

KANSAS-LOWER REPUBLICAN BASIN TOTAL MAXIMUM DAILY LOAD

Waterbody: Lower Wakarusa River Water Quality Impairment: Fecal Coliform Bacteria

1. INTRODUCTION AND PROBLEM IDENTIFICATION

Subbasin: Lower Kansas

County: Douglas

HUC 8: 10270104

HUC 11: 020

Drainage Area: 204.6 sq. mi.

Main Stem Segments: 24 starting at confluence with Kansas River and traveling upstream to confluence with Washington Creek.

Tributary Segments: Coal Creek (80)
Little Wakarusa Creek (71)

Designated Uses: Expected Aquatic Life Support; Primary Contact Recreation; and all other uses on Segments 24 of Main Stem;
Expected Aquatic Life Support; Primary Contact Recreation; and Food Procurement on Coal Creek;
Expected Aquatic Life Support; Secondary Contact Recreation on Little Wakarusa Creek.

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

Impaired Use: Primary Contact Recreation Use on Main Stem and Coal Creek;
Secondary Contact Recreation on Little Wakarusa Creek.

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 500 (primary site) near Lawrence and Station 236 (secondary site) near Eudora.

Period of Record Used: 1990 to 1998

Flow Record: Wakarusa River flow was calculated seasonally (30 years of average daily streamflow) from Wakarusa River near Lawrence (USGS Station 06891500).

Long Term Flow Conditions: 10% High Flow Exclusion = 725 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 Lawrence 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. Thirty one percent of Spring (S) samples and 25% of Summer-Fall (SF) samples were over the primary criterion. Ten percent of Winter (W) samples were over the secondary criterion. Overall 23% 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 500 Over 1990-1998 |
|-------------|--|----------------------------|-----------|----------|-----------|-----------|-----------|------------|---|---|
| | | | | 0 TO 10% | 10 TO 30% | 30 TO 60% | 60 TO 90% | 90 TO 100% | | |

| | | | | | | | | | | |
|----------------------|-------------|--------|------------|---|---|---|----|----|------------------|---------------------|
| LOWER WAKARUSA RIVER | F C B | S | 900-2000 | 8 | 0 | 0 | 16 | 0 | 4/13 = 31% | 8/35=23% Exceedence |
| | | | > 2000 | 0 | 0 | 0 | 0 | 0 | | |
| | | | > 2 X 2000 | 0 | 0 | 8 | 0 | 0 | | |
| | | S F | 900-2000 | 0 | 0 | 0 | 8 | 0 | 3/12 = 25% | |
| | | | > 2000 | 0 | 0 | 0 | 8 | 0 | | |
| | | | > 2 X 2000 | 0 | 8 | 0 | 0 | 0 | | |
| | | W | > 2000 | 0 | 0 | 0 | 0 | 0 | 1/10 = 10% | |
| | | | > 2 X 2000 | 0 | 0 | 0 | 0 | 10 | | |

Desired Endpoint Condition of Water Quality at Site 500 over 2004 - 2008:

Overall, the endpoint of this TMDL will be to reduce the percent of samples over the applicable criteria from 23% 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 725 cfs with no samples exceeding the criterion at flows under 80 cfs.
2. Less than 10% of samples taken in Summer or Fall exceed the primary criterion at flows under 725 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 725 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 within the watershed.

| MUNICIPALITY | STREAM REACH | SEGMENT | DESIGN FLOW | # CELLS | DETENTION TIME |
|-------------------------|---------------------|----------------|--------------------|------------------|-----------------------|
| USD#348 Vinland Elem | Coal Cr. | 80 | 0.002 mgd | 2 | > 150 days |
| Eudora | Wakarusa R. | 24 | 0.263 mgd | 3 | > 120 days |
| Eudora (proposed) | Wakarusa R. | 24 | 0.9 mgd | Activated Sludge | |

Population projections for Eudora to the year 2020 indicate population growth. Projections for associated future water use and resulting wastewater appear to be within design flows for the Eudora system (proposed). The outfall from Eudora is below the monitoring site on the Wakarusa River.

Livestock Waste Management Systems: Eleven operations are registered, certified or permitted within the watershed. These facilities are located in the southern half of the watershed. These operations are either dairy (53% of animal units), or beef (44% of animal units) or swine (3% of animal units). Animal units for the watershed total 1,826. The actual number of animal units on site is variable, but typically less than permitted numbers.

Land Use: Most of the watershed is grassland (38% of the area), cropland (36% of the area) or woodland (15% of the area). Grazing density of livestock is fair to moderate for the watershed (36 animal units/sq. mi.). Cropland is concentrated on the eastern side of the watershed, along alluvial valleys in the tributaries and in the Kansas River valley.

On-Site Waste Systems: The population density in the watershed is high (400 persons/ sq. mi). Rural population projections for Douglas County through 2020 show high population growth. Failing on-site waste systems can contribute bacteria loadings. In FY 1998, 443 inspections or investigations of complaints on failing on-site waste systems were investigated in Douglas County. In the first three quarters of Fiscal Year 1999, 157 such visits have been made on on-site systems in Douglas County. The sporadic excursion from the water quality standards seems to indicate a lack of persistent loadings from such systems on any grand scale. However, the high rural population density expected over the next 20 years makes this source a prime candidate for investigation.

Contributing Runoff: The watershed has an average soil permeability of 0.8 inches/hour according to NRCS STATSGO data base. Runoff would be produced from storms one to three hours in duration, having a recurrence interval of five, ten or 25 years. Runoff is chiefly generated as infiltration excess with rainfall intensities greater than soil permeabilities. Generally, 30 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 65 or 93 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 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.

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 for maintaining their systems in proper working condition and appropriate detention volume to handle anticipated wasteloads of their respective populations. Ongoing inspections and monitoring of the systems 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 Wakarusa River at this location, that flow condition would be flows of 0-14 cfs. Such flows have been exceeded, 95% of the time during the Spring, 67% of the time during the Summer-Fall and 70% of the time during Winter season. 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 initial 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. One of the 11 livestock facilities (accounting for 5% of the animal units in facilities in the watershed) relies on lagoon systems for wastewater detention and long holding times to minimize the release of fecal bacteria to receiving streams. Background levels attributed to wildlife are not significant as a cause of the problem. The previous assessment suggests that faulty on-site waste systems or livestock activities close to the river prime candidates for assessment on the occasional bacteria problem. Given the runoff characteristics of the watershed, overland runoff has to be significant on the watershed to carry waste material from developed areas into streams. Activities to reduce fecal pollution should be directed toward the on-site waste systems, particularly septic systems in the lower portion of the watershed.

Activities to reduce fecal pollution should also 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 combined point source contribution of influence of 14 cfs and the high flow exclusion of 725 cfs. These flows are exceeded 18-95% of the time during the Spring, 8-67% of the time over the Summer and Fall and 6-70% 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 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 Medium Priority for implementation, because there is a lack of runoff contributing to the bacteria problems seen at the monitoring station and because additional source assessment is necessary to examine contributing activities.

Unified Watershed Assessment Priority Ranking: This watershed lies within the Lower Kansas River (HUC 8: 10270104) with a priority ranking of 1 (Highest Priority for restoration work).

Priority HUC 11s and Stream Segments: Until additional assessment is done on the stream reach between 2000-2004, there will be no areas with priority focus of implementation 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.

Timeframe for Implementation: Additional non-point source pollution reduction practices should be installed along the priority stream segment (24) 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 500 indicate growing problems with bacteria impairment, the assessment and follow on implementation will be accelerated.

Delivery Agents: 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 Douglas 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 Medium Priority consideration and should not receive funding until after 2004.

In State Fiscal Year 1999, the state provided to Douglas County, \$54,200 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: 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 500, 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.

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.

BASINS modeling should be conducted to assess the relative contributions of bacteria loading along the river. Such modeling should be completed by 2003.

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 necessary within the watershed of the Wakarusa 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.