New Jersey Department of Environmental Protection
Report on the Establishment of
Total Maximum Daily Load (TMDL)
For Phosphorus in the Lower Sylvan Lake,
Burlington Township, Burlington County, NJ

Amendment to the Tri-County Water Quality Management Plan

Proposed: March 20, 2000
Established: June 9, 2000
Approved: August 14, 2000
Adopted: April 10, 2002

Introduction

A Total Maximum Daily Load (TMDL) represents the assimilative or loading capacity of the receiving water taking into consideration point and nonpoint sources of pollution, natural background, as well as surface water withdrawals. A TMDL is developed as a mechanism for identifying all the contributions to surface water quality impacts and setting goals for load reduction for specific pollutants as necessary to meet surface water quality standards. TMDLs are required, under section 303(d) of the federal Clean Water Act, to be developed for waterbodies that do not meet water quality standards after the implementation of technology-based effluent limitations. TMDLs may also be established to help maintain or improve water quality in waters that are not impaired. Regulations concerning TMDLs are contained in EPA's Water Quality Planning and Management Regulation (40 CFR § 130.7(c)).

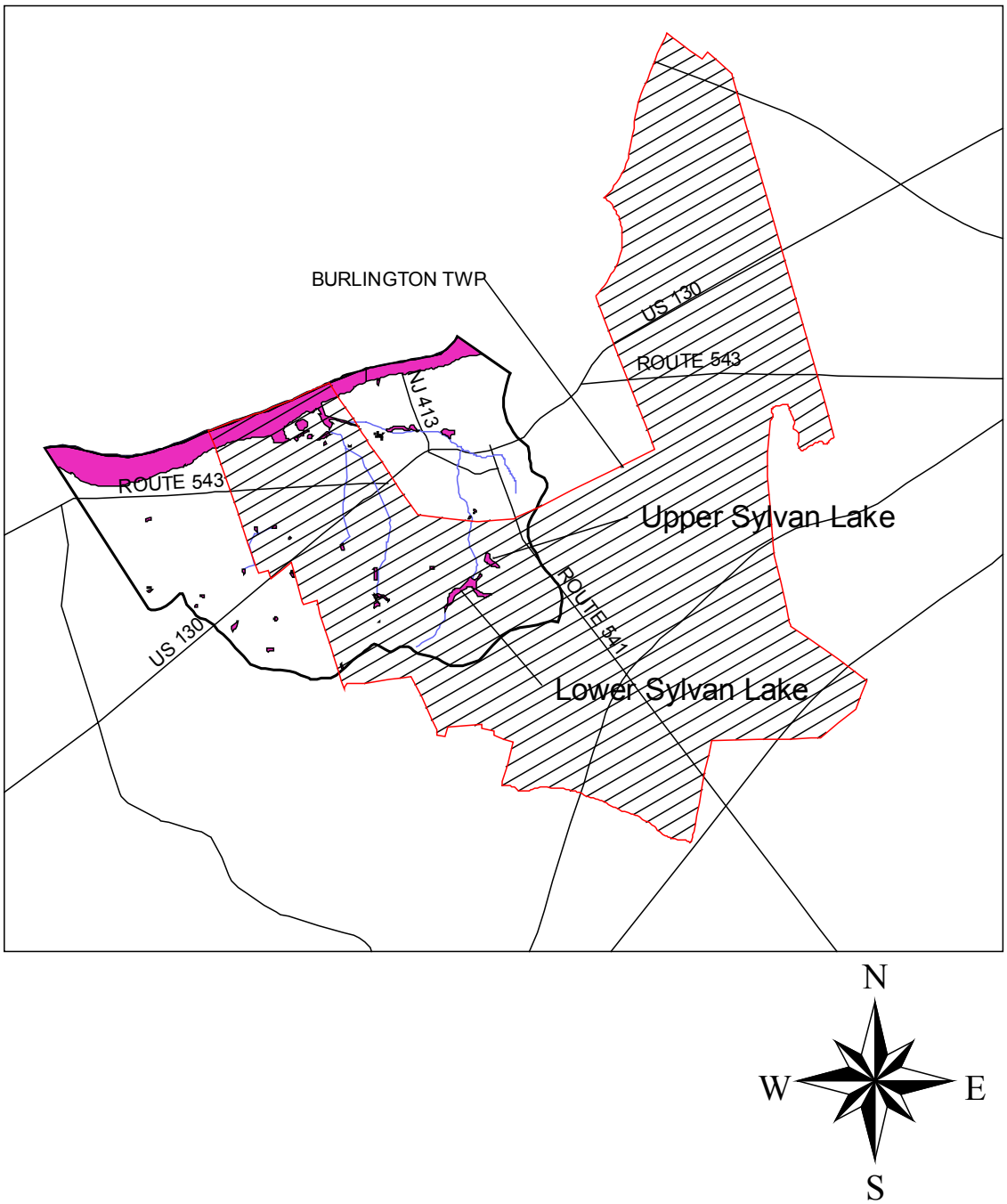
Where TMDLs are required to address documented surface water quality impairment; allocations are made to the varying sources contributing to the water quality problem in order to reduce the total pollutant load received by the waterbody. Load reduction goals established through TMDLs are achieved through the issuance of wasteload allocations for point sources and load allocations for nonpoint source discharges. Since nonpoint source pollution, by definition, does not come from discrete, identifiable sources, load allocations would consist of the identification of categories of nonpoint sources that contribute to the parameters of concern. The load allocation would also include specific load reduction measures for the categories of sources, to be implemented through best management practices (BMPs) including local ordinances for stormwater management and nonpoint source pollution control, headwater protection practices, or other mechanisms for addressing the priority issues of concern. There are no point sources of pollution to the Sylvan Lakes; therefore only load allocations have been developed.

In May 1999, the New Jersey Department of Environmental Protection (NJDEP) and USEPA Region II entered into a Memorandum of Agreement, including an 8-year schedule, to produce TMDLs for all water quality limited segments on the 1998 Section 303(d) list of Water Quality Limited Waterbodies in New Jersey or provide information necessary to remove waterbodies from the list (see Appendix A). Originally a basic TMDL for the Sylvan Lakes was to be established by the Department by December 31, 2000 under this MOA. In order to accommodate EPA's request to accelerate this TMDL

the current deadline for the establishment of the Sylvan Lakes TMDL was revised to June 30, 2000.

Figure 1

Figure 1: Sylvan Lakes



Background

Upper and Lower Sylvan Lakes are located in the Township of Burlington in Burlington County, New Jersey (see Figure 1). The lakes are the result of the impoundment of Mill Stream and have now been diverted into Tanners Run (also called Tanner Brook or Tanners Creek) which is a small tributary of the Delaware River. The earthen dam on Lower Sylvan Lake dates from the 1880s. Lower Sylvan Lake is a 13.9 acre lake with a mean depth of 6.51 feet and a maximum depth of 14.1 feet. Upper Sylvan Lake has a surface area of 4 acres, a maximum depth of 14.7 feet and a mean depth of 7.06 feet. There is an artificial hydraulic connection between the lakes that allows some overflow drainage from the Upper Lake to the Lower Lake during extreme high flow conditions. There is no other outlet from Upper Lake. Historically, before diversion to Tanners Run, when the dam on the Lower Lake failed, there was flooding into Burlington City in addition to flood damage to the surrounding area.

The watershed area that drains into the Sylvan Lakes consists of 158 acres of forest and the remaining 299 acres are residential. Upper Sylvan Lake has a small swimming beach and a fishing area with a small dock. Both lakes are used for fishing and boating.

The Township is currently repairing the dam on Lower Sylvan Lake, before dredging commences in mid-2001. To conduct the repairs, the Lower Sylvan Lake has been lowered about four feet. Trees have been removed from the dam, the embankments will be reinforced with concrete and some of the dam's slopes will be flattened.

Section 303(d) Listing and Applicable Surface Water Quality Standards

Applicable Surface Water Quality Standards (SWQS)

The Upper and Lower Sylvan Lakes are classified as FW-2 non-trout. Designated uses are primary contact recreation (i.e., swimming); secondary contact recreation (i.e., wading, boating); fishing. Criteria that are relevant to the 303(d) listings for the Sylvan Lakes follow:

<u>Phosphorus</u>

Lakes: Phosphorus as total P shall not exceed 0.05 in any lake, pond or reservoir, or in a tributary at the point where it enters such bodies of water, except where site-specific criteria are developed.

Note: Presently, no site-specific criteria apply to the Sylvan Lakes.

<u>Sedimentation</u>

There is no criterion for sedimentation.

<u>Fecal Coliform Bacteria</u>

Because the 303(d) listing applies to a bathing beach, the applicable numerical criteria for fecal coliform is the New Jersey Department of Health and Senior Services (NJDHSS) primary contact standard (N.J.A.C.8:26-1 et seq).

NJDHSS Primary Contact Standard: Individual samples at any particular time shall not exceed 200 fecal coliforms per 100 ml. If and when a sample exceeds the standard, an immediate resample is required, clustering around the region from where the unacceptable sample was taken. If the resample is unsatisfactory, or if a sanitary survey discloses any condition which may present an eminent hazard to public health, the bathing beach shall be closed.

1998 Impaired Waterbodies List (i.e., 303(d) List)
Sylvan Lakes have been included on 1996 and 1998 Impaired Waterbodies Lists due to water quality issues associated with eutrophication of Upper and Lower Sylvan Lakes and bathing beach closures at Upper Sylvan Lake. Water quality issues associated with eutrophication included exceedences of applicable SWQS criteria for Total Phosphorus (TP), Clean Lakes Program guidance values for trophic status and excessive sedimentation.

Data sources for the inclusion of Upper and Lower Sylvan Lakes on Impaired Waterbodies Lists due to eutrophication are: F.X. Browne, Associates (1986), and Clean Lakes Program (pers. comm.). The Clean Lakes Program reviewed these data sets, characterized the lakes as eutrophic and reported this information to the 303(d) Program.

Data sources for the inclusion of Upper Sylvan Lake on Impaired Waterbodies Lists due to bathing beach closure is unclear, but may be the result of personal communication between the Burlington County Health Department which monitors the Upper Sylvan Lake bathing beach and the 303(d) Program. Impaired Waterbodies Listings for Upper and Lower Sylvan Lakes are summarized on Table 1 below.

Table 1: 303(d) Listings for Upper and Lower Lake

Constituent of concern	Upper Sylvan Lake	Lower Sylvan Lake
Bacteria	Listed	Not listed
Total Phosphorus	Listed	Listed
Sedimentation	Listed	Listed

Basis for Impaired Waterbodies Listing for Upper and Lower Sylvan Lakes

- Eutrophication, Total Phosphorus and Sedimentation in Upper and Lower Sylvan Lakes:

Appendix B summarizes water quality data collected from Upper and Lower Sylvan Lakes in 1983. (F.X. Browne, 1986). These data show numerous exceedences of the applicable SWQS criterion for TP in Upper and Lower Sylvan Lakes. In addition,

Attachment 2 compares these data to Clean Lakes Program guidance for evaluating trophic status. Results indicate both Upper and Lower Sylvan Lakes were eutrophic in 1983.

Sediment build-up in Upper and Lower Sylvan Lakes was characterized by F.X. Browne (1986). The depth of unconsolidated sediment in the Upper Lake was 1.62 feet (10,436 cubic yards) and in Lower Sylvan Lake was 1.97 feet (44,068 cubic yards). Sediment accumulation rates were estimated to be 0.19 inches per year (2,818 cubic feet per year) and 0.24 inches per year (11,898 cubic feet per year) in Upper and Lower Sylvan Lakes, respectively.

Based upon their review of estimated macrophyte biomass in concert with assumptions regarding incoming nutrient loads, F.X. Browne (1986) suggests that nutrient translocation from the sediments through the plant tissue to the water column is a significant, if not a predominant, aspect of the nutrient budget for the two lakes. Incoming sediment from tributary inputs and stormwater are also regarded as contributors of nutrients from surrounding land surfaces. The basis for listing sedimentation was its contribution to the phosphorous levels, not for depth or clarity. Therefore sedimentation will be dealt with in the phosphorous TMDL.

- Bacteria and Bathing Beach Closures in Upper Sylvan Lake:

Bathing beach closures occur when fecal coliform data collected at bathing beaches exceed applicable NJDHSS primary contact standards. Bathing beach data have been collected by the Burlington County Health Department to implement the NJDHSS bathing beach monitoring program. Although specific documentation of the historical bathing beach closures at Upper Sylvan Lake bathing beach is not currently available; closures were probably reported to NJDEP as public data were solicited to develop 303(d) lists.

Bacteria listing in 303(d) for Sylvan Lake is based upon bathing beach closures on record occurring in the Upper Lake prior to 1996. Because New Jersey does not list waterbodies in 303(d) based solely upon evaluated data[1] or extrapolations from contiguous waterbodies, listing the Lower Lake for this parameter is deemed inappropriate. There are no designated bathing beaches in the Lower Lake.

Intended Future 303(d)Actions

NJDEP intends to pursue de-listing for Total Phosphorus (TP), sedimentation and bacteria in Upper Sylvan Lake. Data sources to support these proposed 303(d) actions are F.X. Browne (1998) (Appendix C) and Burlington County Health Department (Pers. Comm., Trevor Weigle, 1999-2000).

[1] Evaluated data represent information other than current, site-specific ambient data such as data on land use, location of sources or predictive modeling using estimated input variables (USEPA ,1997).

TP and sedimentation will continue to be listed for Lower Sylvan Lake until remediation projects are completed and subsequent data show compliance with applicable SWQS criteria. These actions are summarized on Table 2 below.

Table 2. Intended Future 303(d) Actions

Constituent of Concern	Upper Sylvan Lake	Lower Sylvan Lake
Bacteria	Pursue delisting	Not applicable*
Total Phosphorous	Pursue delisting	Establish TMDL
Sedimentation	Pursue delisting	Address through phosphorus TMDL

*Listing for bacteria is based on fecal coliform samples for the Upper Sylvan Lake and does not apply to the Lower Sylvan Lake.

Rationale for Intended De-Listings in Upper Sylvan Lake

As documented in F.X. Browne (1998) several significant management measures were implemented in Upper Sylvan Lake. Upper Sylvan Lake management measures included:

- dredging to remove unconsolidated sediment (completed 3/28/94);
- aeration (completed 8/94);
- erosion control and stormwater infiltration (completed 6/96)
- re-routing stormwater to below Lower Sylvan Lake (2 of 4 outfalls removed 1993; 2 outfalls removed 1995-rerouted to Mill Creek watershed, Rancocas Creek);
- public education (ongoing)

As summarized below and in F.X. Browne (1998), these measures resulted in attainment of SWQS criteria for TP and reductions in sediment load. In addition, bathing beach data collected by Burlington County Health Department indicate full support of swimming at the lake beach. Thus, designated uses of Upper Sylvan Lake are now met and are expected to continue to be met.

Sedimentation was listed based on the contribution of the sediments to the levels of TP. Sedimentation is not listed for clarity or for depth (the sedimentation rate is very slow). The measures taken were successful in lowering the levels of TP in the lake.

- Pursue de-listing for TP in Upper Sylvan Lake:

Water quality data were collected and analyzed by NJDEP between 4/94 and 1/95. Results were reported in F.X. Browne (1998) and are shown in Appendix C. TP data collected between April and August 1994 reflect conditions after completion of dredging and removal of 2 of 4 stormwater outfalls. Results show 1 exceedence in 9 sampling events. Data collected between September 1994 and January 1995 reflect conditions subsequent to implementation of aeration in the lake and are most relevant to delisting considerations. These data show very low levels of TP (0.02 to 0.03 mg/l TP). Removal of the remaining 2 stormwater outfalls occurred in 1995 and is probably not

reflected in the above water quality data. However, removal of the additional outfalls would further reduce loads of TP to Upper Sylvan Lake.

- Pursue de-listing for sedimentation in Upper Sylvan Lake:

Significant reductions in sedimentation and its adverse affects were achieved in Upper Sylvan Lake through removal (dredging), stormwater rerouting and nonpoint source controls. Specifically, the following management measures have been implemented:

1. All stormwater pipes have been removed from the lake and conveyance systems redirected away from the Upper lake.
2. Dredging of the lake bottom (completed 28 March 1994) and the removal of all unconsolidated nutrient-laden sediments.
3. Installation of an aeration system in August 1994. Dissolved oxygen in the lake bottom has shown significant improvements following this installation.
4. An array of erosion controls and stormwater infiltration measures have been implemented to control nonpoint source pollution. Measures included installing new sand courts in a play area; removing pavement and replacing it with sod; installing wood chip mulch in a parking area; implementing cleaning and sweeping; installing concrete wheel stops, a stone sub-base, and bituminous walkways.

- Pursue de-listing for bacteria in Upper Sylvan Lake

Weekly sampling for fecal coliform bacteria is performed by the Burlington County Health Department for the 10-week swimming season (mid-June through Labor Day). This sampling protocol is consistent with the NJDEP-NJDHSS protocols for bathing beaches which are used in the Cooperative Coastal Monitoring Program for ocean and bay bathing beaches. Results are shown in Table 3. Of 30 samples, only 1 exceeded the NJDHSS primary contact standard of 200 fecal coliforms per 100 ml (N.J.A.C. 8:26-1 et. seq.) indicating that the bathing beach supports swimming.

Table3**:** Fecal Coliform Sampling for Upper Sylvan Lake

1997	**ct/100ml**	**1998**	**ct/100ml**	**1999**	**ct/100ml**
6/16/97	260	6/18/98	20	5/19/99	<1
6/23/97	30	6/22/98	20	6/14/99	<1
6/30/97	90	6/29/98	60	6/21/99	<1
7/7/97	100	7/8/98	40	7/12/99	<10
7/14/97	80	7/13/98	110	7/19/99	20
7/21/97	30	7/20/98	50	7/26/99	20
7/28/97	100	7/27/98	10	8/2/99	<20
8/4/97	10	8/3/98	20	8/11/99	<20
8/11/97	20	8/10/98	10	8/18/99	<20
8/19/97	150	8/17/98	140	8/25/99	<20
8/25/97	30	8/24/98	<1		
		8/31/98	10		

Source: Burlington County Health Department, Personal communication, Trevor Weigle,1999-2000

Development of a TMDL for Phosphorus in the Lower Sylvan Lake, Burlington County, NJ

Analysis of Phosphorus Data in the Lower Sylvan Lake

Sampling for phosphorus was performed in conformance with NJDEP QA requirements and was acceptable to USEPA's Clean Lakes Program.

A. Total Phosphorus

Based on the 1982 sampling, mean Total Phosphorous (TP) was 0.06 mg/l in Lower Sylvan Lake. TP concentrations in Lower Sylvan Lake were 0.065mg/l during the summer and approximately 0.06 mg/l in October.

B. Macrophyte Surveys
Herbicides have been used periodically on the lake but application was suspended during the sampling period. In the absence of herbicide treatment, the lake had significant areal coverage of macrophyte for depths of less than six feet.

Currently, the Lower Lake is treated with herbicides as needed for periodic overgrowth of duckweed.

Pollutant Sources

Sources of phosphorus to Sylvan Lake include incoming waters from the Mill Stream tributary, surface runoff, stormwater drainage from the area immediately adjacent to the lake, and translocation from the sediment through macrophyte growth. The residences in the area are now sewered; therefore input from septic systems is not an issue (Pers. Comm., Burlington Township Engineer).

Water Quality Modeling

The modeling is based on the work done by F.X. Browne, Inc. (1986) (Appendix B) which has been modified to take into account the changes in land use since the original work was done and New Jersey's adopted standard of 0.05 mg/l for TP. The 96.2 acres or 21% of the surrounding land use that was in agricultural use at the time of the original study is now residential.

F.X. Browne used the Walker (1977) model because after a survey of commonly used models, it was found that the Sylvan Lakes morphological characteristics fit within the

limitations of the Walker model. In addition, the predicted phosphorus concentration was found to be similar to the measured values. The selection and verification of the Walker model is described in the Diagnostic Feasibility Study for the Sylvan Lakes Restoration Project (Appendix B). This document was approved by EPA through the Clean Lakes Program and forms the technical basis for the TMDL. The Walker model is described in EPA's Clean Lakes Manual, Quantitative Techniques for the Assessment of Lake Quality. The Walker model relates allochthonous TP load to steady state TP concentration. Sediment load was estimated in the report but not explicitly included in the study calculations.

No data exist on the quality of the water in the tributary stream, including the storm sewer inputs to the stream. Watershed loads for TP were estimated using the Unit Areal Loadings methodology which uses the land use patterns within the watershed and pollutant export coefficients obtained from literature sources, as described in EPA's Clean Lakes Program guidance manual (Reckhow, 1979). Land use was determined using the NJDEP's GIS system using 1995-1996 data. The export coefficients used are from the F. X. Browne Clean Lakes report (1986) and are 0.16 kg/ha/yr for forest and 1.13 kg/ha/yr for medium density residential.

The current allochthonous load using these coefficients is 137.6 kg/yr TP (1.6 kg/yr from forested land, 136 kg/yr from residential). Therefore, the predicted unit areal phosphorus loading for the 13.9 acre Lower Lake is estimated to be 2.45g/m^2/yr.

The current condition is calculated as follows using allochthonous loads from current land uses (136 kg/yr residential, 1.6 kg/yr forest) and post-dredging depth and detention time (2.62 m and 0.0976 yrs, respectively).

$$P=LT/Z\ (1/(1+.824T^{.454}\ ))$$
$$= 0.071\ mgTP/l$$

Where:

P= steady state phosphorous concentration, mg/l
T= detention time, years=0.098
Z= mean depth, m=2.62
L= annual areal phosphorous loading, g/m^2/yr=2.45

Both the hydraulic residence time and mean depth were adjusted to account for the 32% increase in volume that will occur as a result of the planned dredging. The dredging will increase the mean depth from 1.98 meters to 2.62 meters and the detention time from 0.074 years to 0.098 years. The predicted steady-state phosphorus concentration using these estimated physical parameters and current load is 0.071 mg/l. Sediment load was not explicitly included in the calculation of current condition because, as described previously, the Walker model relates allochthonous load to steady state phosphorus concentration. The model assumptions regarding sediment contribution are adequate for the sediment loading rate before dredging.

Seasonal Variation/Critical Conditions

The target value for the phosphorus TMDL is adjusted to account for seasonal variation as follows. The Walker model predicts steady state phosphorus concentration. F.X. Browne (1986) found that for the Sylvan Lakes the predicted phosphorus concentration using the Walker model successfully reproduced TP concentrations measured at fall turnover. To account for seasonal variation, the average concentration for each station was compared to the peak concentration for each station (peak/average). The average of these ratios is 1.48. Therefore, with a seasonal variation of 48%, a target phosphorus concentration of 0.034 will be used.

Target Condition

The current steady state concentration of 0.071 mg/l of phosphorus must be reduced to a steady state of 0.034 mg/l to avoid exceeding the 0.05 mg/l phosphorus standard. To attain the target steady state concentration of 0.034mg/l TP, a reduction of 52% is necessary. The percent reduction was calculated by comparing the current condition (0.071mg/l) to the target condition of 0.034 mg/l. The model was used to calculate the percent load reduction required from all sources.

Loading Capacity

The total current allochthonous load, including both residential and forested loads as described above, is 137.6 kg/yr. Reducing the current loading rate by 52% results in an acceptable loading capacity of about 65.8 kg/yr.

Reserve Capacity and Margin of Safety

According to Burlington Township the drainage area is almost completely built out. Future growth will not be a consideration with the types of protection now in place. Therefore the reserve capacity is zero.

A margin of safety is required in order to account for the uncertainty in the loading estimates, physical parameters and the model itself. The margin of safety, as described in EPA guidance, can be either explicit or implicit. This TMDL contains an implicit margin of safety by using critical conditions, an over-estimated residential load, total phosphorus, and dredging the lake.

Critical conditions are accounted for by comparing maximum concentrations to mean concentrations and adjusting the target concentration accordingly (0.034 mgTP/L instead of 0.05 mgTP/L). In addition to the conservative approach used for critical conditions, the loading estimates themselves are quite conservative, since the export coefficient for medium density urban land use was used for all non-forested land use. The actual land use is a mixture of low and medium density residential.

Also, the TMDL is calculated using estimates of total phosphorus loads from residential and forested land uses. Use of total phosphorus, as both the endpoint for the standard

and in the loading estimates is a conservative assumption. Use of total phosphorus does not distinguish readily available phosphorus (e.g. dissolved) which is available for algal growth from unavailable phosphorus (e.g. particulate).

In addition to these conservative steps, the removal of the unconsolidated sediment by dredging is planned for the Lower Lake in the near future. The dredging will remove the macrophytes and the contribution of phosphorus cycled through the macrophytes. The removal of unconsolidated sediments will convert the sediments from a net source into a net sink of phosphorus due to settling. The median of the range of values estimated in the Clean Lakes Report for sediment load before dredging is 16.8 kg/yr. The load reduction after dredging will exceed this value, since the sediments will provide a net phosphorus sink. Even assuming that removing the unconsolidated sediment only decreases the sediment load by 16 kg/yr, that is equivalent to 24% of the loading capacity.

Load Allocations

EPA regulations, 40 CFR § 130.2(i), state that "TMDLs can be expressed in terms of either mass per time, toxicity, or other appropriate measure." For lake nutrient TMDLs it is appropriate to express the TMDL on a yearly basis. Long-term average pollutant loadings are typically more critical to overall lake water quality. Also, most available empirical lake models, such as the Walker model used in this analysis, use annual loads rather than daily loads to estimate in-lake concentrations.

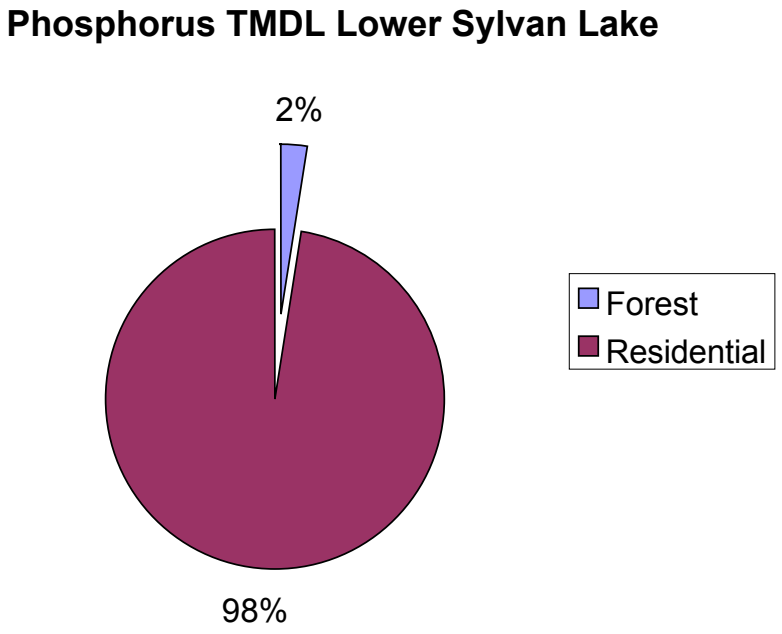
The TMDL is therefore calculated as follows (see figure 2):

TMDL = loading capacity
= Sum of the load allocations + margin of safety + reserve capacity

where:

Loading capacity = 65.8 kg/yr
Sum of load allocations = 65.8 kg/yr
= 64.2 kg/yr residential +1.6 kg/yr forest
Margin of safety = (sediment source reduction of about 24% of loading capacity)
Reserve capacity = 0

Figure 2



In order to attain the TMDL a 53% reduction of the residential load is necessary.

Implementation Plan

An implementation plan is not required at this time as part of the TMDL; however, for completeness, options for addressing the phosphorus exceedances are listed below. A schedule will be developed as needed, working with the township and county governments and with the community through the public process associated with watershed management.

The NJDEP has awarded approximately $900,000 to Burlington Township for dredging to remove the phosphorus-rich sediments from the Lower Sylvan Lake. At least 46,700 cubic yards of sediment are to be removed. The expected completion date of this project is the summer of 2001. Since all the unconsolidated sediments will be removed, the Department has reasonable assurance that the dredging will achieve the predicted reduction of phosphorus load from the sediment necessary to provide an ample margin of safety.

The Clean Lakes Phase I Study for Sylvan Lakes proposed a lake restoration plan to lower the phosphorus to acceptable level (F.X. Browne, 1986). The township and county have taken the following actions in accordance with that restoration plan:

- The township and the county adopted and enforce ordinances to ensure that proper erosion and sediment control practices are designed, constructed and maintained to limit erosion and sedimentation during construction and as part of site design. Since the Clean Lakes Phase I Study was approved, the area has reached build-out. The incremental development, which occurred after June of 1995, was subject to the erosion and sediment control ordinances. Development in accordance with these ordinances is expected to reduce loads by 60% compared to literature coefficients. In the future the erosion and sediment control practices will be applied during construction related to rehabilitation and redevelopment of existing land uses. Therefore, a portion of the load reduction needed from residential sources has been attained.

- A comprehensive environmental education program was developed and implemented for both lakes, including an environmental education curriculum, teacher training, development and installation of environmental kiosks, and planning and construction of a nature trail around the lakes.

A year-long post-dredging monitoring program will be set up by NJDEP to sample for phosphorous to ascertain the reduction levels. If the phosphorous levels are acceptable, then the Department will pursue de-listing for the subsequent 303(d) list.

However, if the levels are unacceptable, a tiered BMP implementation approach will be taken and monitoring will continue to determine if further reductions are needed. The recommended actions are as follows:

1. Cleaning and maintenance program of all detention basins in the lake's watershed to increase their efficiency.
2. Continue public education efforts, particularly regarding goose management and pets. Lawn care education to encourage the use of low or no phosphorus fertilizer (i.e. 15-0-0). Possible addition of a "no mow" buffer strip around the lake.
3. Planting of riparian buffers: installation of vegetative filters in public areas that are a minimum of thirty feet wide, then in private areas as necessary. The Department recommends 75 foot wide buffers where practical.
4. A no phosphorus ordinance to prohibit the use of phosphorus containing fertilizers throughout the watershed.

The Department has reasonable assurance that implementation of these measures will achieve the load reductions needed to attain conformance with the water quality criterion. These steps may be taken one by one as necessary with monitoring after each step to see if the required phosphorus reductions have been attained. It is very possible that not all these actions will be taken.References Cited

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