NEOSHO RIVER BASIN TOTAL MAXIMUM DAILY LOAD

Water Body: Altamont City Lake (Stations #1 Main, #2 North, and #3 West)
Water Quality Impairment: Eutrophication

Subbasin: Middle Neosho

County: Labette

HUC 8: 11070205

HUC 11 (HUC 14)**:** **050** (030)

Ecoregion: Central Irregular Plains, Cherokee Plains (40d)

Drainage Area: Approximately 1.2 square miles.

Conservation Pools:

Summary of Conservation Pool Information

Station	Surface Area (acres)	Maximum Depth (m)	Mean Depth (m)	Retention Time (years)
Altamont City Lake #1(MAIN)	12.5	4.0	1.7	0.40
Altamont City Lake #2 (NORTH)	10.2	3.0	1.3	0.14
Altamont City Lake #3 (WEST)*	10.4	4.0	1.7	0.51

* Impaired but not on 1998 303(d) List

Designated Uses: Primary and Secondary Contact Recreation; Expected Aquatic Life Support; Food Procurement

Authority: City of Altamont

1998 303d Listing: Table 4 - Water Quality Limited Lakes

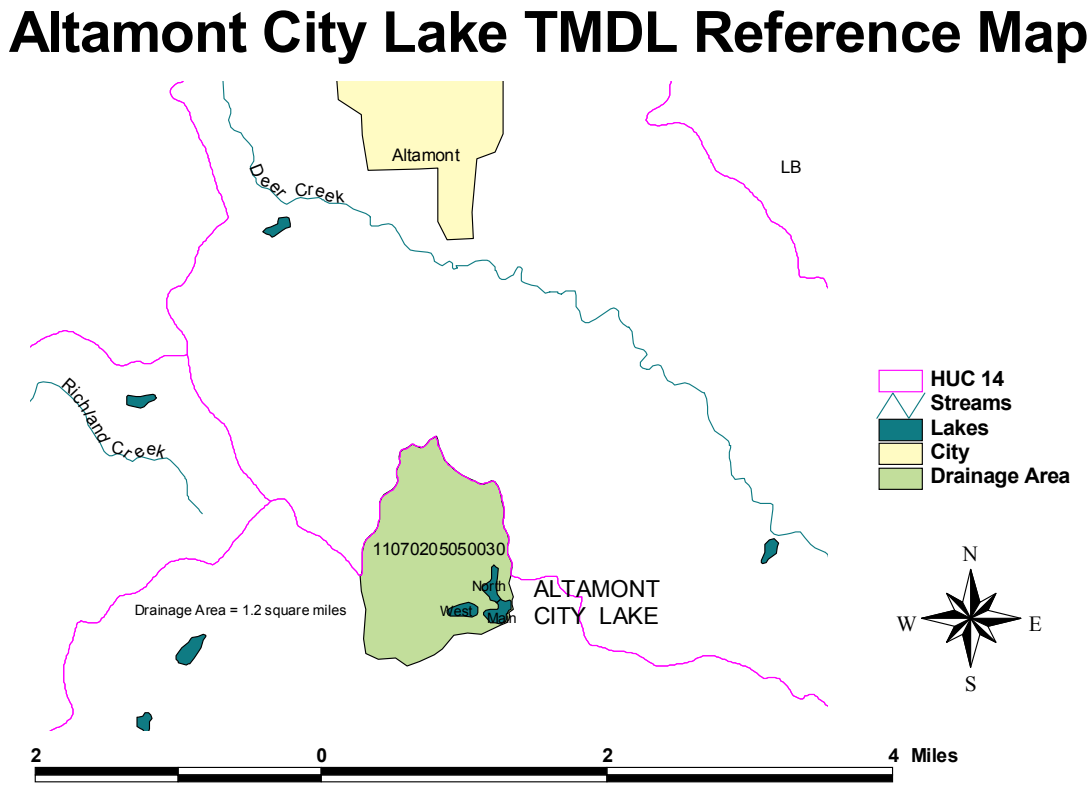
Impaired Use: All uses are impaired to a degree by eutrophication

Water Quality Standard: Nutrients - Narrative: The introduction of plant nutrients into streams, lakes, or wetlands from artificial sources shall be controlled to prevent the accelerated succession or replacement of aquatic biota or the production of undesirable quantities or kinds of aquatic life. (KAR 28-16-28e(c)(2)(B)).

The introduction of plant nutrients into surface waters designated for primary or secondary contact recreational use shall be controlled to

prevent the development of objectionable concentrations of algae or algal by-products or nuisance growths of submersed, floating, or emergent aquatic vegetation. (KAR 28-16-28e(c)(7)(A)).

Figure 1



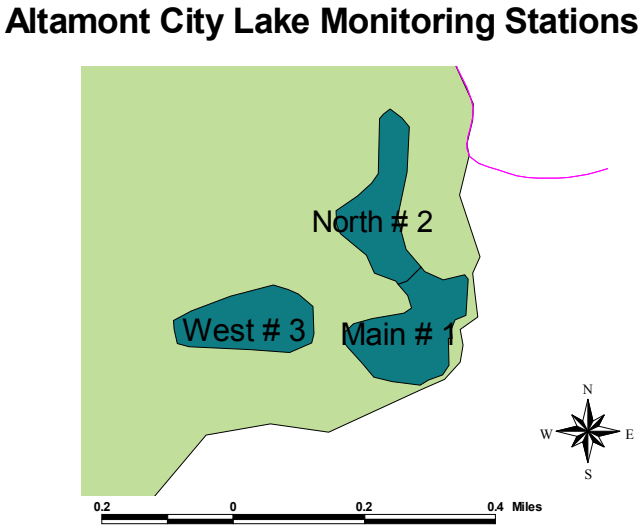
2. CURRENT WATER QUALITY CONDITION AND DESIRED ENDPOINT

Current Condition:

Summary of Sampling Data from KDHE Lake Monitoring Program

Station	Station Number	Date	Phosphorus (mg/L)	Chlorophyll a (ppb)	Trophic State Index	Secchi Disc Depth (m)	Level of Eutrophication
Altamont City Lake #1 (MAIN)	LM068001	7/24/89	0.07	79.20	73.46	0.47	Hypereutrophic
Altamont City Lake #2 (NORTH)	LM068101	7/24/89	N/A	49.90	68.93	0.47	Hypereutrophic
Altamont City Lake #3 (WEST)	LM068201	7/24/89	0.04	12.15	55.07	0.77	Fully Eutrophic

Figure 2



The average total phosphorus and chlorophyll a concentrations were higher at the main and north stations. During the use attainability assessment in 2002, a dam was not seen between the north and main lakes. At these two stations, the chlorophyll a to total phosphorus yield appears high. The yield is moderate at the west station; the total phosphorus and chlorophyll a concentrations were lower as well. The clarity (Secchi Disc Depth) is worse at the main and north stations versus the west station. The Trophic State Index plots for main and north station indicate that total phosphorus is the limiting nutrient. Clay turbidity is the limiting factor at the west station (Appendix B).

The Trophic State Index is derived from the chlorophyll a concentration. Trophic state assessments of potential algal productivity were made based on chlorophyll a concentrations, nutrient levels and values of the Carlson Trophic State Index (TSI). Generally, some degree of eutrophic conditions is seen with chlorophyll a concentrations over 7 μg/L and hypereutrophy occurs at levels over 30 μg/L. The Carlson TSI, derives from the chlorophyll concentrations and scales the trophic state as follows:

1. Oligotrophic	TSI < 40
2. Mesotrophic	TSI: 40 - 49.99
3. Slightly Eutrophic	TSI: 50 - 54.99
4. Fully Eutrophic	TSI: 55 - 59.99
5. Very Eutrophic	TSI: 60 - 63.99
6. Hypereutrophic	TSI: ≥ 64

Interim Endpoints of Water Quality (Implied Load Capacity) at Altamont City Lake over 2007 - 2011:

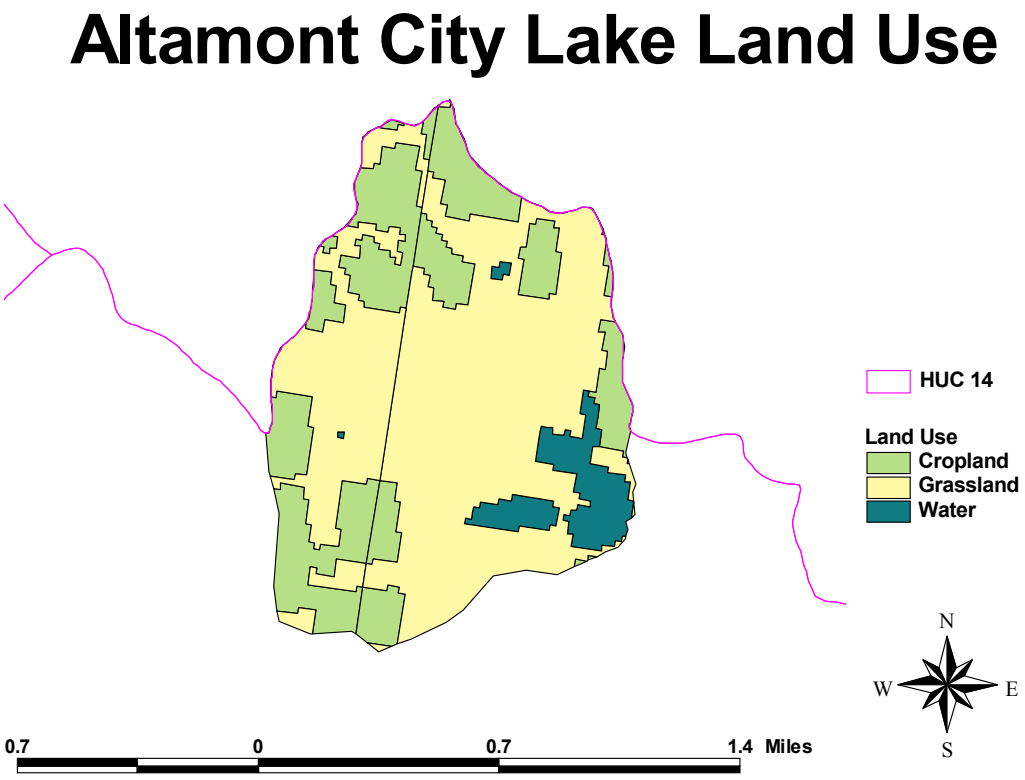
In order to improve the trophic condition of the lake from its current hypereutrophic status in the north and main stations, the desired endpoint will be to maintain summer chlorophyll a concentrations at or below 12 μg/L. Refined endpoints will be developed in 2007 to reflect additional sampling and artificial source assessment and confirmation of impaired status of lake.

3. SOURCE INVENTORY AND ASSESSMENT

Land Use: The watershed around Altamont City Lake has a moderate potential for nonpoint source pollutants. An annual phosphorus load of 8,939 pounds per year is necessary to correspond to the concentrations seen in the lake (Appendix C).

Phosphorus from animal waste is a contributing factor. Sixty-three percent of land around the lake is grassland (Figure 3). The grazing density of livestock is high in summer and winter. Another source of phosphorus within Altamont City Lake is probably runoff from agricultural lands where nutrients have been applied. Land use coverage analysis indicates that 29.9% of the watershed is cropland.

Figure 3



The population density is low, 10.6 people per square mile. The population of Altamont is expected to decrease 4.1% through 2020.

Contributing Runoff: The watershed's average soil permeability is 0.8 inches/hour according to NRCS STATSGO database. About 99.3% of the watershed produces runoff even under

relatively low (1.5''/hr) potential runoff conditions. Runoff is chiefly generated as infiltration excess with rainfall intensities greater than soil permeabilities. As the watersheds' soil profiles become saturated, excess overland flow is produced. Generally, storms producing less than 0.5"/hr of rain will generate runoff from only 4.5% of this watershed, chiefly along the stream channels.

Background Levels: The atmospheric phosphorus and geological formations (i.e., soil and bedrock) may contribute to phosphorus loads. Carp may cause some resuspension of sediment.

4. ALLOCATION OF POLLUTANT REDUCTION RESPONSIBILITY

Phosphorus is allocated under this TMDL. The Load Capacity is 675.1 pounds per year of phosphorus. More detailed assessment of sources and confirmation of the trophic state of the lake must be completed before detailed allocations can be made. The general inventory of sources within the drainage does provide some guidance as to areas of load reduction.

Point Sources: A current Wasteload Allocation of zero is established by this TMDL because of the lack of point sources in the watershed. Should future point sources be proposed in the watershed and discharge into the impaired segments, the current wasteload allocation will be revised by adjusting current load allocations to account for the presence and impact of these new point source dischargers.

Nonpoint Sources: Water quality violations are predominantly due to nonpoint source pollutants. Background levels may be attributed to atmospheric and geological sources. The assessment suggests that animal waste and cropland contribute to the elevated total phosphorus concentrations in the lake. Generally a Load Allocation of 607.6 pounds of total phosphorus per year, leading to an 92.4% reduction, is necessary to reach the endpoint.

Defined Margin of Safety: The margin of safety provides some hedge against the uncertainty of variable annual total phosphorus and the chlorophyll a endpoint. Therefore, the margin of safety will be 67.5 pounds per year of total phosphorus taken from the load capacity subtracted to compensate for the lack of knowledge about the relationship between the allocated loadings and the resulting water quality.

State Water Plan Implementation Priority: Because more data are needed to determine the trophic state of the lake, the Altamont City Lake TMDL will be a Low Priority for implementation.

Unified Watershed Assessment Priority Ranking: This watershed lies within the Middle Neosho (HUC 8: 11070205) with a priority ranking of 24 (Medium Priority for restoration).

Priority HUC 11s: The watershed is within HUC 11 (050).

5. IMPLEMENTATION

Desired Implementation Activities
There is some potential for reducing pollutant loads to this lake through the use of agricultural practices. Some of the recommended agricultural practices are as follows:

1. Implement soil sampling to recommend appropriate fertilizer applications on cropland.
2. Maintain conservation tillage and contour farming to minimize cropland erosion.
3. Install grass buffer strips along streams.
4. Reduce activities within riparian areas.
5. Implement nutrient management plans to manage manure application to land.

Implementation Programs Guidance
Until the 2007 assessment of the continuation of monitoring is made, no direction can be made to those implementation programs.

Time Frame for Implementation: Continued monitoring over the years from 2002 to 2007.

Targeted Participants: Primary participants for implementation will be agricultural producers who are within the drainage of the lake. A detailed assessment of sources will be conducted by KDHE over 2002-2007.

Milestone for 2007: The year 2007 marks the midpoint of the ten-year implementation window for the watershed. At that point in time, sampled data from Altamont City Lake will be reexamined to confirm the impaired status of the lake. Should the case of impairment remain, source assessment, allocation, and implementation activities will ensue.

Delivery Agents: Depending upon confirmation of impairment and assessment of probable sources, the primary delivery agents for program participation will be the City of Altamont, conservation districts for programs of the State Conservation Commission, and the Natural Resources Conservation Service.

Reasonable Assurances:

Authorities: The following authorities may be used to direct activities in the watershed to reduce pollutants.

> 1. K.S.A. 65-171d empowers the Secretary of KDHE to prevent water pollution and to protect the beneficial uses of the waters of the state through required treatment of sewage and established water quality standards and to require permits by persons having a potential to discharge pollutants into the waters of the state.
>
> 2. K.S.A. 2-1915 empowers the State Conservation Commission to develop programs to assist the protection, conservation and management of soil and water resources in the state, including riparian areas.

3. K.S.A. 75-5657 empowers the State Conservation Commission to provide financial assistance for local project work plans developed to control nonpoint source pollution.

4. K.S.A. 82a-901, et seq. empowers the Kansas Water Office to develop a state water plan directing the protection and maintenance of surface water quality for the waters of the state.

5. K.S.A. 82a-951 creates the State Water Plan Fund to finance the implementation of the *Kansas Water Plan.*

6. The *Kansas Water Plan* and the Neosho Basin Plan provide the guidance to state agencies to coordinate programs intent on protecting water quality and to target those programs to geographic areas of the state for high priority in implementation.

Funding: The State Water Plan Fund annually generates $16-18 million and is the primary funding mechanism for implementing water quality protection and pollutant reduction activities in the state through the *Kansas Water Plan*. The state water planning process, overseen by the Kansas Water Office, coordinates and directs programs and funding toward watersheds and water resources of highest priority. Typically, the state allocates at least 50% of the fund to programs supporting water quality protection. This watershed and its TMDL are a Low Priority consideration and should not receive funding until after 2007.

Effectiveness: Effectiveness of corrective actions will depend upon the sources which contribute to the impairment at the lake.

6. MONITORING

Additional data, to establish nutrient ratios, source loading and further determine mean summer lake trophic condition, would be of value prior to 2007. Further sampling and evaluation should occur twice before 2007.

7. FEEDBACK

Public Meetings: Public meetings to discuss TMDLs in the Neosho Basin were held January 9, 2002 in Burlington and March 4, 2002 in Council Grove. An active Internet Web site was established at http://www.kdhe.state.ks.us/tmdl/ to convey information to the public on the general establishment of TMDLs and specific TMDLs for the Neosho Basin.

Public Hearing: Public Hearings on the TMDLs of the Neosho Basin were held in Burlington and Parsons on June 3, 2002.

Basin Advisory Committee: The Neosho Basin Advisory Committee met to discuss the TMDLs in the basin on October 2, 2001, January 9, March 4, and June 3, 2002.

Discussion with Interest Groups: Meetings to discuss TMDLs with interest groups include:
Kansas Farm Bureau: February 26 in Parsons and February 27 in Council Grove

Milestone Evaluation: In 2007, evaluation will be made as to the degree of impairment which has occurred within the watershed and current condition of Altamont City Lake. Subsequent decisions will be made regarding the implementation approach and follow up of additional implementation in the watershed.

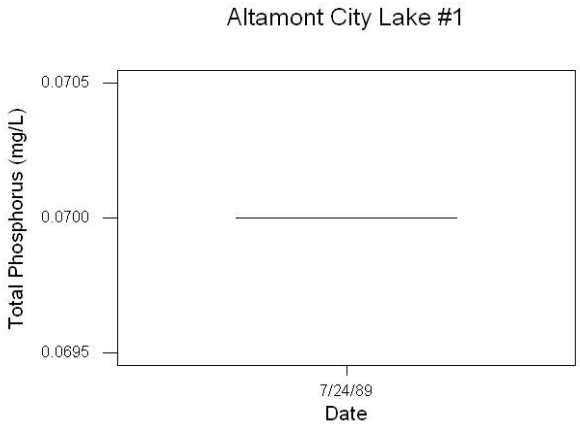
Consideration for 303(d) Delisting: The lake will be evaluated for delisting under Section 303(d), based on the monitoring data over the period 2007-2011. Therefore, the decision for delisting will come about in the preparation of the 2012 303(d) list. Should modifications be made to the applicable water quality criteria during the ten-year implementation period, consideration for delisting, desired endpoints of this TMDL and implementation activities may be adjusted accordingly.

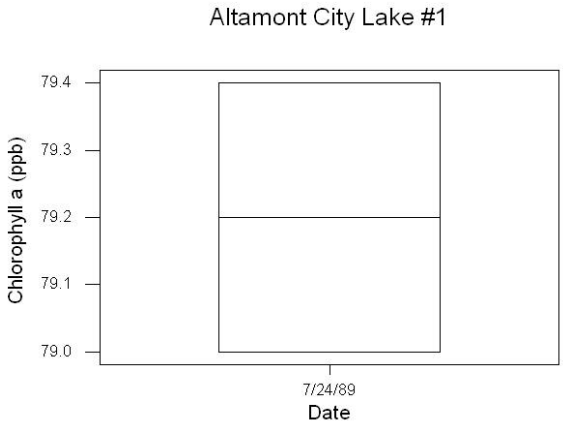
Incorporation into Continuing Planning Process, Water Quality Management Plan and the Kansas Water Planning Process: Under the current version of the Continuing Planning Process, the next anticipated revision will come in 2003 which will emphasize revision of the Water Quality Management Plan. At that time, incorporation of this TMDL will be made into both documents. Recommendations of this TMDL will be considered in *Kansas Water Plan* implementation decisions under the State Water Planning Process for Fiscal Years 2003-2007.

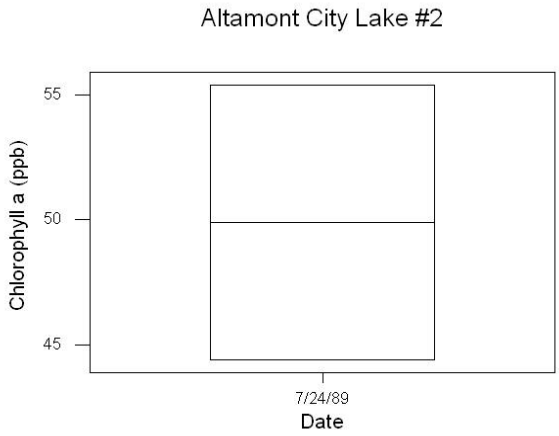
Bibliography

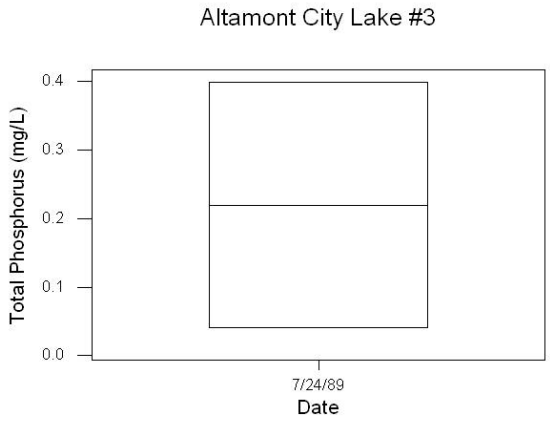
Liscek, Bonnie C. Methodology Used in Kansas Lake TMDLs [web page] Jul. 2001; http://www.kdhe.state.ks.us/tmdl/eutro.htm [Accessed 17 May 2001].

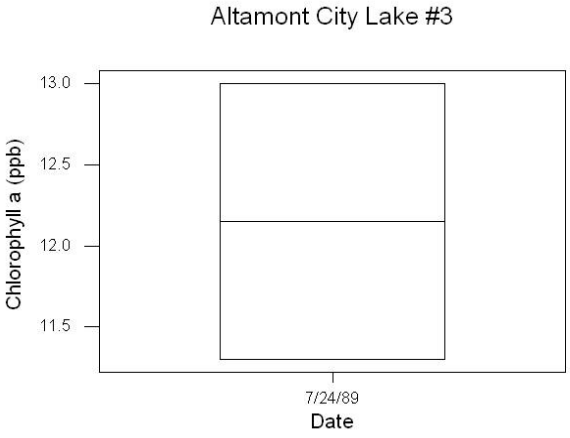
Appendix A - Boxplots



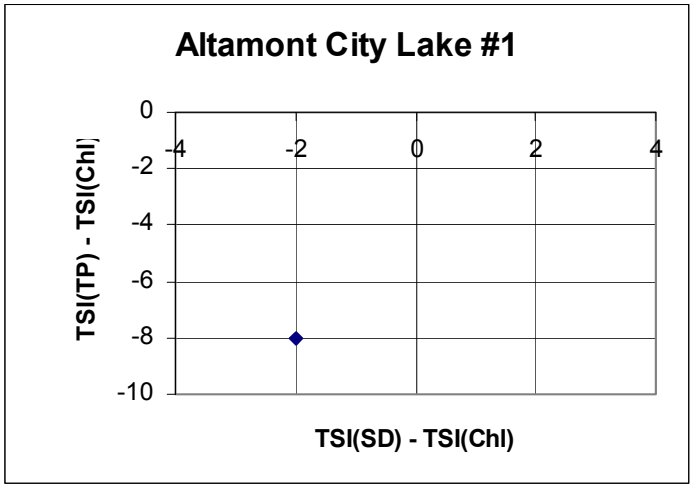




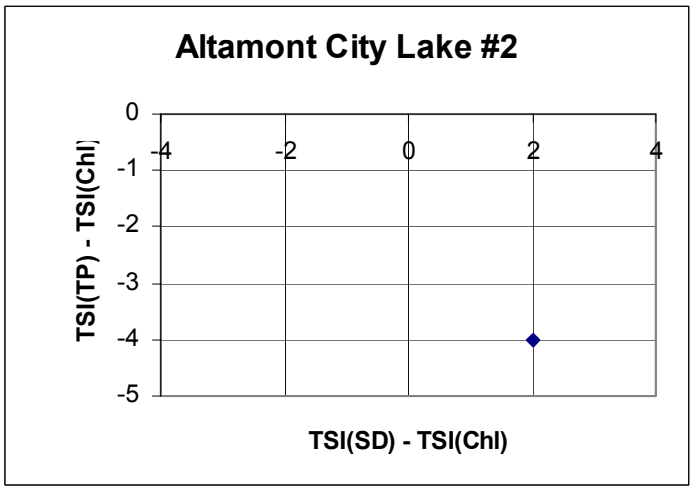

Altamont City Lake #3
Total Phosphorus (mg/L)
0.4
0.3
0.2
0.1
0.0
7/24/89
Date

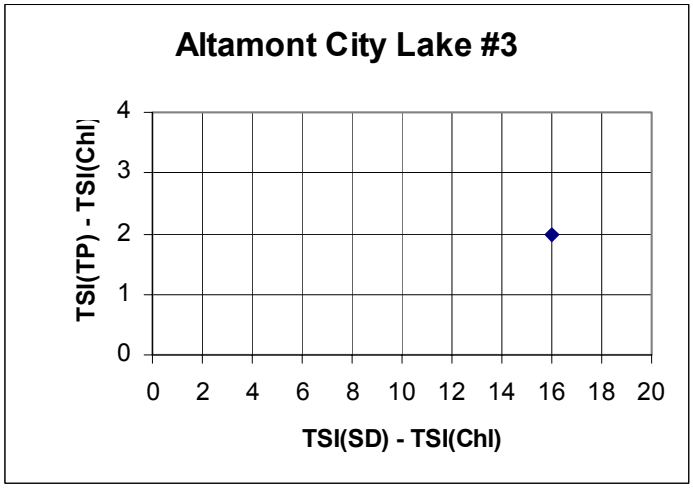

Altamont City Lake #3
Chlorophyll a (ppb)
13.0
12.5
12.0
11.5
7/24/89
Date

Appendix B - Trophic State Index Plots



The Trophic State Index plots for station #1 (Main) and #2 (North) indicate that total phosphorus is the limiting nutrient.





The Trophic State Index plot for station #3 indicates that clay turbidity is the limiting factor.

Appendix B - Input for CNET Model

	Value Input into CNET Model		
Parameter	**#1 Main**	**#2 North**	**#3 West**
Drainage Area (km^2)	3.15	3.15	3.15
Precipitation (m/yr)	0.99	0.99	0.99
Evaporation (m/yr)	1.30	1.30	1.30
Unit Runoff (m/yr)	0.25	0.25	0.25
Surface Area (km^2)	0.051	0.041	0.042
Mean Depth (m)	1.7	1.3	1.7
Depth of Mixed Layer (m)	1.69	1.23	1.69
Depth of Hypolimnion (m)	0.46	0.34	0.46
Observed Phosphorus (ppb)	70.00	70.00	40
Observed Chlorophyl-a (ppb)	79.20	49.9	12.15
Observed Secchi Disc Depth (m)	0.47	0.47	0.77

Appendix C - Output for CNET Models

Station	Current Load (kg/yr)	Load Capacity (kg/yr)
ALTAMONT CITY LAKE #1(MAIN)	7296.89	196.15
ALTAMONT CITY LAKE #2 (NORTH)	1377.43	217.70
ALTAMONT CITY LAKE #3 (WEST)	264.68	261.21
Total	**8939.00**	**675.06**

Approved September 30, 2002