

LOWER ARKANSAS RIVER BASIN TOTAL MAXIMUM DAILY LOAD

Water Body: Medicine Lodge River Tributaries Water Quality Impairment: Selenium

1. INTRODUCTION AND PROBLEM IDENTIFICATION

Subbasin: Medicine Lodge **Counties:** Barber, Comanche, Kiowa, & Pratt

HUC 8: 11060003

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

Drainage Area: 525 square miles at Medicine Lodge; 262 square miles between Belvidere and Medicine Lodge (**Figure 1**)

Main Stem Segment: Non-WQLS: 6, starting at the confluence with Cedar Creek and ending at the confluence with Turkey Creek

Tributary Segments: WQLS: Bear Creek (13)
 Bitter Creek (18)
 Cottonwood Creek (16)
 Little Bear Creek (19)
 Mulberry Creek (14)
 Puckett Creek (15)
 Sand Creek (17)
 Turkey Creek (7)

Designated Uses: Special Aquatic Life Support; Primary & Secondary Contact Recreation; Domestic Water Supply; Food Procurement; Ground Water Recharge; Industrial Water Supply Use; Irrigation Use; Livestock Watering Use for Main Stem Segment

Expected Aquatic Life Support for Bitter Creek, Cottonwood Creek, Little Bear Creek, Puckett Creek, and Sand Creek

Special Aquatic Life Support for Bear Creek, Mulberry Creek, and Turkey Creek

1998 303d Listing: Table 3 - Predominantly Natural Conditions Impact

Impaired Use: Special and Expected Aquatic Life Support

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)).

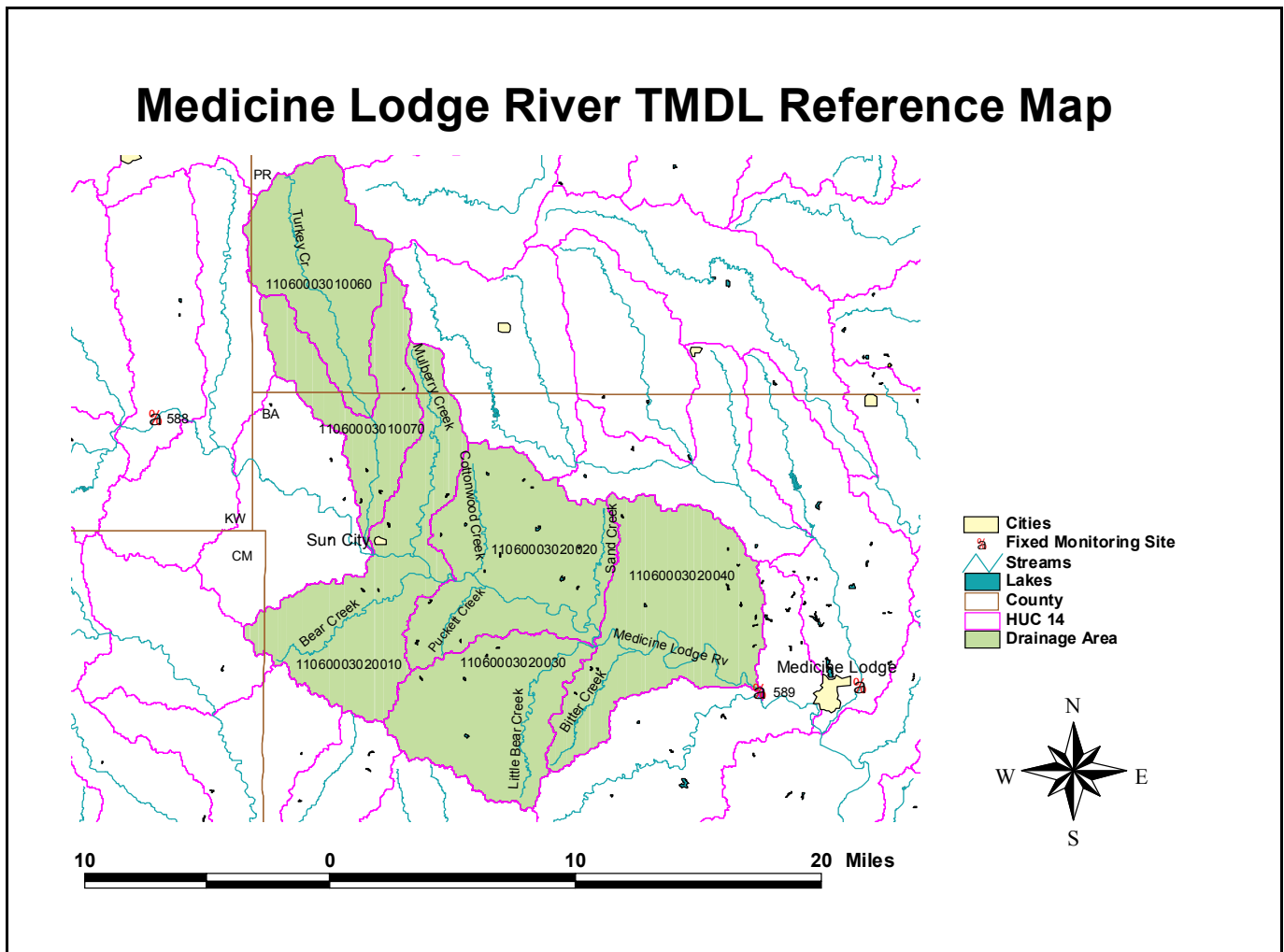


Figure 1

2. CURRENT WATER QUALITY CONDITION AND DESIRED ENDPOINT

Level of Support for Designated Use under 1998 303(d): Partially Supporting for Chronic Aquatic Life

Monitoring Sites: Station 589 near Medicine Lodge

Period of Record Used: 1990, 1994 & 1998

Flow Record: Medicine Lodge at Medicine Lodge flow was calculated by relating estimated flow duration data developed by USGS to actual flow duration data for the Medicine Lodge River near Kiowa (USGS Station 07149000; 1970-2000).

Long Term Flow Conditions: Median Flow = 47 cfs; 7Q10 = 1 cfs

Current Conditions: Selenium concentrations have ranged from not being detected to 9 $\mu\text{g}/\text{liter}$ over the period of record. Five of the 13 samples were above detection limits. Excursions were seen in spring of 1994. Only two of the 13 or fifteen percent of samples from water quality site 589 were over the criterion of 5 $\mu\text{g}/\text{liter}$. There is no relationship with flow.

Desired Endpoints of Water Quality (Implied Load Capacity) at Site 589 over 2005 - 2010: The ultimate endpoint for this TMDL will be to achieve the Kansas Water Quality Standards fully supporting Chronic Aquatic Life. The current standard of 5 $\mu\text{g}/\text{liter}$ of selenium was used to establish this TMDL.

Seasonal variation has been incorporated in this TMDL through the documentation of the seasonal variation of elevated selenium levels. 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

Background: Lower Cretaceous rocks outcrop in the watershed contributing flow to the river at Sun City. High concentrations of selenium are present in some Cretaceous shales in Kansas. Selenium leached from the shales can be concentrated in soil moisture, shallow ground waters, and surface waters by evapotranspiration during dry periods. Waters with elevated selenium could enter the river by flushing during small to moderate precipitation events that would not substantially dilute stream salinity or by seepage from soils and the shallow subsurface following recharge events.

Irrigation Return Flows: No impairment is associated with irrigation return flows off lands with flood irrigation. Most of the irrigation within the overall Medicine Lodge subbasin is located at the Pratt-Barber County line, associated with the southern extent of the Big Bend Prairie Aquifer in the headwaters of Elm Creek. Any return flows from those diversions would be low in selenium because of the low content of the Big Bend Prairie Aquifer and as confirmed by samples taken on Elm Creek (selenium average less than 2 ppb).

Contributing Runoff: The watershed's average soil permeability is 2.5 inches/hour according to NRCS STATSGO data base. About half of the upper watershed produces runoff under relative low (1.5"/hr) rainfall conditions. Under very low (<1"/hr) potential conditions, the potential contributing area is concentrated to the lands west of Medicine Lodge and along the stream channel. Generally, storms producing less than 0.5"/hr of rain will generate runoff from along the stream channels.

4. ALLOCATION OF POLLUTANT REDUCTION RESPONSIBILITY

The source assessment has ascertained that natural selenium loading within the upper watershed generally is responsible for the infrequent excursions seen at Medicine Lodge.

Point Sources: A current Wasteload Allocation of zero is established by this TMDL because of the lack of point sources in the watershed. Should future point sources be proposed in the watershed and discharge into the impaired segments, the current wasteload allocation will be revised by adjusting current load allocations to account for the presence and impact of these new point source dischargers.

Non-Point Sources: The elevated selenium concentrations appear to be geologic in nature. The Load Allocation based on the existing standard will be 0.03-1.24 pounds per day at 1-47 cfs (median flow.)

Defined Margin of Safety: The Margin of Safety provides some hedge against the uncertainty of loading and the sulfate endpoint and will be ten percent of the applicable sulfate load, or 0.01-0.13 pounds per day at 1-47 cfs.

State Water Plan Implementation Priority: Because it appears this watershed's selenium load is predominately natural, this TMDL will be a Low Priority for implementation.

Unified Watershed Assessment Priority Ranking: This watershed lies within the Medicine Lodge subbasin (HUC 8: 11060003) with a priority ranking of 49 (Low Priority for restoration).

Priority HUC 11s: Because of the natural geologic contribution of this impairment, no priority subwatersheds or stream segments will be identified .

5. IMPLEMENTATION

Desired Implementation Activities

1. Monitor any anthropogenic contributions of sulfate loading to river.

Implementation Programs Guidance

Non-Point Source Pollution Technical Assistance - KDHE

- a. Evaluate any potential anthropogenic activities which might contribute selenium to the river as part of an overall Watershed Restoration and Protection Strategy.

Water Quality Standards and Assessment - KDHE

- a. Assess the water quality of any irrigation return flows along tributaries above the confluence with Elm Creek.
- b. Should occasional selenium violations be noted at Medicine Lodge, conduct a special study of water quality on each of the tributaries between Medicine Lodge and Belvidere.

Time Frame for Implementation: Continued monitoring in the year 2002 and 2006.

Targeted Participants: No targets until 2006 assessment.

Milestone for 2006: The year 2006 marks the mid-point of the ten year implementation window for the watershed. At that point in time, additional monitoring data from Station 589 and assessments will be examined to confirm the impaired status of the river and determine the presence of any anthropogenic loading to the creeks. 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 Kansas Department of Health and Environment.

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.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.
4. K.S.A. 82a-951 creates the State Water Plan Fund to finance the implementation of the *Kansas Water Plan*.
5. 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 pollutant 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 are a Low Priority consideration and should not receive funding.

Effectiveness: Minimal control can be exerted on natural contributions to loading.

6. MONITORING

KDHE will continue to collect bimonthly samples during 2002 and 2006 at rotational Station 589, including selenium samples over each of the three defined seasons. Based on that sampling, the status of 303(d) listing will be evaluated in 2010 including an impairment definition reflecting natural conditions. Should impaired status remain, the desired endpoints under this TMDL will be refined and direct more intensive sampling will need to be conducted under specified seasonal flow conditions after 2010.

7. FEEDBACK

Public Meetings: Public meetings to discuss TMDLs in the Lower Arkansas River Basin were held March 9, 2000 and April 26-27, in Hutchinson, Wichita, 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 River Basin. A draft of this TMDL has been maintained on the website since June 1, 2000 and modifications to the original draft have been available to the public for viewing and review up to the date of submitting this TMDL to EPA.

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

Basin Advisory Committee: The Lower Arkansas River Basin Advisory Committee met to discuss the TMDLs in the basin on September 27, and November 8, 1999; January 13 and March 9, 2000. The Committee recommended approval of the Basin Plan which set high priority TMDLs in the basin, thereby, delegating medium and low priority status to this and subsequent TMDLs for the basin. The Kansas Water Authority approved the Basin Plan on July 11, 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 impairment which has occurred within the drainage and current condition of Medicine Lodge River. Subsequent decisions will be made regarding implementation approach and follow up of additional implementation.

Consideration for 303(d) Delisting: Medicine Lodge River will be evaluated for delisting under Section 303(d), based on the monitoring data from 2002-2006. Therefore, the decision for delisting will come about in the preparation of the 2010 303(d) list. Should modifications be made to the applicable criterion 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.