

LOWER ARKANSAS RIVER BASIN TOTAL MAXIMUM DAILY LOAD

Waterbody: Bluff Creek Water Quality Impairment: Selenium

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: 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 Impacts

Impaired Use: Expected Aquatic Life

Water Quality Standard: 5 µg/liter for Chronic Aquatic Life (KAR 28-16-28e(c)(2)(F)(ii))

In stream segments where background concentrations of naturally occurring substances, including chlorides, sulfates and selenium, exceed the water quality criteria listed in Table 1a of KAR 28-16-28e(d), at ambient flow, the existing water quality shall be maintained, and the newly established numeric criteria shall be the background concentration, as defined in KAR 28-16-28b(e). Background

concentrations shall be established using the methods outlined in the “Kansas implementation procedures: surface water,” dated June 1, 1999... (KAR 28-16-28e(b)(9)).

2. CURRENT WATER QUALITY CONDITION AND DESIRED ENDPOINT

Level of Support for Designated Use under 1998 303(d): Not Supporting Expected Aquatic Life

Monitoring Sites: Station 618 near Bluff City

Period of Record Used: 1991, 1995 and 1999 (1999 data 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 = 70 cfs; Median Flow = 14 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 selenium 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 pounds of selenium 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.

Excursions were seen all year round under higher flow conditions. Twenty five percent of the samples from water quality site 618 were over the criterion. This would represent a baseline condition of non-support of the impaired designated use for the site. All violations occurred in 1995.

NUMBER OF SAMPLES OVER SELENIUM STANDARD OF 5 ug/L 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	1	0	0	4/16 = 25%

It is believed that higher flow selenium loading occurs under two processes:

The first process is when soils, stream banks and alluvial sediments, weathered from parent material high in selenium, are washed and scoured into the stream during runoff events. Both turbidity and total suspended solids were elevated for most samples exceeding the standard.

The second process relates to the loss of deep-rooted prairie grasses during the conversion to cropland and terracing in the watershed which has increased recharge. In addition to the historic change in land use, there has also been a proliferation of tributary watershed lakes and ponds. The increase in recharge enhances the movement of salts and selenium from the shallow subsurface weathered zone of the underlying Permian rocks to low lying areas and watershed ponds. In these areas the selenium is concentrated by evapotranspiration. Runoff events flush these areas into the stream. Inspection of the historic flow record of the Medicine River near Kiowa (07149000) indicates that excursions have occurred either during the peak or on the falling limb of runoff events.

Because the violations occurred only in 1995, it is possible that selenium built up within the soil profile and was flushed out during the recharge events of 1995. Drought conditions and low flow were prevalent in 1991 and it is possible that by 1999, the selenium build-up had been flushed and concentrations returned below standards.

Desired Endpoints of Water Quality (Implied Load Capacity) at Site 618 over 2005 - 2010:

The ultimate endpoint for this TMDL will be to achieve Kansas Water Quality Standards fully supporting Aquatic Life. The endpoint will be to achieve the Aquatic Life value of 5 ug/L and this load curve is shown in the TMDL figure. Monitoring data plotting below the TMDL curve will indicate attainment of the water quality standards. Seasonal variation in endpoints is accounted for by notation of the sample date on the annual TMDL curve and will be evaluated based on monitoring data from 2003 and 2007.

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 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

Excursions from the water quality standard appear to occur primarily under higher flow conditions related to runoff events. 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.

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 selenium loading may be associated with background levels, especially where geologic formations naturally high in selenium contribute groundwater to baseflow.

4. ALLOCATION OF POLLUTION REDUCTION RESPONSIBILITY

The nature of selenium 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 selenium 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.

A Wasteload Allocation of zero will be established by this TMDL because of the presumed lack of point source influence on the selenium load in the watershed. Should future monitoring indicate point sources do contribute to the selenium load in impaired segments, the current wasteload allocation will be revised by adjusting current load allocations to account for the presence and impact of these point source dischargers.

Additionally, if future point sources are proposed in the watershed and discharge into the impaired segments and are found contribute to the selenium load, the current wasteload allocation will also be revised by adjusting allocations to account for the presence and impact of these new point source dischargers.

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, particularly natural background levels are seen as the primary factor in causing water quality violations of 1995.

Without a Wasteload Allocation, the Load Allocation assigns responsibility for maintaining water quality across all flow conditions at Site 618. The Load Allocation based on the existing standard will range from 0.0243 pounds per day at the 7Q10 to 0.34 pounds per day at the median flow of 14 cfs.

Defined Margin of Safety: The Margin of Safety provides some hedge against the uncertainty of loading and the selenium endpoint will be ten percent of the applicable selenium load, or 0.0027 pounds per day at 7Q10 and to 0.038 pounds per day at median flow.

State Water Plan Implementation Priority: Because there is uncertainty on the exact mechanism contributing selenium to the stream and there is a lack of violations during the 1999 samplings, this TMDL will be a Medium 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 after 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. Minimize non-point oriented contributions of selenium 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 within one mile of the main stem and directly contributing tributaries after the year 2005 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 2005: The year 2005 marks the midpoint of the ten-year implementation window for the watershed. At that point in time, additional monitoring data from Station 618 (and 530) 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.

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 TMDL is a Medium Priority consideration and should not receive funding until after 2005.

Effectiveness: Improvements in reducing the load generated from runoff to streams can be accomplished through appropriate stream bank management and erosion control systems near streams.

6. MONITORING

KDHE will continue to collect bimonthly samples in 2003 and 2007 at the rotational Station 618, including selenium samples. During the evaluation period (2005-2009), more intensive sampling may 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.

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 will be 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;

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 2006, 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: Bluff Creek 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.

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 2005.

Approved July 27, 2001.