NEOSHO RIVER BASIN TOTAL MAXIMUM DAILY LOAD

Water Body: Parsons Lake
Water Quality Impairment: Siltation

Subbasin: Middle Neosho

County: Neosho

HUC 8: 11070205

HUC 11 (HUC 14)**:** **040** (010)

Ecoregion: Central Irregular Plains/Osage Cuestas (40b)

Drainage Area: Approximately 37.0 square miles.

Conservation Pool: Area = 799 acres
Maximum Depth = 5.5 meters (18 feet)
Mean Depth = 2.1 meters (6.9 feet)
Retention Time = 0.32 years (3.8 months)

Designated Uses: Primary and Secondary Contact Recreation; Expected Aquatic Life Support; Drinking Water; Food Procurement; Industrial Water Supply Use

Authority: City of Parsons

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

Impaired Use: Aquatic Life Support and Primary and Secondary Contact Recreation

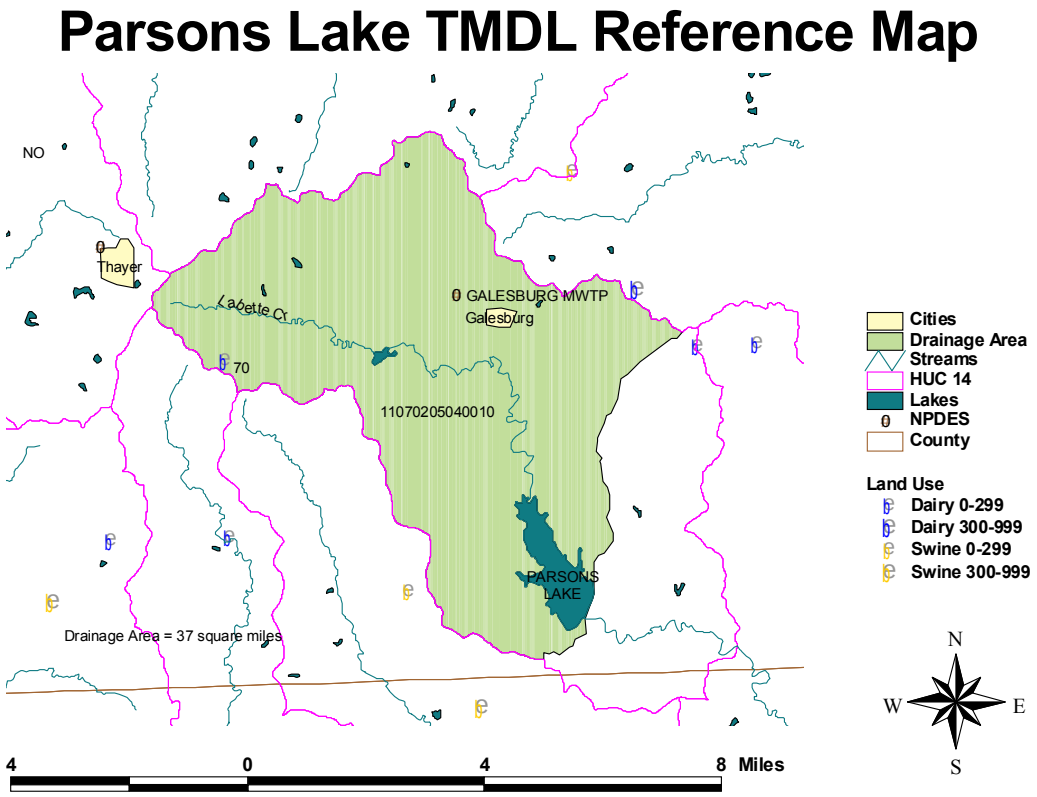
Water Quality Standard: Suspended solids - Narrative: Suspended solids added to surface waters by artificial sources shall not interfere with the behavior, reproduction, physical habitat or other factor related to the survival and propagation of aquatic or semi-aquatic or terrestrial wildlife. (KAR 28-16-28e(c)(2)(D)).

2. CURRENT WATER QUALITY CONDITION AND DESIRED ENDPOINT

Monitoring Sites: Station 041401 in Parsons Lake (Figure 1).

Period of Record Used: Three surveys during 1991 - 2000.

Figure 1



Current Condition: Surface water in Parsons Lake has moderate turbidity, dominated by inorganic materials because the lake receives a steady inflow of silt. The turbidity decreased in 2000, and the total suspended solids concentrations have remained relatively constant. The lake is light limited. The average transparency (Secchi Disc depth) is 22 cm, the average turbidity is 51.4 formazin turbidity units, and the average total suspended solid concentration is 21.7 mg/L. See Appendix A and B and the table below. Lakes are considered to have a siltation problem if they meet the following criteria: chronically turbid, trophic state index plots indicate light limitation, average chlorophyll a concentrations less than 7.2 ppb, and Secchi Disc Depth less than 0.5 meters. Parsons Lake is deemed to be argillotrophic, as its average chlorophyll a concentration is 6.0 ppb (TSI = 48.15), while its average total phosphorus concentration is 134 ppb.

Average Concentrations of Samples from the KDHE Lake Monitoring Program

Date	Average Total Suspended Solids (mg/L)	Average Turbidity (formazin turbidity units)	Secchi Disc Depth (m)
9/10/91	19	54.3	0.25
7/16/96	22	57.3	0.10
6/27/00	28	34.0	0.31

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

In order to improve the quality of the water column, the endpoint for Parsons Lake will be an increase in average transparency as measured by Secchi Disc Depth of 0.30 meter. The current turbidity impairment impedes primary productivity and dampens the support of aquatic life within the lake. However, a concomitant reduction in phosphorus loading must accompany any reduction in sediment loads and accompanying siltation. These phosphorus load reductions are specified in the Parsons Lake Eutrophication TMDL. Much of the phosphorus entering Parsons Lake is attached to sediment. In reducing sediment loads, the associated phosphorus loads should also be reduced, reflected in reduced in-lake total phosphorus concentrations. Modeling with CNET predicts that reduction of phosphorus levels to the 2000 conditions, should allow Secchi Disc depths to reach 0.3 meter. This increased clarity will boost biological productivity in the lake without causing the inception of excessive eutrophic conditions.

Additionally, sediment accumulation in the lake reduces the reservoir volume, and limits accessibility to portions of the lake which have silted in. Additionally, accumulated sediment contributes to recycling contributes to recycling of nutrients within the lake. Therefore, reduction of the turbidity improves the quality of the lake and extends the utility as a water supply and recreation facility.

This TMDL endpoint meets water quality standards as measured and determined by Kansas Water Quality Assessment protocols. These assessment protocols are similar to those used to cite the stream segments in this watershed as impaired on the Kansas 1998 Section 303(d) list.

Seasonal variation in the endpoint is not established by this TMDL. This endpoint can be reached as a result of expected reductions in loading from the various sources in the watershed resulting from implementation of corrective actions and Best Management Practices, as directed by this TMDL. Achievement of the endpoints indicates loads are within the loading capacity of the stream, water quality standards are attained and full support of the designated uses of the stream has been restored, therefore the narrative water quality standard pertaining to suspended solids would be attained.

3. SOURCE INVENTORY AND ASSESSMENT

NPDES: One NPDES permitted facility is located within the watershed. The Galesburg Wastewater Treatment Plant is a three-cell lagoon. Although it has a design flow of 0.024 MGD, the plant rarely discharges. The permit for the plant will expire December 31, 2003. If Galesburg WTP discharges 80 mg/L of total suspended solids (the monthly average permit limit) at design flow, then it would contribute an estimated 16 pounds per day.

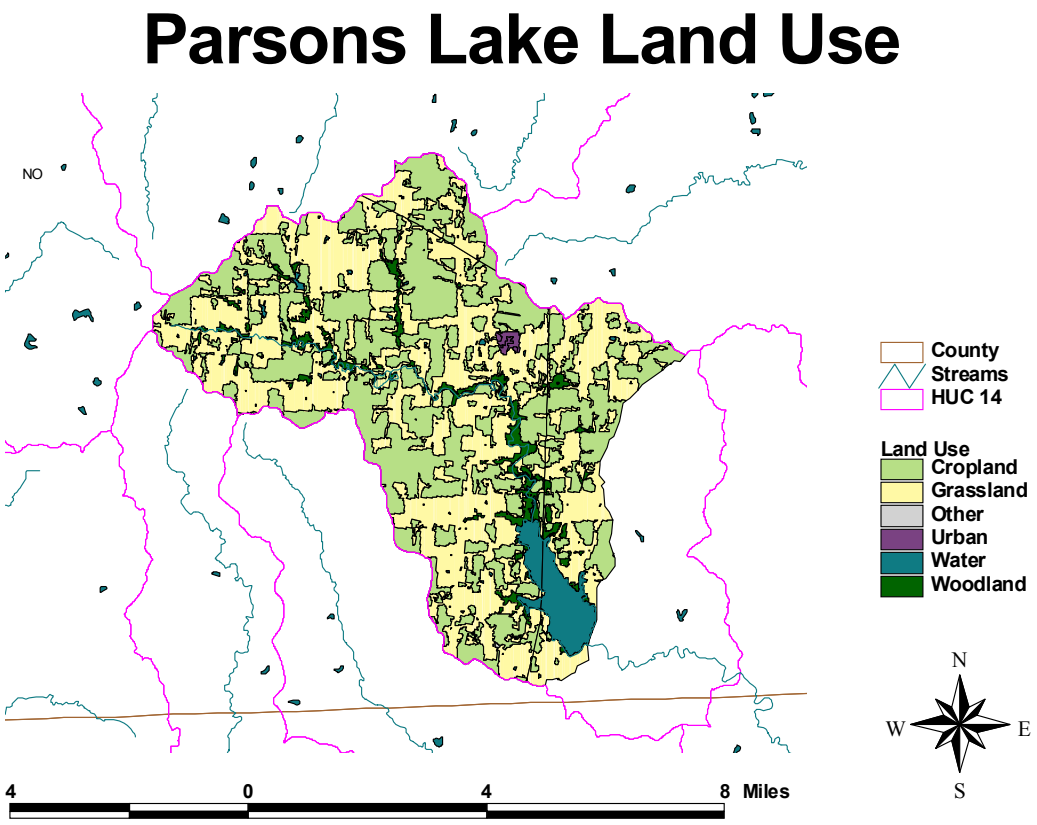


Figure 2

Land Use: The siltation impairment is most likely due to cropland that is adjacent to the streams that drain into Parsons Lake. Soil from exposed land runs-off into the lake, increasing the turbidity and concentration of total suspended solids and decreasing the transparency. Land use coverage analysis indicates that 42.3% of the watershed is cropland, and 48.8% is grassland (Figure 2). More woodland and grassland are needed around the streams to prevent erosion.

Sediment from urban land may get transported into the watershed. The City of Galesburg is expecting no population growth to the year 2020. The population density within the watershed is 13.4 people per square mile. Less than one percent of the watershed is urban.

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 4.5% of this watershed, chiefly along the stream channels.

Background Levels: Carp may cause some resuspension of sediment. Background levels of total suspended solids come from geological sources. Sediment becomes suspended during high flow events as soil along the banks is eroded.

4. ALLOCATION OF POLLUTANT REDUCTION RESPONSIBILITY

The load capacity of Parsons Lake is 34.0 formazin turbidity units. When the turbidity is reduced as specified in this TMDL, the clarity of the lake will improve. Reducing the phosphorus loading, as detailed in the Parsons Lake Eutrophication TMDL, will insure that the algal community will not increase as the clarity improves. More detailed assessment of sources and confirmation of the siltation impairment 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: Because Galesburg WTP rarely discharges, it is unlikely that this facility is contributing to the siltation impairment. Ongoing inspections and monitoring of this NPDES site will be made to ascertain the contributions that have been made by the source. The Galesburg Waste Treatment Plant should comply with its current permit. No reduction in load will be required at this time. Therefore, the Wasteload Allocation should be at 16 pounds of total suspended solids per day.

Nonpoint Sources: Siltation loading comes predominantly from nonpoint source pollution. Given the runoff characteristics of the watershed, overland runoff can easily carry sediment into the streams. The Load Allocation within the lake is turbidity levels not to exceed 30.6 formazin turbidity units, a 61% reduction from current condition.

Defined Margin of Safety: The margin of safety provides some hedge against the uncertainty of the Secchi disc depth endpoint. Therefore, the margin of safety will be 3.4 formazin turbidity units (10%) taken from the load capacity to ensure that adequate load reduction occurs to meet the endpoint.

State Water Plan Implementation Priority: Because Parsons Lake has multiple impairments

and a complex watershed, this TMDL will be a Medium 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 (040).

5. IMPLEMENTATION

Desired Implementation Activities

There is a very good potential that agricultural best management practices will improve the water quality in Parsons Lake. Some of the recommended agricultural practices are as follows:

1. Maintain conservation tillage and contour farming to minimize cropland erosion.
2. Install grass buffer strips along streams.
3. Reduce activities within riparian areas.

Implementation Programs Guidance

Nonpoint Source Pollution Technical Assistance - KDHE

a. Support Section 319 demonstration projects for reduction of sediment runoff from agricultural activities as well as nutrient management.
b. Provide technical assistance on practices geared to establishment of vegetative buffer strips.

Water Resource Cost Share and Nonpoint Source Pollution Control Program - SCC

a. Apply conservation farming practices, including terraces and waterways, sediment control basins, and constructed wetlands.
b. Provide sediment control practices to minimize erosion and sediment and nutrient transport.

Riparian Protection Program - SCC

a. Establish or reestablish natural riparian systems, including vegetative filter strips and streambank vegetation.
b. Develop riparian restoration projects.

Buffer Initiative Program - SCC

a. Install grass buffer strips near streams.
b. Leverage Conservation Reserve Enhancement Program to hold riparian land out of production.

Extension Outreach and Technical Assistance - Kansas State University

a. Educate agricultural producers on sediment, nutrient, and pasture management.
b. Provide technical assistance on buffer strip design and minimizing cropland

runoff.

c. Continue to educate residents and landowners about nonpoint source pollution.

Time Frame for Implementation: Water quality improvement activities are encouraged at the local level prior to 2007. Funding for installing pollution reduction practices should be allocated within the lake drainage after the year 2007. Evaluation of sediment sources to lake and identification of potential management techniques should occur prior to 2007.

Targeted Participants: Primary participants for implementation will be agricultural producers within the drainage of the lake. Initial work in 2007 should include local assessments by conservation district personnel and county extension agents to locate within the lake drainage:

1. Total row crop acreage
2. Cultivation alongside lake

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 Parsons Lake should indicate probable sources of siltation and plans in place to initiate implementation.

Delivery Agents: The primary delivery agents for program participation will be the City of Parsons, conservation districts for programs of the State Conservation Commission, and the Natural Resources Conservation Service. Producer outreach and awareness will be delivered by Kansas State Extension.

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 Medium Priority consideration.

Effectiveness: Sediment control has been proven effective through conservation tillage, contour farming, and use of grass waterways and buffer strips. The key to success will be widespread utilization of conservation farming within the watersheds cited in this TMDL.

6. MONITORING

Additional data, to establish sediment loading and further determine mean summer lake trophic condition, would be of value prior to 2007. Further sampling and evaluation should occur once before 2007 and once between 2007 and 2011.

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 implementation which has occurred within the watershed and current condition of Parsons Lake. Subsequent decisions will be made regarding the implementation approach and follow up of additional implementation in the watershed.

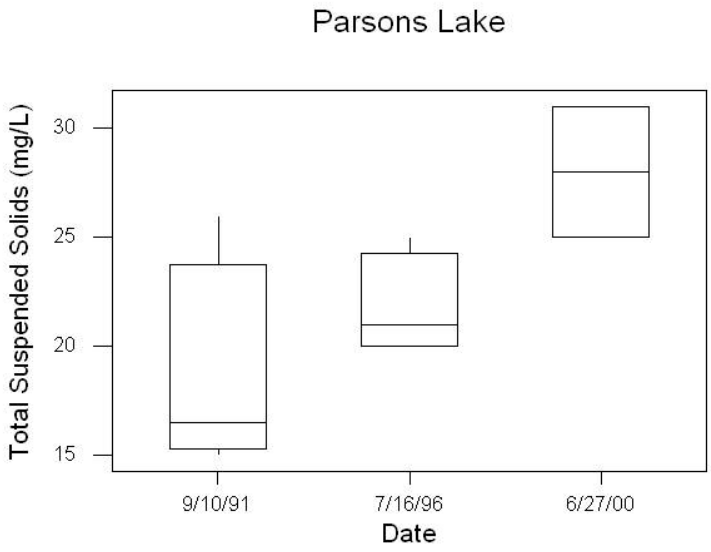
Consideration for 303(d) Delisting: The lake will be evaluated for delisting under Section 303(d), based on the monitoring data over the period 2007-2011. Therefore, the decision for delisting will come about in the preparation of the 2012 303(d) list. Should modifications be made to the applicable water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

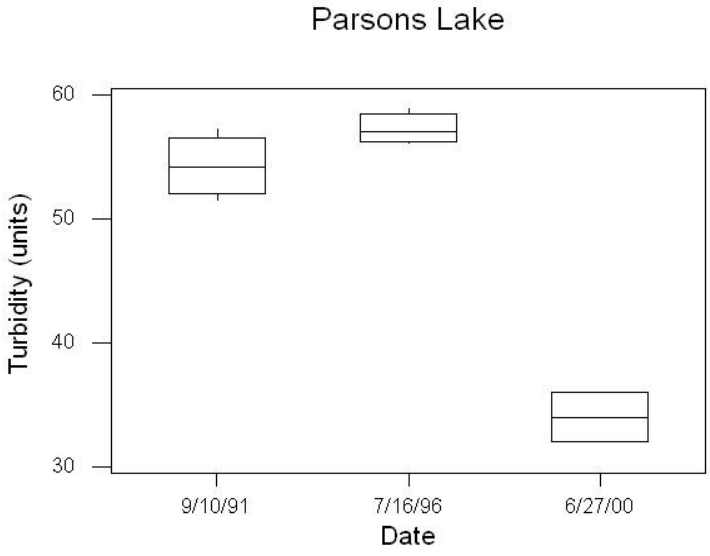
Incorporation into Continuing Planning Process, Water Quality Management Plan and the Kansas Water Planning Process: Under the current version of the Continuing Planning Process, the next anticipated revision will come in 2003 which will emphasize revision of the Water Quality Management Plan. At that 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

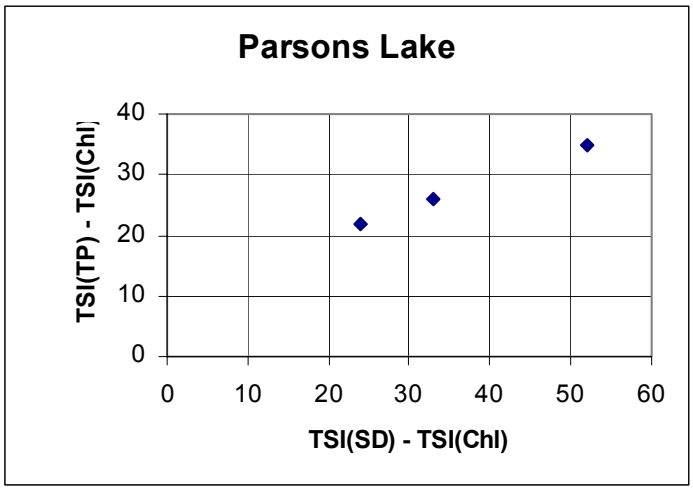
Liscek, Bonnie C. Methodology Used in Kansas Lake TMDLs [web page] Jul. 2001; http://www.kdhe.state.ks.us/tmdl/eutro.htm [Accessed 17 May 2002].

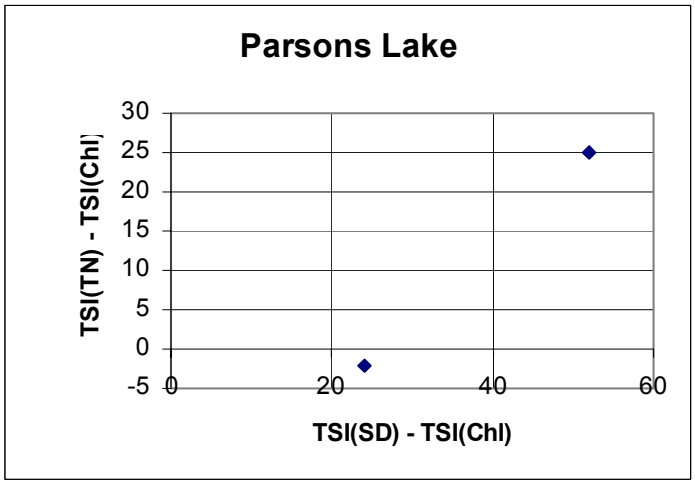
Appendix A - Boxplots





Appendix B - Trophic State Index Plots





The Trophic State Index Plots indicate that light is the limiting factor due to clay turbidity.

Approved September 30, 2002