

CIMARRON RIVER BASIN TOTAL MAXIMUM DAILY LOAD
Water Body: Russell Lake
Water Quality Impairment: Eutrophication

1. INTRODUCTION AND PROBLEM IDENTIFICATION

Subbasin: Upper Cimarron-Liberal

County: Stevens

HUC 8: 11040006

HUC 11 (HUC 14): 020 (060)

Drainage Area: Approximately 3.8 square miles

Conservation Pool: Area = 11.7 acres, Maximum Depth = 1 - 2 meters (variable)

Designated Uses: Secondary Contact Recreation; Expected Aquatic Life Support

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 = 72.16

Monitoring Sites: Station 060101 in Russell Lake.

Period of Record Used: Two surveys during 1988 and 1989.

Current Condition: In 1989, Russell Lake had elevated chlorophyll a concentrations. The average concentration was 69.4 ppb, related to a Trophic State Index of 72.16, indicating hypereutrophic conditions. (No chlorophyll a samples were taken in 1988). Total phosphorus concentrations were high in both years, averaging 422 ppb. All of the phosphorus samples taken

from the lake were over 100 ppb. (Light does not appear to be a limiting factor).

The Trophic State Index of 72 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 |

Interim Endpoints of Water Quality (Implied Load Capacity) at Russell Lake 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 high potential for nonpoint source pollution. The primary source of phosphorus within Russell Lake is probably runoff from agricultural lands where phosphorus has been applied. Land use coverage analysis indicates that 54.6 % of the watershed is cropland. An annual phosphorus load of 573 pounds per year is necessary to correspond to the concentrations seen in the lake.

Fertilizer applications to lawns within the drainage and stormwater delivery to the lake are probably loading sources. The watershed is 38.6 percent urban. The population of Hugoton is projected to increase to the year 2020.

Phosphorus from animal waste is a minor contributing factor. Six percent of land around the lake is grassland. The grazing density of livestock is average in the summer and winter.

Background Levels: Small amounts of phosphorus are contributed from the watershed soils. Nitrogen loads may be contributed from the atmosphere.

4. ALLOCATION OF POLLUTION 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 pollution. Background levels may be attributed to geological sources. The assessment suggests that agricultural and urban runoff throughout the watershed contribute to the hypereutrophic state of the lake. Generally a Load Allocation of 180.5 pounds per year, leading to a 65% 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 20.1 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 Russell Lake is a lake under local jurisdiction and a more detailed source assessment and additional in-lake monitoring of nutrient and algal content is needed and impacts on dissolved oxygen conditions, this TMDL will be a Low Priority for implementation

Unified Watershed Assessment Priority Ranking: This watershed lies within the Upper Cimarron-Liberal subbasin (HUC 8: 11040006) with in Category II (watersheds in need of protection).

Priority HUC 11s: The entire watershed is within HUC 11 (020).

5. IMPLEMENTATION

Desired Implementation Activities

This lake was being planned in the late 1980's as a means to turn the large volume of storm runoff from Hugoton into a recreational lake. There may also be little that can be done to pre-treat the runoff, unless a series of ponds detains the water before it would reach the lake proper. Even with best management practices, the lake could retain a hypertrophic state for most of the year, with brief periods of disruption if storm events flushed the lake. (These brief periods of flushing may also be inconsequential, as the lake was being designed to hold 100% of any normal runoff event).

Implementation Programs Guidance

Until additional assessment of probable sources and in-lake 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 between 2009 and 2013.

Targeted Participants: Primary participants for implementation will be agricultural producers and residents of Hugoton. 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 Russell 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 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 Cimarron 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

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 Cimarron Basin were held March 8 and April 25 in Meade. 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 Cimarron Basin.

Public Hearing: A Public Hearing on the TMDLs of the Cimarron Basin was held in Meade on May 30, 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:
Agriculture: February 28, 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 Russell Lake. Subsequent decisions will be made regarding implementation approach, follow up of additional implementation and implementation in the nonpriority subwatersheds.

Consideration for 303d Delisting: Russell Lake will be evaluated for delisting under Section 303d, based on the monitoring data over the period 2001-2005. 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 2000.

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