

KANSAS-LOWER REPUBLICAN BASIN TOTAL MAXIMUM DAILY LOAD

Waterbody: Republican River near Clay Center Water Quality Impairment: Fecal Coliform Bacteria

1. INTRODUCTION AND PROBLEM IDENTIFICATION

Subbasin: Lower Republican **County:** Clay, Cloud, Republic, and Washington

HUC 8: 10250017 **HUC 11s:** 060, 065, 070, 080, 090, 100, 110 and 131
associated with Otter Creek watershed.

Drainage Area: 865 sq. mi.

Main Stem Segments: 8, 9, 13, 17, and 18 starting at inflow to Milford and traveling upstream to confluence of Salt Creek in Cloud County.

Tributary Segments: Elk Creek (14)
Peel Creek (10)
Spring Creek (53)
Finney Creek (64)
Lincoln Creek (65)
Otter Creek (66)

Designated Uses: Special Aquatic Life Support; Primary Contact Recreation; Domestic Water Supply; Food Procurement; Groundwater Recharge; Industrial Water Supply; Irrigation; and Livestock Watering on Main Stem; Expected Aquatic Life Support; Primary Contact Recreation and Food Procurement on Elk Creek;
Expected Aquatic Life Support; Primary Contact Recreation on Otter Creek.
Expected Aquatic Life Support; Secondary Contact Recreation on Peel Creek, Spring Creek, Finney Creek, and Lincoln Creek

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

Impaired Use: Primary Contact Recreation Use on Main Stem (segments 8, 9, 13, 17, and 18), Elk Creek (14) and Otter Creek (66); Secondary Contact Recreation other Tributaries.

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 503 near Clay Center.

Period of Record Used: 1990 to 1998

Flow Record: Republican River flow was calculated seasonally (30 years of average daily flow) from Republican River at Concordia, KS (USGS Station 06856000).

Long Term Flow Conditions: 10% High Flow Exclusion = 1,860 cfs, 7Q10 = 50 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 Clay Center 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 the Spring and Summer-Fall seasons. Seventeen percent of Spring (S) samples and 24% of Summer-Fall (SF) samples were over the primary criterion. None of Winter (W) samples were over the secondary criterion. Overall 13% 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 503 Over 1990-1998
				0 TO 10%	10 TO 30%	30 TO 60%	60 TO 90%	90 TO 100 %		
REPUBLICAN RIVER NEAR CLAY CENTER	F C B	S	900-2000	0	0	0	4	0	4/23= 17%	10/76=13% Exceedence
			> 2000	0	0	4	4	0		
			> 2 X 2000	0	4	0	0	0		
		S F	900-2000	0	4	0	0	4	6/25= 24%	
			> 2000	0	4	4	0	0		
			> 2 X 2000	0	8	0	0	0		
		W	> 2000	0	0	0	0	0	0/28= 0%	
			> 2 X 2000	0	0	0	0	0		

Interim Endpoints of Water Quality (Implied Load Capacity) at Site 503 over 2004 - 2008:

Overall, the endpoint of this TMDL will be to reduce the percent of samples over the applicable criteria from 13% 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. Seasonal endpoints will be refined in 2004 to reflect additional sampling over 1999-2003. Tentatively,

1. Less than 10 % of samples taken in Spring exceed primary criterion at flows under 1,860 cfs with no samples exceeding the criterion at flows under 475 cfs.
2. Less than 10% of samples taken in Summer or Fall exceed the primary criterion at flows under 1,860 cfs with no samples exceeding the criterion at flows under 250 cfs.
3. Less than 10% of samples taken in Winter exceed secondary criterion at flows under 1,860 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 four NPDES permitted wastewater discharger within the watershed.

MUNICIPALITY	STREAM REACH	SEGMENT	DESIGN FLOW
Clyde	Republican R.	17	0.1 mgd
Clifton	Republican R.	13	0.12 mgd
Enron	Republican R.	13	0.000010 mgd
Clay Center	Finney Cr*	64	0.715 mgd

* Clay Center is in the process of moving discharge point from Finney Cr to Republican R. (Stream Segment 8)

Population projections for Clyde and Clifton to the year 2020 indicate declining population; projections for Clay Center show increasing population. Projections for future water use and resulting wastewater appear to be under design flows for each of the systems. The excursions from the water quality standards appear to occur under low and medium flow conditions in the Spring season (April-June) and under higher precipitation event generated flows (a single low flow exception was noted) for the Summer-Fall season (July-October), indicating that point sources may have a minor impact under lower flows in the watershed.

Livestock Waste Management Systems: 135 operations are registered, certified or permitted within the watershed. Most of these facilities are located in either the lower half or the north side of the watershed. These operations mostly swine/hogs (55% of the animal units), beef (25% of the animal units) or poultry (10% of the animal units). Animal units for the watershed total 58,020. Many facilities have systems (these facilities account for 69% of the animal units in the watershed) 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 cropland (63% of the area) or grassland (29% of the area). Grazing density of livestock is fair to moderate for the watershed (31-39 animal units/sq. mi.). The cropland seems to be evenly distributed across the watershed.

On-Site Waste Systems: The population density in the watershed is low. Rural population

projections for all the counties in the watershed through 2020 show declining population densities. Failing on-site waste systems can contribute bacteria loadings. In FY 1998, six complaints on failing septic systems were investigated in between all counties in the watershed and 4 such complaints were investigated on domestic lagoons. In the first three quarters of Fiscal Year 1999, five complaints have been made on septic systems in the counties of interest and 12 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.

Contributing Runoff: The watershed has an average soil permeability of 1.2 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. Runoff is chiefly generated as infiltration excess with rainfall intensities greater than soil permeabilities. Generally, 13 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 60 or 92 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

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: The point sources are responsible to maintain their lagoons in proper working condition and appropriate detention volume to handle anticipated wasteloads of their respective populations. 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 or the 7Q10, whichever is greater, thereby exerting influence on the water quality of the stream. For the Republican River at this location, that flow condition would be flows of 0-50 cfs. Such flows have been exceeded 97-99% 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 flow conditions, non-point sources are seen as the primary cause of water quality violations. The sixty-eight of the 135 livestock facilities (accounting for 69% of the animal units in the watershed) rely on lagoon systems for wastewater detention and long holding times to minimize the release of fecal bacteria to receiving streams. 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 carry waste material into streams under moderate conditions.

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 50 cfs demarcating point source influence and the high flow exclusion of 1860 cfs. These flows are exceeded 16-99% of the time during the Spring, 11-99% of the time over the Summer and Fall and 11-97% 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; 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 watershed has only a moderate potential for runoff and water quality excursions are not as frequent as other watersheds this TMDL will be a Medium 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: Until additional assessment is done between 2000-2004, no priority subwatersheds or segments will be identified prior to 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 sources is made, no direction can be made to implementation programs.

Time frame for Implementation: After additional assessment, non-point source pollution reduction practices should be installed along the priority stream segments after the year 2004.

Targeted Participants: Primary participants for implementation will be targeted activities identified by follow up assessment of sources, conducted by KDHE, conservation district personnel and county LEPP 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 mid-point of the ten-year implementation window for the watershed. At that point in time, adequate source assessment should be complete which allows an allocation of resources to responsible activities contributing to the bacteria problem. Should sampled data from Station 503 indicate growing problems with bacteria impairment, the assessment and follow on implementation will be accelerated.

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

In State Fiscal Year 1999, the state provided to Clay, Cloud, Republic and Washington counties a total of \$122,646 in 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 four counties for the next fiscal year.

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 503, including fecal coliform samples over each of the three defined seasons. Based on that sampling, 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. Current monitoring efforts should attempt to collect samples reflective of the tentative desired endpoints.

In Spring, samples should be taken at flow conditions below 1,860 cfs, particularly below 475 cfs. In Summer and Fall, samples need to be taken below flows of 1,860 cfs, a majority of which will be collected at flows less than 250 cfs. In Winter, samples need to be taken at flows below 1,860 cfs. Use of the real time flow data available at the Clay Center stream gaging station can direct sampling efforts.

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 2000-2004 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 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 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 after Fiscal Year 2004.

Approved January 26, 2000.