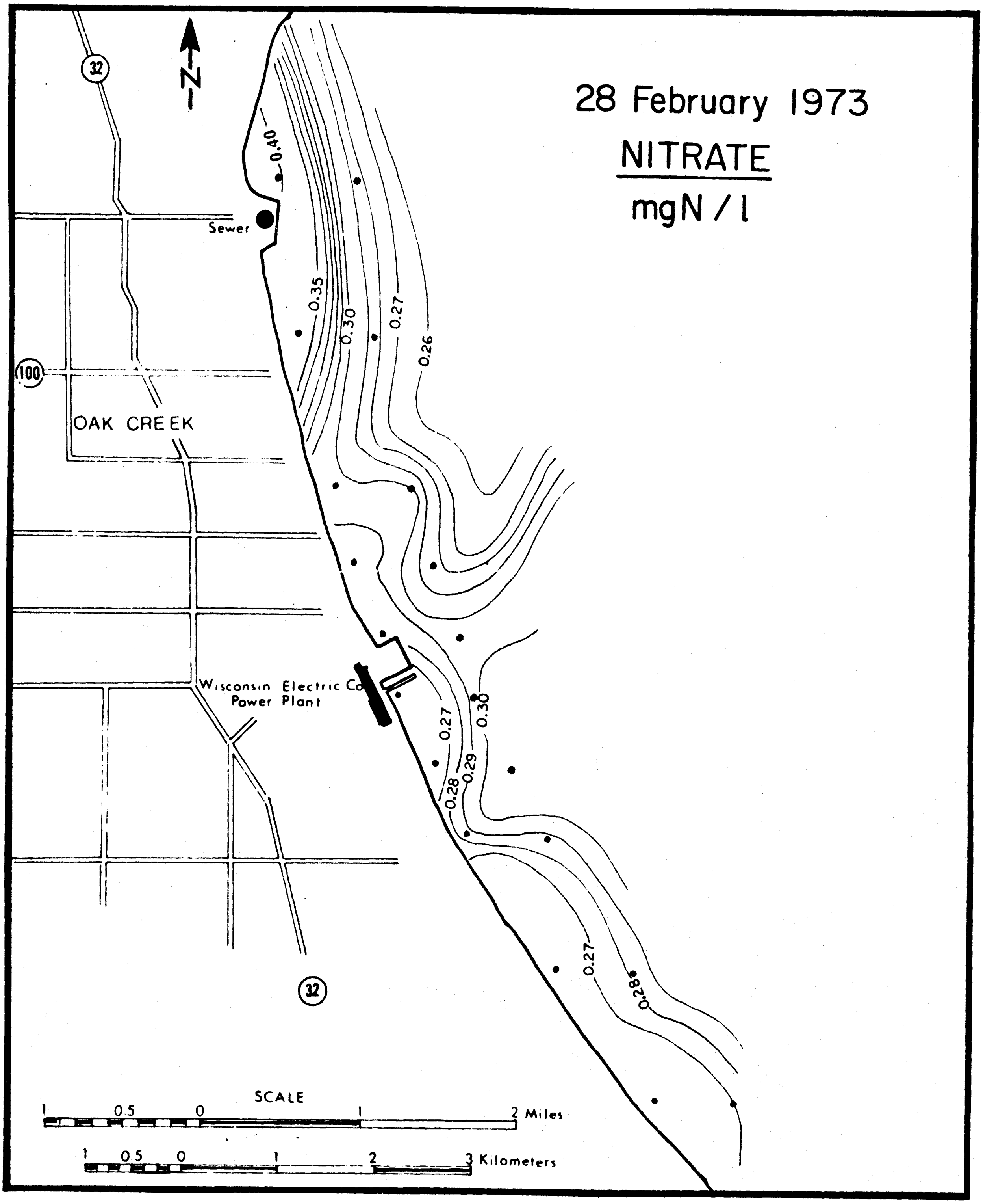

Figure 68. Distribution of nitrate (mg/l) on February 28, 1973.

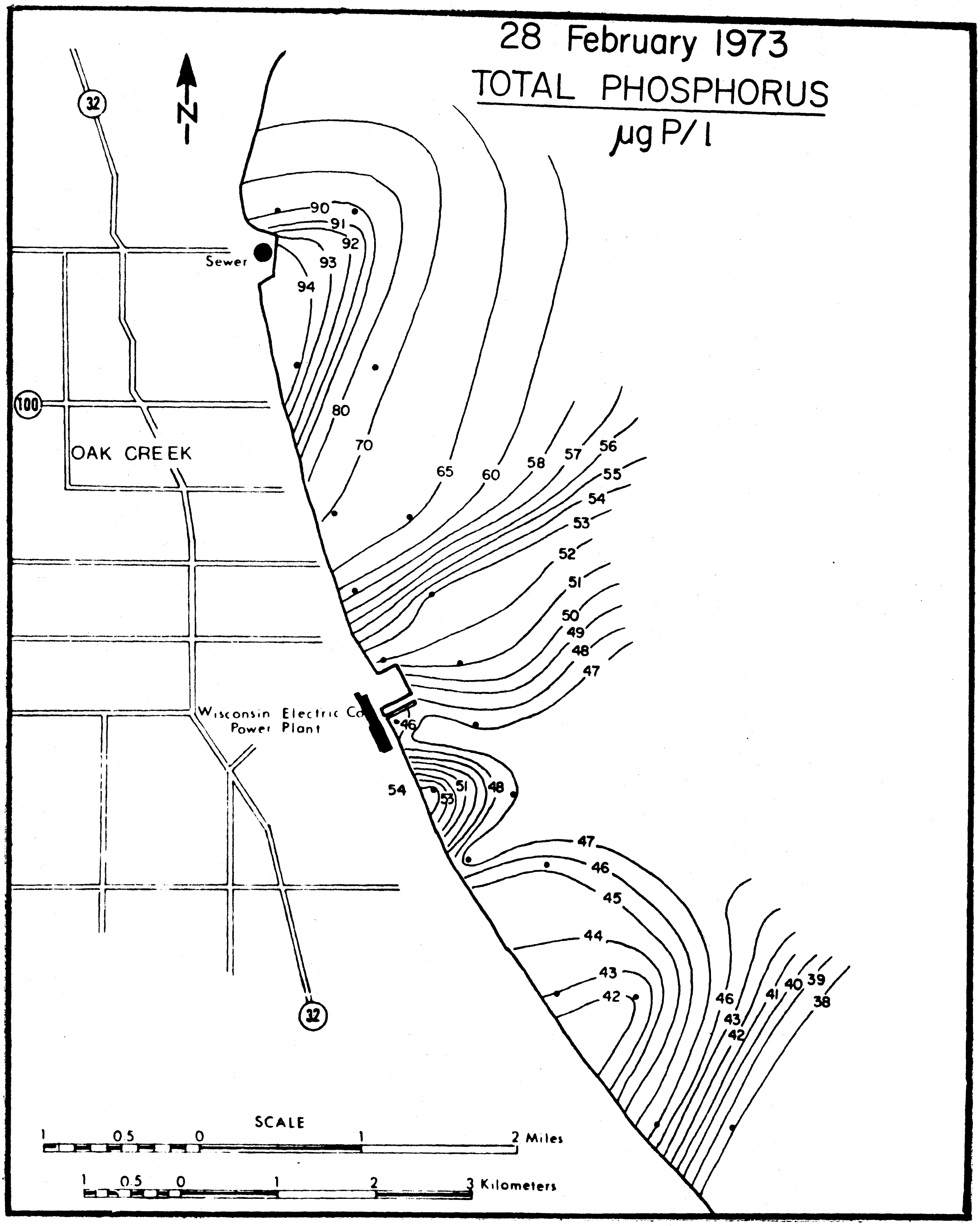

Figure 69. Distribution of total phosphorus (μg/l) on February 28, 1973.

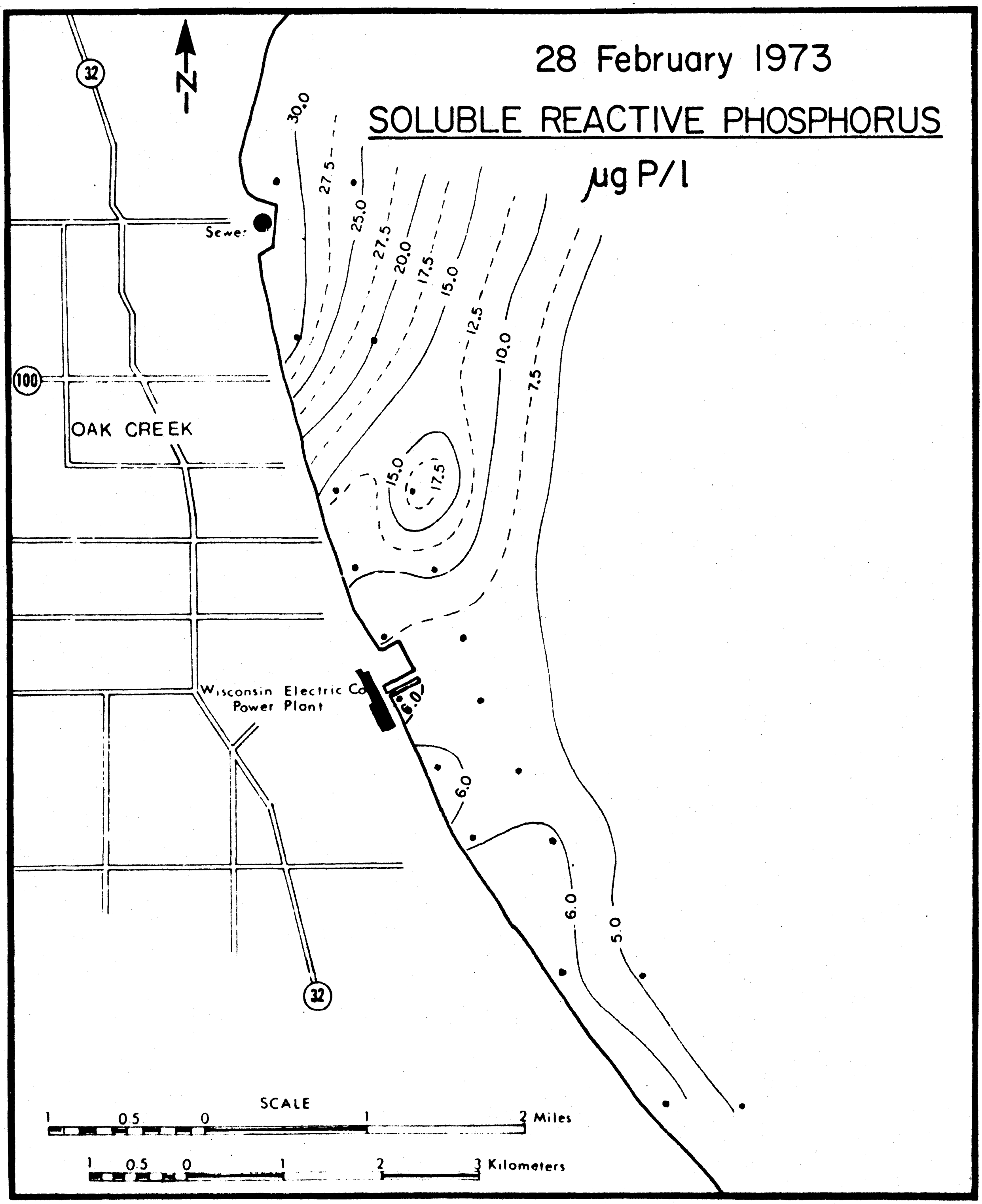

Figure 70. Distribution of soluble reactive phosphorus (μg/l) on February 28, 1973.

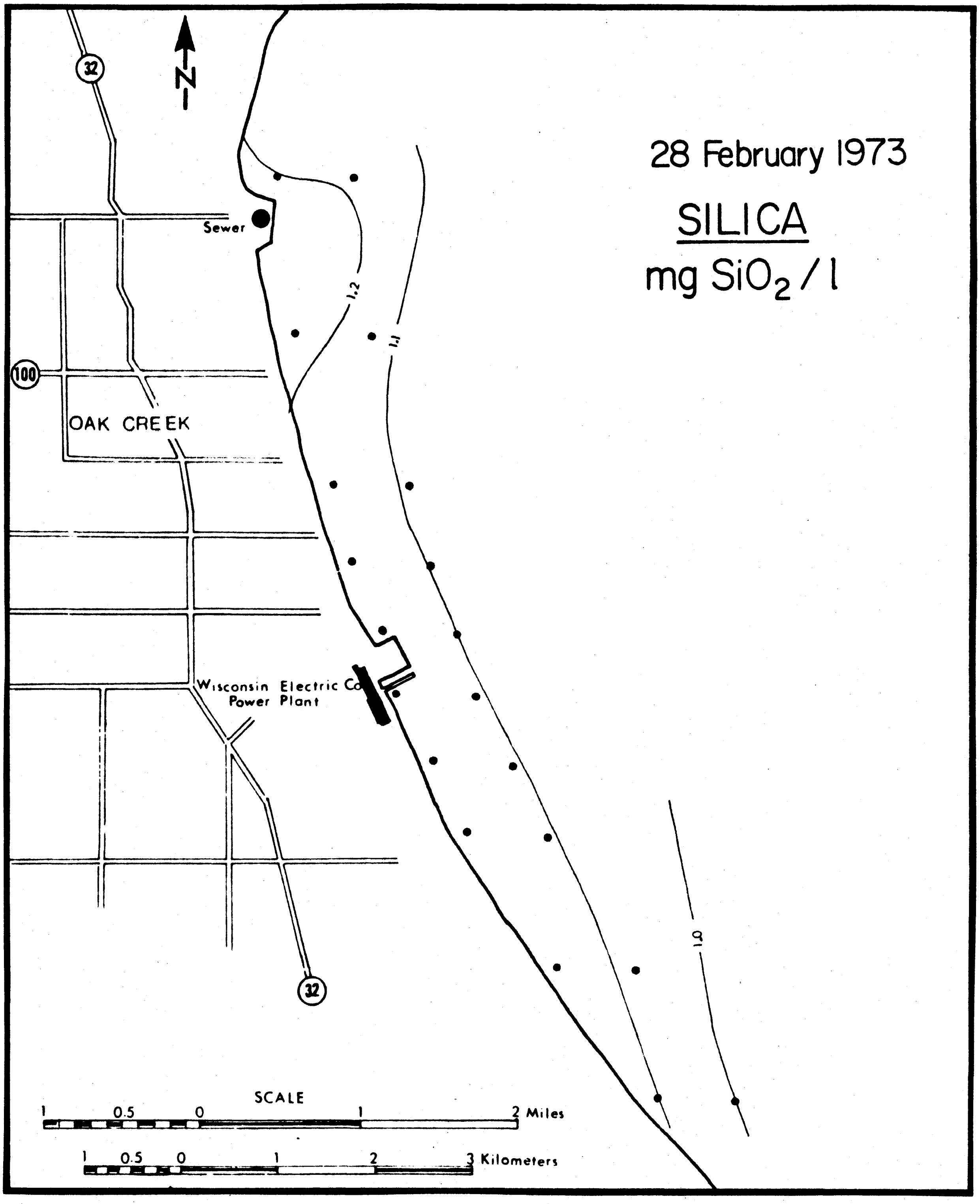

Figure 71. Distribution of silica (mg/l) on February 28, 1973.

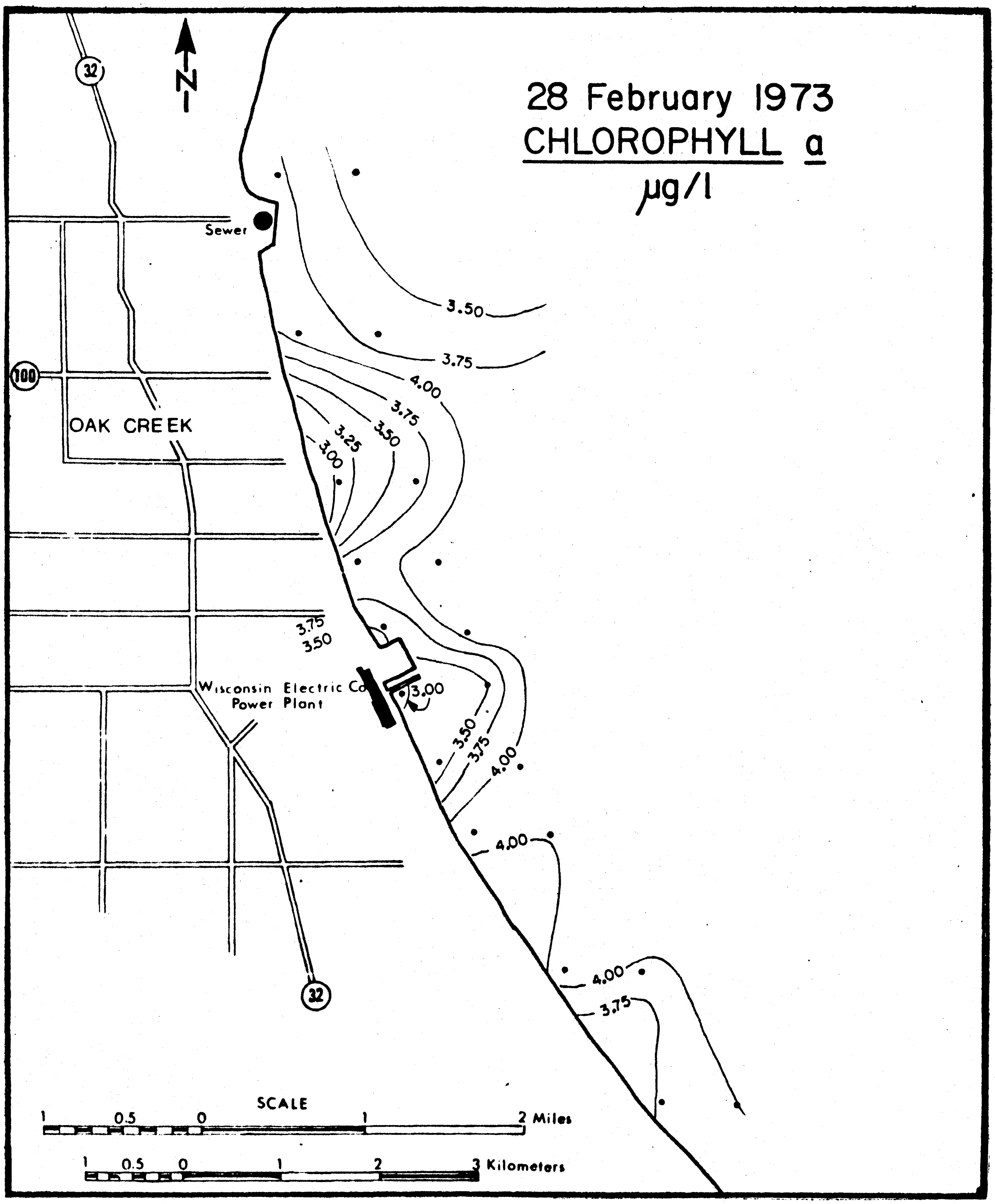

Figure 72. Distribution of chlorophyll a (µg/l) on February 28, 1973.