

KANSAS-LOWER REPUBLICAN BASIN TOTAL MAXIMUM DAILY LOAD

Waterbody: Clarks Creek Water Quality Impairment: Fecal Coliform Bacteria

1. INTRODUCTION AND PROBLEM IDENTIFICATION

Subbasin: Upper Kansas

County: Geary and Morris

HUC 8: 10270101

HUC 11s: 010 and 020

Drainage Area: 255.2 sq. mi.

Main Stem Segments: 8 and 9, starting at confluence of Kansas River, headwaters in Morris County near Delavan

Tributary Segments: Humbolt Creek (10)
Davis Creek (18)
Dry Creek (19)
Mulberry Creek (20)
Ralls Creek (21)

Designated Uses: Primary and Secondary Contact Recreation; Expected Aquatic Life Support; Food Procurement on Main Stem; Expected Aquatic Life Support; Secondary Contact Recreation and Food Procurement on Davis Creek, Dry Creek and Humbolt Creek; Expected Aquatic Life Support and Secondary Contact Recreation on Mulberry Creek and Ralls Creek.

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

Impaired Use: Primary or Secondary Contact Recreation Use on segments 8 and 9; Secondary Contact Recreation Use on segments 10, 18, 19, 20, and 21.

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 303d: Not Supporting Secondary Contact Recreation.

Monitoring Sites: Station 517 near Grandview Plaza

Period of Record Used: 1990--1998

Flow Record: Clarks Creek flow was calculated seasonally (7 years of average daily flow) by the regression of Clarks Creek near Junction City (USGS Station 06879200) on Mill Creek at Paxico (USGS Station 06888500).

Long Term Flow Conditions: 10% High Flow Exclusion = 230 cfs, 7Q10 = 1 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 Clarks Creek 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 seen in Spring (Apr. - Jun.), Summer-Fall (Jul.- Oct.) and Winter (Nov.- Mar.). All excursion were seen above the 50% exceedence level and therefore are associated with precipitation generated higher runoff events. 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	DURATION					F R E Q U E N C Y	Current Condition of Water Quality at Site 517 Over 1987-1997
				0 TO 10%	10 TO 30%	30 TO 60%	60 TO 90%	90 TO 100 %		
CLARKS CREEK	F C B	S	900-2000	0	0	18	0	0	2/11 = 18%	6/39=15% Exceedence
			> 2000	0	0	0	0	0		
			> 2 X 2000	0	0	0	0	0		
		S F	900-2000	0	0	0	0	0	2/13= 15%	
			> 2000	0	8	0	0	0		
			> 2 X 2000	0	8	0	0	0		
		W	> 2000	7	0	0	0	0	2/15= 13%	
			> 2 X 2000	7	0	0	0	0		

Desired Endpoint Condition of Water Quality at Site 517 over 2004 - 2008:

Overall, the endpoint of this TMDL will be to reduce the percent of samples over the applicable criteria from 15% 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 230 cfs with no samples exceeding the criterion at flows under 55 cfs.
2. Less than 10% of samples taken in Summer or Fall exceed the primary criterion at flows under 230 cfs with no samples exceeding the criterion at flows under 20 cfs.
3. Less than 10% of samples taken in Winter exceed secondary criterion at flows under 230 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 no NPDES permitted wastewater dischargers located within the watershed which would affect FCB counts at sampling site 517.

Livestock Waste Management Systems: Fourteen operations are registered, certified or permitted within the watershed, most located toward the middle and upper reaches of the watershed. Animal units for the watershed total 27,134. Most of these operations are either hogs/swine (12,898 animal units) or beef/cattle (13,900 animal units). There are also a fair number of dairy operations but they have a relatively low permitted number of animal units (336). There is a fairly large cattle facility located near the headwaters of Clarks Creek. 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 (61% of the area). Grazing density of livestock is moderate (35-39 animal units/sq. mi.) for the watershed, with many of the projected livestock accounted within the permitted facilities. The majority of cropland is located adjacent to the listed segments and in the upper reaches of the watershed.

On-Site Waste Systems: The population density on the watershed is low (9-24 person/sq. mi.). Rural projections for Geary and Morris County through 2020 show the population density remaining stable, on balance. Failing on-site waste systems can contribute bacteria loadings. In FY 1998, 43 inspections or investigations on complaints on failing on-site systems were investigated in Geary County. In the first three quarters of Fiscal Year 1999, 42 such visits have been made to on-site systems in the county. The sporadic excursion from the water quality standards seems to indicate a lack of persistent loadings from such systems on any grand scale.

Contributing Runoff: The watershed has an average soil permeability of 0.5 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, 83 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 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: No Wasteload Allocations will be established by this TMDL because of the lack of point sources in the watershed.

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. Most of the fourteen livestock facilities (accounting for over 95% of the animal units) 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 livestock in small family operations and on pastureland may contribute to the occasional excursions from the water quality standards seen in the three seasons, as well as potentially failing on-site waste systems. Given the runoff characteristics of the watershed, overland runoff can easily carry waste material into streams.

Activities to reduce fecal pollution should be directed toward the smaller, unpermitted livestock operations in the watershed. 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 230 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 Clarks Creek is a tributary watershed influencing the quality of the main stem of Kansas River above Manhattan.

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 certain segments to larger livestock facilities and heavier grazing densities in the watershed, the Main Stem subwatershed (020) and the entire reach of Clarks Creek (Segments 8 and 9) should receive priority over other listed segments or the Humboldt Creek subwatershed (010).

5. IMPLEMENTATION

Desired Implementation Activities

1. Renew necessary state and federal permits and monitor permitted facilities for permit compliance
2. Install necessary proper manure and livestock waste storage
3. Install necessary grass buffer strips along streams.
4. Install necessary pasture management practices, including proper stock density on grasslands
5. Remove feeding sites in proximity to streams
6. Reduce livestock use of riparian areas
7. Insure proper on-site waste system operations in proximity to main streams.

Implementation Programs Guidance

NPDES and State Permits - KDHE

- a.. Livestock permitted facilities will be inspected for integrity of applied pollution prevention technologies.
- b. Registered livestock facilities with less than 300 animal units will apply pollution prevention technologies.
- c. Manure management plans will be implemented.

Non-Point Source Pollution Technical Assistance - KDHE

- a. Support Section 319 demonstration projects for pollution reduction from livestock operations in watershed.
- b. Provide technical assistance on practices geared to small livestock operations which minimize impact to stream resources.

c. Guide federal programs such as the Environmental Quality Improvement Program, which are dedicated to priority subbasins through the Unified Watershed Assessment, to priority subwatersheds and stream segments within those subbasins identified by this TMDL.

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

- a. Provide alternative water supplies to small livestock operations
- b. Develop improved grazing management plans
- c. Reduce grazing density on pasturelands
- d. Install livestock waste management systems for manure storage
- e. Implement manure management plans
- f. Install replacement on-site waste systems
- g. Coordinate with USDA/NRCS Environmental Quality Improvement Program in providing educational, technical and financial assistance to agricultural producers.

Riparian Protection Program - SCC

- a. Design feeding areas away from streams
- 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 livestock producers on riparian and waste management techniques.
- b. Provide technical assistance on livestock waste management design.
- c. Continue Section 319 demonstration projects on livestock management.

Agricultural Outreach - KDA

- a. Provide information on livestock management to commodity advocacy groups.
- b. Support Kansas State outreach efforts.

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 subwatershed over the years 2000-2004, with minor follow up implementation, including other subwatersheds over 2004-2008.

Targeted Participants: Primary participants for implementation will be small scale livestock producers operating without need of permits within the priority subwatershed. 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. Facilities without water quality controls
2. Unpermitted permanent feeding/holding areas
3. Sites where drainage runs through or adjacent livestock areas
4. Sites where livestock have full access to stream and stream is primary water supply
5. Grazed acreage, overstocked acreage and acreage with poor range condition
6. Poor riparian sites
7. Near stream feeding sites
8. 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 facilities and sites cited in the local assessment participating in the implementation programs provided by the state. Additionally, sampled data from Stations 517 should indicate evidence of reduced bacteria levels at moderate to low flow conditions relative to the conditions seen over 1990-1998.

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 and agricultural interest groups such as Kansas Farm Bureau, Kansas Livestock Association, the Kansas Pork Producers Council and the Kansas Dairy Association. On-site waste system inspections will be performed by Local Environmental Protection Program personnel for Geary County.

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 Geary County, \$77,085 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 county for the next fiscal year

Effectiveness: Non-point source controls for livestock waste have been shown to be effective in reducing pollution in locales such as the Herrington Lake watershed.. The key to effectiveness is participation within a finite subwatershed to direct resources to the activities influencing water quality. The milestones established under this TMDL are intended to gauge the level of participation in those programs implementing 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 in

order to meet the desired endpoints expressed in this TMDL. The state has the authority to impose conditions on activities with a significant potential to pollute the waters of the state under K.S.A. 65-171. If overall water quality conditions in the watershed deteriorate, a Critical Water Quality Management Area may be proposed for the watershed, in response.

6. MONITORING

KDHE will continue to collect bimonthly samples at Station 517, including fecal coliform samples over each of the three defined seasons during the initial implementation period. During the evaluation period (2004-2008), more intensive sampling will need to be conducted under specified seasonal flow conditions in order to determine the achievement of the desired endpoints of this TMDL. In Spring, at least 20 samples should be taken at flow conditions below 230 cfs, with half taken below 55 cfs. In Summer and Fall, 20 samples need to be taken below flows of 230 cfs, a majority of which will be collected at flows less than 20 cfs. In Winter 10 samples need to be taken at flows below 230 cfs.

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 Clarks Creek. Subsequent decisions will be made regarding implementation approach, follow up of additional implementation and implementation in the non-priority subwatershed.

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.