

UPPER ARKANSAS RIVER BASIN TOTAL MAXIMUM DAILY LOAD

Water Body: Jetmore Lake Water Quality Impairment: Aquatic Plants

1. INTRODUCTION AND PROBLEM IDENTIFICATION

Subbasin: Buckner

County: Hodgeman

HUC 8: 11030006

HUC 11 (HUC 14): 030 (010)

Drainage Area: Approximately 34.1 square miles.

Conservation Pool: Area 44 acres, Maximum Depth = 5 meters

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

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

Impaired Use: Expected Aquatic Life Support

Water Quality Standard: Levels of water quality in surface waters of the state shall be maintained to protect the existing uses of those surface waters. (KAR 28-16-28c(a)(1)(A)).

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: Fully Eutrophic, Trophic State Index = 55.28

Monitoring Sites: Station 073901 in Jetmore Lake

Period of Record Used: Three surveys during 1994 - 1999.

Current Condition: Prior to the 1999 survey, Jetmore Lake had very good water quality. The total phosphorus concentration averaged 16.7 ppb, and the chlorophyll a level averaged 7.3 ppb. The aquatic plant community consisted of stonewort algae, pond weed, and water naiads.

At the 1999 survey, the entire macrophyte community was gone. Whether this was due to natural means is not certain. The lake may have been inoculated with grass carp (*Ctenopharyngodon idella*). The result was one typical of such introductions, the lake macrophyte cover was eliminated rather than controlled. Under these circumstances, phosphorus is no longer taken up by the aquatic plants. The phosphorus concentration rose to an average of 62.8 ppb, the chlorophyll a concentration increased to 22.7 ppb, and the lake became more eutrophic.

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 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 |

Phosphorus appears to be the primary limiting factor, although macrophyte influences have had influence in the past. Light is not limiting. The chlorophyll a to total phosphorus yield is high.

Interim Endpoints of Water Quality (Implied Load Capacity) at Jetmore Lake over 2005 - 2009:

In order to improve the trophic condition of the lake from its current fully eutrophic status, the desired endpoint will be summer chlorophyll a concentrations at or below 12 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

Grass carp, if present, appear to have the greatest impact on the aquatic plant community.

Land Use: The watershed has a moderate potential for nonpoint source pollution. An annual phosphorus load of 304.2 pounds per year is necessary to correspond to the concentrations seen in the lake.

The primary source of phosphorus within Jetmore Lake is runoff from agricultural lands where phosphorus has been applied. Land use coverage analysis indicates that 62.2 % of the watershed is cropland and 37.3 % is grassland.

Phosphorus from animal waste is a contributing factor. A high density of livestock grazes on the cropland in the winter. An average number of livestock are present in the watershed in the summer.

Contributing Runoff: The watershed's average soil permeability is 1.1 inches/hour according to NRCS STATSGO data base. About 93% of the watershed produces runoff even under relative low (1.5"/hr) potential runoff conditions. Under very low (<1"/hr) potential conditions, this potential contributing area is greatly reduced (35%). 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% of this watershed, chiefly along the stream channels.

Background Levels: Nutrient recycling of the sediments (from wind mixing and bottom feeding fish) in the lake is likely contributing available phosphorus to the lake for algal uptake. 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 macrophyte 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: 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 lake, 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.

Non-Point Sources: The assessment suggests that cropland and animal waste throughout the watershed contribute to the trophic state of the lake. Generally a Load Allocation of 219.1 pounds per year, leading to a 20% reduction in available phosphorus is necessary to reach the endpoint. If grass carp are present, they likely are the major impact on the aquatic plants and resulting phosphorus levels in the lake.

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 24.3 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 Jetmore Lake needs a more detailed assessment of the aquatic plant impairment, this TMDL will be a Low Priority for implementation

Unified Watershed Assessment Priority Ranking: This watershed lies within the Buckner Subbasin (HUC 8: 11030006) with a priority ranking of 28 (Medium Priority for restoration work).

Priority HUC 11s: The entire watershed is within HUC 11 (030).

5. IMPLEMENTATION

Desired Implementation Activities

Remove the grass carp from Jetmore Lake. Reseed the lake with stonewort algae. There is potential within this watershed to reduce nonpoint source pollutant loads.

Implementation Programs Guidance

Until the 2005 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 2001 to 2005.

Targeted Participants: No targets until the 2005 assessment.

Milestone for 2005: The year 2005 marks the midpoint of the ten-year implementation window for the watershed. At that point in time, milestones should be reached which will have all protection activities planned or implemented in the vicinity of the lake. Additionally, sampled data from the lake should indicate evidence of stable aquatic plant populations in the lake relative to the conditions seen in 1999.

Delivery Agents: Depending upon confirmation of impairment and assessment of probable sources, the primary delivery agents for program participation will be the Kansas Department of Wildlife and Parks.

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

Further evaluation of the aquatic plant community 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 Jetmore Lake. Subsequent decisions will be made regarding implementation approach and follow up of additional implementation.

Consideration for 303d Delisting: Jetmore Lake will be evaluated for delisting under Section 303d, based on the assessment of aquatic plant communities in the lake. 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.

Approved August 9, 2000