

LOWER ARKANSAS RIVER BASIN TOTAL MAXIMUM DAILY LOAD

Waterbody: Bluff Creek Water Quality Impairment: Fecal Coliform Bacteria

1. INTRODUCTION AND PROBLEM IDENTIFICATION

Subbasin: Chikaskia

Counties: Harper and Sumner

HUC 8: 11060005

HUC 11 (HUC 14s): 040 (010, 020, 030, 040, 050, 060, and 070)
050 (010, 020, and 030)

Drainage Area: 413.8 mi²

Main Stem Segment: 15; starting at the confluence with Fall Creek; headwaters in northwest Harper County.

Tributary Segments: Spring Branch (21)
Baehr Creek (22)
Rock Creek (23)
Rush Creek (45)
Beaver Creek (46)
Spring Creek (47)

Designated Uses: Expected Aquatic Life Support; Primary Contact Recreation; Domestic Water Supply; Food Procurement; Ground Water Recharge; Industrial Water Supply Use; Irrigation Use; Livestock Watering Use for Main Stem Segment and Spring Creek

Expected Aquatic Life Support on all tributary segments

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

Impaired Use: Secondary Contact Recreation on all listed segments; Primary Contact Recreation on Main Stem Segment and Spring Creek.

Water Quality Standard: Fecal Coliform Bacteria: 900 colonies per 100 ml for Primary Contact Recreation in April-October (K.A.R. 28-16-283(c)(7)(B)) (disapproved); 2,000 colonies per 100 ml for Secondary Contact Recreation (K.A.R. 28-16-28e(c)(7)(C))

2. CURRENT WATER QUALITY CONDITION AND DESIRED ENDPOINT

Level of Support for Designated Use under 1998 303(d): Partially Supporting Contact Recreation

Monitoring Sites: Station 530 near Caldwell, Station 618 near Bluff City

Period of Record Used: 1990 to 1999 (Station 530): 1991, 1995 and 1999 (Station 618 which in 1999 includes Kansas Biological Survey samples from that year)

Flow Record: USGS Station 07151670; calculated flow based on measurements at 07151670 and data from Station 07149000 (Medicine Lodge River near Kiowa)

Long Term Flow Conditions: 10% Exceedence Flow = 160 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. The calculated flow duration data were examined from the Bluff Creek Gaging Site. The seasonal component of the duration data could not be examined because of lack of a permanent gage on Bluff Creek. High flows and runoff equate to lower flow durations, baseflow and point source influences generally occur in the 75-99% range. A load curve was established for the Primary 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. This load curve represents 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.

At Site 530 excursions were seen during all seasons of the year; at Site 618 excursions occurred in summer and winter. Fifteen percent of the samples from water quality site 530 were over the designated criteria. Seventeen percent of the samples at site 618 were over the criteria. At both sites this would represent a baseline condition of partial support of the impaired designated use. For both sites combined, nine of the eleven samples over the criteria occurred during higher stream flows.

NUMBER OF SAMPLES OVER BACTERIA STANDARD OF 2000 cts/100mL BY FLOW

Station	Season	0 to 10%	10 to 25%	25 to 50%	50 to 75%	75 to 90%	90 to 100%	Cum Freq.
Caldwell (530)	Annual	2	4	0	2	0	0	8/55 = 15%

NUMBER OF SAMPLES OVER BACTERIA STANDARD OF 2000 cts/100mL BY FLOW

Station	Season	0 to 10%	10 to 25%	25 to 50%	50 to 75%	75 to 90%	90 to 100%	Cum Freq.
Bluff City (618)	Annual	1	1	1	0	0	0	3/18 = 17%

Desired Endpoints of Water Quality (Implied Load Capacity) at Sites 530 and 618 over 2005 - 2009:

The ultimate endpoint for this TMDL will be to achieve Kansas Water Quality Standards fully supporting both Primary Contact Recreation and Secondary Contact Recreation. This TMDL will, however, be phased. Kansas adopted a Primary Contact Recreation standard of 900 colonies per 100 ml but EPA subsequently disapproved that standard. This standard was used to establish a load duration curve shown in the TMDL curve. It is recognized, however, that the Primary Contact Recreation Standard will be revised in the future in accordance with national guidance. A revised Primary Contact Recreation TMDL curve will be established in Phase Two of this TMDL to reflect changes in this Standard. For Phase One the endpoint will be to achieve the Secondary Contact Recreation value of 2,000 colonies per 100 ml and this Phase One load curve is also shown in the TMDL figure. The Kansas Standards allow for excursions above these criteria when the stream flow exceeds flow that is surpassed 10% of the time, for this instance, 160 cfs.

Monitoring data plotting below the TMDL curve will indicate attainment of the water quality standards.

This endpoint 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 endpoint 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 municipal wastewater discharger within the watershed.

MUNICIPALITY	STREAM REACH	SEGMENT	DESIGN FLOW	TYPE
Anthony	Spring Creek	47	1.0 mgd	Oxid. Ditch

Population projections for Anthony to the year 2020 indicate modest declines. Projections of future water use and resulting wastewater appear to be within design flows for the current system's treatment capacity. The City is presently changing its treatment to a 3 cell Wastewater

Stabilization Lagoon System. The excursions from the water quality standard appear to occur primarily under higher flow conditions. Of significance to point sources are the excursions under low flow in all seasons, especially during winter, indicating that point sources may have an impact under lower flows in the watershed.

Livestock Waste Management Systems: Thirteen operations are registered, certified or permitted within the watershed. All facilities are located in the upper half of the watershed. Potential animal units for all facilities in the watershed total 7,919. The actual number of animal units on site is variable, but typically less than potential numbers.

Land Use: Most of the watershed is cropland (68% of the area) and grassland (31% of the area). Based on 1997 water use reports, less than 1% of the cropland in the watershed is irrigated. Most of the grassland is located in the upper third of the watershed and on the steeper slopes of alluvial valleys. The off-season grazing density is comparatively high for the upper half and average for the lower half of the watershed for the Lower Arkansas River Basin. The growing season grazing density is average for the watershed when compared to densities for the Lower Arkansas Basin as a whole.

On-Site Waste Systems: Most of the watershed's population density is very low, 2 - 12 persons/mi² except for areas associated with towns or cities (Anthony and immediate surrounding area density is 38-52 persons/mi²). The rural population projection for Harper County through 2020 shows moderate declines. While failing on-site waste systems in rural settings can contribute bacteria loadings, their impact on the impaired segments is very limited, given the density of the rural population.

Contributing Runoff: The watershed's average soil permeability is 1.5 inches/hour according to NRCS STATSGO data base. About 76% of the watershed produces runoff even under relative low (1.5"/hr) potential runoff conditions. Under very low (<1"/hr) potential conditions, this potential contributing area is almost halved (40%). Runoff is chiefly generated as infiltration excess with rainfall intensities greater than soil permeabilities. As the watersheds' soil profiles become saturated, excess overland flow is produced. Generally, storms producing less than 0.5"/hr of rain will generate runoff from only 5% of this watershed, chiefly along the stream channels.

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 annual 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.

Point Sources: Point sources are responsible for maintaining their systems in proper working condition and appropriate detention volume to handle anticipated wasteloads of their respective populations. Anthony presently relies on an oxidation ditch for their wastewater treatment but will change treatment in 2001 to a 3 cell lagoon system and reduce their design flow to 0.30 mgd. Ongoing inspections and monitoring of this system will be made to ensure that minimal contributions have been made by this source.

The Wasteload Allocation is defined at the flow condition of the design flow or the 7Q10, whichever is greater, thereby exerting influence on the water quality of the stream. For Bluff Creek, that flow condition would be flows of 0 - 1.55 cfs. Such flows have been exceeded 80-99% of the time at Water Quality Sampling Site 530 and 77-99% of the time at Site 618. Future NPDES and state permits will be conditioned such that discharges from permitted facility will not cause violations of the applicable bacteria criteria at or below this 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 runoff conditions, non-point sources are seen as a significant cause of water quality violations. Background levels 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 along the river. Implementation of non-point source pollution control practices should be taken within one mile of the river or any directly contributing tributary.

The Load Allocation assigns responsibility for maintaining water quality below the TMDL curve over flow conditions exceeded less than 80% of the time at Site 530 and less than 77% of the time at Site 618. 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 (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 of the multitude of impairments which are occurring within this watershed and to begin to address dissolved oxygen and bacteria loading, this TMDL will be a High Priority for implementation.

Unified Watershed Assessment Priority Ranking: This watershed lies within the Chikaskia River Subbasin (HUC 8: 11060005) with a priority ranking of 30 (Medium Priority for restoration work).

Priority HUC 11s and Stream Segments: Until additional assessment is done on the main stem and tributary reaches between 2000-2005, priority focus of implementation prior to 2005 will concentrate on installing best management practices adjacent to Bluff Creek and directly contributing tributaries in HUC 11 11060005040.

5. IMPLEMENTATION

Desired Implementation Activities

1. Renew state and federal permits and inspect permitted facilities for permit compliance
2. Install proper manure and livestock waste storage
3. Install grass buffer strips along tributaries.
4. Install pasture management practices, including proper stock density on grasslands
5. Remove winter 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. Municipal permits for facilities in the watershed will be renewed after 2002 with continuation bacteria monitoring and permit limits preventing excursions in bacteria criteria.
- b. Livestock permitted facilities will be inspected for integrity of applied pollution prevention technologies.
- c. Registered livestock facilities with less than 300 animal units will apply pollution prevention technologies.
- d. 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 watersheds and stream segments within those subbasins identified by this TMDL.

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

- a. Develop improved grazing management plans
- b. Install livestock waste management systems for manure storage
- c. Implement manure management plans
- d. Install replacement on-site waste systems
- e. Coordinate with USDA/NRCS Environmental Quality Improvement Program in providing educational, technical and financial assistance to agricultural producers.

Riparian Protection Program - SCC

- a. Design winter 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 subwatersheds over the years 2001-2005, with follow up implementation thereafter.

Targeted Participants: Primary participants for implementation will be small livestock producers operating without need of permits within the priority watershed. 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 contributing tributaries 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 2001 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 2005: The year 2005 marks the mid-point 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 the seven monitoring stations should indicate evidence of reduced bacteria levels at median conditions relative to the conditions seen over 1987-1999.

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 or 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 Sedgwick, Harvey and Reno 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 Lower Arkansas 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.

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 voluntary 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 1987-1999, the state may employ more stringent regulations on non-point sources 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 530 and in 2003 and 2008 at the rotational Station 618, including fecal coliform bacteria samples. During the evaluation period (2005-2010), 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. The manner of evaluation will be consistent with the assessment protocols used to establish the case for impairment in these streams. Following current (1998) Kansas assessment protocols, monitoring will ascertain at this phase if less than 10% of samples exceed the applicable criterion at flows under 160 cfs with no samples exceeding the criterion at flows under 83 cfs. Use of the real time flow data available at the Medicine Lodge near Kiowa stream gaging station can direct sampling efforts.

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.

Monitoring of bacteria levels in effluent will be a condition of NPDES and state permits for facilities. This monitoring will continually assess the functionality of the systems in reducing bacteria levels in the effluent released to the streams.

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 Lower Arkansas Basin were held March 9, 2000 and April 26-27, 2000 in Wichita, Hutchinson, Arkansas City and Medicine Lodge. 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 Lower Arkansas Basin.

Public Hearing: A Public Hearing on the TMDLs of the Lower Arkansas Basin was held in Wichita on June 1, 2000.

Basin Advisory Committee: The Lower Arkansas Basin Advisory Committee met to discuss the TMDLs in the basin on September 27, November 8, 1999; January 13, 2000; March 9, 2000 and June 1, 2000

Discussion with Interest Groups: Meetings to discuss TMDLs with interest groups include:
Agriculture: January 12, February 2 and 29, 2000
Environmental: March 9, 2000

Conservation Districts: November 22, 1999

Industry: December 15, 1999, January 13, February 9 and 22, 2000

Local Environmental Protection Groups: September 30, November 2, December 16, 1999

Milestone Evaluation: In 2005, evaluation will be made as to the degree of implementation which has occurred within the watershed and current condition of Bluff Creek. Subsequent decisions will be made regarding the implementation approach and follow up of additional implementation in the watershed.

Consideration for 303(d) Delisting: The river will be evaluated for delisting under Section 303(d), based on the monitoring data over the period 2005-2009. Therefore, the decision for delisting will come about in the preparation of the 2010 303(d) 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.

At this phase of the TMDL, assessment for delisting will evaluate if the percent of samples over the applicable secondary contact recreation criterion is less than 10% for samples taken at flows below the high flow exclusion over the monitoring period of 2005-2009. This assessment defines full support of the designated use under water quality standards as measured and determined by current 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. As protocols and assessments for impairment change for future 303(d) lists, the monitoring data collected under this TMDL will use these new assessments and protocols for delisting consideration.

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 2001-2005.

Approved August 9, 2000.