

KANSAS-LOWER REPUBLICAN BASIN TOTAL MAXIMUM DAILY LOAD

Waterbody: Washington Creek
Water Quality Impairment: Dissolved Oxygen

1. INTRODUCTION AND PROBLEM IDENTIFICATION

Subbasin: Lower Kansas River

Counties: Douglas

HUC 8: 10270104

HUC 11s: 020 (part)

Drainage Area: Approximately 42 square miles.

Main Stem Segments: 36, starting at confluence of Wakarusa River with headwaters near Globe.

Tributary Segments: Chicken Creek (79) - Unimpaired

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

1998 303d Listing: Table 1 - Predominant Point and Non-point Source Impacts

Impaired Use: Expected Aquatic Life Support on Segment 36

Water Quality Standard: Dissolved Oxygen: 5 mg/l (KAR 28-16-28e(c)(2)(A))

2. CURRENT WATER QUALITY CONDITION AND DESIRED ENDPOINT

Level of Support for Designated Use under 1998 303d: Not Supporting Expected Aquatic Life

Monitoring Sites: Station 678 near Lawrence.

Period of Record Used: 1995

Flow Record: Estimated flow conditions from Dragoon Creek near Burlingame; USGS Station 06911900

Long Term Flow Conditions: 7Q10 = 1 cfs (estimated)

Current Condition: Excursion from DO WQS seen in August, October and December of 1995

Date (1995)	February 1	April 5	June 7	August 9	October 4	December 27
DO	12.5 mg/l	8.0 mg/l	7.0 mg/l	3.7 mg/l	4.1 mg/l	3.7 mg/l

Average Biochemical Oxygen Demand for Feb-June: 3.1 mg/l and for Aug-Dec: 3.9 mg/l. Average ammonia concentrations were 0.01 mg/l and 0.07 mg/l, respectively. DO excursions appear to coincide with low flow conditions.

Desired Endpoints of Water Quality at Site 678 over 2004 - 2008

The desired endpoint will be reduced biochemical oxygen demand from artificial sources such that average BOD concentrations remain below 3.1 mg/l in the stream which results in no excursions below 5 mg/l of DO detected between 2004 - 2008, particularly at low flows in the summer and fall.

Achievement of this endpoint will maintain full support of the aquatic life function of the creek and attain the dissolved oxygen water quality standard. Seasonal variation is accounted for by this TMDL, since the TMDL endpoint is sensitive to low flow conditions, generally occurring in late summer to early winter.

This endpoint will be reached as a result of expected, though unspecified, 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 endpoint 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.

3. SOURCE INVENTORY AND ASSESSMENT

NPDES: There are no NPDES permitted wastewater dischargers located within the watershed.

Livestock Waste Management Systems: Three operations are certified or permitted within the watershed, all located in upper reaches of the watershed away from the monitoring station. These operations are either swine or dairy and all have relatively low permitted number of animal units. The two permitted livestock facilities have waste management systems designed to minimize runoff entering their operations or retaining runoff from their areas. Such systems are designed for the 25 year, 24 hour rainfall/runoff event, which would be indicative of flow durations well under 10 percent of the time. The actual number of animal units on site is variable, but typically less than permitted numbers.

Land Use: Most of the watershed is mixed between grassland, cropland and woodland. About half the cropland in the watershed is located within a mile of the stream, with 40% of that area in crops. Grazing density of livestock is light for the watershed, with many of the projected livestock accounted within the registered facilities.

On-Site Waste Systems: A number of residents within Douglas County, just outside of Lawrence, rely on septic systems or on-site waste lagoons. Failing on-site waste systems contribute pollutant loadings. In FY 1998, 242 complaints on failing septic systems were investigated in Douglas County and 29 such complaints were investigated on domestic lagoons. In the first three quarters of Fiscal Year 1999, 60 complaints have been made on septic systems in Riley County and 8 on domestic lagoons. It is likely that nutrient and organic enrichment from on-site waste systems in the watershed is a cause of the water quality excursion. Population projections for the county indicate steady growth, suggesting continued occurrence of occasional problems on the creek.

Contributing Runoff: The watershed has an average soil permeability of 0.8 inches/hour according to NRCS STATSGO data base. Runoff would be produced under storms ranging in duration from one to six hours, having a recurrence interval of five, ten or twenty five years. Runoff is chiefly generated as infiltration excess with rainfall intensities greater than soil permeabilities. Generally, 30 percent of the watershed would generate runoff under dryer conditions or smaller storms. Moderate or wet conditions or larger storms would see runoff contributed from 90 percent of the watershed.

Background Levels: Some organic pollution may be associated with environmental background levels, including contributions from wildlife, but it is likely that the density of animals such as deer is fairly dispersed across the watershed resulting in minimal loading to the streams below the levels necessary to violate the water quality standards.

4. ALLOCATION OF POLLUTION REDUCTION RESPONSIBILITY

Point Sources: Because of the lack of point sources, there will be no Wasteload Allocation for this TMDL

Non-Point Sources: Based on the assessment of sources, the distribution of excursions from water quality standards and the relationship of those excursions to runoff conditions, non-point sources are seen as the primary cause of water quality violations. The permitted livestock facilities rely on lagoon systems for wastewater detention and long holding times to minimize the release of fecal bacteria to receiving streams. Ongoing inspections and monitoring of the lagoons will be made to ensure that minimal contributions have been made by these sources. Background levels attributed to wildlife are not significant as a cause of the problem. The previous assessment suggests that organic matter deposited in the stream from adjacent cropland or faulty on-site waste systems are a primary suspect in the occasional dissolved oxygen problem. Given the runoff characteristics of the watershed, overland runoff probably needs to be close to the stream to generate a deposit of material to exert oxygen demand. The incidence of low flow suggests that the material was already in the stream. Activities to reduce nutrient or organic pollution should be directed toward near by on-site waste systems, and adjacent croplands. The Load Allocation relates to the comparable BOD levels seen in the creek before and after the oxygen standard was violated. As such the Load Allocation will be a 20% reduction in BOD concentration measured in the stream at low flows, resulting in BOD levels of 3 mg/l or less.

Defined Margin of Safety: Because of the uncertainty between loads exerting oxygen demand, the interaction of available streamflow and the resulting dissolved oxygen concentrations, the defined margin of safety will be additional reduction of at least 0.1 mg/l of BOD below the desired endpoint, so that measured BOD is below 3 mg/l in the stream under low flow conditions.

State Water Plan Implementation Priority: Because this watershed has had some problem with dissolved oxygen which has short term and immediate consequences for aquatic life, this TMDL will be a High Priority for implementation.

Unified Watershed Assessment Priority Ranking: This watershed lies within the Lower Kansas Subbasin (HUC 8: 10270104) with a priority ranking of 1 (Highest Priority for restoration work).

Priority HUC 11s and Stream Segments: Because of the proximity of cropland to the stream and the benefits to introduce filter strips to insulate the stream from surrounding land use, Stream Segment 36, from Lone Star Lake to the mouth should be the focus of priority.

5. IMPLEMENTATION

Desired Implementation Activities

1. Insure proper on-site waste system operations in proximity to main stream.
2. Install buffer strip along the stream to insulate it from surrounding land use.

Implementation Programs Guidance

Non-Point Source Pollution Control Program - SCC

- a. Install on-site waste system improvements in lower reaches of watershed.

Riparian Protection Program - SCC

- a. Develop riparian restoration projects in stream reaches impacted by urban activity.

Buffer Initiative - SCC

- a. Establish a vegetative buffer strip in areas adjacent to creek between Lone Star Lake and the mouth.

Extension Outreach and Technical Assistance - Kansas State University

- a. Promote Home*A*Syst in suburban and ranch areas

Local Environmental Protection Program - KDHE

- a. Inspect on-site waste systems within one mile of main tributary streams.

Timeframe for Implementation: Pollution reduction practices should be installed within the priority stream segment (36) over the years 2000-2004.

Targeted Participants: Primary participants for implementation will be homeowners in the area of the watershed below Lone Star Lake and agriculture producers immediately adjacent to the creek. 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. Failing on-site waste systems
2. Cropland farmed up to edge of bank
3. Areas of denuded riparian vegetation.

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 mid-point of the ten year implementation window for the watershed. At that point in time, milestones should be reached which will have at least two-thirds of the landowners responsible for the on-site waste systems or cropland cited in the local assessment participating in the implementation programs provided by the state. Additionally, sampled data from Station 678 should indicate evidence of no oxygen deficit problems

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 County staff managing. Local Environmental Protection Programs for Douglas County will perform on-site waste system inspections.

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.A.R. 28-16-69 to -71 implements water quality protection by KDHE through the establishment and administration of critical water quality management areas on a watershed basis.
4. 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.
5. 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.
6. 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.
7. K.S.A. 82a-951 creates the State Water Plan Fund to finance the implementation of the *Kansas Water Plan*.
8. 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.

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 Douglas County, \$54,200 of State Water Plan Funds for non-point source pollution reduction. The Commission will decide State Fiscal Year 2000 allocations in May 1999 and is expected to direct similar amounts of funding to the two counties for the next fiscal year

Effectiveness: Improvements in septic systems can be quite effective in limiting movement of nutrients and organic matter from the homestead toward streams. Buffer strips are being touted as a significant means for protection of streams.

6. MONITORING

KDHE should collect bimonthly samples at Station 678 in 2002, 2004 and 2006 in order to assess progress and success in implementing this TMDL in reaching its endpoint.

KDHE should also use the BASINS model to evaluate the contributions of the oxygen sag within the watershed. Model results should be complete in 2000 for subsequent use in program implementation decisions.

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

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

Consideration for 303d Delisting: The streams in this watershed 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.