COMPARATIVE STUDY
on
THE EUTROPHICATION
of
LAKE SEBASTICOOK, MAINE
1965, 1971-1973

United States Environmental Protection Agency

Region I

JOHN F. KENNEDY FEDERAL BUILDING · GOVERNMENT CENTER - BOSTON, MASSACHUSETTS 02203

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1965, 1971-1973

by
P. M. Nolan
A. F. Johnson

U. S. ENVIRONMENTAL PROTECTION AGENCY
REGION I
BOSTON, MASSACHUSETTS

APRIL 1975

LAKE SEBASTICOOK, MAINE

U. S. ENVIRONMENTAL PROTECTION AGENCY

REGION I

BOSTON, MASSACHUSETTS

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SUMMARY

A technical study was conducted from November 1971 to August 1973 to assess eutrophication of Lake Sebasticook at Newport, Maine and to measure progress versus work conducted in 1965. Selected biological and chemical parameters are compared on a seasonal and yearly basis.

Average total phosphorus values are higher during the 1971-1973 survey than during 1965. Station EB-01 at the outlet of Corundel Lake (Station 3) is of special interest because of the higher total phosphorus average of 0.15 mg/l compared to 0.07 mg/l average of 1965. This indicates the possibility of the discharge of additional municipal and/or industrial waste from the Dexter vicinity or a non point discharge since 1965. Total phosphorus concentration has increased in Lake Sebasticook to approximately 0.08 mg/l in 1971-1972 and approximately 0.10 for 1973, up from 0.05 mg/l in 1965. This is considered hypereutrophic according to recent data from the National Eutrophication Survey.

Less nitrogen is present in the inlet water of the East Branch of the Sebasticook River and in the water column and sediment of Lake Sebasticook now than in 1965. Denitrification of aquatic systems is known to occur when photosynthetic activity of algae causes high alkaline levels in warm eutrophic lakes, and sediments have low concentrations of oxygen. However, denitrification is a complex process that is still inadequately understood and its explanation is not attempted in this report.

Two kinds of pollution tolerant benthic fauna, tubificid worms and midgefly larvae, were dominant in 1972 and 1973 as in 1965. Further degradation of bottom sediments is indicated by the smaller number of pollution tolerant organisms present in 1972 (14 per sq. ft.) and in 1973 (3 per sq. ft.) compared to 1965 (35 per sq. ft.).

Excessive algal growths similar to the 1965 eutrophic conditions for Lake Sebasticook are indicated when overall average chlorophyll a values and algal counts for 1971 to 1973 of 11.26 ug/l and 11,715 cells/ml respectively are compared with 11.63 ug/l chlorophyll a and 11,354 cells/ml for 1965. The extent of enrichment is apparent when Sebasticook is compared to the nonfertilized water of Lake Wassookeag with a 1973 chlorophyll a value of 0.38 ug/l and cell counts of 467/ml.

Conclusions

1. Phosphorus input to Lake Sebasticook from the East Branch of the Sebasticook River is still too high to reverse Sebasticook from a eutrophic state to a non-eutrophic state.

2. Lake bed sediments and riverbed sludges are a significant source of phosphorus in Sebasticook.

3. Nitrogen overall is lower within the immediate Sebasticook system and the data suggests a denitrification process within the lake.

4. Benthic animal populations are sparse and consist only of sludge worms and red midges.

5. Algae continues to be a problem, however, some seasonal improvements are noted.

6. All parameters taken collectively describe Lake Sebasticook as eutrophic.

INTRODUCTION

History

Lake Sebasticook at Newport, Maine was studied in 1965 by Mackenthun 1966 (et al) to determine the extent and cause of excessive fertilization of the lake. Eutrophication of the lake was confirmed by the volume of blue-green algae, noxious odors, low or absent dissolved oxygen in the deeper waters, high phosphorus and nitrogen concentrations and a lake bed associated animal population composed dominantly of midge larvae and sludgeworms. Fertilization of Lake Sebasticook was determined to be caused principally by nutrients contained in domestic and industrial wastes discharged to the East Branch of the Sebasticook River at Dexter and Corinna, Maine.[(1)(2)]

Subsequent to the 1965 study one major source of phosphorus pollution, a potato processing plant, to Lake Sebasticook burned down. The town of Corinna constructed and now has in operation a secondary waste treatment plant (WWTP) with a designed level of treatment capable of 85-95% BOD and solids removal. Phosphorus removal up to 30% can be expected from a plant of this design. The WWTP is designed to receive a volume of 1.2 mgd which breaks down to 1 mgd from Eastland Woolen Mills and 0.2 mgd from the town of Corinna. The town of Dexter upstream of Corinna on the East Branch of the Sebasticook River does not have a waste treatment facility and domestic and industrial wastes are discharged directly to the river. Being considered are two alternatives for waste water treatment for Dexter, either construction of a new WWTP or a tie-in with the plant in Corinna, after modification.

With the elimination of one major source of phosphorus pollution and the implementation and operation of waste treatment facilities, a technical study was undertaken by the Region I Division of Surveillance and Analysis, Biology Section to make an up-to-date assessment of Sebasticook to determine if the lake is demonstrating signs of recovery from the advanced eutrophic state reported in 1965. The program was initiated in November 1971 (autumn) and continued on a quarterly basis for the winter and spring quarters of 1972 and the spring and summer quarters of 1973.

Conduct of Study

Sample station locations Figure 1 and 2 are the sampling locations used for the 1971-1973 study. These stations on Lake Sebasticook and on the East Branch of the Sebasticook River are contiguous with stations designated in 1965 by Mackenthun. In the summer of 1973 Lake Wassookeag was sampled as a control and samples of substrate were obtained upstream of the mouth of the East Branch Sebasticook River to determine the nutrient potential in the river bottom. The 1965 reference stations are listed below those symbols used in 1971-1973, Figures 1 and 2. Table 1 indicates the approximate station locations in terms of longitude and latitude.

Sampling Procedures

Water samples were collected from boats, bridges or through drilled ice holes using a Kemmerer water sampler. The lake samples were collected at three depths and the tributary samples were collected from one depth. Benthic sediment samples for biological and chemical analysis were collected using a Petersen grab sampler. All samples were preserved and analyzed according to standard procedures.[3,4,5]

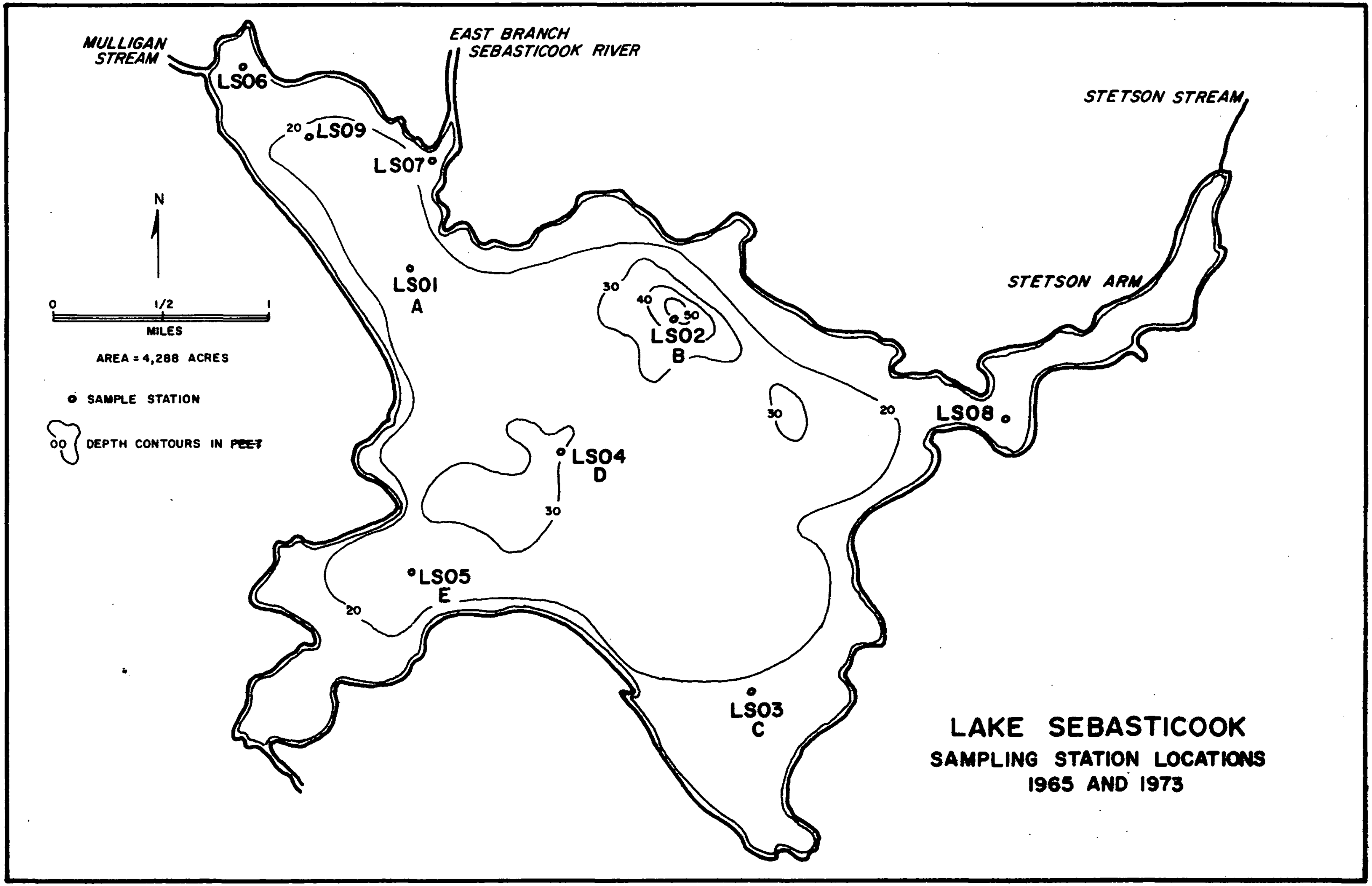
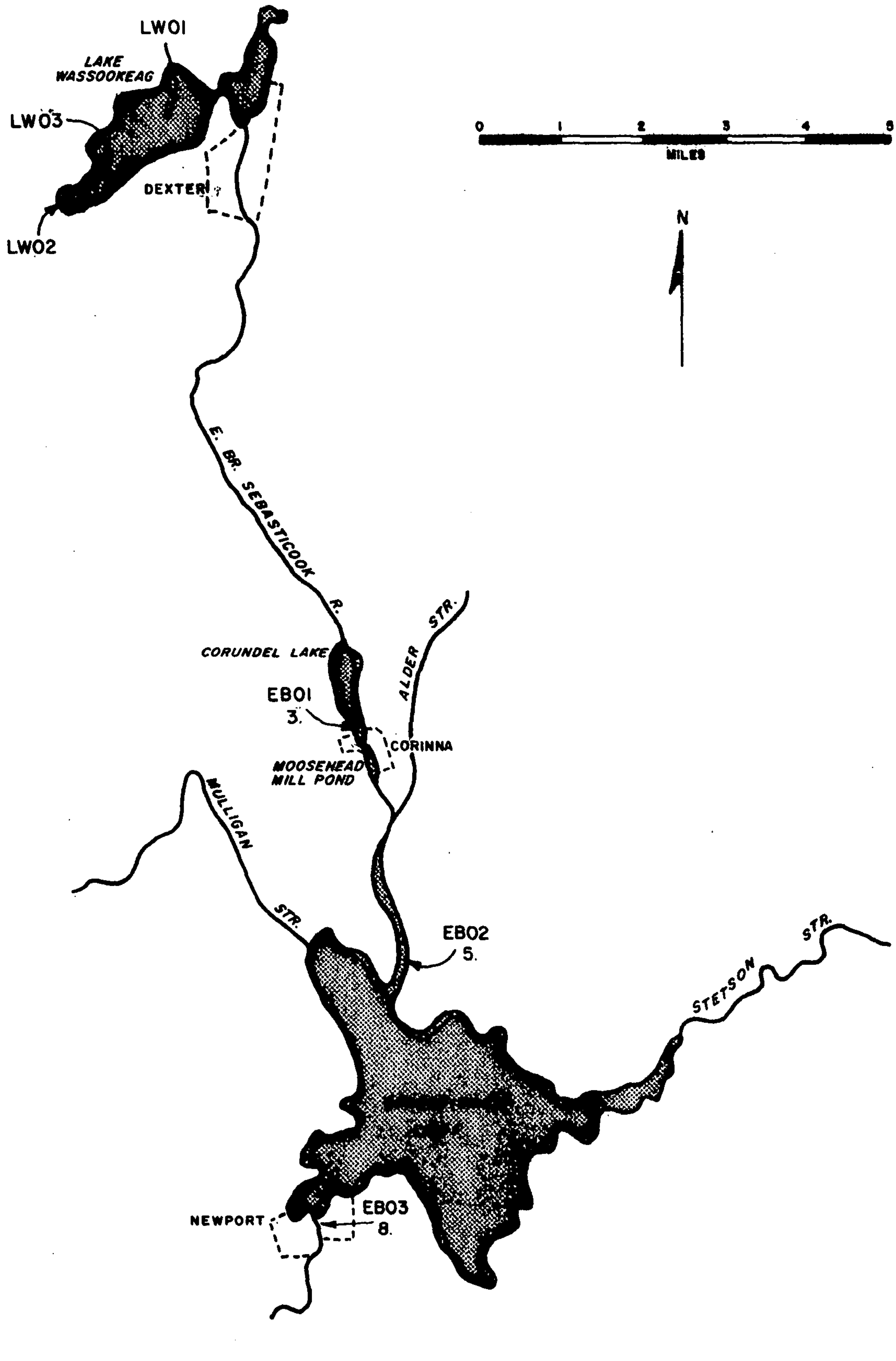

MULLIGAN STREAM
EAST BRANCH SEBASTICOOK RIVER
STETSON STREAM
STETSON ARM
LS06
LS09
LS07
LS01
A
LS02
B
LS08
LS04
D
LS05
E
LS03
C
20
30
40
50
N
0
1/2
1
MILES
AREA = 4,288 ACRES
SAMPLE STATION
DEPTH CONTOURS IN FEET
LAKE SEBASTICOOK
SAMPLING STATION LOCATIONS
1965 AND 1973

FIGURE 1



LAKE SEBASTICOOK TRIBUTARIES

SAMPLING STATION LOCATIONS
1965 AND 1973

FIGURE 2

BIOLOGY

Benthic invertebrates

Bottom muds were sampled in 1971, 1972 and 1973 (Table 1) (Figure 1) to make a comparison of benthic animals with the 1965 survey findings. Fine, soft, black mud at Stations LS01 through LS05 (Tables 2 and 3) had sparse populations of midgefly larvae (*Chironomus riparius*) and sludge-worms (*Tubificidae*). An average of 35 organisms per square foot, 57% midgefly larvae and 43% sludgeworms, were found during the May, 1965 survey. Similar benthic populations existed six years later (Nov. 1971) with an average of 44 organisms per square foot, 25% midgefly larvae and 72% sludgeworms, and May 1972 with an average of 14 organisms per square foot, 54% midgefly larvae and 46% sludgeworms (Table 6). Special characteristics of the blood of both animals facilitate extraction of dissolved oxygen from oxygen deficient environments. The midgefly, *Chironomus riparius*, has two pairs of finger-like anal gills for greater aid in the respiratory process.

Three stations were selected in May, 1972 (LS06, LS07, LS08) near river and stream inlets for benthic invertebrates analysis of shallow areas (average depth 6 feet compared to 40 feet for Stations LS01 through LS05).

Soft mud at Station LS06 near the mouth of Mulligan Stream supported a variety of 6 kinds of life, pollution tolerant sludgeworms dominated the benthic life on this polluted substrate (Table 3). LS06 is in the general area of the inlet of the E.B. Sebasticook River.

Water of apparent poor quality flows over the hard, gravel and sand substrate at Station LS07 near the mouth of the East Branch of the

Sebasticook River as it supported a scant population of only 18 animals per square foot and was lacking the clean water mayflies and caddisflies.

Living on the gravel and sand bottom of Station LS08 leading into Stetson Arm and Stetson Stream were a great variety of benthic fauna, 14 kinds, and greater numbers, 280 bottom organisms per square foot, including pollution sensitive forms such as caddisflies, mayflies, planarians, hydrozoans, ostracods and cladocerans.

Organic nutrients have not accumulated on this hard substrate as flow from Pleasant Lake by route of Stetson Stream contributes water of good quality which enables a diverse population of benthic animals to survive. The bottom fauna on the natural substrate of Stetson Arm (Station LS08) contributes a food source that would support a sport fishery and is the only area of the lake where fishermen were observed during the May, 1972 survey. In contrast, environmental degradation of bottom sediments caused by excessive build-up of organic nutrients at Stations LS01-LS06 and the poor water quality at Station LS07 is indicated by the presence of pollution tolerant benthos and their paucity of numbers.

The hard substrate of Station LS07 (50% gravel, 50% sand) with 7 feet of water is similar to the hard substrate of Station LS08 (50% gravel, 50% sand) with six feet of water. A slow water current flows over these stations.

Benthos was sampled in 1973 (Stations LS01-LS05) with the average number of organisms for the month of May being 18 per sq. ft. and July being 3 per square foot. Two control stations in Lake Wassookeag

(LW02 and LW03) in August 1973 yielded 137 organisms per square foot (Tables 4, 5 and 6).

Strong hydrogen sulphide odors were detected in bottom sediments and a depleted oxygen level of 0.6 parts per million in the lower depths of Lake Sebasticook during the July-August 1973 survey which indicates active biological decomposition and an environment that is close to being saprobic thereby eliminating most aquatic animal life.

A total of 17 pollution tolerant sludgeworms and midgefly larvae (*Chironomus riparius*) were collected in July from five stations in Lake Sebasticook (Stations LS01-LS05) which averaged 33 feet in depth, in comparison, one control station in oligotrophic Lake Wassookeag (LW03) supported 103 organisms consisting of sludgeworms and clean water midge-flies (*Anatopynia sp.*) in the profundal zone. Mayflies and an alderfly were found at a depth of approximately 30 feet.

The soft mud substrate of control station LW02 (Aug. 1973) at a water depth of 7 feet supported a variety of 13 clean water forms of life. A comparable station in Lake Sebasticook (LS06) with a soft mud bottom at a water depth of 6 feet (May 1972) had 6 kinds of life dominated by pollution tolerant sludgeworms (Table 3 and 5).

Algae

Increased availability of phosphorus resulted in algal blooms causing the "green paint" covering the rock along the shoreline and the "pig-pen" odors reported in the 1966 report.[1] Excessive algal growths have continued into the 1971-1973 survey periods and the rock along the shoreline were observed to have a dark green color; however, odors of decaying algae were not noticed.

The seasonal averages for algal counts for all Lake Sebasticook stations at the five foot, 15-30 foot and 30-55 foot depths for three surveys in 1965 and for four surveys from February 1972 to July 1973 are listed in Table 7 for comparison purposes. Averages were determined at the five foot depth for all surveys rather than surface counts due to piling up of surface algae from wind and wave action. The effect of piling is considered significant but not representative of uniform lake conditions in this case.

Climatological variation during the year, i.e., temperature, light intensity, cloud cover, and wind can cause variation in algae populations for different months at different vertical depths; however, when compared, algae counts for the spring and summer surveys at all depths in 1965 of 11,300 algae per milliter are similar to the spring and summer averages for 1973 of 11,700 algae per milliter.

To contrast again, the Lake Wassookeag control has a sparse phytoplankton population of 467 algae per milliter for the 1973 summer survey. This reflects upon the eutrophism of Lake Sebasticook which is attributed to the high phosphorus concentrations noted in the section on nutrients.

High algal counts in the East Branch of the Sebasticook River are noted downstream of Dexter at Station EB01 (8,500 per milliter) and below Corinna at Station EB02 (20,600 per milliter). A substantially higher average was recorded in 1965 for Station EB02 (Station 5 in 1965) of

99,000 per milliter (Table 8). This massive algal growth could have resulted from the surface matting and subsequent shoreline decay of algae observed during the 1965 survey of Lake Sebasticook, but was not evidenced during the 1971-1973 surveys.

Chlorophyll a

In general, chlorophyll present in a lake increases as the lake becomes more eutrophic and supports greater algal populations. In Table 9, the averaged chlorophyll a values exhibit considerable variation at different depths, from season to season during a year, and from season to season for different years, due probably to thermal stratification, temperature, light intensity, availability of nutrients, etc.; but the seasonal and yearly averages for all depths and stations show a similar chlorophyll a average value during 1965 as in the period from 1971 to 1973.

The chlorophyll a averages, from the upper, middle and lower depths (0-5', 10-25', 30-55') from all stations for 1965 (summer and fall), of 11.63 ug/l are similar to the summer (1973) and fall (1971) chlorophyll a average of 11.68 ug/l in Lake Sebasticook. Overall, the average lake chlorophyll a concentration of 11.63 ug/l is similar to the average Ch a concentration (11.26 ug/l) recorded for the 1971 to 1973 period. From this it is deduced that the relative amount of algal standing crop in Lake Sebasticook shows no change in the period since 1965.

The unfertilized waters of Lake Wassookeag, Lake Sebasticook's principle headwater source, has a summer 1973 chlorophyll a average value of 0.38 ug/l.

NUTRIENTS

Chemical parameters which are commonly associated with eutrophication were sampled for five seasons; November 1971, February 1972, May 1972, 1973 and July 1973. The results of the analysis for the samples are listed in the Appendix.

Two parameters, total phosphorus (TP) and total Kjeldahl nitrogen (TKN) are discussed here as a means for comparison with data generated in 1965. Both Lake Sebasticook and the East Branch Sebasticook River are assessed in this manner to determine changes and make evaluations relative to eutrophication. The TKN values as reported for 1965 are the sum of the extrapolated organic nitrogen and ammonia (TKN=Org N+NH_3).

Summary (Nitrogen and Phosphorus)

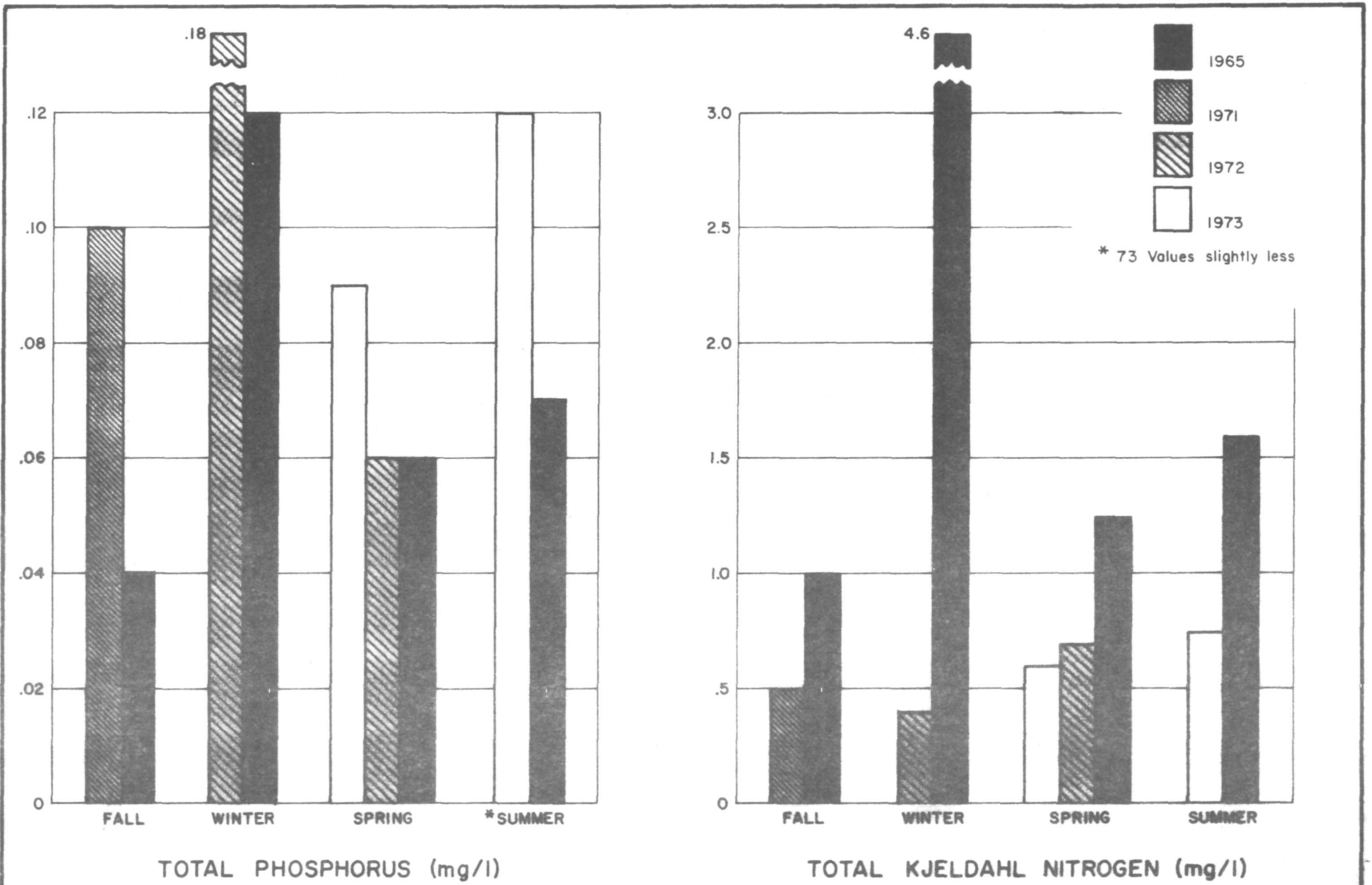
The histograms (Figures 3, 4, 5) summarize the data for TKN and TP for the fall, winter, spring and summer seasons. Total phosphorus in Lake Sebasticook for the fall of 1971 is approximately 2.5 times greater than the comparable season in 1965. In the winter of 1972 TP is 1.5 times greater than in 1965. For the spring of 1973 the total phosphorus is approximately 1.5 times greater than those values reported for 1972 and 1965 with the 1972 and 1965 values being approximately equal. The 1973 summer values for total phosphorus again exceed those values for 1965 by approximately 1.5 times.

Total phosphorus for the East Branch of the Sebasticook River (Figure 4) shows some variability from season to season and station to station. Station EB-01, (above Corinna) has higher phosphorus values recently (i. e., 1971-1973) than in 1965 with the summer of 1973 being the exception. Station EB02, below Corinna, demonstrates higher values in 1965 than in 1971, 1972 or 1973 with the winter of 1972 being a major exception. EB03, at the outlet of Lake Sebasticook, exhibits total phosphorus concentrations which are higher overall for 1971-1973 than in 1965. This reflects the higher TP concentrations noted in Lake Sebasticook in Figure 3.

Total Kjeldahl nitrogen, Figures 3 and 5, are compared in the same fashion as total phosphorus. For Lake Sebasticook for all seasons from 1971 to 1973 the TKN values range from approximately two to eighteen times less than in 1965. Similarly, for the East Branch of the Sebasticook TKN values are two to ten times less in 1971, 1972, 1973 than in 1965, the only exception being the winter 1972 value for Station EB01 where the TKN's are only slightly higher in 1965.

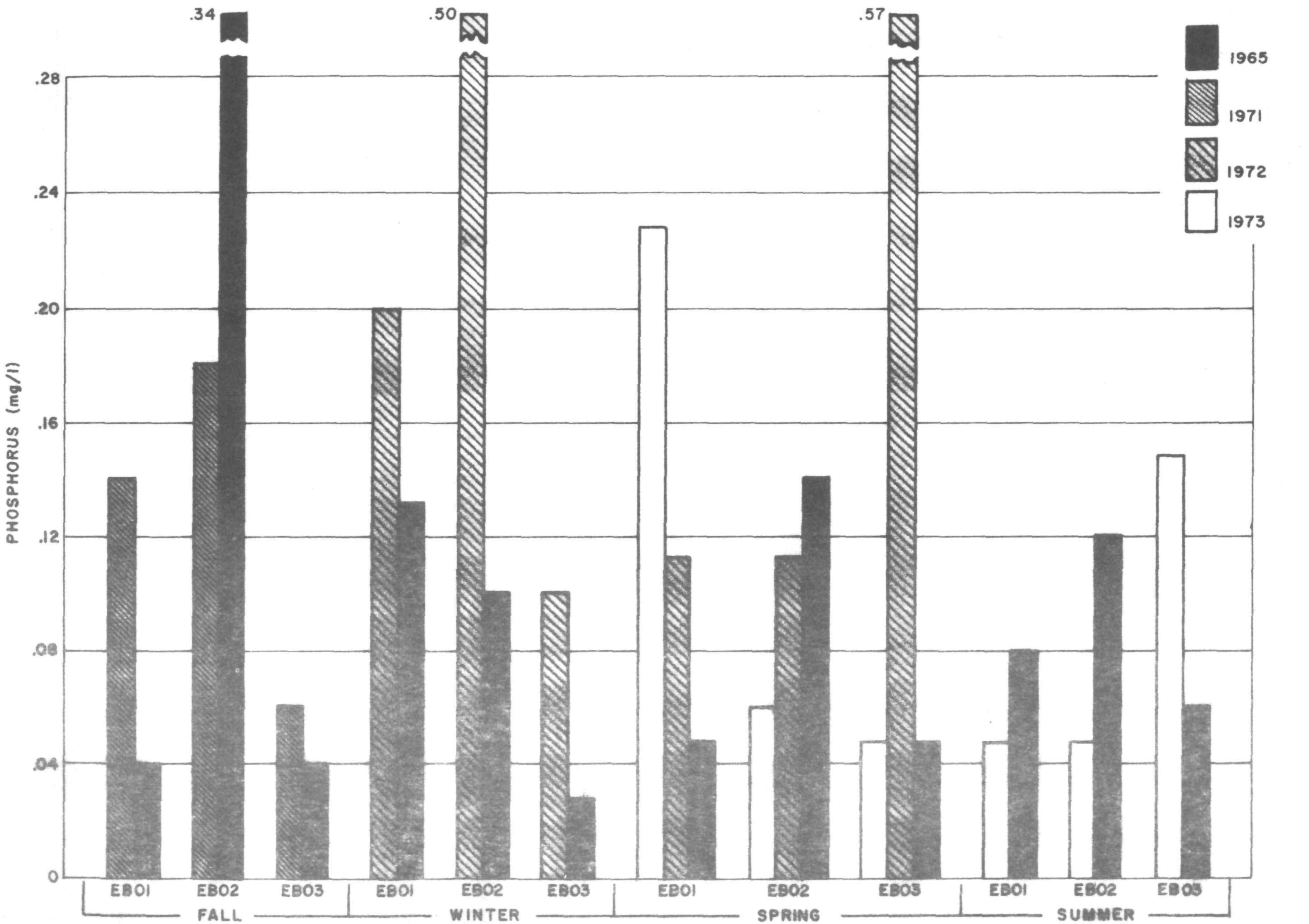
Overall, the average total Kjeldahl nitrogen values for both Lake Sebasticook and the East Branch of the Sebasticook River are approximately five times less for the five seasons from 1971-1973 compared to 1965.

Values for other parameters in the nitrogen series, ammonia (NH_4), nitrate (NO_3) and nitrite (NO_2) appear in the Appendix. These nitrogen species are difficult to interpret because the concentrations continually change due to the many factors regulating the complex nitrogen cycle in nature. For this reason, a comparative analysis has not been made, however, a general assessment of these parameters show a trend similar to that for TKN but it is not as marked.



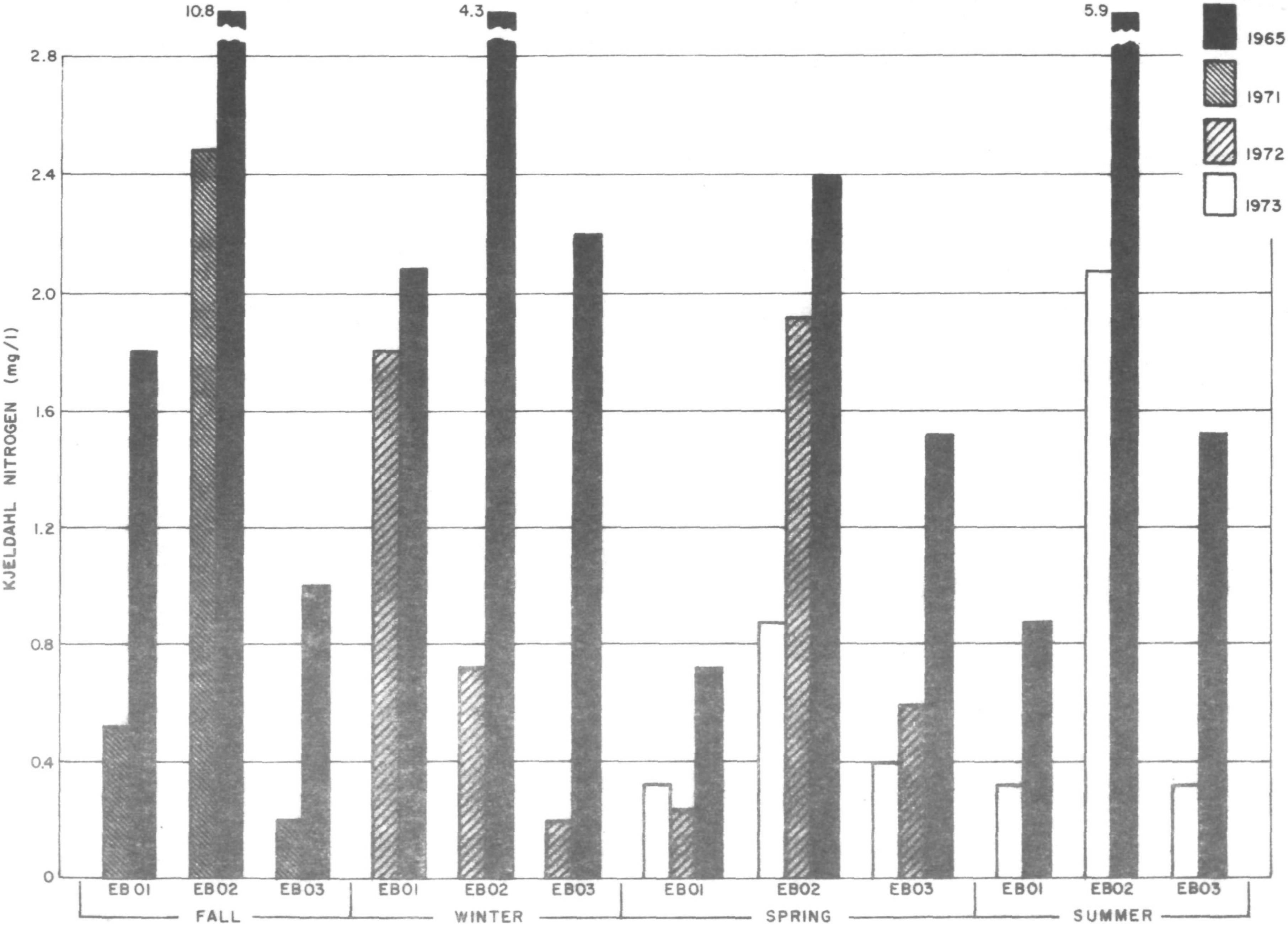
SEASONAL AVERAGES - LAKE SEBASTICOOK, MAINE

FIGURE 3



EAST BRANCH SEBASTICOOK RIVER - SEASONAL AVERAGE TOTAL PHOSPHORUS

FIGURE 4



EAST BRANCH SEBASTICOOK RIVER - SEASONAL AVERAGE TOTAL KJELDAHL NITROGEN

FIGURE 5

Sediments

Sediment samples were collected from five lake stations (Figure 1) for four seasons from November 1971 to July 1973. The sediments were analyzed for total Kjeldahl nitrogen and total phosphorus. The results of these analyses are presented as percent dry weight in Table 11. For comparative purposes the sediment data for the same parameters for May 1965 is also included.

Total phosphorus (TP) values for the sediments show some variability from season to season. The data for May 1972 compares favorably with the data for May of 1965 in terms of lake average .100 vs. .106% dry weight respectively, however, when the data for May 1973 is compared to 1965 and 1972 the data shows approximately a 25% decrease. The data for November 1971 and July 1973 also represent 20-25% TP reductions when compared to May 1972 and 1965. These differences can be partially explained by seasonal turnover during which time a recycling and restocking of nutrient deficient lake water normally occurs with resultant decreases in sediment concentrations. The reduction of TP in the sediments as shown in the data strongly suggests this phenomena to be a source of the increased total phosphorus concentrations noted for the overlying waters of Lake Sebasticook.

Lake Sebasticook sediments data for nitrogen shows a marked decrease in concentration from November 1971 to July 1973 when compared to the 1965 data. Average values as shown in Table 11 represent approximately a decrease of five times overall.

Nitrogen/Phosphorus Ratios

Table 10 lists Nitrogen: Phosphorus ratios for November 1971, May 1972 and 1973 and for July 1973. Table 10 also lists the May 1965 values. The ratios show a substantial decrease for November 1971 - July 1973 when compared to May 1965. The literature does not offer a definitive explanation as to the significance of high or low N:P ratios. Data in the literature[6,7,8,9] for which phosphorus and nitrogen sediment values are available show trends that suggest that low N:P ratios are more commonly found in eutrophic lake systems and higher ratios are more indicative of less fertile systems. It appears that the high TP concentrations found in eutrophic sediments are a factor in the low N:P ratios. The extremely low N:P ratios found for Lake Sebasticook in 1971 and 1972-1973 appear to be a result of the nitrogen values being lower by a factor of approximately five. TP in comparison is approximately the same or slightly less than in 1965. Whether or not these ratios indicate that Sebasticook is more eutrophic now than in 1965 cannot be determined unless the lower nitrogen can be explained. Lake Wassookeag, a noneutrophic lake at the headwaters of the East Branch Sebasticook River has a N:P ratio of 7.5 for July 1973.

Discussion (Nutrients)

The report entitled "Fertilization and Algae in Lake Sebasticook, Maine," serves as baseline information which describes Lake Sebasticook as very eutrophic and which also describes the East Branch of the Sebasticook River as the principle source of nutrification to the lake. By use of this data and information generated in 1965 a comparison is made which correlates the condition of the 1960's with those conditions as of July and August 1973.

Prior to the start of our studies in November 1971, the major source of phosphorus, a potato processing plant, to the river and thus to Lake Sebasticook burnt down. This quirk of fate together with the start of secondary treatment for the Town of Corinna has not reflected any significant improvement in stream conditions or in the eutrophic lake conditions reported in 1966, particularly with respect to phosphorus.

Above Corinna at Station EB01, the five season average for total phosphorus for 1971-1973 of 0.14 mg/l is approximately 30% greater than the average value recorded in 1965 for a comparable time frame. The increase in phosphorus suggests greater and/or additional inputs to the river upstream, probably from industrial and municipal sources in the Dexter area or from a nonpoint discharge.

Station EB02, at the mouth of the East Branch of the Sebasticook River, (the inlet to Lake Sebasticook) the average total phosphorus value for five seasons 1971-1973 is approximately the same as that for the four seasons average in 1965. EB02 is below the town of Corinna's municipal discharge and below the location of the former potato processing plant. Considering these averages compiled from seasonal data, the indication is that the new secondary treatment plant at Corinna and the total elimination of the major industrial source of phosphorus pollution (55% of all TP discharged to the East Branch Sebasticook River from the Corinna area in 1965) has not resulted in a decrease in TP being contributed to Lake Sebasticook.

The fact that no significant change has occurred suggests other causes or sources of phosphorus. Among these other possibilities are inefficient waste treatment at Corinna, agricultural runoff and phosphorus in sludge deposits between Corinna and Lake Sebasticook which resuspend with gas bubbles from decomposition and which are scoured from the bottom during periods of high flow. Actual analysis of two sludge samples collected from the stretch of river during August 1973, approximately 2.0 miles upstream of the inlet to Sebasticook, Figure 2, yielded results of approximately .07% TP dry weight. This is considered to be a relatively high concentration. The high TP coupled with the fact that sludge was seen floating to the surface with gas bubbles and carried with the current into Lake Sebasticook demonstrates that the stream bottom below Corinna is a discrete source of phosphorus pollution to the lake. Efficiency of the WWTP at Corinna should be evaluated and the role of agricultural runoff as a serious potential source of phosphorus to the system should also receive study to further determine exact phosphorus sources. In 1965, it was estimated that less than 2% of the TP in Lake Sebasticook came from agricultural drainage. Today, with the tendency to increase arable land and farm production phosphorus runoff could be substantially higher and therefore represent a significant non-point source.

In the report entitled "Fertilization and Algae in Lake Sebasticook, Maine" 1966, a total phosphorus objective of .02 mg/l for Lake Sebasticook was proposed. This objective is based on the phosphorus concentrations found for samples collected from Lake Wassookeag, a lake at the heart of the headwaters of the East Branch of the Sebasticook River. In 1965 the

TP concentrations did not exceed 0.02 mg/l and the lake did not demonstrate the problems associated with eutrophication which characterized Lake Sebasticook. Furthermore, to attain the .02 mg/l objective it was suggested that an 80% reduction of TP would be required from all incoming wastes, which means essentially the East Branch of the Sebasticook River. It was estimated that ten years would be required to deplete the nutrient rich Lake Sebasticook water with inflowing nutrient poor river water. According to our data there are no gains in this direction. In the eight years elapsed since 1965, Lake Sebasticook demonstrates an overall average phosphorus increase in the range of 30%. For the East Branch of the Sebasticook River, the burning of the snowflake Canning Co., and the secondary treatment plant at Corinna should logically lower the amount of phosphorus contributed to the river and thus to Lake Sebasticook. This apparently is not the case, as stream phosphorus loads are approximately the same as in 1965 below Corinna at the inlet to Lake Sebasticook.

It appears that .02 mg/l TP for Lake Sebasticook may be an unrealistic objective. Preliminary results of the National Eutrophication Survey indicate that about one-third of the 242 lakes studied probably will have mean concentrations greater than .05 mg/l phosphorus even after advanced treatment for phosphorus removal (assuming that a 50% reduction in TP is accomplished).[10] Our data to date suggests placement of Sebasticook into this category of lakes. Perhaps the only means of achieving the .02 mg/l phosphorus objective may be similar to that method observed by Edmundson in his Lake Washington studies.[11] He observed that when phosphorus concentrations were reduced by 72% from approximately .08 mg/l to .02 mg/l, the lake reverted from a eutrophic state to a noneutrophic state. This was accomplished by total diversion of the inflow of sewage treatment plant effluent. Although the measures were drastic, the results were positive.

The lake bed of Sebasticook, taken alone, is a vast source of phosphorus for fertilization and algal growth. This is well demonstrated during the spring seasons of May 1965, 1972 and 1973. It can be seen that for May 1965 and 1972 the average water column TP values are both .06 mg/l and similarly the TP in the sediments are .106% dry weight and .100% dry weight respectively. However, in May 1973 the average TP in the water column is .09 mg/l or a 50% increase over the previous spring data. Corresponding to this, the average sediment value for May 1973 is .075% dry weight, or approximately a 25% decrease from that of the previous spring data. The sediment phosphorus reservoir as indicated appears to be a major supplement to the enriched condition in Lake Sebasticook and probably will be for many more years in the future.

Contrary to the upward trend in total phosphorus in the Lake Sebasticook system, the nitrogen in the water and sediments show a decrease which is approximately five times less than in 1965. It is difficult to determine whether or not the nitrogen decrease in Lake Sebasticook is entirely due to decreased input as exemplified by the lower tributary load or whether a denitrification process is occurring within the lake. It could be a combination of these factors. Denitrification, although not completely understood, is known to occur in eutrophic lakes in both sediments and in the water column.[12,13] The process is more likely to occur in anaerobic conditions such as found in sediments and overlying waters of the hypolimnion of a eutrophic lake during the summer stagnation. General warming trends and pH shifts to alkaline are factors contributory to denitrification.

Vertical Profiles - Ch a, pH, Temp., D.O.

Figure 6 shows the curves for mean chlorophyll a, pH, temperature and dissolved oxygen concentrations for mean lake depth. The vertical profile for temperature shows the lake to be stratified during late July 1973. The mean temperature differential between surface waters and hypolimnial waters is approximately 10°C. Corresponding to the thermocline are distinct stratifications for Ch a, pH and D.O.

Algal standing crop in Lake Sebasticook expressed as chlorophyll a is highest in the lake epilimnion or euphotic zone. The mean Ch a concentration of approximately 25 ug/l in the upper water column decreases with depth to a mean of 3 ug/l in the hypolimnial waters.

In the euphotic zone of lakes, algae utilize (carbon dioxide) CO_2 in photosynthesis and produce oxygen (O_2). Vigorous photosynthetic activity can produce supersaturated dissolved oxygen concentrations in the zone of activity in the epilimnion. The vertical profile for oxygen in Figure 6 shows supersaturated conditions approximately 180% of saturation in the upper water column; with depth the D.O. is reduced to almost 0 close to the bottom, creating nearly anaerobic conditions.

As algae photosynthize in the water, free CO_2 is used, calcium bicarbonate is reduced by precipitation of calcium carbonate, and the pH rises.[14] The pH profile in Figure 6 dramatizes this quite well with a mean pH near 10 in the epilimnion and a neutral pH at the bottom.

Taken collectively the profiles for dissolved oxygen, pH, temperature and chlorophyll a show a distinct congruency towards describing Lake Sebasticook as eutrophic.

Recommendations

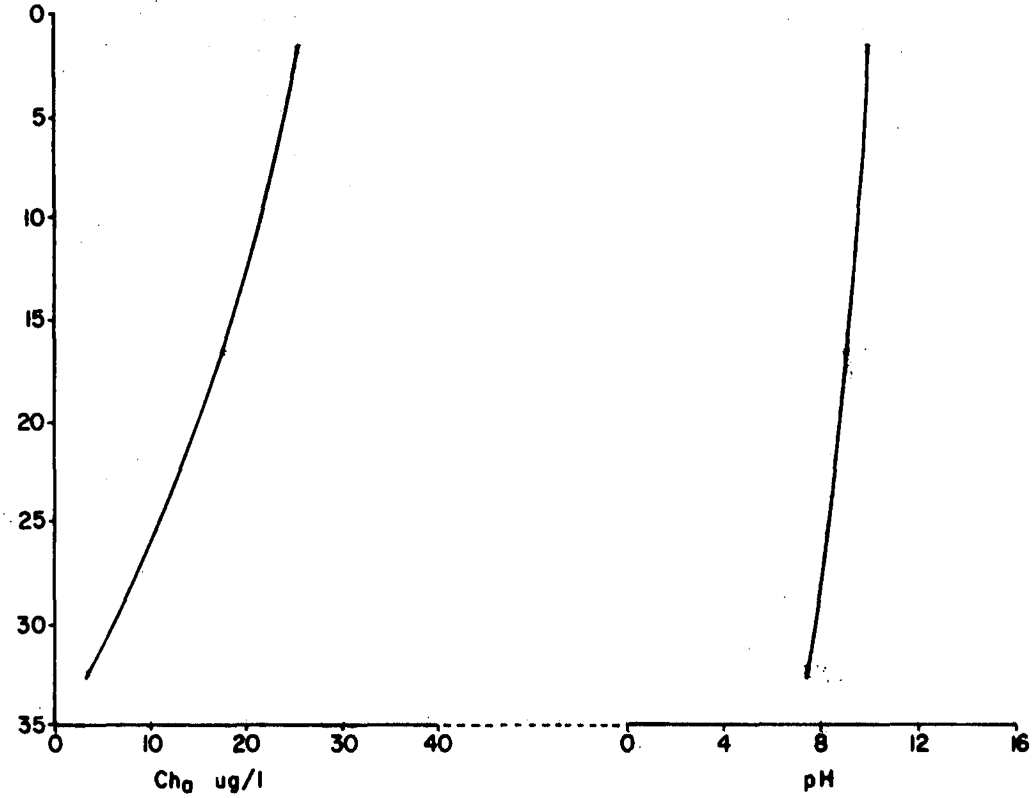
1. Evaluate treatment efficiency for the WWTP in Corinna and determine the total phosphorus contribution to the East Branch of the Sebasticook River from the Corinna area.

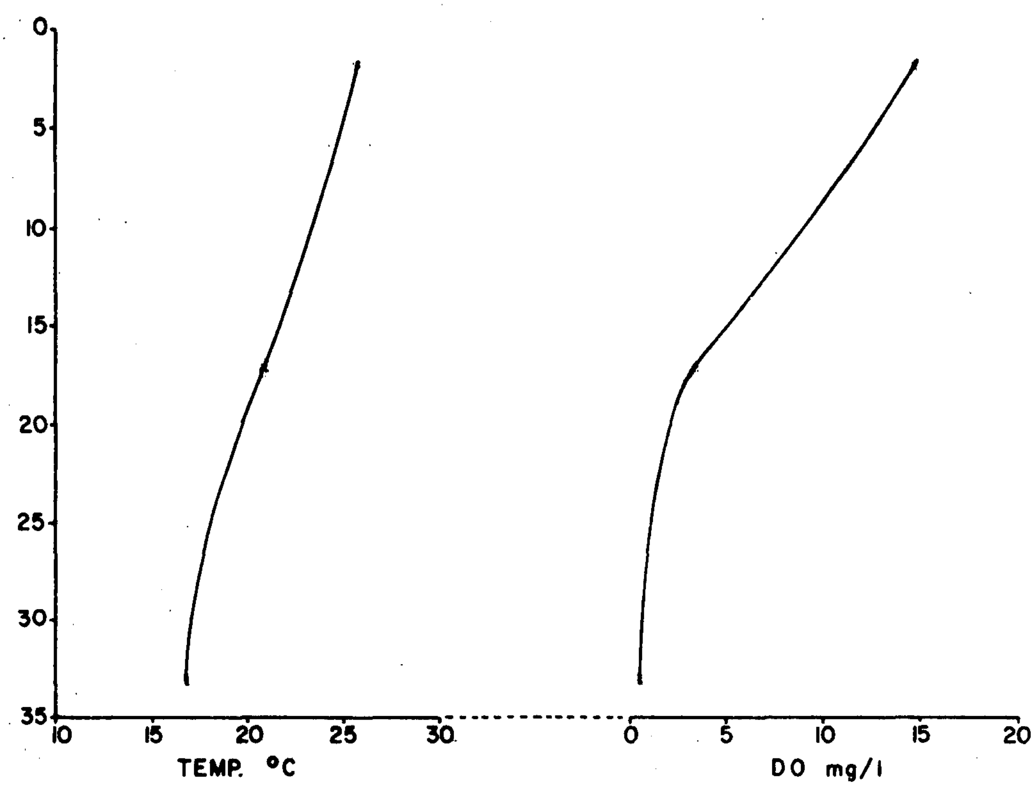
2. Determine significant point discharges of municipal and industrial wastes from the Dexter area which presently have a bearing on the phosphorus load in the East Branch Sebasticook River.

3. Closely evaluate the significance of non-point discharges such as agricultural runoff and other bank sources and the impact they have on Lake Sebasticook.

4. Enforcement of the State of Maine's water quality standards which require phosphorus removal on all point discharges, together with appropriate land management practices, are strongly urged in order to return Lake Sebasticook to a viable resource.

5. The State of Maine should monitor lake conditions at least once every year as a means of evaluating and assessing lake conditions relative to eutrophication.





LAKE SEBASTICOOK

JULY 31, AUG. 1, 1973

MEAN

CHLOROPHYLL a - pH - TEMPERATURE - DISSOLVED OXYGEN

vs.

MEAN WATER DEPTH

FIGURE 6

Bibliography

1. Department of Health, Education, and Welfare, FWPCA, January, 1966, "Fertilization and Algae in Lake Sebasticook, Maine," Technical Advisory and Investigations Activities, Cincinnati, Ohio.

2. Mackenthun, K. M., Kemp, L. E., Stewart, R. K., February 1968, Nutrients and Algae in Lake Sebasticook, Maine. Journal Water Pollution Control Federation, Vol. 40, No. 2, Part 2.

3. Environmental Protection Agency 1971, "Methods For Chemical Analysis of Water and Wastes," Water Quality Office, Analytical Quality Control Laboratory, Cincinnati, Ohio.

4. American Public Health Association 1971, Standard Methods, 13th Edition, AWWA, APHA, WPCF, New York, N. Y.

5. U. S. Environmental Protection Agency, 1973, "Biological Field and Laboratory Methods" EPA-670/4-73-001, Environmental Monitoring Series, Office of Research and Development, Cincinnati, Ohio.

6. Kemp, A., Gray, C., Mudrochova, A., Nutrients in Natural Waters, 1972, "Changes in C, N, P, and S in the Last 140 Years In Three Cores. From Lakes Ontario, Erie and Huron," John Wiley & Sons, N.Y., pgs. 251-279.

7. Gahler, A.R., Sanville, W.D., April 1971, "Lake Sediments - Characterization of Lake Sediments and Evaluation of Sediment-Water Nutrient Interchange Mechanisms in the Upper Klamath Lake System," Pacific Northwest Water Laboratory, Water Quality Office, U.S. EPA, Corvallis, Oregon, pgs. 26-32.

8. Konrad, J.G., Keeney, D.R., Chesters, G., Chem., K.L. 1970, "Nitrogen and Carbon Distribution in Sediment Cores of Selected Wisconsin Lakes." J. Water Pollution Control Fed. 42,2096-7.

9. Williams, J., Syers, J., Harris, R., Armstrong, D., 1970, "Adsorption Desorption of Inorganic Phosphorus by Lake Sediments in a 0.1m Na Cl System." Env. Sci. and Tech. Vol 4, No. 6.519

10. U.S. Environmental Protection Agency, 1973, "Critique on Proposed Phosphorus Standards," Pacific Northwest Environmental Research Lab, Corvallis, Oregon pg. 3.

11. Edmondson W. T., 1970, "Phosphorus, Nitrogen and Algae in Lake Washington after Diversion of Sewage," Science 14, 690-1.

Bibliography

12. Brezonik, P. L., 1972 "Nitrogen: Sources and Transformations in Natural Waters" in _Nutrients in Natural Waters_, John Wiley & Sons N. Y. Pg. 26-31.

13. Brezonik, P.L., Lee, F. G., "Denitrification as a Nitrogen Sink in Lake Mendota, Wis.", Env. Sci. & Tech. Vol 2, No. 2, Pg. 120-5.

14. Ruttner, F. 1963, _Fundamentals of Limnology_, Third Ed., Univ. of Toronto Press, Canada, Pg. 70.

TABLE I

Lake Sebasticook, Maine
Sampling Stations
1965 - 1973

1971 1973 Stations	1965 Stations	Longitude	Latitude
LS-01	A	69° 15' 25"	44° 52' 12"
LS-02	B	69° 13' 28"	44° 53' 09"
LS-03	C	69° 14' 06"	44° 50' 32"
LS-04	D	69° 14' 32"	44° 51' 35"
LS-05	E	69° 14' 35"	44° 51' 06"
EB-01	3	69° 15' 41"	44° 55' 28"
EB-02	5	69° 15' 01"	44° 53' 09"
EB-03	8	69° 16' 31"	44° 50' 25"
LS-06		69° 16' 08"	44° 53' 03"
LS-07		69° 15' 23"	44° 52' 36"
LS-08		69° 13' 11"	44° 51' 31"
LS-09		69° 15' 54"	44° 52' 56"
LW-01		69° 18' 34"	45° 01' 54"
LW-02		69° 20' 18"	45° 01' 05"
LW-03		69° 19' 37"	45° 01' 18"

TABLE 2

Benthic Organisms - Lake Sebasticook, Maine
May 31, 1972
Per Sq. Ft.

Organisms	Stations LS 01	LS 02	LS 03	LS 04	LS 05	LS 06	LS 07	LS 08
Oligochaeta (aquatic worms)							4	64
Tubificidae (sludge worms)			16		17	134		
Diptera (midgeflies)						46	1	15
Chironomus riparius (bloodworms)		7	21	3	8			
Hirudinea (leech)						1	1	1
Gastropoda (snails)						12	1	80
Pelecypoda (clams)						9	1	36
Copepoda (copepods)						1	4	38
Cladocera (water fleas)							5	29
Amphipoda (scuds)								1
Ostracoda (seed shrimp)								3
Hydracarina (water mites)							1	3
Hydrozoa (hydra)								1
Turbellaria (planarian)								5

TABLE 2 (Con't)

Benthic Organisms - Lake Sebasticook, Maine
May 31, 1972
Per Sq. Ft.

Organisms	Stations LS 01	LS 02	LS 03	LS 04	LS 05	LS 06	LS 07	LS 08
Ephemeroptera (mayflies)								1
Trichoptera (caddisflies)								3
Kinds	0	1	2	1	2	6	8	14
Total	0	7	37	3	25	203	18	280

TABLE 3

Benthic Organisms - Lake Sebasticook, Maine
May 30, 1973
Per Sq. Ft.

	Stations				
Organisms	LS 01	LS 02	LS 03	LS 04	LS 05
Oligochaeta (aquatic worms)					
Tubificidae (sludge worms)		19	27	3	
Diptera					
Chironomus riparius (bloodworms)		9	32	1	
Kinds	0	2	2	2	0
Total	0	28	59	4	0

TABLE 4

Benthic Organisms - Lake Sebasticook and Lake Wassookeag, Maine
July 31 - Aug. 1, 1973
Per Sq. Ft.

Organisms	LS 01	LS 02	LS 03	LS 04	LS 05	LW 02	LW 03
Oligochaeta (aquatic worms)							
Tubificidae (sludge worms)		5	7	1			56
Diptera (midgeflies)							
Chironomus riparius		3			1		
Anatopynia sp.						29	38
Polypedilum ophiodes						47	
Unidentified						11	
Ephemeroptera (mayflies)							
Hexagenia bilineata						19	8
Tricorythidae						1	
Megaloptera (alderflies)							
Sialis sp.						4	1
Trichoptera (caddisflies)							
Psychomyia sp.						8	
Pelecypoda (clams)						13	
Cladocera (water fleas)						19	
Copepoda (copepods)						8	
Amphipoda (scuds)						1	
Ostracoda (seed shrimp)						11	
Bryozoa (moss animalcules)						1*	
Kinds	0	2	1	1	1	13	4
Total	0	8	7	1	1	172	103

*Colonial Form

TABLE 5

Benthic Organisms - Lake Sebasticook, Maine
Nov. 17, 1971
Per Sq. Ft.

Organisms	LS 01	LS 02	LS 03	LS 04	LS 05
			Stations		
Oligochaeta (aquatic worms)					
Tubificidae (sludge worms)	1	7	100	8	44
Diptera (midgeflies)					
Chironomus Riparius (bloodworms)		5	20	3	29
Copepoda (copepod)		1	5		
Kinds	1	3	3	2	2
Total	1	13	125	11	73

TABLE 6

Midgeflies - Sludgeworms
Average Per Sq. Ft.
Lake Sebasticook, Maine
1965-1973

Year	Month	Average Per Sq. Ft.	Midgefly Larvae % Sq. Ft.	Sludgeworms % Sq. Ft.
1965*	May	35	57%	43%
1965*	July	57	62%	38%
1971	Nov	44	25%	72%
1972	May	14	54%	46%
1973	May	18	45%	55%
1973	July	3	24%	76%

*Fertilization and Algae in Lake Sebasticook, Maine
Technical Advisory and Investigations Activities,
Robert A. Taft Sanitary Eng. Center, Cincinnati, Ohio
January, 1966

TABLE 7

Lake Sebasticook, Maine
Algae Count (Average)
Per Milliter
1965 - 1973

	Upper	Middle	Lower
Lake Sebasticook	5 ft.	15-30 ft.	30-55 ft.
May 11-27, 1965*	17,875	10,416	6,959
July 28-Aug. 1, 1965*	27,684	4,467	725
Nov. 2, 1965*	4,090	11,727	3,850
Feb. 15-16, 1972	4,852	9,576	13,369
May 31, 1972	6,940	6,554	7,778
May 31, 1973	16,527	15,817	16,594
July 31, 1973	14,969	2,863	3,520
Lake Wassookeag (Control)			
Aug. 1, 1973	283	723	396

Seasonal and yearly averages for comparable seasons

	Upper	Middle	Lower
Lake Sebasticook			
Spring - Summer 1965	22,780	7,441	3,842
Spring - Summer 1973	15,748	9,340	10,057

1965 11,354 per milliter
1973 11,715 per milliter

Lake Wassookeag (Control)
1973 (Summer) 467 per milliter

*Fertilization and Algae in Lake Sebasticook, Maine
Technical Advisory and Investigation Activities
Robert A. Taft Sanitary Engineering Center, Cinn., Ohio
January 1966

TABLE 8

East Branch Sebasticook River, Maine
Algae Count
Per Milliter (Average)
1965, 1971-1973 (Comparable Stations)

Station		3	5	8
May 11-27, 1965*		3,537	39,512	30,123
July 26-31, 1965*		610	224,150	7,275
Nov. 2, 1965*		-	33,400	2,700
	Average	2,073	99,020	13,366

Station		EB01	EB02	EB03
Nov. 17, 1971		-	10,358	-
Feb. 15, 1972		6,000	28,979	5,830
May 31, 1972		7,075	6,395	9,735
May 31, 1973		16,987	39,620	26,205
July 31, 1973		4,245	17,716	4,641
	Average	8,576	20,613	11,602

*Fertilization and Algae in Lake Sebasticook, Maine
Technical Advisory and Investigation Activities
Robert A. Taft Sanitary Engineering Center, Cinn. Ohio
January 1966.

TABLE 9

Lake Sebasticook, Maine
Chlorophyll a
Micrograms Per Liter (Average)

	Upper (0-5')	Middle (10-25')	Lower (30-55')
July 28-Aug. 1, 1965*	21.97	3.67	2.99
Oct. 30-Nov. 2, 1965*	13.20	14.38	13.61
Nov. 17, 1971	8.67	7.40	8.90
Feb. 15, 1972	8.95	9.12	8.73
May 31, 1972	5.29	5.32	5.53
May 30, 1973	21.34	16.14	18.57
July 31, 1973	24.63	17.45	3.04
Aug. 1, 1973 (Lake Wassookeag)	<0.10	0.94	<0.10

Seasonal and Yearly Averages for Entire Lake

July 28-Aug. 1, 1965	<9.54	<11.63
Oct. 30-Nov. 2, 1965	13.73	
Nov. 17, 1971	8.32	11.68
July 31, 1973	15.04	
May 30, 1973	18.68	16.86
July 31, 1973	15.04	
Feb. 15, 1972	8.93	7.15
May 31, 1972	5.38	

All surveys Nov. 17, 1971 - July 31, 1973	11.26
All surveys July 28, 1965 - July 31, 1973	11.37
Aug. 1, 1973 (Lake Wassookeag)	<0.38

*Fertilization and Algae in Lake Sebasticook, Maine
Technical Advisory and Investigation Activities
Robert A. Taft Sanitary Engineering Center, Cinn., Ohio
January 1966

TABLE 10

Lake Sebasticook, Maine
Sediments
Nitrogen/Phosphorous
Ratios

Station	Reference Station	May 65*	Nov. 71	May 72	May 73	July 73
LS 01	A	8.8	2.7	1.1	1.9	1.8
LS 02	B	8.7	1.8	1.8	2.1	2.3
LS 03	C	5.6	1.5	1.7	1.3	1.5
LS 04	D	7.5	1.2	1.2	1.3	1.7
LS 05	E	6.4	2.1	1.5	2.1	1.8
L. Wassookeag		20.0				8.9

*Seasonal Average 2 Values.

TABLE 11

Lake Sebasticook, Maine
Sediments
Phosphorus and Nitrogen
% Dry Weight

Phosphorus

1971 - 1973 Station	1965 Stations	May 65	Nov. 71	May 72	May 73	July 73
LS01	A	.095	.075	.114	.090	.084
LS02	B	.120	.074	.079	.063	.055
LS03	C	.070	.080	.083	.062	.077
LS04	D	.120	.101	.125	.088	.084
LS05	E	.125	.082	.101	.074	.078
Average		.106	.082	.100	.075	.076
Lake Wassookeag		.05				.027
East Branch Sebasticook R. Lagoon Upstream of Inlet to Lake						.073

Nitrogen

1971 - 1973 Station	1965 Stations	May 65	Nov. 71	May 72	May 73	July 73
LS01	A	.85	.204	.133	.173	.152
LS02	B	.90	.130	.148	.129	.125
LS03	C	.40	.118	.147	.083	.114
LS04	D	.90	.120	.148	.116	.143
LS05	E	.80	.174	.157	.154	.141
Average		.77	.149	.146	.131	.135
Lake Wassookeag		1.0				0.24
East Branch Sebasticook R. Lagoon Upstream of Inlet to Lake						0.41

APPENDIX

Lake Sebasticook, Maine
Chlorophyll a
Micrograms Per Liter
Nov. 17, 1971

Station		Upper	Middle	Lower
LS01		8.18	9.22	14.54
LS02		6.75	8.34	6.75
LS03		6.04	5.27	12.95
LS04		5.74	6.75	9.61
LS05		-	7.47	10.65
	Average	8.67	7.40	8.90
EB01		4.45		
EB02		40.81		
EB03		4.46		

Lake Sebasticook, Maine
Chlorophyll a
Micrograms Per Liter
Feb. 15-17, 1972

Station		Upper	Middle	Lower
		5'	10-25'	30-55'
LS01		7.08	11.84	4.62
LS02		15.18	4.61	5.85
LS03		6.92	11.13	26.11
LS04		10.25	10.25	2.32
LS05		5.34	7.80	4.77
	Average	8.95	9.12	8.73
EB01		10.61		
EB02		8.21		
EB03		4.61		

Lake Sebasticook, Maine
Chlorophyll a
Micrograms Per Liter
May 31, 1972

Station		Upper	Middle	Lower
		5'	10-25'	30-55'
LS01		6.11	4.26	5.41
LS02		5.41	5.53	7.50
LS03		5.98	6.49	9.22
LS04		6.55	6.10	4.39
LS05		4.26	4.26	4.26
LS06		6.11	-	-
LS07		5.53	-	3.12
LS08		2.41	-	4.83
	Average	5.29	5.32	5.53
EB01		3.12		
EB02		10.13		
EB03		8.07		

Lake Sebasticook, Maine
Chlorophyll *a*
Micrograms Per Liter of Water
July 31, 1973 - August 1, 1973

Station		Upper	Middle	Lower
		0-5'	10-25'	30-55'
LS 01		11.91	2.55	0.39
LS 02		7.81	5.37	0.01
LS 03		3.86	19.33	11.69
LS 04		2.63	52.11	2.65
LS 05		13.37	7.88	0.47
LS 09		108.25	-	-
	Average	24.63	17.45	3.04

	Upper	Middle	Lower
EB 01	6.10		
EB 02	36.54		
EB 03	4.79		
LS 01 (Lake Wassookeag)	<0.10	0.94	<0.10

Lake Sebasticook, Maine
Chlorophyll a
Micrograms Per Liter
May 31, 1973

Station		Upper	Middle	Lower
LS01		29.07	15.31	17.39
LS02		22.34	22.95	16.92
LS03		19.32	16.92	25.52
LS04		17.31	18.24	18.21
LS05		18.70	7.31	14.65
	Average	21.34	16.14	18.57

EB01	5.18
EB02	7.00
EB03	21.62

Lake Sebasticook, Maine
Algae Count
Nov. 17, 1971
Per Milliter

Station		Upper
LS01		906
LS02		1,075
LS03		962
LS04		792
LS05		912
	Average	929
EB01		-
EB02		10,358
EB03		-

Lake Sebasticook, Maine
Algae Count
Feb. 15-16, 1972
Per Milliter

Station		Upper	Middle	Lower
LS01		3,000	6,735	14,716
LS02		3,396	22,300	9,339
LS03		-	8,000	23,376
LS04		4,302	9,735	9,622
LS05		8,716	3,113	9,792
	Average	4,852	9,576	13,369
EB01		6,000		
EB02		28,979		
EB03		5,830		

Lake Sebasticook, Maine
Algae Count
May 31,1972
Per Milliter

Station		Upper	Middle	Lower
LS01		3,283	8,150	6,622
LS02		7,415	3,622	6,452
LS03		7,811	8,320	8,547
LS04		13,301	6,113	13,641
LS05		8,830	6,566	8,999
LS06		6,905	-	-
LS07		4,358	-	6,169
LS08		3,622	-	4,019
	Average	6,940	6,554	7,778
EB01		7,075		
EB02		6,395		
EB03		9,735		

Lake Sebasticook, Maine
Algae Count
May 31,1973
Per Milliter

Station		Upper	Middle	Lower
LS01		16,357	16,659	11,829
LS02		19,470	21,111	22,017
LS03		23,376	14,829	25,696
LS04		14,150	18,282	13,018
LS05		9,282	8,207	10,414
	Average	16,527	15,817	16,594
EB01		16,987		
EB02		39,620		
EB03		26,205		

Lake Sebasticook, Maine
Algae Count
Per Milliter
July 31 and Aug. 1, 1973

Station		Upper	Middle	Lower
LS01		2,264	283	1,698
LS02		1,585	2,038	1,868
LS03		1,302	3,339	4,641
LS04		2,660	4,471	2,434
LS05		2,207	4,188	6,962
LS09		79,800	-	-
	Average	14,969	2,863	3,520
EB01		4,245		
EB02		17,716		
EB03		4,641		
LW01 (Lake Wassookeag)		283	723	396

Lake Sebasticook, Maine
Total Kjeldahl Nitrogen as N
Feb. 17, 1972
MG/L

Station		Upper	Middle	Lower
LS01		0.7	0.2	0.5
LS02		0.2	0.3	0.3
LS03		0.4	0.3	1.2
LS04		0.3	0.3	0.5
LS05		0.4	0.4	0.3
	Average	0.4	0.3	0.6
EB01		1.8		
EB02		0.7		
EB03		0.2		

Lake Sebasticook, Maine
Total Kjeldahl Nitrogen as N
MG/L

June 1, 1972

Station		Upper	Middle	Lower
LS01		0.9	0.6	0.8
LS02		0.2	0.8	0.9
LS03		0.7	0.7	0.7
LS04		1.0	0.8	0.7
LS05		0.8	0.6	0.9
	Average	0.7	0.7	0.8
EB03		0.6		
EB02		1.9		
EB01		0.2		

Nov. 17, 1971

Station		Upper	Middle	Lower
LS01		0.8	0.8	0.4
LS02		0.4	0.4	0.5
LS03		0.3	0.3	0.5
LS04		0.4	0.3	0.3
LS05		0.4	0.6	0.3
	Average	0.5	0.5	0.4
EB01		0.5		
EB02		2.5		
EB03		0.2		

Lake Sebasticook, Maine
Ammonia (NH_3 - N)
MG/L

May 31, 1972

Station		Upper	Middle	Lower
LS01		.01	.01	.12
LS02		.01	.04	.52
LS03		.01	.19	.20
LS04		.05	.04	.03
LS05		.01	.19	
	Average	0.02	0.09	0.22
EB01		.01		
EB02		.83		
EB03		.05		

Feb. 15, 1972

Station		Upper	Middle	Lower
LS01		.37	.10	5.36
LS02		.22	.27	1.62
LS03		.07	.37	.06
LS04		.11	.03	.42
LS05		.03	.03	.33
	Average	.16	.16	1.56
EB01		1.48		
EB02		.75		
EB03		.07		

Lake Sebasticook, Maine
Total Phosphorus
MG/L
May 31, 1973

Station		Upper	Middle	Lower
LS01		.21	.05	.28
LS02		.06	.04	.13
LS03		.06	.07	.08
LS04		.04	.04	.16
LS05		.05	.07	.07
	Average	.084	.054	.144

TOTAL PHOSPHORUS CONCENTRATION = 0.094 MG/L

EB01	.23
EB02	.06
EB03	.05

Lake Sebasticook, Maine
Nitrate - Nitrite
MG/L

May 31, 1972

Station		Upper	Middle	Lower
LS01		.01	.01	.12
LS02		.01	.07	.07
LS03		.01	.06	.14
LS04		.02	.06	.02
LS05		.02	.03	.02
	Average	.01	.05	.07
EB01		.01		
EB02		.04		
EB03		.04		

Feb. 15-16, 1972

Station		Upper	Middle	Lower
LS01		.01	.06	.04
LS02		.03	.07	.02
LS03		.06	.02	.07
LS04		.02	.03	.15
LS05		.08	.03	.08
	Average	.04	.04	.07
EB01		.21		
EB02		.26		
EB03		1.45		

Lake Sebasticook, Maine
Nitrite, NO_2-N
MG/L
May 31, 1973

Station		Upper	Middle	Lower
LS01		0.01	0.01	0.01
LS02		0.01	0.01	0.01
LS03		0.01	0.01	0.01
LS04		0.01	0.01	0.01
LS05		0.01	0.01	0.01
	Average	0.01	0.01	0.01

AVERAGE NITRITE 0.01

EB01	0.01
EB02	0.01
EB03	0.01

Lake Sebasticook, Maine
Nitrate NO_3-N
MG/L
May 31, 1973

Station		Upper	Middle	Lower
LS01		0.05	0.19	0.08
LS02		0.05	0.05	0.05
LS03		0.05	0.05	0.37
LS04		0.05	0.05	0.05
LS05		0.05	0.05	0.05
	Average	0.05	0.08	0.12

TOTAL NO_3-N CONCENTRATION = 0.08

EB01	0.05
EB02	0.05
EB03	0.13

Lake Sebasticook, Maine
Ammonia NH_3-N*
MG/L
May 31, 1973

Station		Upper	Middle	Lower
LS 01		0.20	0.20	0.20
LS 02		0.20	0.20	0.20
LS 03		0.20	0.20	0.20
LS 04		0.20	0.20	0.20
LS 05		0.20	0.20	0.20
	Average	0.20	0.20	0.20

Total NH_3-N Concentration = 0.20

EB 01	0.20
EB 02	0.20
EB 03	0.20

*All Values Less Than Recorded

Lake Sebasticook, Maine
Total Kjeldahl Nitrogen
MG/L
Aug. 1, 1973

Station		Upper	Middle	Lower
LS 01		0.67	0.67	0.40
LS 02		1.60	0.70	0.34
LS 03		0.27	0.61	0.44
LS 04		0.93	0.21	0.42
LS 05		0.54	0.26	0.54
	Average	0.80	0.49	0.43

Average TKN = 0.57

EB 01	0.35
EB 02	0.85
EB 03	0.38

Lake Sebasticook, Maine
Algae Count
Nov.17, 1971
Per Milliter

Station		Upper
LS01		906
LS02		1,075
LS03		962
LS04		792
LS05		912
	Average	929
EB01		-
EB02		10,358
EB03		-

Lake Sebasticook, Maine
Algae Count
May 31, 1972
Per Milliter

Station		Upper	Middle	Lower
LS01		3,283	8,150	6,622
LS02		7,415	3,622	6,452
LS03		7,811	8,320	8,547
LS04		13,301	6,113	13,641
LS05		8,830	6,566	8,999
LS06		6,905	-	-
LS07		4,358	-	6,169
LS08		3,622	-	4,019
	Average	6,940	6,554	7,778
EB01		7,075		
EB02		6,395		
EB03		9,735		

Lake Sebasticook, Maine
Algae Count
Feb. 15-16, 1972
Per Milliter

Station		Upper	Middle	Lower
LS01		3,000	6,735	14,716
LS02		3,396	22,300	9,339
LS03		-	8,000	23,376
LS04		4,302	9,735	9,622
LS05		8,716	3,113	9,792
	Average	4,852	9,576	13,369
EB01		6,000		
EB02		28,979		
EB03		5,830		

Lake Sebasticook, Maine
Algae Count
May 31, 1973
Per Milliter

Station		Upper	Middle	Lower
LS01		16,357	16,659	11,829
LS02		19,470	21,111	22,017
LS03		23,376	14,829	25,696
LS04		14,150	18,282	13,018
LS05		9,282	8,207	10,414
	Average	16,527	15,817	16,594
EB01		16,987		
EB02		39,620		
EB03		26,205		

Lake Sebasticook, Maine
Algae Count
Per Milliter
July 31 and Aug. 1, 1973

Station		Upper	Middle	Lower
LS 01		2,264	283	1,698
LS 02		1,585	2,038	1,868
LS 03		1,302	3,339	4,641
LS 04		2,660	4,471	2,434
LS 05		2,207	4,188	6,962
LS 09		79,800	-	-
	Average	14,969	2,863	3,520
EB 01		4,245		
EB 02		17,716		
EB 03		4,641		
LW 01	(Lake Wassookeag)	283	723	396

Lake Sebasticook, Maine
Nutrients
7/31, 8/1, 8/2, 1973

Station #	Depth	TKN	NO_3-N	NO_2-N	NH_3-N	TP
LS01S	2.0	0.2	K.02	K.02	0.02	0.06
LS01M	18.0	0.2	K.02	K.02	0.07	0.08
LS01B	35.0	1.4	K.02	K.02	0.34	0.05
LS09S	2.0		K.02	K.02	.06	K.05
LS02S	2.0	0.3	.04	K.02	.02	K.05
LS02M	21.0	0.5	K.02	K.02	.04	0.41
LS02B	42.0	2.0	K.02	K.02	1.4	K.05
LS03S	2.0	0.3	0.05	K.02	.02	K.05
LS03M	11.0	0.2	K.02	K.02	.06	.05
LS03B	22.0	1.2	K.02	K.02	.01	K.05
LS04S	2.0	0.4	K.02	K.02	.01	K.05
LS04M	18.0	0.2	K.02	K.02	.03	0.38
LS04B	32.0	1.5	K.02	K.02	1.4	K.05
LS05S	2.0	0.4	K.02	K.02	.02	K.05
LS05M	17.0	0.3	K.02	K.02	0.02	0.22
LS05B	32.0	0.8	K.02	K.02	0.78	0.14
EB01	2.0	0.3	K.02	K.02	0.10	.05
EB02	2.0	2.1	K.02	K.02	1.5	.05
EB03	2.0	0.3	K.02	K.02	.06	0.15

Lake Sebasticook, Maine
Total Phosphorus
MG/L

Nov. 17, 1971

Station		Upper	Middle	Lower
LS01		.10	.10	.14
LS02		.08	.10	.10
LS03		.06	.06	.18
LS04		.06	.06	.10
LS05		.20	.06	.10
	Average	.10	.08	.12
EB01		.14		
EB02		.18		
EB03		.06		

Feb. 15-17, 1972

Station		Upper	Middle	Lower
LS01		-	.16	.28
LS02		.04	.06	.41
LS03		.04	.05	.72
LS04		.06	.34	.06
LS05		.04	.06	.46
	Average	.04	.13	.39
EB01		.20		
EB02		.50		
EB03		.10		

May 31, 1972

Station		Upper	Middle	Lower
LS01		.04	.02	.04
LS02		.03	.06	.09
LS03		.03	.04	.06
LS04		.08	.07	.03
LS05		.02	.09	.15
	Average	.04	.06	.07
EB01		.11		
EB02		.11		
EB03		.57		