

KANSAS-LOWER REPUBLICAN BASIN TOTAL MAXIMUM DAILY LOAD

Waterbody: Buffalo Creek Water Quality Impairment: Fecal Coliform Bacteria

1. INTRODUCTION AND PROBLEM IDENTIFICATION

Subbasin: Lower Republican **County:** Cloud, Jewell, Mitchell and Republic

HUC 8: 10250017 **HUC 11:** 020 and 030

Drainage Area: 390 sq. mi.

Main Stem Segments: 29 and 37; starting at confluence with Republican River and traveling upstream to Mankato.

Tributary Segments: Cheyenne Creek (55)
Whites Creek (54)
Spring Creek (44)
Salt Creek (30)

Designated Uses: Expected Aquatic Life Support; Primary Contact Recreation; and Food Procurement on Main Stem Segment 37 and Salt Creek;
Expected Aquatic Life Support; Secondary Contact Recreation; and Food Procurement on Main Stem Segment 29 and Whites Creek;
Expected Aquatic Life Support; Secondary Contact Recreation on Cheyenne Creek, Spring Creek.

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

Impaired Use: Primary and Secondary Contact Recreation Use on Main Stem Segment 37 and Salt Creek; Secondary Contact Recreation on all other listed 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: Not Supporting Secondary Contact Recreation

Monitoring Sites: Station 509 near Concordia

Period of Record Used: 1990 to 1998

Flow Record: Buffalo Creek at Jamestown (USGS Station 06855800) flow was calculated seasonally from a regression on White Rock Creek at Burr Oak (USGS Station 06853800) and expanded 30 years of average daily streamflow (seasonally).

Long Term Flow Conditions: 10% High Flow Exclusion = 150 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 Jamestown and Burr Oak Gaging Stations 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

Three excursions were seen; one in Spring (S) and two in Summer-Fall (SF) season during the 1990 - 1998 sampling period. No Winter (W) samples were over the secondary criterion. Overall 8% of the samples were over the criteria. This would represent a baseline condition of full support of the impaired designated use. Impairments were seen in the most recent data set (1996-1997) used to set the 1998 303d list.

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 509 Over 1990-1998	
				0 TO 10%	10 TO 30%	30 TO 60%	60 TO 90%	90 TO 100 %			
BUFFALO CREEK		F C B	S	900-2000	0	0	0	0	0	1/11 = 9%	3/38 = 8% Exceedence
				> 2000	0	0	0	0	0		
				> 2 X 2000	0	0	9	0	0		
			S F	900-2000	0	0	7	0	0	2/14 = 14%	
				> 2000	0	0	0	0	0		
				> 2 X 2000	7	0	0	0	0		
			W	> 2000	0	0	0	0	0	0/13 = 0%	
				> 2 X 2000	0	0	0	0	0		

Desired Endpoints of Water Quality (Implied Load Capacity) at Site 509 over 2004 - 2008:

Overall, the endpoint of this TMDL will be to maintain the percent of samples over the applicable criteria 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 endpoints will be developed in 2004 to reflect additional sampling and confirmation of impaired status. 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 is one NPDES permitted wastewater discharger located within the watershed. This point source (Mankato MWTP) is located at the headwaters of the furthest upstream segment. Population projection through 2020 for Mankato indicate a moderate decrease in population. System design flows (0.2 mgd) are well within projected water use. Based on the monitoring data and load duration curves, this point source contribution to the bacteria loading at the monitoring site appears to be minimal.

Livestock Waste Management Systems: Fourteen operations are registered, certified or permitted within the watershed. Most facilities are located in proximity to the mainstem in the watershed. These operations are either swine/hogs (67% of animal units) or beef/cattle (23% of animal units). Animal units for the watershed total 5,462. The actual number of animal units on site is variable, but typically less than permitted numbers.

Land Use: Most of the watershed is cropland (66% of the area) and grassland (29% of the area). Grazing density of livestock is fair for the watershed (29 -31 animal units/sq. mi.). Cropland is predominate in the lower three quarters of the watershed.

On-Site Waste Systems: The population density in the watershed is low (8 - 15 persons/ sq. mi). Rural population projections for all counties associated with this watershed through 2020 show population declines.

Contributing Runoff: The watershed has an average soil permeability of 1.1 inches/hour according to NRCS STATSGO data base. Runoff would be produced from storms one to two hours in duration, having a recurrence interval of five, ten or twenty five years and storms of three hours in duration, having a recurrence interval of twenty-five years. Runoff is chiefly generated as infiltration excess with rainfall intensities greater than soil permeabilities. Generally, 12 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 36 or 85 percent of the watershed respectively.

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 river below the levels necessary to violate the water quality standards.

4. ALLOCATION OF POLLUTION REDUCTION RESPONSIBILITY

Based on the lack of data showing water quality excursions during the 1990 - 1998 period and the lack of runoff generated along this reach, no allocations for implementation should be made until additional monitoring and assessment is made to establish linkage between activities and impairment to the stream reach(es).

Point Sources: Mankato relies on a treatment system to minimize the release of fecal bacteria to receiving streams. Point sources are responsible to maintain their systems in proper working condition and appropriate capacity to handle anticipated wasteloads of their respective populations. Ongoing inspections and monitoring of the system will be made to ensure that minimal contributions have been made by these sources. Disinfection will be expected of Mankato as it complies with its NPDES permit.

The Wasteload Allocation is defined at the flow condition where the Mankato design flow

represents more than 10% of the flow or the 7Q10, whichever is greater, thereby exerting influence on the water quality of the stream. For Buffalo Creek at this location, that flow condition would be flows of 0-3 cfs. Such flows have been exceeded 68-91% 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 flow conditions, non-point sources are seen as a significant cause of water quality violations. The permitted livestock facilities rely on lagoon for wastewater treatment to minimize the release of fecal bacteria to receiving streams. Ongoing inspections and monitoring of the system will be made to ensure that minimal contributions have been made by these sources. Background levels might be represented by the low loads plotting below each of the seasonal curves. The previous assessment suggests that activities in proximity to the stream may be contributing to the bacteria violations. These activities would include livestock in small family operations and on pastureland along the streams, 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 and rural homesteads and farmsteads in the watershed. The Load Allocation assigns responsibility for maintaining water quality below the TMDL curve over flow conditions bracketed by the low flow of 3 cfs demarcating point source influence and the high flow exclusion of 150 cfs. These flows are exceeded 14-91% of the time during the Spring, 9-74% of the time over the Summer and Fall and 7-68% of the time during the Winter. Best Management Practices will be directed toward those activities such that there will be minimal violation of the applicable bacteria criteria at higher flows.

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; 1900 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: Because this watershed has a very low potential for runoff and few water quality excursion have been documented at the monitoring site during 1990-1998 this TMDL will be a Low Priority for implementation.

Unified Watershed Assessment Priority Ranking: This watershed lies within the Lower Republican River (HUC 8: 10250017) with a priority ranking of 11 (High Priority for restoration work).

Priority HUC 11s and Stream Segments: Pending additional monitoring and assessment, no priority subwatersheds or stream segments should be identified until after 2004.

5. IMPLEMENTATION

Desired Implementation Activities

1. Minimize non-point oriented contributions of bacteria loading to river.
2. Install disinfection treatment at upstream point sources.

Implementation Programs Guidance

NPDES - Municipal Program - KDHE

- a. Issue renewed NPDES permit for Mankato with continued disinfection requirements which are necessary to reduce bacteria counts below criteria downstream.

Until additional assessment of non-point sources is made, no direction can be made to those implementation programs.

Time frame for Implementation: Continued monitoring over the years 2000-2004.

Targeted Participants: 2004 assessment will establish targeted participants

Milestone for 2004: The year 2004 marks the midpoint of the ten-year implementation window for the watershed. At that point in time, additional monitoring data from Station 509 will be reexamined to confirm the impaired status of the streams within this watershed. Should the case of impairment remain, source assessment, allocation and implementation activities will ensue.

Delivery Agents: Regarding point source treatment, KDHE staff in the Municipal Programs Section will develop the appropriate permits, schedules of compliance and review of plans. Review of technical information and studies will be made by KDHE staff of the Technical Services Section and the Bureau of Environmental Field Services.

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 Cloud, Jewell, Mitchell, and Republic counties.

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 TMDL is a Low Priority consideration and should not receive funding until after 2004.

Effectiveness: Improvements in reducing bacteria loading to streams can be accomplished through appropriate management and control systems for municipal wastewater, livestock waste and on-site waste systems.

6. MONITORING

KDHE will continue to collect bimonthly samples at Station 509, including fecal coliform samples over each of the three defined seasons during 1999-2003. Based on that sampling, the status of 303d listing will be evaluated in 2004. Should impaired status remain, the desired endpoints under this TMDL will be refined and direct more intensive sampling will need to be conducted under specified seasonal flow conditions over the period 2004-2008.

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 impairment present and what implementation is necessary within the watershed of Buffalo Creek and its current condition of water quality.

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 1999-2003. Therefore, the decision for delisting will come about in the preparation of the 2004 303d list. Should the streams continue to be listed as impaired in 2004, the next evaluation for delisting will occur with the preparation of the 2008 Section 303d list. Should modifications be made to the applicable water quality criteria during the ten year implementation period, consideration for delisting, development of desired endpoints of this TMDL and implementation activities will 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 2004.

Approved January 26, 2000.