

# KANSAS-LOWER REPUBLICAN BASIN TOTAL MAXIMUM DAILY LOAD

## Waterbody: Upper Wakarusa River Watershed Water Quality Impairment: Sediment Impact on Aquatic Life

### 1. INTRODUCTION AND PROBLEM IDENTIFICATION

**Subbasin:** Lower Kansas River      **Counties:** Douglas, Osage, Shawnee, and Wabaunsee

**HUC 8:** 10270104      **HUC 11:** 010 (entire watershed)

**Drainage Area:**      Approximately 364 square miles.

**Main Stem Segments:** 30 and 31, starting at Clinton Lake with headwaters in eastern Wabaunsee County near Eskridge.

**Designated Uses:**      Expected Aquatic Life Support, Primary Contact Recreation and all other designated uses.

**1998 303d Listing:**      Table 2–Stream Segments Identified by Biological Monitoring

**Impaired Use:**      Expected Aquatic Life Support on Segments 30 & 31

**Water Quality Standard:** Suspended solids--Narrative: Suspended solids added to surface waters by artificial sources shall not interfere with the behavior, reproduction, physical habitat or other factor related to the survival and propagation of aquatic or semi-aquatic or terrestrial wildlife. (KAR 28-16-28e(c)(2)(D)).

### 2. CURRENT WATER QUALITY CONDITION AND DESIRED ENDPOINT

**Level of Support for Designated Use under 303d:** Partially Supporting Aquatic Life

**Monitoring Sites:** Station 109 near Topeka

**Period of Record Used:** Stream Chemistry: 1985–1998  
Biological Monitoring: 1982–1996

#### **Current Condition:**

Percent EPT taxa and total suspended solid concentrations need to be analyzed to address the sediment/biological impact impairment. The MBI index may also be examined; however it is not as good of an indicator as percent EPT taxa. The EPT index is the proportion of aquatic taxa present

within a stream belonging to pollution intolerant orders; Ephemeroptera, Plecoptera and Trichoptera (mayflies, stoneflies and caddisflies). Higher percentages of total taxa comprising these three groups indicate less pollutant stress and better water quality. Typically, these macroinvertebrates utilize a coarse substrate in the stream for habitat. Elevated amounts of suspended solids deposit on the substrate and limits its utility by these clean water indicators.

When aquatic life is partially impaired on this stream segment, the percentage of EPT taxa ranges from 11.11 to 31.43% (18.4 % average). Under full support conditions, the percentage averages 26.0. Total suspended solids range from 1.0 - 698 mg/L and average 58.2 mg/l.

### **Desired endpoint for Wakarusa River from 2004 - 2008**

The use of biological indices allows assessment of the cumulative impacts of dynamic water quality on aquatic communities present within the stream. As such, these index values serve as a baseline of biological health of the stream. Sampling occurs during open water season (April to November) within the aquatic stage of the life cycle of the macroinvertebrates. As such there is no described seasonal variation of the desired endpoint of this TMDL. The endpoint would be average percent composition of EPT taxa of 25% or more over 2004-2008.

Achievement of this endpoint would be indicative of full support of the aquatic life use in the stream reach, therefore the narrative water quality standard pertaining to suspended solids would be attained.

## **3. SOURCE INVENTORY AND ASSESSMENT**

**Land Use:** The population within the watershed is projected to increase through the year 2040. Douglas County is expected to have the highest level of growth; the population will double around 2030. With the increase in population comes increased urban, residential and highway construction. Soil from exposed land runs-off into the streams, increasing the concentration of total suspended solids in streams. However, sediment from urban land is probably not a major contributor in this situation because only 1% of land in the watershed is urban.

The more likely cause of high concentrations of total suspended solids is cropland. Five thousand acres of cropland are adjacent to the streams. Within the watershed, the land is predominantly used for cropland (28%) and grassland (55%). Only 10 % of land in the upper Wakarusa River watershed is wooded. More woodland and grassland is needed around the stream to prevent erosion.

**Contributing Runoff:** The watershed has an average soil permeability of 0.6 inches/hour according to NRCS STATSGO data base. Runoff would be produced under storms ranging in duration from one to six hours, having a recurrence interval of five, ten or twenty five years. Runoff is chiefly generated as infiltration excess with rainfall intensities greater than soil permeabilities. Generally, 71 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 91 to 92 percent of the watershed.

**Background Levels:** Background levels of total suspended solids come from natural sources. Sediment becomes suspended during high flow events as soil along the banks and stream bed is eroded.

#### **4. ALLOCATION OF POLLUTION REDUCTION RESPONSIBILITY**

There is an indirect, yet un-quantified relation between sediment loading and biological integrity. Decreased loads should result in aquatic communities, indicative of improved water quality. The characteristics of biological data to integrate the impacts of the entire watershed on the aquatic community defies allocation of specific loads between point and non-point sources. The relative presence of point and non-point activities has to be used to assess the relative contributions and responsibilities for sediment load reduction in the watershed. Therefore, allocations are made for this TMDL in a general sense to direct appropriate action, following in the belief that qualitative reduction in sediment loads will yield improved MBI values. More detailed allocations will be made in 2004 based on additional source assessment and establishment of quantitative relations between stream sediment and aquatic biology for this stream.

**Point Sources:** Based on the assessment of sources, point sources do not contribute to water quality impairment relative to sediment impacts on stream biology. At this point, the Wasteload Allocation will be a reduction of TSS loadings from point sources such that monthly TSS concentrations are maintained below 80 mg/l, leading to in stream concentrations below 100 mg/l at flows below 10 cfs. The sporadic occurrence of partial support conditions, indicated by EPT percentages over 25%, seems to indicate a lack of consistent loading from the upper drainage.

**Non-Point Sources:** Given the runoff characteristics of the watershed, overland runoff can easily carry sediment from the watershed into the streams. The sporadic nature of the EPT values indicates that sediment impairment waxes and wanes over time, hinting that loadings are variable. As such, non-point sources are implicated as a primary source of these loadings. There are variety of sources contributing sediment to the stream. Additional assessment is necessary to quantify those contributions. At this point, the Load Allocation will be a reduction of sediment loadings such that average total suspended solids concentrations are below 100 mg/L in stream a majority of the time.

**Defined Margin of Safety:** In order to ensure that biological data collected in 2004-2008 are not skewed by a single sample with a high proportion of EPT taxa, the defined margin of safety will be a median value of EPT taxa percentages among samples taken over 2004 - 2008 which must exceed 25%. As an additional assurance of full support of the aquatic life use, the median percentage of individuals in a sample which are EPT taxa must exceed 55%, thereby verifying the full support conditions for aquatic life indicated by the MBI value.

**State Water Plan Implementation Priority:** The upper Wakarusa River is a high priority TMDL, because implementation of this TMDL will also influence water quality of Clinton Lake, currently impaired by eutrophication and sedimentation in the reservoir arms.

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

**Priority HUC 11s and Stream Segments:** HUC 010 encompasses the entire watershed. The main stem segments (30 & 31) of the Wakarusa River should be the priority focus of implementation because of their direct impact on Clinton Lake.

## **5. IMPLEMENTATION**

### **Desired Implementation Activities**

1. Implement and maintain conservation farming, including conservation tillage, contour strips and no till farming.
2. Install grass buffer strips along streams.
3. Reduce activities within riparian areas
4. Minimize road and bridge construction impacts on streams
5. Monitor wastewater discharges for excessive Total Suspended Solid loadings

### **Implementation Programs Guidance**

#### **NPDES - KDHE**

- a. Ensure proper monitoring, permitting, and operations of municipal wastewater systems to limit TSS discharge.

#### **Non-Point Source Pollution Technical Assistance - KDHE**

- a. Support Section 319 demonstration projects for reduction of siltation runoff from agricultural or road construction activities
- b. Provide technical assistance on practices geared to establishment of vegetative buffer strips.
- c. Provide technical assistance on road construction activities in vicinity of streams.

#### **Water Resource Cost Share Program - SCC**

- a. Apply conservation farming practices, including terraces and waterways

#### **Non-Point Source Pollution Control Program - SCC**

- a. Provide sediment control practices to minimize erosion and sediment transport

#### **Riparian Protection Program - SCC**

- a. Establish or reestablish natural riparian systems, including vegetative filter strips and streambank vegetation.
- 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 agricultural producers on sediment and pasture management
- b. Provide technical assistance on buffer strip design and minimizing cropland runoff

**Timeframe for Implementation:** Management practices necessary to implement this TMDL beyond the initial emphasis should be deferred until 2004, pending additional source assessment and evaluation of biological data collected over 2000-2004.

**Targeted Participants:** Primary participants for implementation will be agricultural producers operating within the drainages of the priority subwatersheds. Initial work over 2000-2004 should include an inventory of activities in those areas with greatest potential to impact the stream, including, within a mile of the stream:

1. Total rowcrop acreage
2. Degree of residue compliance on Highly Erodible Lands
3. Acreage of poor rangeland or overstocked pasture
4. Livestock use of riparian areas
5. Unvegetated or graded roadside ditches
6. Construction projects without erosion control techniques

Some inventory of local needs should be conducted in 2000 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 2004:** The year 2004 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 fifty percent of the producers responsible for the land use activities cited in the local assessment participating in the implementation programs provided by the state. Additionally, sampled data from the Wakarusa should indicate evidence of reduced sediment impacts on the stream biology relative to the conditions seen over 1985-1998. Quantitative relationships between suspended sediment and biological measures should be established by 2004.

**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.

**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. 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.
4. 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.
5. 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.
6. K.S.A. 82a-951 creates the State Water Plan Fund to finance the implementation of the *Kansas Water Plan*.
7. 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 watershed and its TMDL is a **High Priority** consideration.

In State Fiscal Year 1999, the state provided to Douglas and Shawnee counties, \$148,697 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 two counties for the next fiscal year

**Effectiveness:** Sediment control has been proven effective through conservation tillage, contour farming and use of grass waterways and buffer strips. The key to success will be widespread utilization of conservation farming within the watersheds cited in this TMDL.

Should 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 1990-1998, the state may employ more stringent conditions on agricultural producers in the watershed through establishment of a Critical Water Quality Management Area in order to meet the desired endpoints expressed in this TMDL.

## **6. MONITORING**

KDHE will continue to collect seasonal biological samples from the Wakarusa River for three years over 2000 - 2004 and an additional three years over 2004-2008 to evaluate achievement of the desired endpoint. As quantitative relationships between sediment and biology are established, routine sampling at the Topeka station for sediments should be evaluated over 2000-2008. Periodic monitoring of sediment content of wastewater discharged from treatment systems will be expected under reissued NPDES and state permits.

Additional source assessment needs to be conducted and local program management needs to identify its targeted participants of state assistance programs for implementing this TMDL. This information should be collected in 2000-2004 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 which has occurred within the drainage and current biological condition of the Wakarusa River. Subsequent decisions will be made regarding implementation approach, follow up of additional implementation and implementation in the non-priority subwatersheds.

**Consideration for 303d Delisting:** Wakarusa River 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 siltation 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 for Fiscal Years 2000-2004.

Approved January 26, 2000.