

KANSAS-LOWER REPUBLICAN BASIN TOTAL MAXIMUM DAILY LOAD

Waterbody: Tuttle Creek Lake
Water Quality Impairment: Siltation

1. INTRODUCTION AND PROBLEM IDENTIFICATION

Subbasins: Lower Big Blue
& Lower Little Blue

Counties: Marshall, Nemaha, Washington, and
Republic

HUC 8s: 10270205 & 10270207

HUC 11s: 10270205: 035, 044, 050, 060, 070, 080,
090, 100, 110, 120, 130, 140, 150, 160, 169
10270207: 031, 074, 083, 090, 100

Drainage Area: Approximately 9,628 square miles.

Conservation Pool: Elevation 1075'; Volume 335,000 acre-feet

Tributary Arms: Big Blue River
Little Blue River
Black Vermillion River
Fancy Creek

Designated Uses: Primary Contact Recreation; Food Procurement; Domestic Water
Supply; Expected Aquatic Life Support

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

Impaired Use: All uses impaired from Siltation

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

Level of Support for Designated Use under 303d: Not Supporting Aquatic Life Support and
Primary Contact Recreation

Monitoring Sites: Station 61201 in Tuttle Creek Lake.

Period of Record Used: 1988, 1991, 1994, 1996, 1997, 1998

Lake Record: 1968-1997 elevations from U.S. Army Corps of Engineers for Tuttle Creek Lake.

Current Condition: Lake has consistently high levels of turbidity and siltation. The lake has seen a 30% loss of its original storage since the dam closed in 1962. Based on trend analysis of sediment survey data from the Corps of Engineers, projections to 2008 indicate a loss of 48,000 acre-feet of storage from 1996 surveyed levels. Siltation within the headwaters and arms of the lakes coincidentally reduces the surface area of the lake, as well.

Average suspended solids concentrations in the watershed also are quite high. Large silt loads come over the stateline on both the Big and Little Blue Rivers.

Average Suspended Solid Concentrations from Locations in Tuttle Creek Drainage Area

-----Stateline-----		Headwaters			
Little Blue	Big Blue	Blue Rapids	Black Vermillion	Mill Creek	Fancy Creek
286 ppm	346 ppm	408 ppm	268 ppm	172 ppm	77 ppm

Loss of storage is to be expected when a stream is impounded into a storage facility. The sediment load which would be transported downstream is trapped by the impoundment. Therefore, excessive sediment transport results in accelerated loss of storage and impairment of the designated uses of the lake. The intent of this TMDL is to reduce the rate of loss of storage over the period 1999-2008.

Desired Endpoints of Water Quality at Tuttle Creek Lake over 2004 - 2008

1. Storage within the conservation pool (1075') will remain within 90% of the surveyed pool of 1996; therefore 270,000 - 275,000 acre-feet of storage will remain after 2008.

This endpoint will be reached as a result of expected reductions in sediment loading from the various sources over all seasons in the watershed resulting from implementation of corrective actions and Best Management Practices, as directed by this TMDL. Achievement of the endpoints indicate loads are within the loading capacity of the lake, water quality standards are attained with minimal impact to the lake resources and full support of the designated uses of the lake has been protected.

3. SOURCE INVENTORY AND ASSESSMENT

The primary source of siltation within Tuttle Creek Lake is sediment loads from runoff events off of croplands in the Big and Little Blue River Basins and the Black Vermillion Subbasin. Selection of geographic sources of sediment is a function of a given watershed's proportion of

cropland, its proximity to the lake and its propensity to generate runoff. Land use coverage analysis indicates large percentages of cropland in subwatersheds of the Big Blue River Subbasin (HUC8=10270205), particularly along the Big Blue River itself and the Black Vermillion River. Sixty-five to seventy percent of the subwatersheds are cropland. Subwatersheds of the Little Blue River Subbasin (HUC8=10270207) are about half cropland, with a greater proportion of grassland than the watersheds to the east. The subwatersheds of the Little Blue which are closer to the headwater of Tuttle Creek Lake have a higher proportion of cropland.

Soils in the eastern subwatersheds appear less permeable (average permeability of 0.4"/hr to 0.6"/hr) while those of the Little Blue Subbasin are more permeable (0.7"/hr to 0.9"/hr). Consequently, runoff contributions tend to be generated from the Big Blue River or Black Vermillion drainages rather than from the western side of the drainage area. Under wet conditions or intense storms, the whole basin contributes runoff. Under moderate or lower conditions, a higher proportion of the eastern watersheds generate runoff than the western watersheds.

The following table summarizes these three characteristics for the subwatersheds above Tuttle Creek which are most likely to have contributions of sediment loading into the lake. The recommended subwatershed targets are indicated by bold type.

HUC 11	Description	%Crop	Avg. Perm	% of Wtshd w/ Runoff		
				Hi	Mod	Low
10270205035	Mission-Murdock	65%	.6"	97	93	51
10270205044	Hrshoe Crk-Big Blue	65%	.6"	97	93	51
10270205050	Spring Creek	66%	.6"	97	93	51
10270205090	N.Fork Black Vermillion	70%	.4"	99	99	92
10270205100	Black Vermillion	65%	.4"	99	99	92
10270205070	Robidoux Creek	54%	.4"	99	99	92
10270205080	Marshall Co - Minor Strms	62%	.4"	99	99	92
10270207090	Lower Little Blue	52%	.8"	91	83	12
10270207100	Coon-Camp Crks	56%	.8"	91	83	12
10270207083	Mill Creek	54%	.9"	89	54	13
10270205140	Fancy Creek	44%	.7"	91	83	12

Analysis of tributary data in the Black Vermillion watershed indicates the runoff pattern of total suspended solids peaks. Higher TSS concentrations were seen on the North Fork of the Black Vermillion and certain tributaries in the northeast portion of the watershed. Those tributaries tend to drain extensive cropland areas. Generally, eight to 22 percent of the samples taken over the three years had elevated total suspended solids.

Governor's Water Quality Initiative Data

Site	Number of Samples Over 100 mg/l TSS	Average of All Samples
128	17	187 mg/l
129	10	50 mg/l
130	6	62 mg/l
131	7	60 mg/l
132	15	92 mg/l
133	12	168 mg/l
134	14	92 mg/l
141	13	79 mg/l

4. ALLOCATION OF POLLUTION REDUCTION RESPONSIBILITY

Point Sources: Since this pollutant is associated with agricultural non-point source pollution, there will be no Wasteload Allocation assigned to point sources for siltation under this TMDL.

Non-Point Sources: As described in the Source Assessment, the subwatersheds with high proportion of cropland, strong propensity for runoff and in proximity to the Tuttle Creek headwaters are targeted for implementing this TMDL. The Load Allocation will involve reducing historic storage loss rates by 45% in order to maintain storage within 10% of 1996 levels. Projected loads between 1996 and 2008 will be reduced by 48%, resulting in an accumulation of 24,000-25,000 acre-feet of sediment, averaging 2100 acre-feet per year.

Defined Margin of Safety: The margin of safety will account for uncertainty between sediment loads into the lake and its impact on the designated uses. The margin of safety can best be expressed as a reduction in sediment accumulations. An additional 5000 acre-feet of storage should be expected to remain unfilled in the year 2008 after the load allocation accumulates; therefore, 275,000 is the desired endpoint of conservation storage.

State Water Plan Implementation Priority: Because this lake has tremendous importance in influencing the water supply and water quality of the Kansas River, the investment made by the state in the conservation storage of the lake and the need to comprehensively package implementation measures to handle multiple impairments in the lake and watershed, this TMDL will be a High Priority for implementation.

Unified Watershed Assessment Priority Ranking: This lake's watersheds encompass both the Lower Big Blue Subbasin (HUC8: 10270205) and the Lower Little Blue Subbasin (HUC8: 10270207). The Unified Watershed Assessment assigned a priority ranking of 2 to the Lower Big Blue and 10 to the Lower Little Blue subbasins (Both Highest Priority for restoration work.)

Priority HUC 11s and Stream Segments: Because of their high proportion of cropland, proximity to the lake and ability to generate runoff, the following subwatersheds are highest priority:

Big Blue River Subbasin		Priority Stream Segments
10270205035	Mission-Murdock	22,41,42
10270205044	Hrshoe Crk-Big Blue	26,17,18,20,21
10270205050	Spring Creek	19
10270205090	N.Fork Black Vermillion	15
10270205100	Black Vermillion	13,14
10270205070	Robidoux Creek	16,47,53
Little Blue River Subbasin		
10270207090	Lower Little Blue	1,2,37,38,39,40,42,43,45
10270207100	Coon-Camp Crks	23,44

Additionally, sediment load reduction should be targeted at the stateline, through conservation farming in Nebraska.

5. IMPLEMENTATION

Desired Implementation Activities

1. Implement and maintain necessary conservation farming, including conservation tillage, contour strips and no till farming.
2. Install necessary grass buffer strips along streams.
3. Reduce activities within riparian areas
4. Minimize road and bridge construction impacts on streams

Implementation Programs Guidance

Non-Point Source Pollution Technical Assistance - KDHE

- a. Support Section 319 demonstration projects for reduction of siltation runoff from agricultural or road construction activities
- b. Provide technical assistance on practices geared to establishment of vegetative buffer strips.
- c. Provide technical assistance on road construction activities in vicinity of streams.

Water Resource Cost Share & Non-Point Source Pollution Control Programs - SCC

- a. Apply conservation farming practices, including terraces and waterways
- b. Provide sediment control practices to minimize erosion and sediment 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 and pasture management
- b. Provide technical assistance on buffer strip design and minimizing cropland runoff

Big Blue River Compact - KDA

- a. Continue to support bistate efforts to reduce sediment runoff

Timeframe for Implementation: Pollution reduction practices should be installed within the priority subwatersheds and along the priority stream segments during the years 2000-2004, with minor follow up implementation, including other subwatersheds over 2004-2008.

Targeted Participants: Primary participants for implementation will be agricultural producers operating within the drainages of the priority subwatersheds. Implemented activities should be targeted at those areas with greatest potential to impact the stream. Nominally, this would be activities located within one mile of the streams including:

1. Total rowcrop acreage
2. Degree of residue compliance on Highly Erodible Lands Applications of siltation
3. Acreage of poor rangeland or overstocked pasture
4. Livestock use of riparian areas
5. Unvegetated or graded roadside ditches
6. Construction projects without erosion control techniques

Some inventory of local needs should be conducted in 2000 to identify such activities. Such an inventory would be done by local program managers with appropriate assistance by commodity representatives and state program staff in order to direct state assistance programs to the principal activities influencing the quality of the streams in the watershed during the implementation period of this TMDL.

Milestone for 2004: The year 2004 marks the midpoint of the ten-year implementation window for the watershed. At that point in time, milestones should be reached which will have at least fifty percent of the producers responsible for the land use activities cited in the local assessment

participating in the implementation programs provided by the state. Additionally, sampled data from Tuttle Creek should indicate evidence of reduced siltation levels at the conservation pool elevations relative to the conditions seen over 1994-1998.

Delivery Agents: The primary delivery agents for program participation will be the 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 pollution.

1. K.S.A. 65-164 and 165 empowers the Secretary of KDHE to regulate the discharge of sewage into the waters of the state.
2. 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.
3. 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.
4. K.S.A. 75-5657 empowers the State Conservation Commission to provide financial assistance for local project work plans developed to control non-point source pollution.
5. 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.
6. K.S.A. 82a-951 creates the State Water Plan Fund to finance the implementation of the *Kansas Water Plan*.
7. The *Kansas Water Plan* and the Kansas-Lower Republican 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.
8. K.S.A. 82a-529 is the Big Blue River Compact which supports bistate pollution abatement in the Big Blue River Basin.

Funding: The State Water Plan Fund, annually generates \$16-18 million and is the primary funding mechanism for implementing water quality protection and pollution 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 is a High Priority consideration.

In State Fiscal Year 1999, the state provided to Washington, Marshall and Nemaha counties, \$446,662 of State Water Plan Funds for non-point source pollution reduction, which included \$5600 for buffer strip installation. The Commission will decide State Fiscal Year 2000 allocations in May 1999 and is expected to direct similar amounts of funding to the three counties for the next fiscal year

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. Should participation significantly lag below expectations over the next five years or monitoring indicates lack of progress in improving water quality conditions from those seen over 1990-1998, the state may employ more stringent conditions on agricultural producers in the watershed through establishment of a Critical Water Quality Management Area in order to meet the desired endpoints expressed in this TMDL. The state can also push improvement in sediment loadings from Nebraska through the Big Blue River Compact.

6. MONITORING

KDHE will continue to collect seasonal samples from Tuttle Creek Lake twice in the five year period 2000-2004 and three times during 2005-2008. The Corps of Engineers should schedule a reconnaissance survey of conservation storage during the same period. A complete sediment survey should be made in 2008. The USGS should be employed to place markers in the existing sediments in 2000 and revisit those sites in 2008 to assess the rate of sediment accumulation within the lake.

Regular monitoring of sites in the drainage will also indicate reductions in sediment delivery to streams through management practices. Periodic monitoring of total suspended solids content of wastewater discharged from treatment systems will be expected under reissued NPDES and state permits.

USGS should complete analysis of SSURGO soil data and 30-m resolution DEM topographic data to evaluate the relative runoff contributing areas within the watershed and provide greater resolution on where implementation activities would be most effective. This analysis should be complete in 2000.

Local program management needs to identify its targeted participants of state assistance programs for implementing this TMDL. This information should be collected in 2000 in order to support appropriate implementation projects.

7. FEEDBACK

Public Meetings: Public meetings to discuss TMDLs in the KLR Basin were held March 10, 1999 in Topeka, April 27 in Lawrence and April 29 in Manhattan. 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 Kansas-Lower Republican Basin.

Public Hearing: A Public Hearing on the TMDLs of the Kansas-Lower Republican Basin was held in Topeka on June 3, 1999.

Basin Advisory Committee: The Kansas-Lower Republican Basin Advisory Committee met to discuss the TMDLs in the basin on December 3, 1998; January 14, 1999; February 18, 1999; March 10, 1999; May 20, 1999 and June 3, 1999.

Discussion with Interest Groups: Meetings to discuss TMDLs with interest groups include:
Agriculture: November 10, 1998; December 18, 1998; February 10, 1999; April 10, 1999, May 4, 1999, June 8, 1999 and June 18, 1999.
Municipal: November 12, 1998, January 25, 1999; March 1, 1999; May 10, 1999 and June 16, 1999.
Environmental: November 3, 1998; December 16, 1998; February 13, 1999; March 15, 1999, April 7, 1999 and May 3, 1999.
Conservation Districts: March 16-18, 24-25, 1999

Task Force: A special task force to examine the issues of establishing a TMDL on Tuttle Creek met on November 9, 1998; January 5, 1999 and February 15, 1999. Additionally, subcommittees met to discuss implementation, biological impacts, municipal impacts and data analysis.

Blue River Compact: The water quality committee of the Compact and the Compact Administration met on May 7 and May 23, 1999 to discuss this TMDL.

Milestone Evaluation: In 2004, evaluation will be made as to the degree of implementation which has occurred within the drainage and current condition of the Tuttle Creek Lake. Subsequent decisions will be made regarding implementation approach, follow up of additional implementation and implementation in the non-priority subwatersheds.

Consideration for 303d Delisting: Tuttle Creek Lake will be evaluated for delisting under Section 303d, based on the monitoring data over the period 2004-2008. Therefore, the decision for delisting will come about in the preparation of the 2008 303d 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 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 for Fiscal Years 2000-2004.

Approved January 26, 2000.