

UPPER ARKANSAS RIVER BASIN TOTAL MAXIMUM DAILY LOAD

Water Body: Hamilton County State Fishing Lake
Water Quality Impairment: Eutrophication Bundled with Aquatic Plants

1. INTRODUCTION AND PROBLEM IDENTIFICATION

Subbasin: Middle Arkansas-Lake McKinney **County:** Hamilton

HUC 8: 11030001 **HUC 11 (HUC 14):** 010 (080)

Drainage Area: Approximately 15.8 square miles.

Conservation Pool: Area 25 acres, Maximum Depth = 2 meters

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

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)).

2. CURRENT WATER QUALITY CONDITION AND DESIRED ENDPOINT

Level of Eutrophication: Hypereutrophic, Trophic State Index = 77.75

Monitoring Sites: Station 016101 in Hamilton County State Fishing Lake

Period of Record Used: Three surveys during 1997-1999

Current Condition: Hamilton County SFL had elevated chlorophyll a concentrations in 1998 and 1999. The chlorophyll a concentration rose to 48.1 ppb in 1998 and increased to 307.8 ppb in 1999. In 1997, the chlorophyll a concentration was 12.3 ppb, which is below the water quality standard for secondary contact recreation (20 ppb).

The Trophic State Index of 78 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 12 ug/l and hypereutrophy occurs at levels over 30 ug/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 |

Total phosphorus concentrations average 308 ppb. All of the samples taken from the lake were over 100 ppb. The chlorophyll a to total phosphorus yield is high. The total nitrogen to total phosphorus ratio is 18.4, indicating that phosphorus is the primary limiting factor. Light is not limiting, despite high inorganic turbidity during the 1999 survey.

Aquatic plants were very abundant in the 1997-1998 surveys. However, no plants were observed during 1999, when lake level was even lower than previously observed. The decrease in aquatic plants may be due to the introduction of grass carp into the lake. Concurrent with the disappearance of the macrophytes was an increase in chlorophyll levels to >300 ppb.

Interim Endpoints of Water Quality (Implied Load Capacity) at Hamilton County SFL over 2005 - 2009:

In order to improve the trophic condition of the lake from its current hypereutrophic status, the desired endpoint will be summer chlorophyll a concentrations at or below 20 ug/l, corresponding to a trophic state of eutrophic conditions by 2009. Refined endpoints will be developed in 2005 to reflect additional sampling and artificial source assessment and confirmation of impaired status of lake.

3. SOURCE INVENTORY AND ASSESSMENT

Land Use: The watershed has a low to moderate potential for nonpoint source pollution. The primary source of phosphorus within Hamilton County SFL is probably from animal waste. Seventy-seven percent of land around the lake is grassland. The summer grazing density of livestock is average; the winter grazing density is low. Land use coverage analysis indicates that

22% of the watershed is cropland. An annual phosphorus load of 463 pounds per year is necessary to correspond to the concentrations seen in the lake.

Background Levels: Wildlife waste increases the levels of nitrogen and phosphorus in the lake. Trees are located around Hamilton County SFL; leaf litter may be adding to the nutrient load. Geological formations contain small amounts of phosphorus (up to 0.5% of total weight), and may contribute to phosphorus loads.

4. ALLOCATION OF POLLUTANT REDUCTION RESPONSIBILITY

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 wildlife waste and leaf litter. The assessment suggests that cropland and animal waste contribute to the eutrophic state of the lake. Generally a Load Allocation of 279.2 pounds per year, leading to a 33% reduction in available phosphorus 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 loads and the chlorophyll a endpoint. Therefore, the margin of safety will be 31.0 pounds per year of total phosphorus taken from the load capacity to ensure that adequate load reduction occurs to meet the endpoint.

State Water Plan Implementation Priority: Because a more detailed source assessments and additional monitoring of nutrient and algal content and the aquatic plant population is needed, this TMDL will be a Low Priority for implementation

Unified Watershed Assessment Priority Ranking: This watershed lies within the Middle Arkansas-Lake McKinney Subbasin (HUC 8: 11030001) with a priority ranking of 31 (Medium Priority for restoration work).

Priority HUC 11s: The entire watershed is within HUC 11 (010).

5. IMPLEMENTATION

Desired Implementation Activities

Some potential exists for nutrient load reductions from this watershed. However, the lack of water from inadequate hydrologic production appears to be the main cause in the poor water quality conditions found at Hamilton Co. SFL.

Implementation Programs Guidance

Until additional assessment of probable sources and nutrient content is made, no direction can be made to those implementation programs.

Time Frame for Implementation: Pollution reduction practices should be installed within the lake drainage during the years from 2009 to 2013.

Targeted Participants: Primary participants for implementation will be agricultural producers. A detailed assessment of sources will be conducted by KDHE over 2003-2005.

Milestone for 2005: The year 2005 marks the midpoint of the ten-year implementation window for the watershed. At that point in time, sampled data from Hamilton County SFL 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 local officials.

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 Upper Arkansas 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 2005.

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

6. MONITORING

KDHE will collect nutrient and chlorophyll a samples from Hamilton County SFL in 2000. The lake is being surveyed concurrently with the wetland upstream of it for the duration of the EPA funded grant. Additional data, to establish nutrient ratios, source loading and further determine mean summer lake trophic condition, would be of value prior to 2006. Further sampling and evaluation should occur once before 2006.

7. FEEDBACK

Public Meetings: Public meetings to discuss TMDLs in the Upper Arkansas Basin were held March 8 and April 24 in Garden City and April 25 in Great Bend. 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 Upper Arkansas Basin.

Public Hearing: A Public Hearing on the TMDLs of the Upper Arkansas Basin was held in Garden City on May 31, 2000.

Basin Advisory Committee: The Upper Arkansas Basin Advisory Committee met to discuss the TMDLs in the basin on October 6, 1999; January 11 and 24, 2000; March 8, 2000;

Discussion with Interest Groups: Meetings to discuss TMDLs with interest groups include:

Associated Ditches of Kansas: October 6, 1999; January 28, 2000; March 8, 2000; and April 24, 2000.
Agriculture: February 28, 2000
Environmental: March 9, 2000

Milestone Evaluation: In 2005, evaluation will be made as to the degree of impairment which has occurred within the drainage and current condition of Hamilton County SFL. Subsequent decisions will be made regarding implementation approach and follow up of additional implementation.

Consideration for 303d Delisting: Hamilton County SFL will be evaluated for delisting under Section 303d, based on the monitoring conditions before 2005. Therefore, the decision for delisting will come about in the preparation of the 2006 303d list. Should modifications be made to the applicable nutrient criterion 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 2002 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 after Fiscal Year 2005.

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