LPL-002
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Report

Loon Lake Study
Phase I, 1991

Scope ID: 91L15

Loon Lake - Wescott Management District
Shawano County, Wisconsin

May 1992

Foth & Van Dyke
engineers · architects · scientists

Loon Lake Study

Contents

1.0 Background

Loon Lake is a 305 acre lake located in northeast Shawano County. The lake is in the Wolf River drainage basin. Tributaries to Loon Lake drain both wooded areas and farmland. It is estimated that farmland comprises less than 5 percent of the surface area located within the drainage basin. If runoff is occurring from farmland, it is more likely to affect tributary #1 than #2 (see Figure 4-2). Wooded areas include wetlands located mainly to the north and west of the lake. Drainage from the east and northeast is both wooded and open farmland, the main tributary from this direction being a discharge from Lulu Lake. Loon Lake discharge is to Shawano Lake.

Private homes border Loon Lake on the east, south, and southwest. Areas to the west and northwest of the lake are poorly drained, characteristic of wetland habitat and generally unsuitable for private development. Figure 4-1 shows the soil types surrounding Loon Lake.

Historically, based on water chemistry, Loon Lake is considered somewhat eutrophic. Appendix 1 contains water quality data for Loon lake. The Loon Lake Association has harvested weeds in the past as well as in 1991. The Association is concerned about the potential for accentuated weed growth (emergent and submergent) and is cognizant of the fact that algae may also become a problem at certain times of the year.

2.0 Purpose of The Study

The purpose of the Loon Lake study is to get a sense for the current trophic status of the lake. Most lakes in the central Wisconsin region are either Mesotrophic or Eutrophic or in a transition from one of these states to the other.

The current study is designed to accumulate basic data on the dynamics of Loon Lake. Areas to be investigated include:

2.1 Nutrient Loading

The United States Geological Survey is determining the total and dissolved phosphorus concentration of streams tributary to the lake. This data is found in Table 4-1.

2.2 Plant Cover Type

Lake District personnel have worked with Foth & Van Dyke to map out the lake plant cover type. As weed harvesting will occur during the study period, amount of weeds harvested will be documented.

2.3 Watershed Study

Foth & Van Dyke has evaluated the watershed to determine land use practices. This information will be compared with influent phosphorus loading information (item #1 above).

3.0 Objective of The Study

The objectives of the study are:

- Document nutrient loading to the lake from the basin.
- To determine the overall stability of the lake.
- To determine if there are external sources of pollution contributing to the lake budget.
- To determine if external sources of pollution are having an impact on the lake.
- To evaluate the land use practices in the Loon Lake watershed.

To accomplish these objectives, Foth & Van Dyke in conjunction with representatives of the Loon Lake, Lake District Association plan to conduct a three year study. This report is a summary of the activities conducted during the first year of the study.

4.0 Presentation of The Data

4.1 Nutrient Loading

Beginning in September 1991, the Lake District began taking monthly samples from the streams tributary to Loon Lake. Samples were sent to the Wisconsin State Lab of Hygiene for the analysis of total and dissolved phosphorus. Table 4-1 is a summary of the data obtained through April, 1992. Tributary stream #1 receives water from Lulu Lake. Tributary stream #2 receives water from a large drainage basin north of Loon Lake.

Table 4-1

Loon Lake - Phosphorus Data 1991
Data in mg/L

	Tributary Stream #1		Tributary Stream #2	
Date	Total Phos.	Dissolved Phos.	Total Phos.	Dissolved Phos.
09/10/91	0.004	0.002	0.012	0.003
10/07/91	<0.004	N/D	<0.004	0.002
11/06/91	0.019	0.004	0.013	0.004
12/10/91	0.009	0.003	0.014	0.005
03/04/92	0.012	0.004	0.013	0.005
03/18/92	0.010	0.003	0.012	0.004
04/06/92	0.010	0.002	0.017	0.002

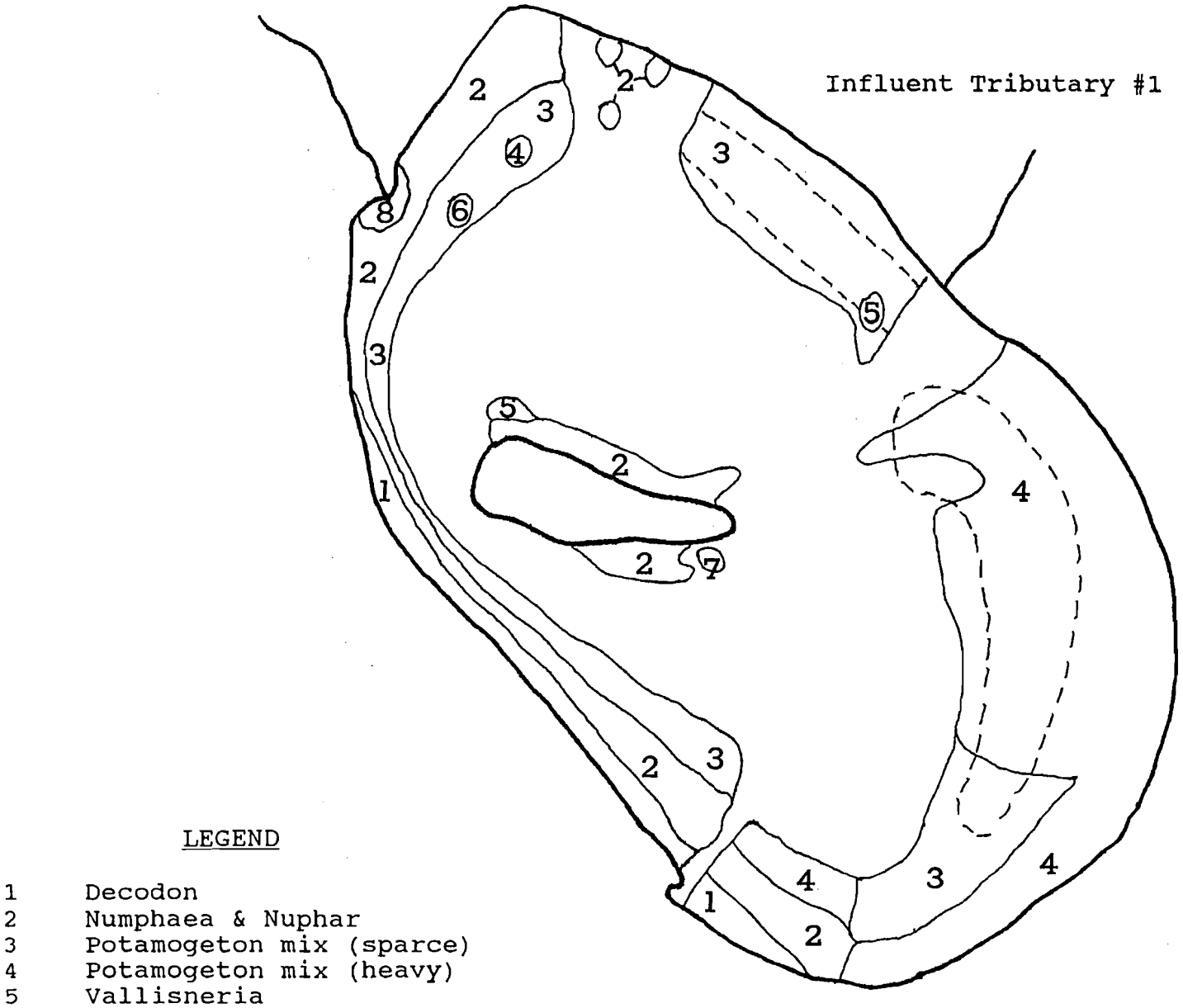
N/D = not detected

4.2 Plant Cover Type

In August 1991, Foth & Van Dyke and Lake District representatives conducted a lake survey to document the emergent and submerged plant cover type. Figure 4-1 plots the plant communities found in Loon Lake. Areas where weed harvesting occurred in 1991 are delineated. It is estimated that approximately 105 wet tons of weeds were removed from Loon Lake during 1991. Table 4-2 is a list of plant species found in Loon Lake. It should be noted that where plant communities are identified in Figure 4-1 as "Potamogeton mix", in these areas, Potamogeton

Figure 4-1

Loon Lake
Aquatic Plant Cover Type



LEGEND

1 Decodon
2 Numphaea & Nuphar
3 Potamogeton mix (sparce)
4 Potamogeton mix (heavy)
5 Vallisneria
6 Ceratophyllum
7 Najas
8 Typha
---- Area of weed harvest 1991

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species comprised thedominant cover with other genera present. Common genera included with Potamogeton were Anacharis, Vallisneria, Myriophyllum, and Utricularia.

Table 4-2

Loon Lake
Plant Species List

1. Typha latifolia	16. Scirpus validus
2. Sparganium androcladium	17. Carex sp.
3. Potamogeton amplexifolium	18. Calla palustris
4. Potamogeton crispus	19. Pontederia cordata
5. Potamogeton gramineus	20. Salix spp.
6. Potamogeton natans	21. Myrica sp.
7. Potamogeton pulcher	22. Ceratophyllum demersum
8. Potamogeton richardsonii	23. Nymphaea tuberosa
9. Potamogeton robbinsii	24. Nuphar variegatum
10. Potamogeton strictifolius	25. Brasenia schreiberi
11. Najas flexilis	26. Decodon verticillatus
12. Najas guadalupensis	27. Myriophyllum spp.
13. Sagittaria graminea	28. Utricularia spp.
14. Anacharis canadensis	29. Megalodonta beckii
15. Vallisneria canadensis	

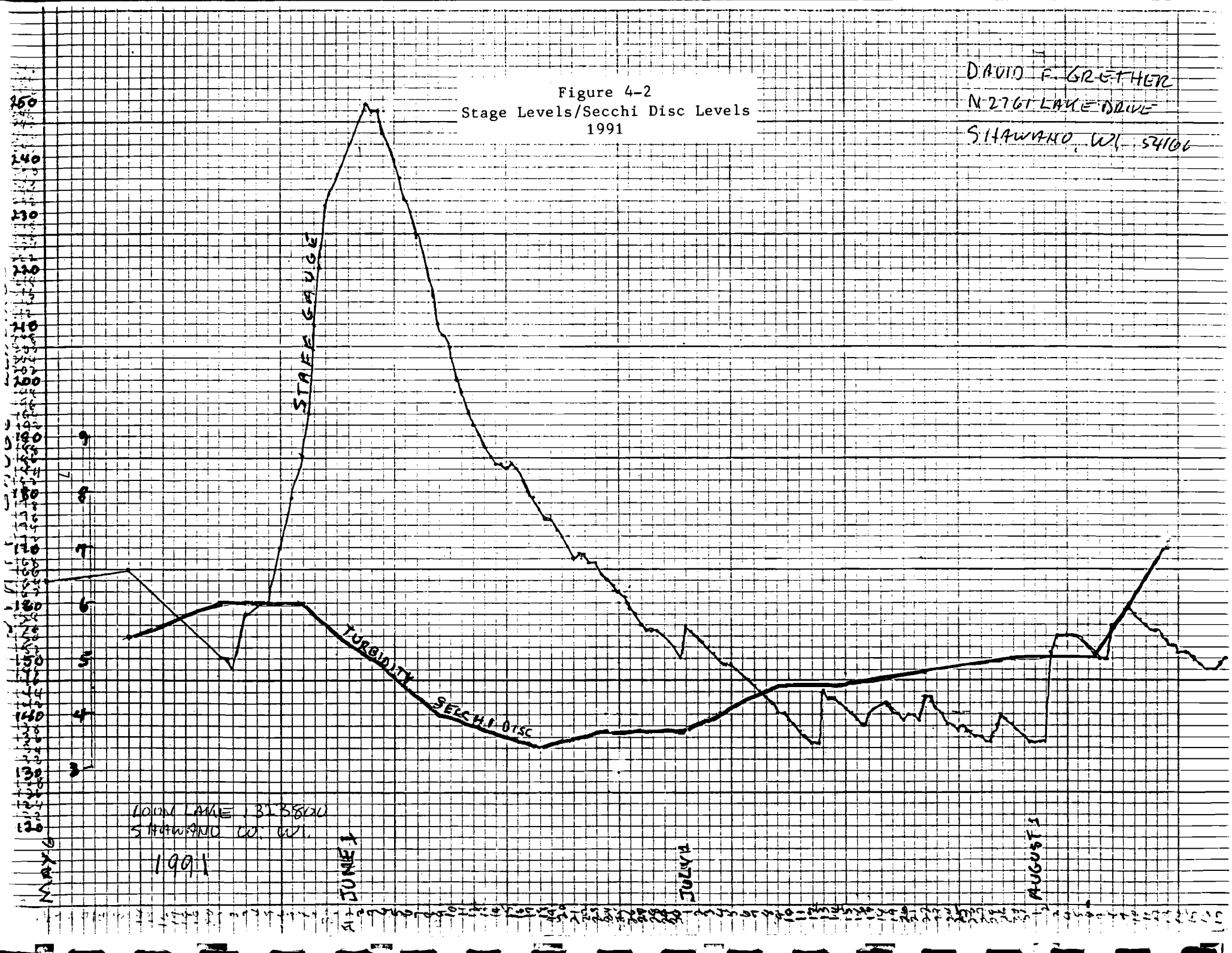
During 1991, Lake District representatives also obtained secchi disc readings and collected lake stage information. Lake stage information was obtained by reading a staff gauge located at the outlet of Loon Lake. This data is presented in Figure 4-2.

4.3 Watershed Study

A review of the watershed for Loon Lake indicates that the watershed feeding Loon Lake is small. Less than five percent is agricultural, a very small percentage is residential, and there is no evidence of major industrial sources found within this watershed. Maps and aerial photos of the Loon Lake Watershed are found in Appendix 3. Little can be done by Loon Lake District to modify these land use practices. The immediate shoreline for Loon Lake has some residential development. The soil suitability for septic systems is indicated in Figure 4-3. The adjacent soil types are:

Figure 4-2
Stage Levels/Secchi Disc Levels
1991

DAVID F. GROETHER
N2761 LAKE DRIVE
SHAWANO, WI. 54166



Co = Cormant Mucky Loamy Fine Sand
Mk = Markey and Cathro Mucks
RsA = Rousseau Loamy Fine Sand 0-2% Slopes
CtA = Croswell Loamy Sand 0-3% Slopes
MnD = Menahga Loamy Sand 12-30% Slopes
WaA = Wainola Fine Sand 0-3% Slopes
MaB = Mahtomedi - Menahga Loam Sand 2-6% Slopes

These soil types have the following suitability for septic systems:

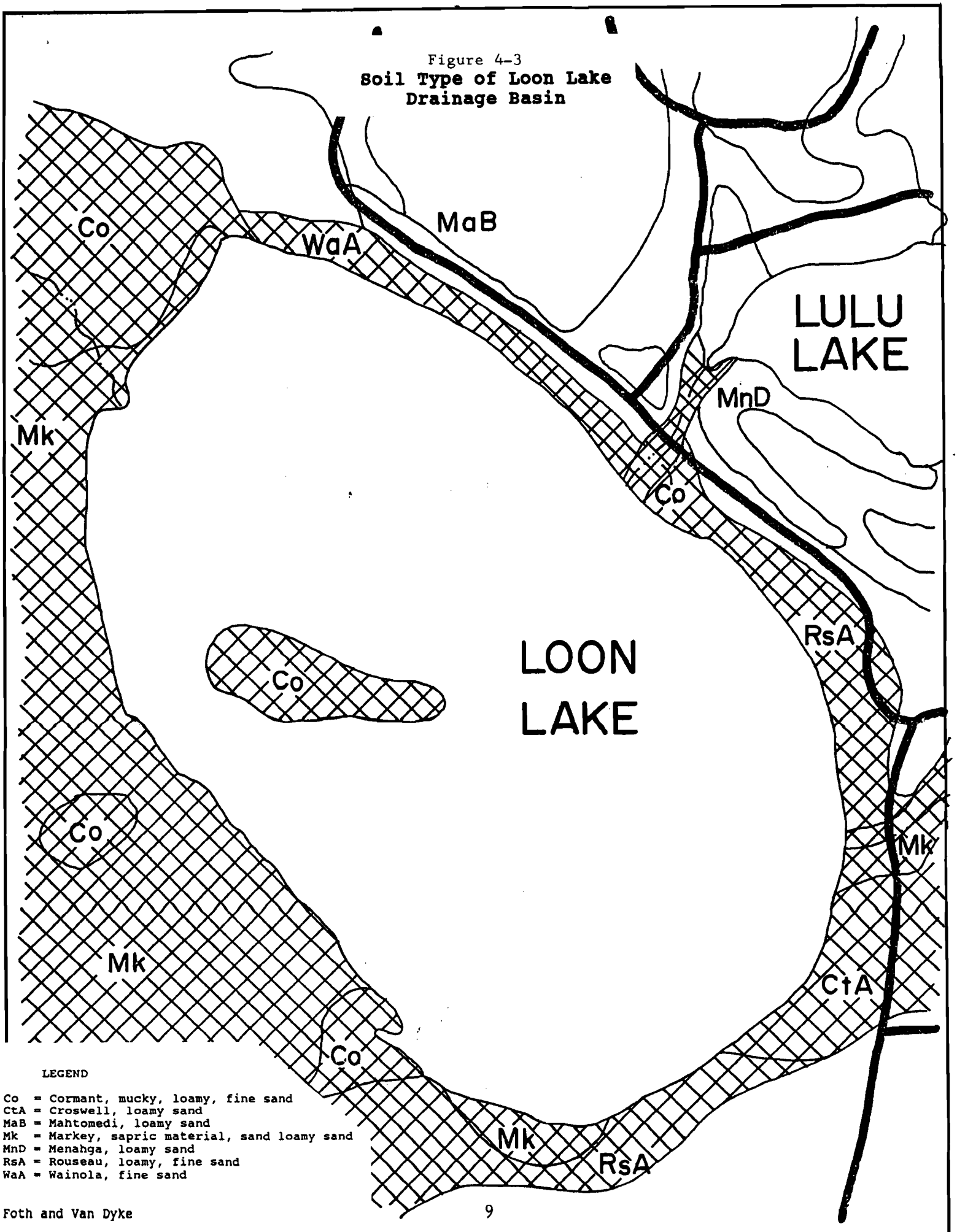
Co = Severe: Ponding, Poor Filter
Mk = Severe: Ponding, Poor Filter
RsA = Severe: Wetness, Poor Filter
CtA = Severe: Wetness, Poor Filter
MnD = Severe: Poor Filter, Slope Potential for Groundwater Contamination

WaA = Severe: Wetness, Poor Filter
MaB = Severe: Poor Filter, Potential for Groundwater Contamination

This information was obtained from the soil survey of Shawano County, Wisconsin, United States Department of Agriculture, Soil Conservation Services, 1982.

Based on this information, residential septic systems locations in these areas are suspect for nutrient loadings to Loon Lake.

Figure 4-3
Soil Type of Loon Lake Drainage Basin



LEGEND

Co = Cormant, mucky, loamy, fine sand
CtA = Croswell, loamy sand
MaB = Mahtomedi, loamy sand
Mk = Markey, sapric material, sand loamy sand
MnD = Menahga, loamy sand
RsA = Rouseau, loamy, fine sand
WaA = Wainola, fine sand

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5.0 Discussion of Data

As indicated earlier, the purpose of this study is to document the conditions of the lake. Phase I of the study (1991) was intended to target certain aspects of the basin i.e., document land use and determine nutrient loading from sources tributary to Loon Lake.

The primary focus of the nutrient study is to determine the potential for impact from outside sources and through monitoring influent sources, determine if there is indeed impact attributable to these sources.

Data in Table 4-1 shows the nutrient loading for the last quarter of 1991. Concentrations of phosphorus in both tributary streams are considered low. Concentrations of dissolved phosphorus at the start of the active growing season in excess of 0.01 mg/l can produce nuisance algae blooms. All of the influent streams maintained concentrations of less than or equal to 0.005 mg/l dissolved phosphorus. Based on this limited amount of information, it would appear that impacts due to these sources will be minimal. As the monitoring continues, it may be learned that concentrations of phosphorus in the influent increase seasonally. However, this has yet to be proven. It should be noted that while these sources appear to be insignificant, in combination with other as yet identified sources could provide nutrients sufficient to sustain nuisance weed and algae growth.

Inlake data (Appendix 1) suggests that the lake carries a slightly higher phosphorus budget than either of the tributary streams are supplying. Because weed harvesting will remove varying quantities of phosphorus, this activity may contribute to the reduction of total phosphorus in Loon Lake. Harvesting may only be maintaining the phosphorus level, however. Over time, Loon Lake - Wescott Management District, may be able to determine if this concentration is increasing, decreasing or remaining static.

Aside from contributions from tributaries, there are other sources of phosphorus. These include phosphorus in sediments, that which is tied up in plant and animal biomass, direct watershed drainage to the lake, and that contributed by septic systems.

Foth & Van Dyke has recommended that these other sources be evaluated. In the continuation of the present study (copy in Appendix 2), these factors will be studied in more detail.

6.0 Recommendations

This portion of the project has resulted in a preliminary assessment of the watershed surrounding Loon Lake. It is recommended that monitoring the influent nutrient loading be continued so that a broader base of information will be obtained.

Future work should be designed to determine if the lake is eutrophically stable. Of prime interest should be whether or not the Lake District is maintaining nutrient levels at a constant level through weed harvesting practices. A future study should determine if weed harvesting is a practice which will be necessary on a short term basis or is necessary as a long term solution.

The Loon Lake - Wescott Management District should continue to follow through with the second and third year of the evaluation. A Management Plan will then be developed which will give direction to the District for preventative and/or corrective actions. At that point, it will be up to the District to implement those steps which are feasible.

Phase II Continuation Study

The steps outlined below are proposed for Phase II of the lake study.

1. As with Phase I, we will attend a kick off meeting to prepare for this study. Topics which will be covered at this meeting will include:

   - Task assignments
   - Schedules
   - Client expectations
   - Procedural methods

2. One area of concern for the Loon Lake district is the impact of private sanitary systems currently in use by residents of Loon Lake. If Phase I of the project indicates that these systems in general have the potential to impact the water quality of the lake, an evaluation will be completed of the current wastewater disposal systems. This part of the project will include a more detailed evaluation of the individual systems at the lake. The overall impact of the individual systems will be evaluated to determine what the most cost effective alternative would be for correcting any problems. As an example, if the study indicates that very few systems are in need of upgrading, alternatives such as holding tanks and mound seepage systems will be looked at. However, if a significant portion of the systems will require upgrading, the costs for extending the sanitary sewer system to the unserviced portion of the lake will be developed. These evaluations will consider both the capital cost investments and the long term operating costs when looking at a cost effective alternative.

   Within your budget, you have identified costs associated with laboratory work. This part of Phase II may need the use of laboratory data to further confirm our findings in Phase I. Because Phase I is not complete, we are not able to specify the exact laboratory requirements at this time. Our intent is to work within your budget limits. If the need exists to exceed these limits, we will obtain authorization from your commission prior to any work being completed.

3. Storm water runoff may have a significant impact on the lake water quality. The land use evaluation conducted for the watershed associated with Loon Lake under Phase I is intended to identify areas of concern. Phase II of the project will look at what steps can be done to improve the land use practices and prevent the degradation of water quality in Loon Lake. While a lake district does not have authority to regulate land use practices outside of the district boundaries, steps can

be taken to educate land owners in the area about proper land management. The district can also approach other governmental agencies to obtain assistance outside of their boundaries.

4. Another area of concern for Loon Lake is the current level of weed growth within the lake. As a part of Phase II, we will evaluate steps available to control weed growth. Steps such as weed harvesting, chemical treatment and others will be looked at. This review will be based on cost and historical data collected from other lake districts that have faced similar problems. In most cases, this approach to lake management should be considered as a short term solution. However, these practices may address your needs until long term solutions can be implemented.

5. A mid-course meeting will be scheduled to discuss the current findings and serve as an opportunity to provide general feedback to our staff. We fully expect that your commission will be working with Foth & Van Dyke throughout this study; however, scheduled meetings such as this often act as a catalyst to bring concerns to the attention of all individuals involved.

6. A report will be prepared which addresses the work scope outlined above. This report will be made available to your commission in draft form prior to finalization. This will give you the opportunity to comment and provide input to the final report.

7. We will attend a final meeting to present our findings and the report to your lake district at a general meeting. The outcome of reports to your lake district at a general meeting. The outcome of reports such as this may impact people within the district. A general meeting will go a long way to prevent rumors from developing and it will also provide an opportunity for your members to ask questions.