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# Foth & Van Dyke

REPORT

# Loon Lake Study
# Phase II, 1992

Scope ID: 91L15

*Loon Lake - Wescott Management District*
*Shawano County, Wisconsin*

April 1993

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Prepared for
**Loon Lake - Wescott Management District**

Prepared by
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April 1993



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# Loon Lake Study

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# 1 Introduction

In 1991, the Loon Lake - Wescott Management District began a study of Loon Lake. The purpose of the study was and still is to accumulate basic information on Loon Lake and begin to put together a management plan for Loon Lake. The study is targeted to occur in three phases and expected to take place over a three year period. This report is a continuation of Phase I (1991) and is a summary of activities conducted in 1992.

## 1.1 Summary of 1991 Findings

In 1991, Phase I of the Loon Lake study concentrated on three areas. These included:

1. Nutrient loading. Phosphorus loading coming into the lake and in-lake phosphorus concentrations were documented.
2. Aquatic plant cover types. Lake vegetation was mapped. Weed harvesting was documented.
3. Lake watershed study. The Loon Lake drainage basin was mapped and evaluated from the standpoint of basin use, soil types, and drainage area.

Overall, nutrient loading from outside sources, specifically tributaries, seems to be a minor concern. However, it was felt that it would be necessary to collect data from several seasons as well as more than one year to obtain a better perspective of nutrient loading.

Weed harvesting such as that which was conducted in 1991 could be a mechanism for nutrient removal from the lake. However, it has yet to be determined if this practice needs to be conducted yearly in order to just maintain nutrient levels in the lake or if there are other options available for nutrient control.

Based on an evaluation of local soil types, it appears that much of the soil surrounding Loon Lake is not suitable for septic systems. An evaluation of septic systems in unsewered areas around Loon Lake was targeted for and was completed during Phase II.

## 1.2 Emphasis of 1992 Study

Phase II of the Loon Lake study was designed to accomplish several objectives. First, some of the data gathering efforts conducted in Phase I needed to be continued in Phase II. This is necessary to support the initial findings and provide some sense of continuity from one year to the next. Phosphorus studies were continued through 1992. Second, the 1991 study indicated that other sources of nutrient loading should be studied including storm water and septic systems. These sources were evaluated in Phase II.

Specific areas of study conducted during Phase II included:

1. Assess impact of private sewers/septic systems.
2. Assess impact of storm water.
3. Continue weed growth study.
4. Continue phosphorus loading study.

Sections 2 through 5 of this report discuss these specific areas of study.

## 2 Impact of Private Sewers/Septic Systems

The Loon Lake - Wescott Management District includes sewered and unsewered property owners around Loon Lake, Shawano County. Loon Lake is bordered on the south, east, and southwest by private homes. Areas to the west and northwest of the lake are poorly drained, characteristic of wetland habitat and generally unsuitable for private development.

### 2.1 Zoning Requirements

Zoning requirements for residential lots in Shawano County call for a minimum lot size of 20,000 square feet. This size is required for a septic system and a replacement system. All septic system fields must be located at a distance of a minimum of 75 feet away from the high water mark. While existing systems that do not meet these requirements are not required to change, zoning restrictions are excellent indicators of potential problems with on-site systems.

### 2.2 Field Work Conducted in 1992

Foth & Van Dyke conducted a physical survey of each unsewered property of the lake. The information collected included lot size, type of wastewater disposal, location of the system on the lot, and any other problems the system may have. The summary of this field data is provided in Appendix A.

### 2.3 Summary and Analysis of Data

To obtain some sort of categorization of the data provided in Appendix A, Foth & Van Dyke developed a ranking system for the data. Categories include the type of system, lot size, system age, elevation of the system above the lake, distance of the system from the lake, and any other problems the system may have. To aid in the analysis of the data, each category was given a ranking corresponding to the quality of the parameter. The ranking system is as follows:

| **Elevation Above Lake** | | **Distance From Lake** | |
|---|---|---|---|
| Category | Value | Category | Value |
| 0-10 feet | 1 | 0-75 feet | 1 |
| >10 feet | 2 | 75+ feet | 2 |
| Lot Area | Value | System Age | Value |
| 0-20,000 sq. ft. | 1 | 0-10 years | 3 |
| 20,000+ sq. ft. | 2 | 10-20 years | 2 |
| | | 20+ years | 1 |
| Problems | Value | | |
| Outhouse | 1 | | |
| Shared System | 2 | | |
| Overflow | 1 | | |
| None | 3 | | |

The point values for the systems are tabulated and shown in Appendix A. For each category, values were selected that would indicate a potential for a problem system. For the combined categories of elevation above the lake and distance from the lake, a value of one was selected as an indicator of potential problems. For lot areas, a value of one was below the minimum lot size currently allotted in the count and indicate that at least a replacement system would not be available for that lot. For systems 20 years old or more, the combined effects of age, construction techniques, and design requirements at the time of installation indicate potential problems. Under the problem system category, property owners with outhouses were identified as problems.

In most cases, the age of the system was unknown. A value of at least one was assigned to an entry for which no data was available.

Total points for each lot are also shown in Appendix A. Systems with total points of seven or less would indicate a high potential for problems.

From an evaluation of the private sewer system data, we see that there is a distinct dichotomy. We find that many of the systems which score low do so because of a number of factors including age of the system, location of the system on the site and size of the lot. Scores ranging from five to seven are considered low. Scores of eight and nine reflect systems with good points and some marginal aspects. Systems with scores 10 and above appear to reflect an acceptable installation—acceptable being relative to the scoring system established.

Several of the systems evaluated are failing or have the potential for failure. Of the questionable systems, most would not meet present day codes. The concern here is the impact these systems may have on the lake. From the 1991 report we know that most of the soils along the lake are unsuitable for septic systems. Therefore, if systems are failing and soils are not appropriate for such systems, then there is a real potential for an impact on the lake through groundwater infiltration. This study does not demonstrate nor was it intended to document lake contamination from private septic systems. The study does demonstrate the potential for impact based on the types of systems which are located on the lake. This information should be used by the Lake District to determine how best to use District monies, whether they be targeted for continued weed harvesting or other methods for controlling nutrient loading.

## 2.4 Cost Analyses

If a significant number of private sewerage systems have a low ranking, then it may be prudent to consider the cost of putting in a municipal sewer system to serve the unsewered residents on the east side of Loon Lake. Foth & Van Dyke has completed a cost analysis to provide an estimate of the costs for installation of such a system (Appendix B). These costs should be compared to the cost of upgrading those systems which may be failing.

The cost analysis is provided so that the Lake District can weigh the various options and these can be incorporated into the overall lake district management plan. To utilize the cost comparison, one should consider the total cost for a replacement system including costs for piping and individual connections fees. For those systems which have a low rating, costs for replacement systems (septic, holding or mound installations) can be compared with installation of a sewer connection. Table 2-1 provides the comparison of costs associated with installation of sanitary sewer versus replacement of existing systems with holding tanks.

## Table 2-1

### Cost Comparison for Installation of *Sanitary Sewer Versus Individual* Holding Tank System Replacement

| | Holding Tank[1] | Sanitary Sewer |
|---|---|---|
| Total Cost | 98,000 | 240,240 |
| Total Number Units | 28 | 28 |
| Total Cost per Unit | $3,500 (20 years) | $11,000 (40 years)[2] |
| Cost per Year | $175 | $275 |
| O&M[3] | ($135/mo x 12) | $2.50/1,000 gal + $26/quarter |
| | $1,620/year | $244/year |
| TOTAL COSTS | $1,790/year | $519/year |
| | | |
| Actual Payment Schedule | | |
| Capital Cost | $3,500 (1st year) | $1,100/year/10 years |
| O&M Costs | $1,620/year | $519/year |
| Costs/Year | | |
| Year 1 | $5,120 | $1,619 |
| 2 | 1,620 | 1,619 |
| 3 | 1,620 | 1,619 |
| 4 | 1,620 | 1,619 |
| 5 | 1,620 | 1,619 |
| 6 | 1,620 | 1,619 |
| 7 | 1,620 | 1,619 |
| 8 | 1,620 | 1,619 |
| 9 | 1,620 | 1,619 |
| 10 | 1,620 | 1,619 |
| 11 | 1,620 | 244 |
| 12 | 1,620 | 244 |
| 13-20 | 1,620 | 244 |
| Total for 20 Years | $35,900 | $18,630 |

1 Since the sanitary sewer is designed for a life of 40 years, it is anticipated that all current septic systems will be replaced at least once during this time period and the replacement system will necessarily be a holding tank.

2 The actual cost per unit is estimated to be $8,580 but the interest on a ten-year loan increases the cost to about $1,100 per year per household.

3 Gallons of wastewater discharged per household is estimated at 150 gpd (three persons per unit @ 50 gallons per person). This is equivalent to 4,500 gallons per month per household. A 5,000 gallon holding tank will be pumped once per month at a rate of $0.03 per 1,000 gallons.

Table 2-1 was developed based on the assumption that all current septic systems will be replaced at least once during the 40-year life of the sanitary sewer. Since the Wisconsin Department of Natural Resources uses a life of 20 years on individual septic systems, the capital cost estimate provided under the holding tank scenario could be increased by a factor of 1.5 or 2.0 to provide an equivalent comparison to the sanitary system installation. Therefore, holding tank estimates, as provided in Table 2-1, may be quite conservative.

One issue which the District will have to respond to will be the impact of septic systems which are currently judged as being adequate. It has to be assumed that the owner(s) of newer systems will not want to abandon the newer system prior to the end its life expectancy. If these systems continue to operate until failure, what could be the possible impact on the lake ecosystem? Since septic systems overflow to a leach field, and leach fields along the eastern and northeastern shore of the lake may be in the groundwater or saturated zone or have the ability to leach readily into these zones, there is the possibility that even well functioning new systems will continue to contribute nutrients to the saturated zone and possibly into the lake proper. Therefore, it should be noted that a new septic system, as well as mound systems, will have potential for contributing nutrients to Loon Lake. Fully sealed holding tanks which do not discharge to a leach bed will not have the potential for lake contamination unless the system leaks.

From a lake management standpoint, septic and mound systems, whether new or old, have the potential to contribute nutrients to the lake budget. The actual loading of nutrients from these systems to the lake proper may be such that it is sufficient to require the lake district to annually conduct weed harvesting. This aspect should be part of the consideration of total costs associated with replacement of septic systems with newer units or replacement with a sanitary sewer system.

There are specific state rules governing sanitary sewer extensions and hookups such as the system identified herein. If more than 50 percent of the residents approve of the extension, then all of the affected residents must buy in to the system and are required to hookup. It is acknowledged that there will be people who do not want to have a new system especially those who have newer, well functioning systems. The rule, however, requires that all must hookup if the service is put in.

## 3 Storm Water Impact Assessment

It is not anticipated that there will be significant impact from storm water runoff in the Loon Lake watershed. Much of the watershed is served by the two tributary streams and data from these streams does not indicate that there should be concern. Tributary Stream No. 1 drains an area which has the potential for a higher amount of erosion than does Tributary Stream No. 2. No significant impacts due to erosion have been reported from either of these streams.

In personal correspondence with Glen Angove and Frank Grether, it is noted that after significant rainfall the water of Loon Lake does have a tendency to show a stain. Secchi disc readings during these periods of time are reduced but recover within one to two days. It is likely that the rising water levels in the wetland areas to the north and west of Loon Lake give rise to the stained appearance.

There is some potential for nutrients accessing Loon Lake from the use of fertilizers. Nitrogen and/or phosphorus-based fertilizers applied around the lake could leach into the soils and access the lake through groundwater infiltration. Fertilizers may access the lake through direct runoff. Homeowners could control this source by limiting the amount of fertilizer used, mulching grass clippings back onto the lawn instead of bagging (and reapplying fertilizer), and refraining from mowing vegetation into the lake.

## 4 Weed Growth Study

The Loon Lake - Wescott Management District conducted weed harvesting in 1991 and 1992. The 1991 weed harvesting effort included areas along the east and southeast portions of the lake. The 1992 weed harvesting efforts included much of the same area and extended the effort to small areas of the west bank. Slightly more than 100 wet tons of weeds were harvested during 1992 compared with 105 wet tons of weeds harvested during 1991.

Weeds continue to be a concern with lake district homeowners. There is no indication that the harvesting could be discontinued in the near future though based on the return for the level of effort, the district may be able to reduce the manhours devoted to this activity in 1993.

Since weed growth is associated with nutrient loading, weed growth could be discouraged with the management of nutrient sources. While this study has not identified significant loading from tributary streams, possible input from failed septic systems has not been ruled out. Section 2 discussed the potential of nutrient input from septic systems.

# 5 Phosphorus Loading Study

In 1991, representatives of Loon Lake - Wescott Management District began taking samples of streams which are tributary to Loon Lake. These samples were analyzed for phosphorus. Initial data suggests that both of the tributary streams are contributing low levels of phosphorus. Figure 5-1 shows the location of the tributary streams with respect to the lake proper.

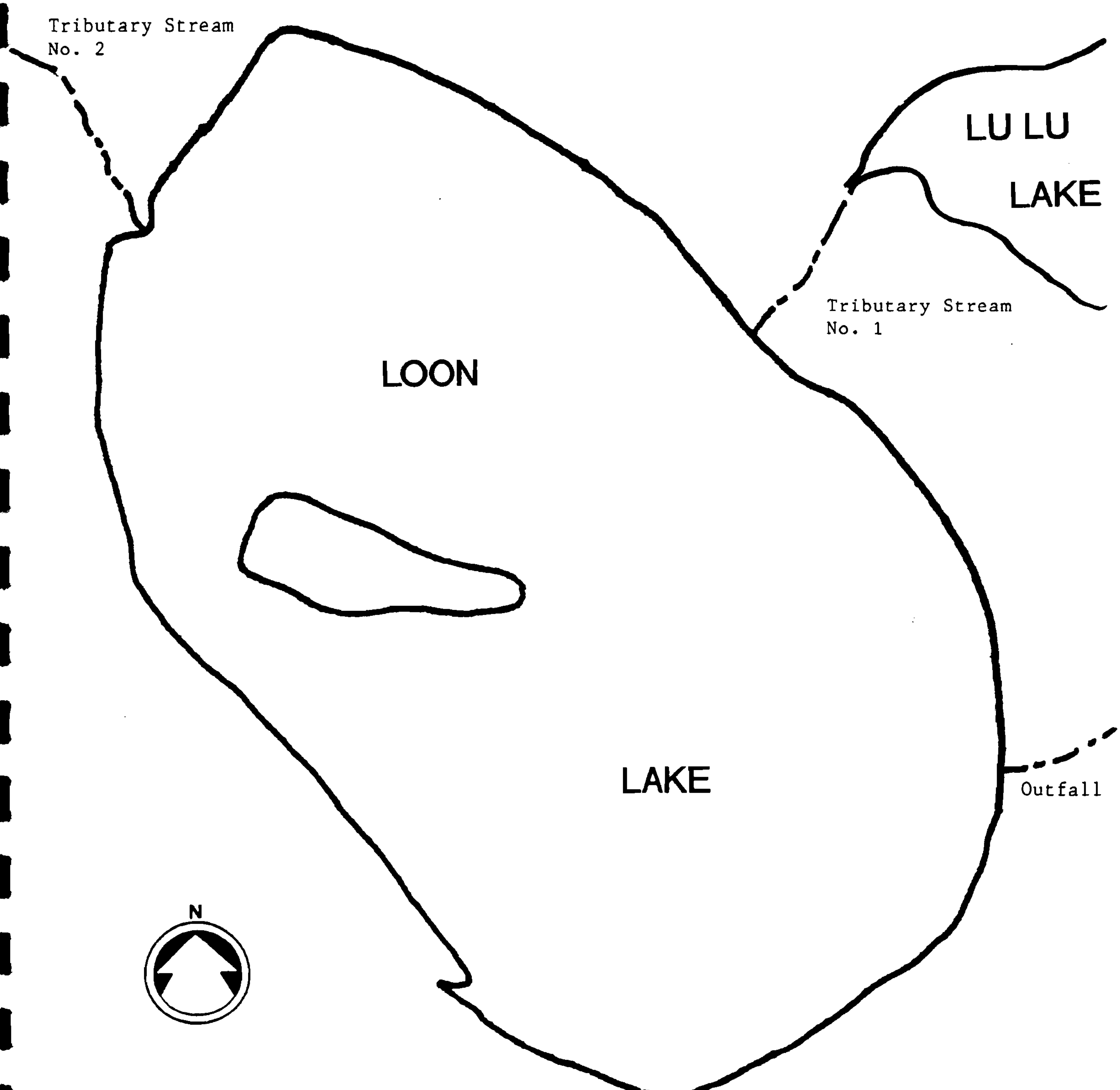
The study of phosphorus loading from tributaries was continued into 1992. The purpose of continuing the study was to determine if there are any seasonal trends in phosphorus loading or if there is any additional phosphorus coming from Lulu Lake in the spring during turnover. Lulu Lake is upstream of Loon Lake on Tributary 1. It was thought that if phosphorus is tied up in bottom sediments or plant matter in Lulu Lake, this could be released into the lake proper during spring turnover and subsequently be discharged to Loon Lake via Tributary 1. To observe this phenomenon, it was decided to increase phosphorus sampling to twice per month from ice out into early summer. Phosphorus data appears on Table 5-1. Data from 1991 appears in Table 5-1 for comparison purposes.

As in 1991, the dissolved phosphorus contributed by either stream is low, neither exceeding 0.006 mg/l. Concentrations of dissolved phosphorus at the start of the active growing season in excess of 0.01 mg/l can produce nuisance algae blooms.

It is noted that both streams more than doubled the total phosphorus input to Loon Lake during the year, the amount peaking in May. Since both streams seem to follow the same pattern, there appears to be no significant contribution from Lulu Lake which would not otherwise occur naturally.

Figure 5-1

Loon Lake Drainage Basin



# Table 5-1

## Loon Lake - Phosphorus Data (1991-1992)
## Data in mg/l

| Date | Tributary #1 | | Tributary #2 | |
|---|---|---|---|---|
| | 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 |
| 01/01/92 | 0.007 | 0.003 | 0.013 | 0.016 |
| 02/04/92 | 0.006 | 0.003 | 0.014 | 0.004 |
| 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 |
| 04/22/92 | 0.019 | 0.004 | 0.020 | 0.004 |
| 05/11/92 | 0.024 | N/D | 0.027 | N/D |
| 05/28/92 | 0.016 | 0.003 | 0.025 | 0.003 |
| 06/30/92 | 0.014 | 0.002 | 0.019 | 0.005 |
| 08/10/92 | 0.013 | 0.004 | 0.018 | 0.006 |
| 09/10/92 | 0.015 | N/D | 0.017 | N/D |
| 10/05/92 | 0.011 | 0.002 | 0.019 | 0.004 |
| 10/21/92 | 0.008 | 0.002 | 0.016 | 0.006 |
| 11/10/92 | 0.014 | 0.002 | 0.019 | 0.003 |
| 12/01/92 | 0.028 | 0.006 | 0.015 | 0.003 |
| Average | 0.012 | 0.004 | 0.016 | 0.004 |
| Maximum | 0.028 | 0.006 | 0.027 | 0.016 |

N/D = No data.

# 6 Summary

Foth & Van Dyke has completed Phase II of a three-year planning study for the Loon Lake - Wescott Management District. Some of Phase I activities were carried over into Phase II including monitoring phosphorus loading into the lake system from tributaries and monitoring weed harvesting activities. Additional activities conducted during Phase II included an assessment of private sewer systems along the east/northeast shore of Loon Lake.

## 6.1 Discussion of Phosphorus Monitoring Data

Monitoring data from 1991 and 1992 of tributaries to Loon Lake indicate that dissolved phosphorus concentrations entering Loon Lake should not be sufficient to cause nuisance weed conditions. The monitoring effort was increased in 1992 during the spring runoff/lake turnover period to determine if phosphorus loadings might increase during this time period. While an increase in phosphorus was observed, the increase was not considered to be significant.

From the monitoring data it is assumed that Loon Lake carries a nutrient budget sufficient to maintain a certain weed population. That budget does not appear to be significantly reduced by weed harvesting efforts. If nutrient loading from tributary sources are low and the suggestion is that the nutrient influent levels are too low to support continued weed growth, then phosphorus from other sources has to be considered. These sources could be sediments, unharvested weeds which release phosphorus on an annual basis, private septic systems, non-point source runoff/infiltration and/or lawn fertilization which results in nutrient loading through runoff or infiltration.

## 6.2 Evaluation of Weed Harvesting

The Loon Lake - Wescott Management District has been harvesting weeds for several years. About 105 wet tons of weeds were harvested in 1991 while just over 100 wet tons were harvested in 1992. It appears that the same amount of weeds can be harvested annually but that a higher level of effort was necessary in 1992 to obtain that same level of harvest as obtained in 1991. If this trend continues, it may indicate that the District is slowly reducing the amount of nutrients in the lake system. However, it should be noted that 1992 was a very cool summer and lower weed growth was noted in several local lakes. Continued weed harvesting may become a permanent annual activity if nutrient loading is not reduced.

## 6.3 Summary of Private Sewer System Study

In 1992 Foth & Van Dyke conducted a study of the unsewered homes along the east/northeast shore of Loon Lake. As not all homeowners were available for contact or the site visit, some of the data obtained is less than desired. However, from the data obtained, several conclusions can be drawn. These include:

1. Soils in the area are not well suited for private septic or mound systems. This is because of several conditions including high water table, close proximity to the lake proper, poor soil type, and high permeability of soils.

2. There is a high degree of failed systems, unsuitable systems, and old systems located in study area. Foth & Van Dyke prepared a ranking system for the private sewer systems. The ranking system takes into account the potential for problems with the system based on items listed in items 2 and 1 above.

3. The only systems which may be acceptable to the District for the purposes of long range lake management are holding tank installations. Even with these, proper maintenance is required.

4. Even if all marginal or failed systems were replaced with new units, the units would have to be holding tanks. The reason for this is because due to the poor suitability of the soil and proximity of the systems to the lake, any leach system has a high potential for accessing the lake and contributing to the nutrient loading problems.

There is the potential to locate a cluster system east of the lake on a sand hill. To accomplish this, the potential owners would have to purchase additional acreage and obtain the necessary easements. Since the cluster system would be above and behind current residences, all leachate will still progress past the residences toward the lake. If a new system is to be proposed to replace existing systems and a sewer is available, then the appropriate alternative is to extend the sewer.

It is estimated that as many as 90 percent of the private sewer systems could be problematical from a lake management standpoint. This is based of ranking system provided in Section 2 above and illustrated in Appendix A.

## 6.4 Summary of Costs and Benefits

Foth & Van Dyke included a cost analysis comparison for replacement of private sewer systems with holding tanks versus a sanitary sewer main. Assuming over the twenty year life cycle of the project that each system will be required to be replaced (including current new systems) the capital costs for private system replacement for new private systems are about half of sanitary sewer capital costs. However, the O&M costs for private systems will far outweigh the O&M costs for a sanitary sewer system both initially and over the long term. These cost comparisons are provided in Table 2-1.

The benefit of installation of sanitary system is threefold. First, the District will see a permanent solution to the sewer question. Second, whether the potential for leach systems accessing the lake proper is real or perceived, the sanitary installation will eliminate that potential. Finally, with the installation of a sanitary sewer, there is the possibility that weed harvesting can be reduced or eliminated over time.

## 7 Recommendations

Foth & Van Dyke has completed two years of study of the dynamics of Loon Lake. Additional investigations could be proposed and conducted, however, enough information has been learned from the past studies to make some recommendations which will help the Loon Lake - Wescott Management District plan for the future and actually manage the lake.

The following recommendations should be reviewed and implemented where feasible.

1. First and foremost, the District needs to be able to control the amount of nutrients which can be discharged directly or indirectly into the basin. Since nutrient uptake is a function of biological activity, and excess biological activity, particularly excess weed growth, is the main emphasis of this study, the District must develop a management plan to control nutrients.

   Currently excess weeds are harvested to reduce the nuisance growths. This has the added benefit of removing some of the nutrients from the lake budget. It is recommended that this practice continue unless and until other remedies make weed harvesting impractical. Two conditions could curtail weed harvesting. First, if the level of effort increases with little additional or a reduction in weeds being harvested, then harvesting could be reduced, eliminated, or perhaps skip a year for economical reasons. Second, there may be some thought to conducting an ambitious harvesting program. The macrophytes are good competitors for the nutrients. We caution against this idea, however. Excessive nutrient removal may not be accomplished through a one-time major harvest. Remember that much of the nutrients may be tied up in sediments and other biological organisms other than the macrophytes. Overharvesting of the macrophytes could encourage a proliferation of lower level organisms particularly algae which in turn could become a greater nuisance than the macrophytes. This could also harm the environment for fish and other aquatic organisms. We therefore recommend that you resist the urge to accelerate the harvesting of macrophytes as a measure to obtain a quick nutrient reduction.

   It has been suggested that much of the nutrients are tied up in sediments. To a certain degree nutrients will always be a part of the sediments. Much of the nutrient load will be associated with sediments as organic matter settles to the bottom annually. Some of the organic matter will release the nutrients to the water column as the nutrients become soluble and available.

2. Nutrients tied up in this sediment can be removed by dredging. Dredging will represent a major disruption of the lake dynamics and is considered a drastic measure for relief. We do not recommend dredging for Loon Lake as a long-term solution to the nutrient problem. If nutrients are being made available from an excess in the sediments, then over time, the sediment will have released the excess to macrophytes and since the macrophytes are being harvested, the excesses will slowly diminish over time. The key element here is whether or not the sediments are gaining nutrients from a continuous source.

   This study has indicated that neither of the two tributaries to Loon Lake provide sufficient nutrients to cause excessive weed growth in Loon Lake. While the standing biomass certainly has much of the nutrients temporarily tied up and the sediments can contain a nutrient load, two other sources which could contribute nutrients to the lake include runoff or infiltration from the use of fertilizers, and leachate from private sewer systems.

3. It is recommended that the property owners fertilize near shore areas lightly if at all. Wet type applications may be better than dry applications because this could reduce the possibility of fertilizer runoff. Neither application will prevent access to the lake under high saturation conditions in the soil which could pull nutrients into and through the saturation zone. Near shore residents should consider irrigation using lake water and using ambient lake nutrient concentrations for nutrient application. Such a program may need approval from a regulatory agency.

4. It is strongly recommended that the District evaluate the option of abandoning private sewer systems in favor of connecting to the sanitary sewer system. The Phase II study indicates that there is significant potential for private systems to impact the lake. The condition of the private sewers may be the reason that weed harvesting has to be conducted at all. Estimated costs for hookup to a sanitary system are lower than the comparable private system over the 20-year life of the private system.

# Appendix A

## Loon Lake - Wescott Management District
## Cost Estimate for Sanitary Sewer Extension

## Preliminary Cost Estimate
## Loon Lake Sanitary Extension
## Loon Lake - Wescott Management District
## April 1993

| Quantity | Unit | Description | Unit Cost | Price |
|---|---|---|---|---|
| 3,000 | LF | 8" PVC Sanitary | 30.00 | 90,000.00 |
| 50 | VF | 4 ft. Std. manhole | 130.00 | 6,500.00 |
| 28 | EA | 8" X 4" Wye Branches | 25.00 | 700.00 |
| 1 | LS | Easements | 5,000.00 | 5,000.00 |
| 1 | LS | Erosion Control | 2,000.00 | 2,000.00 |
| 100 | CY | Pipe Fondation Material | 8.00 | 800.00 |
| 100 | CY | Select Backfill | 6.00 | 600.00 |
| 2,800 | LF | 4" PVC Lateral | 18.00 | 50,400.00 |
| 3,000 | LF | Landscape Restoration | 4.00 | 12,000.00 |
| | SUBTOTAL | | | 168,000.00 |
| 10% Contingency | | | | 16,800.00 |
| | SUBTOTAL | | | 184,800.00 |
| 30% Engineering, Legal, Administration | | | | 55,440.00 |
| | TOTAL | | | 240,240.00 |

Assumptions

1. Distance from existing lift station to end of extension is 3000 LF. The entire length will be gravity sewer.
2. Easements will be obtained to extend private alley the entire distance.
3. Thirty percent Engineering, Legal, Administration is complete through construction.
4. Each of the 28 reidences is assumed to get a 100 linear foot 4" diameter lateral. Any remaining distance and the cost to hook up each residence is not included.
5. The alley along which the sewer main is to be installed is not a paved roadway.
6. The existing lift station is located such that a creek crossing is not necessary.

# Appendix B

## Loon Lake - Wescott Management District
## Private Sewer Ranking Data

## Private Sewer Ranking System

| Unit # | Unit Type(1) | Lot Area(2) | Unit Age | Elevation Above Lake(3) | Distance From Lake (4) | Total Points |
|---|---|---|---|---|---|---|
| 1 | 2 | 1 | 1 | 2 | 1 | 7 |
| 2 | 2 | 2 | 1 | 2 | 2 | 9 |
| 3 | 2 | 1 | 1 | 2 | 2 | 8 |
| 4 | 2 | 1 | 1 | 2 | 2 | 8 |
| 5 | 1 | 1 | 1 | 1 | 1 | 5 |
| 6 | 1 | 1 | 1 | 1 | 1 | 5 |
| 7 | 1 | 2 | 1 | 1 | 1 | 6 |
| 8 | 1 | 1 | 1 | 1 | 1 | 5 |
| 9 | 2 | 1 | 3 | 2 | 2 | 10 |
| 10 | 2 | 1 | 1 | 1 | 1 | 6 |
| 11 | 2 | 1 | 1 | 2 | 2 | 8 |
| 12 | 2 | 1 | 1 | 2 | 2 | 8 |
| 13 | 1 | 1 | 1 | 1 | 1 | 5 |
| 14 | 2 | 1 | 3 | 2 | 2 | 10 |
| 15 | 2 | 2 | 1 | 1 | 1 | 7 |
| 16 | 2 | 2 | 2 | 1 | 1 | 8 |
| 17 | 1 | 1 | 1 | 1 | 1 | 5 |
| 18 | 3 | 2 | 1 | 2 | 2 | 10 |
| 19 | 3 | 2 | 3 | 1 | 1 | 10 |
| 20 | 2 | 2 | 3 | 1 | 1 | 9 |
| 21 | 2 | 2 | 1 | 1 | 1 | 7 |
| 22 | 3 | 2 | 3 | 1 | 1 | 10 |
| 23 | 2 | 2 | 2 | 1 | 1 | 8 |
| 24 | 2 | 2 | 3 | 2 | 2 | 11 |
| 25 | 2 | 2 | 1 | 2 | 2 | 9 |
| 26 | 2 | 2 | 3 | 2 | 2 | 11 |
| 27 | 2 | 2 | 2 | 1 | 1 | 8 |
| 28 | 2 | 2 | 2 | 1 | 1 | 8 |

Key: System Type 1 = outhouse, 2 = septic system, 3 = holding tank
Lot Area 1 = < 20,000 sq. ft., 2 = > 20,000 sq. ft.
System Age 1 = 0-10 yrs, 2 = 10-20 yrs, 3 = > 20 yrs
Elevation above lake 1 = < 10 feet, 2 = > 30 feet
Distance from lake 1 = < 50 feet, 2 = > 50 feet