

KANSAS-LOWER REPUBLICAN BASIN TOTAL MAXIMUM DAILY LOAD

Waterbody: Wildcat Creek Water Quality Impairment: Fecal Coliform Bacteria

1. INTRODUCTION AND PROBLEM IDENTIFICATION

Subbasin: Upper Kansas

County: Riley

HUC 8: 10270101

HUC 11: 060

Drainage Area: 14 miles² at Riley, 74 miles² at Manhattan

Main Stem Segments: 2, starting at confluence of Kansas River, headwaters in Riley County near Leonardville

Tributary Segments: Silver Creek (12)
Little Arkansas Creek (13)
Kitten Creek (14)
Little Kitten Creek (16)

Designated Uses: Primary and Secondary Contact Recreation; Special Aquatic Life Support; Domestic Water Supply; Food Procurement; Irrigation; Industrial; Ground water Recharge; Livestock on Wildcat Creek and Silver Creek;
Expected Aquatic Life Support and Secondary Contact Recreation on Little Arkansas Creek, Kitten Creek, and Little Kitten Creek.

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

Impaired Use: Primary or Secondary Contact Recreation Use on all segments

Water Quality Standard: Fecal Coliform Bacteria: 2000 colonies per 100 ml for Secondary (KAR 28-16-28e(c)(7)(C)); 900 colonies per 100 ml for Primary (KAR 28-16-28e(c)(7)(B))
Classified streams may be excluded from applying these criteria when streamflow exceeds flow that is surpassed 10% of the time ((KAR 28- 16-28c(c)(2))

2. CURRENT WATER QUALITY CONDITION AND DESIRED ENDPOINT

Level of Support for Designated Use under 1998 303d: Partial Supporting Secondary Contact Recreation

Monitoring Sites: Station 652 near Manhattan

Period of Record Used: 1993 & 1997

Flow Record: Wildcat Creek flow was calculated by proportional flow to total drainage area from Clarks Creek. Clarks Creek was calculated by the regression of Clarks Creek on Mill Creek at Paxico (USGS Station 06888500, Recorded daily data 1953 - 1997).

Long Term Flow Conditions: 10% High Flow Exclusion = 120 cfs, 7Q10 = 2 cfs

Current Conditions: Since loading capacity varies as a function of the flow present in the stream, this TMDL represents a continuum of desired loads over all flow conditions, rather than fixed at a single value. Flow duration data were examined from the calculated Wildcat flow data set for each of the three defined seasons: Spring (Apr-Jun), Summer-Fall (Jul-Oct) and Winter (Nov-Mar). High flows and runoff equate to lower flow durations, baseflow and point source influences generally occur in the 85-99% range. Load curves were established for both Primary Contact Recreation and Secondary Contact Recreation criterion by multiplying the flow values along the curve by the applicable water quality criterion and converting the units to derive a load duration curve of colonies of bacteria per day. These load curves represent the TMDL since any point along the curve represents water quality at the standard at that flow. Historic excursions from WQS are seen as plotted points above the load curves. Water quality standards are met for those points plotting below the applicable load duration curves.

Excursions from WQS were seen in Spring (Apr. - Jun) and Summer-Fall (Jul.- Oct.). Of the two excursions, one was noted at lower spring flow, one at higher summer flow. Anecdotal information provided by Riley County indicated quality of creek passing through Ft. Riley Military Reservation was good. Excursion likely occurring in lower end of stream. This would represent a baseline condition of partial support of the impaired designated use.

PERCENT OF SAMPLES OVER WATER QUALITY STANDARDS BY FLOW AND SEASON

STREAM NAME	I M P A I R M E N T	S E A S O N	MAGNITUDE	0 TO 10%	10 TO 30%	30 TO 60%	60 TO 90%	90 TO 100%	F R E Q U E N C Y	Current Condition of Water Quality at Site 652 Over 1993 & 1997
WILDCAT CREEK	F C B	S	% OVER MANAGEMENT GOAL	0	0	0	0	0	1/5= 20%	2/12=17% Exceedence
			% OVER 200% OF GOAL	0	0	0	0	0		
			% OVER HIGH IMPLEMENTATION NEEDS	0	0	0	20	0		
		S F	% OVER MANAGEMENT GOAL	0	0	0	0	0	1/4= 25%	
			% OVER 200% OF GOAL	0	0	0	0	0		
			% OVER HIGH IMPLEMENTATION NEEDS	0	25	0	0	0		
		W	% OVER MANAGEMENT GOAL	0	0	0	0	0	0/3= 0%	
			% OVER HIGH IMPLEMENTATION NEEDS	0	0	0	0	0		

Desired Endpoint Condition of Water Quality at Site 652 over 2004 - 2008:

Overall, the endpoint of this TMDL will be to reduce the percent of samples over the applicable criteria from 17% to less than 10% for samples taken at flows below the high flow exclusion over the monitoring period of 2004-2008. This TMDL endpoint meets water quality standards as measured and determined by Kansas Water Quality Assessment protocols. These assessment protocols are similar to those used to cite the stream segments in this watershed as impaired on the Kansas 1998 Section 303d list.

Seasonal variation in endpoints is accounted for by TMDL curves established for each season and will be evaluated based on monitoring data from 2004-2008. Monitoring data plotting below the applicable seasonal TMDL curves will indicate attainment of the water quality standards. As with the overall endpoint, the manner of evaluation of the seasonal endpoints is consistent with the assessment protocols used to establish the case for impairment in these streams.

1. Less than 10 % of samples taken in Spring exceed primary criterion at flows under 120 cfs with no samples exceeding the criterion at flows under 30 cfs.
2. Less than 10% of samples taken in Summer or Fall exceed the primary criterion at flows under 120 cfs with no samples exceeding the criterion at flows under 10 cfs.
3. Less than 10% of samples taken in Winter exceed secondary criterion at flows under 120 cfs.

These endpoints 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 endpoints indicate 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 two NPDES permitted wastewater dischargers located within the watershed, both are municipal discharging waste stabilization lagoons with 2-4 cells and 120 - 150 day detention. All permits expire in the year 2000.

MUNICIPALITY	STREAM REACH	SEGMENT	DESIGN FLOW	# CELLS	DETENTION TIME
Riley	Wildcat Creek	2	0.06 MGD	2	> 150 days
Leonardville	Wildcat Creek	2	0.045 MGD	2	> 150 days

Population projections for these municipalities to the year 2020 indicate declining population or little growth and projections of future water use and resulting wastewater appear to remain under design flows for each of the lagoon systems. Most cities appear to have additional treatment capacity available. Since the excursions from the water quality standards appear to be isolated and not consistent, and at estimated flows far greater than the design flows of each of these lagoons, point source impacts appear to be minimal to the watershed. Impacts from municipal lagoons appear to be local in nature and insignificant at the downstream monitoring site.

Livestock Waste Management Systems: Nine operations are registered, certified or permitted within the watershed, most located in upper reaches of the watershed. Most of these operations are either swine or dairy and all have relatively low permitted number of animal units. All 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 grassland, with 62% of the area in grass. Grazing density of livestock is very light for the watershed, with many of the projected livestock accounted within the registered facilities. Since much of the watershed is on Ft. Riley, land use is relatively restricted in terms of development. The majority of cropland is located toward the mouth of the creek. The other significant land use is urban, with expansion of suburban residence west of Manhattan likely to affect the lower portion of the watershed.

On-Site Waste Systems: A number of residents within Riley County, just outside of Manhattan, rely on septic systems or on-site waste lagoons. Failing on-site waste systems contribute bacteria loadings. In FY 1998, 65 complaints on failing septic systems were investigated in Riley County and 5 such complaints were investigated on domestic lagoons. In the first three quarters of Fiscal

Year 1999, 32 complaints have been made on septic systems in Riley County and 2 on domestic lagoons. The sporadic excursion from the water quality standards seems to indicate a lack of persistent loadings from such systems on any grand scale. It is likely that nutrient and organic enrichment from on-site waste systems in the vicinity of Manhattan and the sampling site is suspected to be the cause of the water quality excursion. Population projections for the city and county indicate steady growth in both, suggesting continued occurrence of occasional problems on the lower end of the creek.

Contributing Runoff: The watershed has an average soil permeability of 0.6 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, 76 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 98-99 percent of the watershed.

Background Levels: Some fecal bacteria counts 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

The nature of bacteria loading is too dynamic to assign fixed allocations for wasteloads and non-point loads. Instead, allocation decisions will be made which reflect the expected reduction of bacteria loading under defined flow conditions. These flow conditions will be defined by the presumed ability of point or non-point sources to be the dominant influence on stream water quality. Therefore, the allocation of wasteloads and loads will be made by demarcating the seasonal TMDL curves at a particular flow duration level. Flows lower than that designated flow will represent conditions which are the responsibility of point sources to maintain water quality standards, those flows greater than the designated flow are the responsibility of non-point sources up to the high flow exclusion value.

Point Sources: The two municipal facilities rely on lagoon systems for wastewater detention and long holding times to minimize the release of fecal bacteria to receiving streams. The municipal wastewater systems are currently designed to accommodate growth. The point sources are responsible for maintaining their lagoons in proper working condition and appropriate detention volume to handle anticipated wasteloads of their respective populations. State and NPDES permits will continue to be issued on 5 year intervals, with inspection and monitoring requirements and conditional limits on the quality of effluent released from these lagoons. Ongoing inspections and monitoring of the lagoons will be made to ensure that minimal contributions have been made by these sources.

The Wasteload Allocation is defined at the flow condition where the sum of the design flows represent more than 10% of the flow, thereby exerting influence on the water quality of the

stream. For Wildcat Creek at this location, that calculated flow condition would be flows of 0-5 cfs. Such flows have been exceeded 99% of the time during the three seasons. Future NPDES and state permits will be conditioned such that discharges from permitted facilities will not cause violations of the applicable bacteria criteria at this low flow.

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. Background levels attributed to wildlife are not significant as a cause of the problem. 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. The previous assessment suggests that faulty on-site waste systems are a primary suspect in the occasional bacteria problem. Given the runoff characteristics of the watershed, overland runoff can easily carry waste material from developed areas into streams.

Activities to reduce nutrient or organic pollution should be directed toward the on-site waste systems, particularly septic systems in the lower portion of the watershed. The goal for reduction in pollution contributions would be to have all septic systems in the watershed below the Little Kitten Creek drainage have inspections and faulty systems repaired. The Load Allocation assigns responsibility for maintaining water quality below the TMDL curve over flow conditions bracketed by the 7Q10 low flow of 1 cfs and the high flow exclusion of 120 cfs. These flows are exceeded 20-99% of the time during the Spring, 6-99% of the time over the Summer and Fall and 8-99% of the time during the Winter.

Defined Margin of Safety: Because there will not be a traditional load allocation made for fecal bacteria, the margin of safety will be framed around the desired endpoints of the applicable water quality standards. Therefore, evaluation of achieving the endpoints should use values set 100 counts less than the applicable criteria (800 colonies for primary contact recreation; 1,900 colonies for secondary contact recreation) to mark full support of the recreation designated use of the streams in this watershed. By this definition, the margin of safety is 100 colonies per 100 ml and would be represented by a parallel line lying below each seasonal TMDL curve by a distance corresponding to loads associated with 100 colonies per 100 ml.

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

Unified Watershed Assessment Priority Ranking: This watershed lies within the Upper Kansas Subbasin (HUC 8: 10270101) with a priority ranking of 22 (Moderate Priority for restoration work).

Priority HUC 11s and Stream Segments: Because of the proximity of the stream to urbanized pressure with septic system proliferation, the lower reach of Wildcat Creek (Segment 2) below the confluence of Little Kitten Creek (Segment 16) will be the priority focus of attention.

5. IMPLEMENTATION

Desired Implementation Activities

1. Insure proper on-site waste system operations in proximity to main streams.

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.

Extension Outreach and Technical Assistance - Kansas State University

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

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 segments (2 & 16) over the years 2000-2004.

Targeted Participants: Primary participants for implementation will be homeowners in the areas west of Manhattan within the Wildcat Creek drainage. Implemented activities should be targeted at those areas with greatest potential to impact the stream. Nominally, this would be activities located nearest the streams including:

1. Failing on-site waste systems

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 two-thirds of the landowners responsible for the on-site waste systems cited in the local assessment participating in the implementation programs provided by the state. Additionally, sampled data from Station 652 should indicate evidence of no bacteria problems below the high flow exclusion.

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 Riley 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 Riley County, \$102,346 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 bacteria, nutrients and organic matter from the homestead toward streams.

6. MONITORING

KDHE should collect bimonthly samples at Station 652 in 2003, 2005 and 2007 in order to assess progress and success in implementing this TMDL.

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

Monitoring of bacteria levels in effluent will be a condition of NPDES and state permits for facilities using lagoons as the method of wastewater treatment. This monitoring will continually assess the functionality of the lagoon systems in reducing bacteria levels in the effluent released to the streams.

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

Milestone Evaluation: In 2004, evaluation will be made as to the degree of implementation which has occurred within the watershed and current condition of the Wildcat Creek.

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.