

# Kansas-Lower Republican Basin High Priority Issue Watershed Restoration and Protection Approved August 2006

## Issue

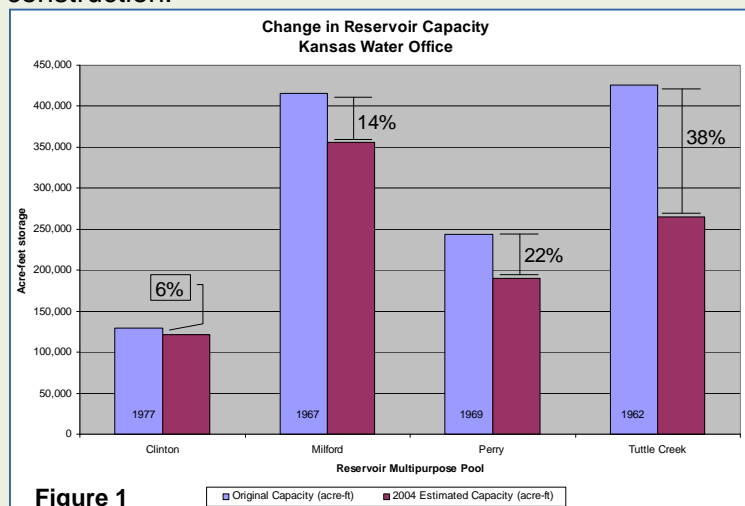
The restoration and protection of watersheds, particularly those above public water supply reservoirs, is a priority in the Kansas-Lower Republican Basin. With growing urban [populations](#) within the basin, the restoration and protection of these watersheds and water bodies are of critical importance.

## Description

There are five federal reservoirs in the Kansas-Lower Republican basin. Four of these reservoirs are operated by the U.S. Army Corps of Engineers (Corps): Milford, Tuttle Creek, Perry and Clinton. The fifth, Lovewell Reservoir, is operated by the U.S. Bureau of Reclamation (Bureau), and is used primarily for irrigation. Milford, Tuttle Creek, Perry and Clinton are used for public water supply programs that serve numerous cities and rural water districts (RWDs) in the basin, primarily in the rapidly growing urbanized communities within the Kansas River corridor. These reservoirs are also managed by the Corps for flood control, recreation and to support navigation in the Missouri River.

## Water Quality Impairments

A number of reservoirs and streams within the basin are experiencing water quality impairments. Fecal coliform bacteria and dissolved oxygen are the most prevalent stream impairments. Eutrophication due to nutrient loading, pesticides and siltation are the primary water quality problems affecting reservoirs. Reservoir sedimentation is also a water quantity concern. As sediment accumulates in a reservoir's multipurpose pool, the capacity for water supply storage is reduced. Figure 1 shows the estimated percent of water supply storage capacity lost to sediment deposition in federal reservoirs in the basin since their construction.



Water quality is addressed through a combination of restoration and protection efforts using both voluntary, incentive-based approaches and regulatory programs.

Surface water not meeting water quality standards in the basin are included on the 2004 303d list of impaired waters.<sup>(7)</sup> High priority Total Maximum Daily Loads (TMDLs) for impaired surface waters in the Kansas-Lower Republican basin were submitted to the Environmental Protection Agency by the Kansas Department of Health and Environment (KDHE) for approval on June 30, 1999. An additional round of TMDL development was completed in 2006. Table 1 provides information on rivers and lakes within the basin that are designated as a high priority for TMDL implementation. Figure 2 shows the location of these areas within the basin. High priority TMDL watersheds are identified to target voluntary, incentive based programs that provide technical and financial assistance for implementation of non-point source pollution management practices that can address designated pollutants.

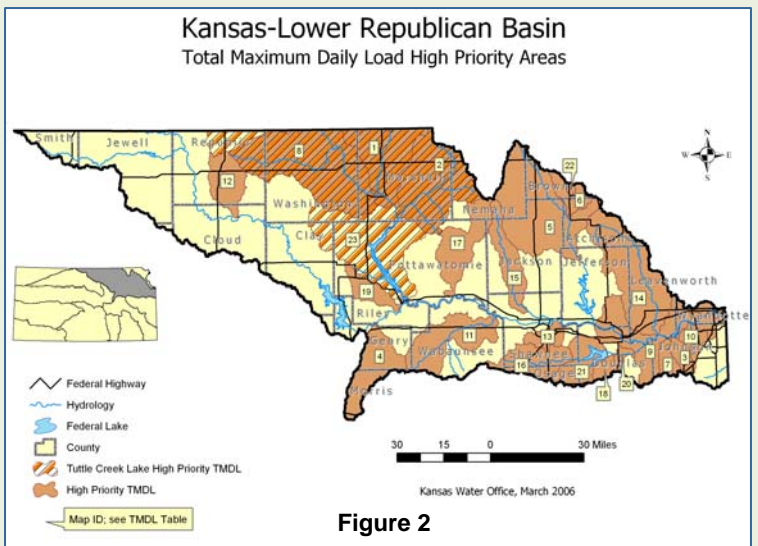


Figure 2

## Surface Water Nutrient Reduction

Nutrient sources within the basin include both point and nonpoint sources. The major point sources in the basin include large wastewater treatment plants, which are regulated under the National Pollutant Discharge Elimination Program (NPDES) administered by KDHE (Figure 3).

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**TABLE 1  
KANSAS-LOWER REPUBLICAN BASIN HIGH PRIORITY TMDLS**

NEW MAP ID	WATERBODY	IMPAIRMENTS	HUC11 WATERSHEDS
<b>STREAM SEGMENTS</b>			
1	Big Blue River	FCB	10270205(040,070)
2	Black Vermillion River	FCB	10270205(050,060)
3	Cedar Creek	FCB, Nitrate	10270104(060)
4	Clarks Creek	FCB	10270101(010)
5	Delaware River above Perry Lake	FCB	10270103(010,020,030,040)
6	Grasshopper Creek	FCB	10270103(020)
7	Kill Creek	FCB	10270104(060)
8	Little Blue River	FCB	10270207(075,085,090)
9	Lower Kansas River	ECB	10270104(020,050,060)
10	Mill Creek (JO Co.)	FCB, BIO	10270104(060)
11	Mill Creek (WB Co.)	FCB	10270102(030,040)
12	Salt Creek	FCB, DO	10250017(030)
13	Shunganunga Creek	FCB, DO	10270102(090)
14	Stranger Creek	FCB	10270104(030,040)
15	Upper Soldier Creek	Sed	10270102(080)
16	Upper Wakarusa River	FCB, Sed/TSS, Nutr/BOD	10270104(010)
17	Vermillion Creek	FCB	10270102(020)
18	Washington Creek	DO	10270104(020)
19	Wildcat Creek	FCB, DO	10270101(020)
<b>WETLANDS</b>			
20	Baker Wetlands	DO	10270104(020)
<b>LAKES</b>			
21	Clinton Lake	E	10270104(010)
7	Gardner City Lake*	DO, E	10270104(060)
3	Lake Olathe & Cedar Lake	E	10270104(060)
22	Mission Lake	Pest, E	10270103(020)
23	Tuttle Creek Lake	Silt, Pest, E	10270205(011,031,040,050,060) 10270205 (070,080,090) 10270206(071) 10270207(034,035,075,085,090)

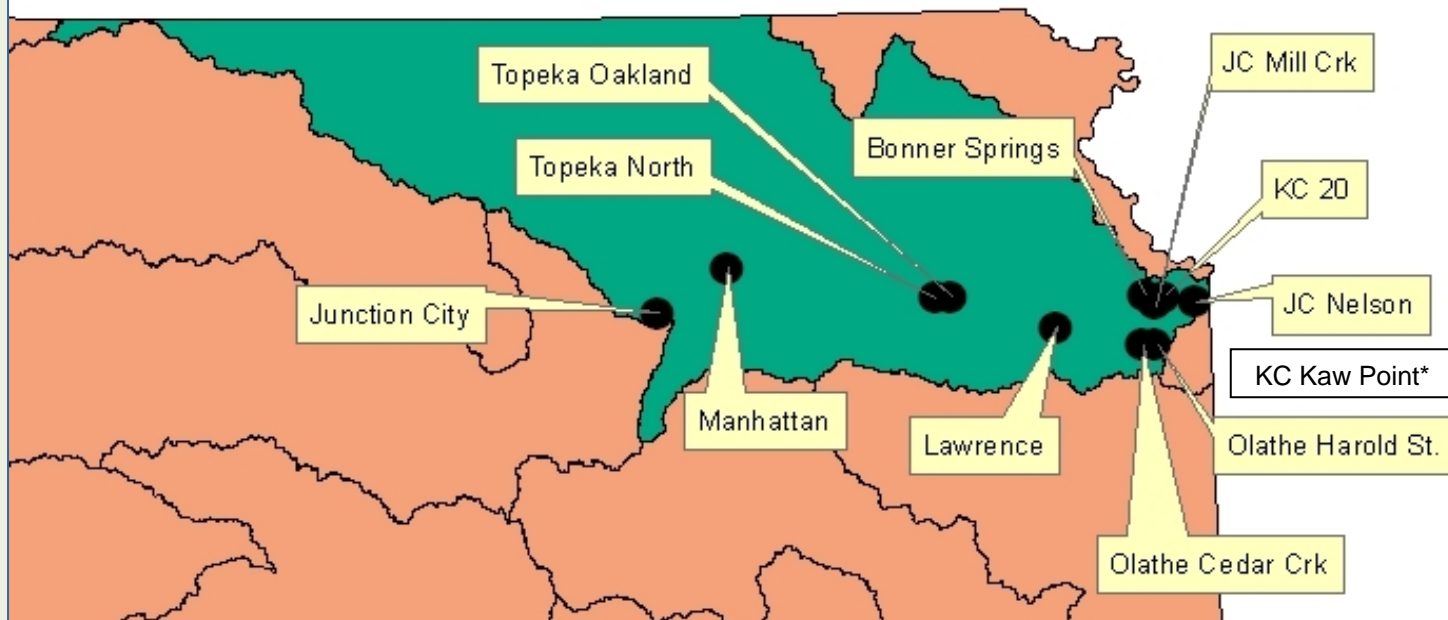
\*The lake impairment is only related to the contributing area of Gardner Lake.

**Key:**

BIO:	Biology
DO:	Low dissolved oxygen in upper 3 meters of water column over deepest location in water body
E:	Eutrophication, biological community impacts and excessive nutrient/organic loading. If applicable, the Eutrophication TMDLs are bundled with pH, aquatic plants, and/or DO impairments. These impairments are all interrelated and effected by nutrient loading.
ECB:	E. coli Bacteria
FCB:	Fecal Coliform Bacteria
HUC:	U.S. Geologic Survey Hydrologic Unit Code
Nutr/BOD:	Nitrogen and Phosphorus/Biochemical Oxygen Demand
Pest:	Pesticides
TSS:	Total Suspended Solids
Sed:	Sediment

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**Major Wastewater Treatment Plants in the Kansas-Lower Republican Basin**



**Figure 3**

\* The KC Kaw Point facility has an emergency discharge outfall to the Kansas River. The facility's primary discharge outfall is to the Missouri River. Therefore, the nutrient load for the KC Kaw Point facility is attributed to the Missouri River Basin.

The primary nonpoint sources of pollution include both agricultural and urban areas. Table 2 shows the relative contribution of point and nonpoint sources in the Kansas-Lower Republican basin for total phosphorus (TP) and total nitrogen (TN) leaving the state.

<b>Table 2</b>			
<b>Kansas-Lower Republican Nutrient Reduction Data</b>			
<b>Source: KDHE Bureau of Water - February 14, 2006</b>			
<b>Statewide Perspective</b>			
<b>Parameter (Ton/yr)</b>	<b>State Total</b>	<b>KLR</b>	<b>% of State Total</b>
TN Leaving State	51,205	23,543	46%
TP Leaving State	7,670	3,788	49%
Point Source TN	10,600	2,336	22%
Point Source TP	2,836	1,000	35%
Nonpoint Source TN	40,605	21,207	52%
Nonpoint Source TP	4,834	2,788	58%

<b>Basin Perspective</b>					
<b>Parameter (Ton/yr)</b>	<b>Total</b>	<b>Point Source</b>	<b>PS %</b>	<b>Non-point Source</b>	<b>NPS%</b>
TN	23,543	2,336	10%	21,207	90%
TP	3,788	1,000	26%	2,788	74%

The *Kansas Surface Water Nutrient Reduction Plan*,<sup>(6)</sup> developed by KDHE, outlines a statewide strategy for

reducing the export of TN and TP in surface waters leaving the state. This involves additional reductions in nutrients from point source discharges through the NPDES Program and reductions in nonpoint sources through development and implementation of Watershed Restoration and Protection Strategies (WRAPS). The Nutrient Reduction Plan includes Improvement Potential Index (IPI) maps for Kansas counties for TP and TN reductions.<sup>(6)</sup> In the Kansas-Lower Republican basin, Cloud, Brown, Nemaha and Republic counties showed the highest improvement potential for TP while White Cloud, Republic and Wabaunsee counties showed the highest improvement potential for TN.

**Source Water Protection**

All [public water suppliers](#) in the basin have completed source water assessments in cooperation with the KDHE. The next step is the development of voluntary source water protection plans.

There are 190 public water suppliers in the Kansas-Lower Republican basin that treat raw water. Most of these public water suppliers utilize ground water. Some public water suppliers with a surface water intake also use wells in the alluvium of the same river. From the perspective of the population served, surface water from

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streams and reservoirs is the largest source, followed by alluvial wells, and then ground water. Most residents in the basin get water from the Kansas River or one of its major tributaries.

Each source water assessment included a susceptibility score which can help communities determine which contaminants pose the most significant threat to their water supply. A score generated from the susceptibility analysis, indicates whether the susceptibility range is low, moderate or high for potential threats of contamination in an assessment area. Each public water supplier received susceptibility scores in the following contaminant categories: microbiological, nitrates (ground water only), pesticides, inorganic compounds, synthetic organic compounds, volatile organic compounds, sedimentation (surface water only), and eutrophication/phosphorus (surface water only).

Of public water suppliers using ground water in the Kansas-Lower Republican basin, 59% had low susceptibility scores, 41% had moderate scores and none had high scores. Of public water suppliers using [surface water](#), 63% had low scores, 31% had moderate scores and six percent had high scores. The most commonly identified problems with ground water were inorganic compounds, pesticides and nitrates. The most commonly identified problems with surface water were pesticides, microbes and inorganic compounds.

For communities using ground water, development of a wellhead protection program is recommended. For communities using surface water, the development of a Watershed Restoration and Protection Strategy (WRAPS) is the best mechanism to ensure water quality protection for their public water supply. Topeka, Lawrence and Manhattan are examples of large public water suppliers in the basin that have instituted source water protection efforts.



Aerial of Topeka from the East. Photo courtesy of KGS

### ***Wetland and Riparian Area Management***

The primary approach to wetland and riparian area management in the basin focuses on providing technical and financial assistance to landowners to protect and restore these resources in priority watersheds through the implementation of best management practices. Water quality has been a primary focus with implementation efforts targeted to high priority TMDL watersheds (Figure 2). In addition, the Republican River watershed above Milford Reservoir is identified in the *Kansas Wetlands and Riparian Areas Protection and Restoration Implementation Plan* as an area of high biological importance and a priority for implementation activities. Sixteen conservation districts in the basin have developed wetland and riparian protection plans.

### ***Watershed Restoration and Protection Strategies***

WRAPS are stakeholder-driven management plans designed to address multiple water resource issues within a specific watershed. The WRAPS process provides a means to integrate objectives from multiple local, state and federal programs into a comprehensive, coordinated strategy for a specific watershed. This can include TMDL attainment, nutrient reduction, source water protection, riparian and wetland management and other natural resource objectives.

Watersheds above the four federal reservoirs in the basin that serve public water supply needs have been identified as watersheds of significant state interest for development and implementation of WRAPS. WRAPS projects have been initiated in each of these watersheds as well as other watersheds within the basin including the middle and lower Kansas Rivers.<sup>(5)</sup> Watersheds with WRAPS projects currently underway in the basin encompass priority areas for TMDL implementation, areas with a high improvement potential index for nutrient reduction, source water assessment areas and priority areas for wetland and riparian protection.

An important consideration for watershed restoration and protection in this basin, particularly along the Kansas River corridor, is urbanization. Between 1950 and 2000, the population of Kansas increased by 783,000 people, half of this increase was in Johnson County alone. Five other counties in the basin (Douglas, Geary, Pottawatomie, Riley and Shawnee) contributed another 22% of this increase.

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As the amount of impervious surface in a watershed (i.e. rooftops, roads, parking lots, etc.) increases, water resources can be adversely impacted. Runoff volume increases and additional pollutants associated with urban environments may enter streams and ponds unless preventive steps are taken by local governments and urban residents. Sound land use planning and stormwater management are essential to limit adverse effects.

Local [land use](#) planning and zoning authorities provide cities and counties effective tools to minimize the potential impacts of development on water resources. Urban stormwater management programs can be implemented to manage the amount of impervious surface in urbanizing watersheds and properly control increased runoff resulting from urbanization. Programs that provide technical assistance and education to urban residents regarding actions that can reduce or eliminate potential pollution sources also play an important role. These programs can be integrated with WRAPS projects to ensure a comprehensive approach to watershed management in urban areas. Urban communities in the basin that are implementing NPDES stormwater management programs and participating in WRAPS projects including Lawrence, Manhattan, Mission Hills, Olathe and Topeka.

Another consideration for watershed restoration and protection in the basin will be the potential for conversion of Conservation Reserve Program (CRP) acreage back to production agriculture as contracts expire. As of January 2006, nearly 289,000 acres were enrolled in the CRP in 20 Kansas counties contained wholly or partially within the basin. Contracts for approximately 45% of these acres expired in 2007.<sup>(8)</sup> If land is taken out of permanent grass cover, implementation of best management practices will be needed to minimize potential adverse impacts to water resources within the basin.

#### **Other Watershed Related Activities**

- All counties within the basin have adopted local sanitary/environmental codes and participate in the Local Environmental Protection Program (LEPP).
- Counties in the basin that have countywide planning and zoning programs include Clay, Douglas, Geary, Jackson, Jefferson, Johnson, Leavenworth, Pottawatomie, Osage, Riley, Shawnee, Wabaunsee and Wyandotte.
- All conservation districts in the basin have adopted nonpoint source pollution management plans. Buffer coordinators have also been employed in 14 counties in the basin to facilitate enrollment of stream buffers in the continuous CRP and the State Water

Quality Buffer Initiative.

- A number of urban communities in the Kansas-Lower Republican basin are included in the Phase I and Phase II NPDES Stormwater Program.
- As of December 2005, there were six active contamination sites being remediated through the State Water Plan Contamination Remediation Program.
- An interstate collaborative partnership has been working to reduce sediment, nutrients, herbicides and bacteria loads in the Tuttle Creek Lake watershed. Local, state and federal water quality agencies in Nebraska and Kansas have been working together to conduct water quality monitoring and implement best management practices in the watershed under the leadership of the Water Quality Committee of the Blue River Compact Commission. In 2006, the project was awarded a grant from the EPA Targeted Watersheds Grant Program for additional monitoring and to provide enhanced funding for technical and financial assistance to implement best management practices in a four county target area within the watershed.
- There are 17 organized watershed districts in the basin.

#### **Applicable Kansas Water Plan Objectives**

- Reduce the average concentration of bacteria, biochemical oxygen demand, solids, metals, nutrients, pesticides and sediment that adversely affect the water quality of Kansas lakes and streams.
- Ensure that water quality conditions are maintained at a level equal to or better than year 2000 conditions.
- Reduce the average concentration of dissolved solids, metals, nitrates, pesticides and volatile organic chemicals that adversely affect the water quality of Kansas ground water.
- Maintain, enhance or restore priority wetlands and riparian areas.

#### **Basin Specific Objectives**

- Over 25% of the high priority TMDLs identified in 1999 and 2006 for the Kansas-Lower Republican basin will have data supporting their delisting as impaired on the 2012 Kansas 303(d) list.
- All public water suppliers will complete and implement a source water protection plan.

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- Nutrient reduction goals will be included in all WRAPS projects within the basin and sediment reduction goals included in WRAPS projects above the four federal priority reservoirs.
  - Integrate urban stormwater management goals into all urban area WRAPS and support the implementation of urban stormwater management projects as outlined in WRAPS action plans.
8. USDA Farm Service Agency. 2006. *Summary of Active and Expiring CRP Crop land Acres by County*. [www.fsa.usda.gov](http://www.fsa.usda.gov)
  9. Kansas Water Office. 2003. *Kansas Wetland and Riparian Areas Protection and Restoration Plan*.

**Recommended Actions**

1. Work with stakeholder groups to incorporate TMDL implementation, nutrient and sediment reduction, and urban stormwater management goals into applicable WRAPS projects.
2. Target technical and financial assistance programs for water quality protection and restoration to implement TMDLs and WRAPS action plans.

**Resources**

1. Kansas Water Office. 2006. *Kansas Water Plan Water Quality Policy and Institutional Framework Section*
2. Kansas Water Office. November 2003. *Kansas Water Plan Kansas Lower-Republican Basin Section, Watershed Restoration and Protection Issue*.
3. Kansas Department of Health and Environment, Bureau of Environmental Remediation. December 2005. *Basin Updates and Site Accomplishments*.
4. Kansas Department of Health and Environment, Bureau of Water. 2004. *Kansas Source Water Assessment Report*, [www.kdheks.gov/nps/swap](http://www.kdheks.gov/nps/swap)
5. Kansas Department of Health and Environment, Bureau of Water. 2006. *Kansas Watershed Restoration and Protection Strategy*. [www.kdheks.gov/nps/wraps](http://www.kdheks.gov/nps/wraps)
6. Kansas Department of Health and Environment, Bureau of Water. December 2004. *Surface Water Nutrient Reduction Plan*, [www.kdheks.gov/water](http://www.kdheks.gov/water)
7. Kansas Department of Health and Environment, Bureau of Water. 2006. *Watershed Planning and TMDL Program*, [www.kdheks.gov/tmdl](http://www.kdheks.gov/tmdl)