

KANSAS-LOWER REPUBLICAN BASIN TOTAL MAXIMUM DAILY LOAD

Waterbody: Republican River in Middle Republican Basin Water Quality Impairment: Fecal Coliform Bacteria

1. INTRODUCTION AND PROBLEM IDENTIFICATION

Subbasin: Middle Republican

County: Jewell and Republic

HUC 8: 10250016

HUC 11: 091, 128, 135, and 140

Drainage Area: 220.5 sq. mi.

Main Stem Segments: 1 and 2; starting near Scandia and traveling upstream to Kansas state line with Nebraska.

Tributary Segments: Crosby Creek (77)
Otter Creek (79)

Designated Uses: Expected Aquatic Life Support; Primary Contact Recreation; and all other uses on Segments 1 and 2 of Main Stem;
Expected Aquatic Life Support; Secondary Contact Recreation on Tributary segments.

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

Impaired Use: Primary and Secondary Contact Recreation Use on Main Stem;
Secondary Contact Recreation on Crosby Creek and Otter.

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 231 near Hardy, Nebraska

Period of Record Used: 1987 to 1998

Flow Record: Republican River flow was calculated seasonally (30 years of average daily streamflow) from Republican River near Hardy, Nebraska (USGS Station 06853500).

Long Term Flow Conditions: 10% High Flow Exclusion = 660 cfs, 7Q10 = 21 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 Hardy Gaging Station 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 were seen in all three seasons. Ten percent of Spring (S) samples and 41% of Summer-Fall (SF) samples were over the primary criterion. No Winter (W) samples were over the secondary criterion. Overall 17% of the samples were over the criteria. 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 231 Over 1987-1998
				0 TO 10%	10 TO 30%	30 TO 60%	60 TO 90%	90 TO 100%		
REPUBLICAN RIVER	F C B	S	900-2000	0	0	5	0	0	2/20 = 10%	11/65 = 17% Exceedence
			> 2000	0	0	0	0	0		
			> 2 X 2000	0	0	5	0	0		
	S F	S	900-2000	5	5	0	0	5	9/22 = 41%	
			> 2000	5	0	0	10	5		
			> 2 X 2000	5	5	0	0	0		
	W	W	> 2000	0	0	0	0	0	0/23 = 0%	
			> 2 X 2000	0	0	0	0	0		

Interim Endpoints of Water Quality (Implied Load Capacity) at Site 231 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. Refined seasonal endpoints will be developed in 2004 to reflect additional sampling and confirmation of impaired status. Tentatively,

1. Less than 10 % of samples taken in Spring exceed primary criterion at flows under 660 cfs with no samples exceeding the criterion at flows under 165 cfs.
2. Less than 10% of samples taken in Summer or Fall exceed the primary criterion at flows under 660 cfs with no samples exceeding the criterion at flows under 140 cfs.
3. Less than 10% of samples taken in Winter exceed secondary criterion at flows under 660 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 within the watershed.

Livestock Waste Management Systems: Twelve operations are registered, certified or permitted within the watershed. Most facilities are located toward the middle of the watershed. These operations are either swine (81% of animal units) or beef (18% of animal units). Animal units for the watershed total 4,233. The actual number of animal units on site is variable, but typically less than permitted numbers. Most of these operations are located below the monitoring site.

Land Use: Most of the watershed is cropland (58% of the area) and grassland (37% of the area). Grazing density of livestock fairly low for the watershed (29 - 34 animal units/sq. mi.). Cropland is concentrated in the eastern half of the watershed.

On-Site Waste Systems: The population density in the watershed is very low (6 - 12 persons/sq. mi). Rural population projections for Jewell and Republic Counties through 2020 show population declines.

Contributing Runoff: The watershed has an average soil permeability of 1.4 inches/hour according to NRCS STATSGO data base. Runoff would be produced from storms one hour in duration, having a recurrence interval of five, ten or twenty five years and from storm 2 hours in duration having a recurrence interval of ten and twenty five years. Runoff is chiefly generated as infiltration excess with rainfall intensities greater than soil permeabilities. Generally, 9 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 46 or 79 percent of the watershed respectively. It is likely that some of the contribution toward the problem emanates from beyond the stateline.

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

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. More detailed Wasteload and Load Allocations will be made in 2004 after additional sampling and more detailed assessment of the sources contributing to the bacteria impairment. At this point of time, the following can be anticipated.

Point Sources: Since there are no point sources located within the watershed, there will be no Wasteload Allocations established under 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. Background levels attributed to wildlife are not significant as a cause of the problem.

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 7Q10 low flow of 21 cfs demarcating potential point source influence and the

high flow exclusion of 660 cfs. These flows are exceeded 16-99% of the time during the Spring, 7-99% of the time over the Summer and Fall and 10-98% of the time during the Winter. Best Management Practices will be directed toward those activities in the upstream watersheds such that there should be accrued benefits of reduced violations of the applicable bacteria criteria at higher flows on the main stem of the river.

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: Because this stream reach is located near the stateline, with little activity attributable to monitored conditions, this TMDL will be a Low Priority for implementation.

Unified Watershed Assessment Priority Ranking: This watershed lies within the Middle Republican River (HUC 8: 10250016) with a priority ranking of 48 (Low 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.

Implementation Programs Guidance

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

Time frame for Implementation: Additional non-point source pollution reduction practices should be installed along the priority stream segments (1 & 2) after the year 2004 re-evaluation and confirmation of the impairment.

Targeted Participants: Primary participants for implementation will be any targeted activities identified by follow up assessment of sources, conducted by KDHE, conservation district personnel and county Local Environmental Protection Program staff.

Based on the local assessment, implementation activities should focus participation within those areas with greatest potential for impact on stream resources.

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 231 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: Depending upon confirmation of impairment and assessment of probable sources, 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 Jewell and Republic counties 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 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 231, 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 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 the Republican River 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 Years 2004.

Approved January 26, 2000.