

KANSAS-LOWER REPUBLICAN BASIN TOTAL MAXIMUM DAILY LOAD

Waterbody: Buffalo Creek Water Quality Impairment: Chloride

1. INTRODUCTION AND PROBLEM IDENTIFICATION

| | | | |
|--------------------------------|--|----------------|--------------------------------------|
| Subbasin: | Lower Republican | County: | Cloud, Jewell, Mitchell and Republic |
| HUC 8: | 10250017 | HUC 11: | 020 and 030 |
| Drainage Area: | 390 sq. mi. | | |
| Main Stem Segments: | 29 and 37; starting at confluence with Republican River and traveling upstream to Mankato. | | |
| Tributary Segments: | Cheyenne Creek (55) Whites Creek (54) Spring Creek (44) Salt Creek (30) | | |
| Designated Uses: | Expected Aquatic Life Support; Primary Contact Recreation; and Food Procurement on Main Stem Segment 37 and Salt Creek; Expected Aquatic Life Support; Secondary Contact Recreation; and Food Procurement on Main Stem Segment 29 and Whites Creek; Expected Aquatic Life Support; Secondary Contact Recreation on Cheyenne Creek, Spring Creek. | | |
| 1998 303d Listing: | Table 1 - Predominant Non-point Source and Point Source Impacts | | |
| Impaired Use: | Expected Aquatic Life | | |
| Water Quality Standard: | 352 mg/l for Expected Aquatic Life (KAR 28-16-28e(c)(2)(F)(ii)) | | |

In stream segments where background concentrations of naturally occurring substances, including chlorides and sulfates, 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 303d: Not Supporting Expected Aquatic Life

Monitoring Sites: Station 509 near Concordia

Period of Record Used: 1990 to 1998

Flow Record: Buffalo Creek at Jamestown (USGS Station 06855800) flow was calculated seasonally from regression on White Rock Creek at Burr Oak (USGS Station 06853800) and expanded 30 years of average daily streamflow seasonally.

Long Term Flow Conditions: Median Flow = 15 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 Jamestown and Burr Oak Gaging Stations 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 the chloride 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 chloride 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 eight percent of Spring samples and 53% of Summer-Fall samples were over the criterion. Fifty nine percent of Winter samples were over the criterion. Overall 51% of the samples were over the criteria. This would represent a baseline condition of non-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 509 Over 1990-1998 |
|---------------|--|----------------------------|------------|-------------|-----------------|-----------------|-----------------|----------------------|---|---|
| | | | | 0 TO 10% | 10 TO 30% | 30 TO 60% | 60 TO 90% | 90 TO 100 % | | |
| BUFFALO CREEK | C L | S | > 352 mg/l | 0 | 0 | 8 | 23 | 8 | 5/13 = 38% | 25/49 = 51% Exceedence |
| | | S F | > 352 mg/l | 0 | 11 | 26 | 5 | 11 | 10/19 = 53% | |
| | | W | > 352 mg/l | 0 | 24 | 18 | 12 | 6 | 10/17 = 59% | |

Desired Endpoints of Water Quality (Implied Load Capacity) at Site 509 over 2004 - 2008:

Overall, the endpoint of this TMDL will be to maintain the percent of samples over the applicable developed criteria to less than 10% of samples taken 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.

Consistent with the Kansas Implementation Procedures for Surface Water, a numeric criteria based on the background concentration may be developed using the mean concentration of instream measurements gathered when streamflow was less than the median flow on Buffalo Creek. A minimum of five data points are needed to determine the background concentration.

Tentatively, the mean background chloride concentration based on data over 1990-1998 at flows at or below 15 cfs is 588 mg/l. Therefore, over 2004-2008, less than 10% of the samples should be greater than 588 mg/l.

Seasonal variation has been incorporated in this TMDL through the documentation of the seasonal consistency of elevated chloride 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

Groundwater contributing geologic formations underlying this watershed have a naturally high level of chloride. Much of the chloride in the surface water can be attributed to this natural contribution to baseflow. Some aggravation or impairment might be associated with irrigation return flows off lands with flood irrigation, road treatments during winter months and household-scale water softeners in municipal settings.

4. ALLOCATION OF POLLUTION REDUCTION RESPONSIBILITY

Additional assessment will be necessary to ascertain the amount of natural chloride loading within the watershed and balance due to irrigation return flows, road treatment, and household water softeners within municipalities. The following can be anticipated:

Point Sources: There is one point source in the watershed, Mankato, releasing a design flow of 0.2 MGD (0.3 cfs). The Wasteload Allocation shall be 570 pounds per day of chloride (based on design flow of 0.3 cfs) at the 7Q10 of 1 cfs. This allocation may increase to 950 pounds per day should an increase in background concentrations (around 588 mg/l) be confirmed.

Non-Point Sources: The majority of chloride load appears background in nature. The Load Allocation will be 1240 pounds per day of chloride at the 7Q10. This allocation will increase if the elevated background concentrations become the applicable criteria. The allocation also increases as a function of flows above the 7Q10 of 1 cfs.

Defined Margin of Safety: The Margin of Safety will be ten percent of the applicable chloride load, or 190 pounds per day at 7Q10.

State Water Plan Implementation Priority: Because it appears this watershed's chloride load is predominately natural in source this TMDL will be a Low 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: Pending additional monitoring and assessment, no priority subwatersheds or stream segments should be identified until after 2004.

5. IMPLEMENTATION

Desired Implementation Activities

1. Minimize anthropogenic oriented contributions of chloride loading to river.

Implementation Programs Guidance

Until the 2004 assessment of the continuation of monitoring is made, no direction can be made to those implementation programs.

Timeframe for Implementation: Continued monitoring over the years 2000-2004.

Targeted Participants: No targets until 2004 assessment.

Milestone for 2004: The year 2004 marks the mid-point of the ten year implementation window for the watershed. At that point in time, additional monitoring data from Station 509 will be re-examined to confirm the impaired status of the streams within this watershed and the validity of the suggested background concentration. 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 Water Office and the Kansas Department of Agriculture.

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 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 Low Priority consideration and should not receive funding.

Effectiveness: Improvements in reducing chloride loading to streams can be accomplished through appropriate management of irrigation return flows, winter road treatments, and household water softener. Minimal control can be exerted on natural contributions to loading.

6. MONITORING

KDHE will continue to collect bimonthly samples at Station 509, including chloride samples over each of the three defined seasons. Based on that sampling, the status of 303d listing will be evaluated in 2004, including application of a numeric criteria based on background concentrations. 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 over the period 2004-2008.

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 Buffalo Creek 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 1999-2003. Therefore, the decision for delisting will come about in the preparation of the 2004 303d list. Should the streams continue to be listed as impaired in 2004, the next evaluation for delisting will occur with the preparation of the 2008 Section 303d list. Should modifications be made to the applicable water quality criteria during the ten year implementation period, consideration for delisting, development of desired endpoints of this TMDL and implementation activities will 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.