

Neosho Basin High Priority Issue Watershed Restoration and Protection January 2009

Issue

Watershed Restoration and Protection efforts are needed to address a variety of water quality and water resource concerns such as achieving Total Maximum Daily Loads (TMDL), Nutrient Reduction goals, development of Source Water Protection Plans, reduction of sedimentation in reservoirs and lakes, and protection or restoration of wetland and riparian habitats.

Description

There are three federal reservoirs in the [Neosho basin](#): [Marion](#), [Council Grove](#), and [John Redmond](#). All of these reservoirs are operated by the U.S. Army Corps of Engineers (Corps). All three reservoirs are used for public water supply programs that serve numerous cities and rural water districts. The reservoirs are also managed by the Corps for flood control and recreation.

All three reservoirs, and many streams and tributaries that connect them, are experiencing water quality impairments. Fecal coliform bacteria and low levels of dissolved oxygen are the most prevalent stream impairments. Sedimentation and eutrophication are the most prevalent reservoir and lake impairments.

Reservoir sedimentation is a major water quantity concern, particularly in reservoirs where the state owns storage for the Water Marketing Program, or where an assurance district owns storage. As sediment accumulates in a reservoir's multi-purpose pool, the capacity for water supply storage is reduced. Figure 1 shows the estimated percent of multipurpose pool capacity lost, including water supply storage, to sediment deposition in federal reservoirs in the Neosho basin since construction.

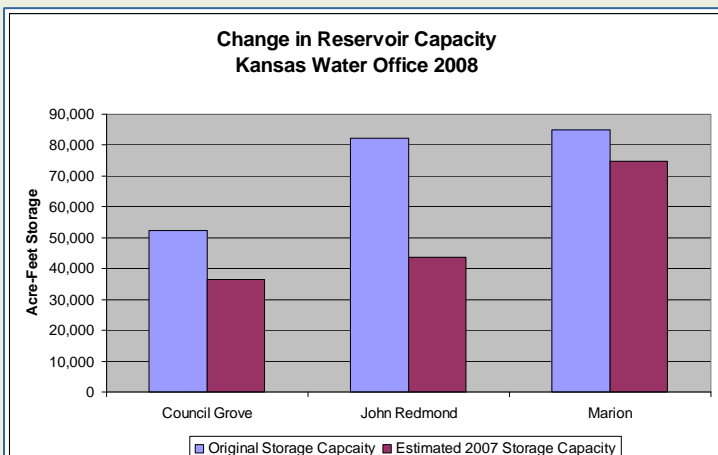


Figure 1. Loss of Reservoir Capacity

Loss of capacity in John Redmond Reservoir is the most pressing issue among the three reservoirs. Efforts are underway to determine the sources of sediment and to identify actions most likely to result in improvement in long term reservoir storage capacity. These efforts are described in other parts of this section.

Water Quality Impairments

Water quality protection and improvement is most effectively addressed at the watershed level, using regulatory and non-regulatory programs. [Surface water](#) quality monitoring is conducted to assess the level of pollutants in the water and the health of the biological community. If monitoring indicates that a river segment or other water body is consistently violating surface water quality standards, the water is classified as water quality impaired. Water bodies not meeting water quality standards for their designated use(s) are identified on the 303(d) list. The 303(d) list is used to identify those waters targeted for the development of Total Maximum Daily Loads (TMDLs). A TMDL is the maximum amount of a pollutant that a water body can receive without exceeding water quality standards. Since pollution can arrive via point and nonpoint sources, the TMDL process distributes responsibility for the pollutant load reductions among those contributing sources. TMDLs are assigned high, medium, or low priority status for implementation. High priority TMDLs are targeted for financial assistance programs. Medium priority TMDLs are addressed if resources are available after high priority TMDL needs are satisfied. Low priority TMDLs are monitored to track their status and are addressed last.⁽⁸⁾

The Kansas Department of Health and Environment (KDHE) has completed the first two rounds of TMDLs within the Neosho basin based on the 1998 and 2004 303(d) lists. There are 60 approved TMDLs within the Neosho basin that describe the strategies and goals to reduce pollution to achieve water quality standards. The 2008 303(d) list submitted to the Environmental Protection Agency (EPA) identifies watersheds associated with 26 stream chemistry sampling stations and two biological monitoring stations as water quality impaired. Among the streams, dissolved oxygen (D.O.) depletion, zinc, total phosphorus and copper cause the greatest number of impairments. Among the lakes, eutrophic conditions indicative of excessive algae production are the predominant cause of impairment. Many of the stream segments, configured in a watershed setting, have a TMDL applied to them as a whole. KDHE has reviewed and revised Neosho basin TMDLs and submitted them to EPA in late summer 2008. The following changes are

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proposed: a new high priority Eutrophication and Siltation TMDL for Council Grove Reservoir, and a revision of the current Marion Reservoir High Priority TMDL.

Spring River Metals TMDL Review

Spring River and its tributaries in the far southeastern part of the basin, including Shoal Creek, Short Creek, Shawnee Creek, Turkey Creek and Center Creek in Cherokee County, is a valuable biological resource in the basin, providing habitat for many unique and some threatened or endangered species ([HUC 11070207](#)). Of particular concern are mussel populations that have been in decline since the start of heavy metal mining. Due to historic mining activities in the area, these waters are contaminated by lead, zinc, copper and cadmium. TMDLs have been developed for these streams. The ultimate endpoint for this TMDL is to achieve the established metals criteria for the Aquatic Life Use of the Spring River and its tributaries under the Kansas Water Quality Standards. However, because of the interdependency of the water quality criteria, total hardness and flow, the endpoints desired for the metal concentrations seen in the Spring River and tributaries will vary with flow condition. In addition, biological endpoints are included. See KDHE TMDL website Neosho River basin Total Maximum Daily Load for a complete description of this TMDL.⁽⁷⁾ This TMDL has been evaluated during this round of TMDL submissions. No changes are being recommended.

Dissolved Oxygen TMDL Priority Review

KDHE completed a regional study of D.O. conditions and causes of low levels during 2007. As a result of this evaluation, KDHE has recommended that several D.O. TMDLs be moved from high priority to medium priority (Turkey and Mud creeks) and the Neosho Basin Advisory Committee (BAC) concurs with this recommendation.

Table 1 provides information on rivers and lakes within the basin that are designated high priority for TMDL implementation following the recommendations of moving several of the currently listed high priority D.O. TMDLs to medium priority. Figure 2 shows the location of these watersheds within the basin.

Needs Inventory

A component of the TMDL process is to quantify the cost to implement best management practices and technical assistance necessary to address the impairments. The

Map ID	Waterbody	Impairments	HUC 8 Watersheds
Stream Segments			
1	Spring River	Cd, Cu, Pb, Zn	11070207
2	Labette Creek	DO	11070205
3	Cherry Creek	DO	11070205
4	Eagle Creek	DO	11070201
5	Mud Creek	E. coli	11070202
6	Turkey Creek	E. coli	11070204
Lakes			
7	Marion Lake	E	11070202
8	Council Grove Lake	E, Silt	11070201
9	Olpe City Lake	E, Silt	11070201
Key:			
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			
FCB: Fecal Coliform Bacteria			
E. Coli Indicator bacteria with FCB			
HUC: U.S. Geologic Survey Hydrologic Unit Code			
Silt: Observed siltation and/or chronic turbidity that impacts development of trophic state			
Cd Cadmium			
Pb Lead			
Cu Copper			
Zn Zinc			

State Conservation Commission has prepared a “needs inventory” to estimate costs associated with reducing nonpoint source pollution in this basin, and to guide implementation of best management practices. Programs are targeted at achieving high priority TMDL goals.

Surface Water Nutrient Reduction

The impacts of nutrients originating in Kansas have been well documented – Gulf of Mexico hypoxia, excessive productivity in Kansas and downstream reservoirs, and taste and odor problems in drinking water originating from reservoirs. Reduction and control of nutrients is needed to begin mitigating those impacts. 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 System (NPDES) (Figure 3).⁽⁴⁾ [Neosho basin](#) water quality is also a concern in Oklahoma, particularly for nutrient loading in the Grand River and Grand Lake of the Cherokees. Several interstate watershed groups have been formed to develop regional strategies to implement restoration and protection objectives.

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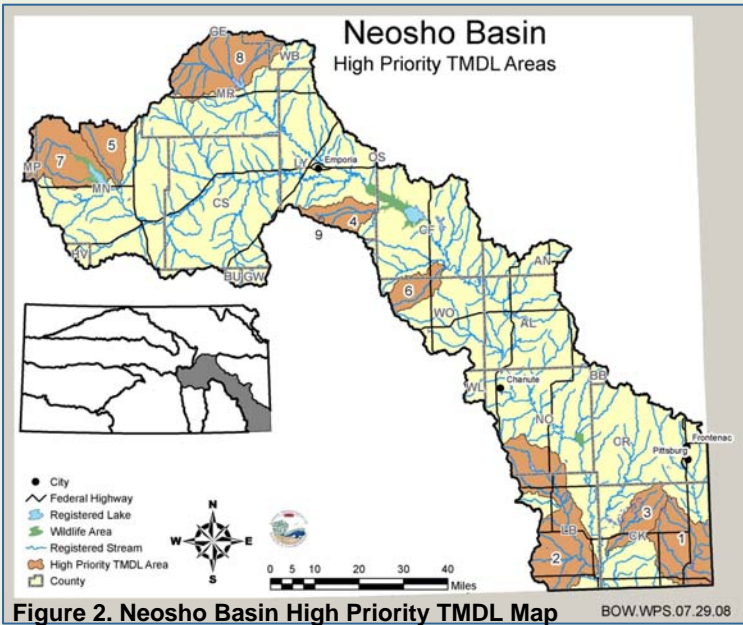


Figure 2. Neosho Basin High Priority TMDL Map BOW.WPS.07.29.08

Nonpoint sources of pollution include both agricultural and urban areas. Table 2 shows the relative contribution of point and nonpoint sources in the Neosho basin for total phosphorus (TP) and total nitrogen (TN) leaving the state.

The Kansas Surface Water Nutrient Reduction Plan,⁽¹²⁾ 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

Table 2
Neosho Nutrient Reduction Data
Source: KDHE Bureau of Water – February 14, 2006
Statewide Perspective

Parameter	State Total	Neosho	% of State Total
TN Leaving State (Ton/yr)	51,000	9,260	18
TP Leaving State (Ton/yr)	7,700	832	11
Point Source TN (Ton/yr)	9,215	583	5
Point Source TP (Ton/yr)	1,925	231	7
Nonpoint Source TN (Ton/yr)	41,785	8,677	22
Nonpoint Source TP (Ton/yr)	5,775	601	12

Basin Perspective

Parameter	Total	PS	PS %	NPS	NPS%
TN (Ton/yr)	9,260	583	6	8,677	94
TP (Ton/yr)	832	231	28	601	72

(see maps in [Water Quality Policy Section](#)). In the Neosho basin, Cherokee and Labette counties showed the highest improvement potential for TP and TN.

U.S. Army Corps of Engineers John Redmond Feasibility Study⁽⁶⁾

The Kansas Water Office (KWO) is participating in a Feasibility Study with the Tulsa District Corps of Engineers in the watershed above John Redmond Reservoir. This study will provide information to the WRAPS project stakeholders as they develop their WRAPS plan (see description of this program further in this issue description). Specific objectives of the study include:

- a. Preserve storage in John Redmond Reservoir for flood control, water supply, and other authorized purposes.
- b. Revitalize John Redmond Reservoir for flood control, water supply, and other authorized purposes.
- c. Reduce watershed contributions of sediment and harmful chemicals, such as phosphorous, into John Redmond Reservoir.
- d. Restore riparian habitat (including native grass buffer zones) that improves the value and function of the ecosystem.
- e. Restore wetlands that improve the value and function of the ecosystem.
- f. Restore aquatic riverine habitat that improves the

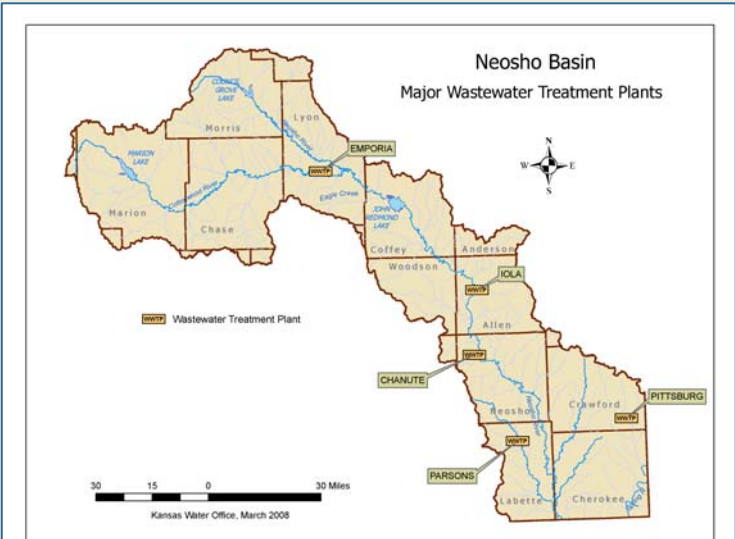


Figure 3. Neosho Basin Major Wastewater Treatment Plants

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- value and function of the ecosystem.
- g. Preserve riparian habitat (including native grass buffer zones) essential to the value and function of restored habitat above.
 - h. Preserve wetlands essential to the value and function of restored habitat above.
 - i. Preserve aquatic habitat essential to the value and function of restored habitat above.
 - j. Protect public resources, utilities, including power, water, and transportation, from the impacts of flooding, bank erosion, and channel changes.
 - k. Protect wetland and grasslands from invasive plant species.

Logjam Study, Sediment Monitoring, and Sub-watershed Assessment

The KWO has also contracted a study of a logjam that has developed over more than 20 years at the inflow to John Redmond Reservoir, near the Jacob's Creek landing boat ramp (Figure 4). This logjam is largely a result of sedimentation at John Redmond where the Neosho River slows to form the reservoir. Input of large woody material from the watershed has resulted in accumulation of this material over about a 2.5 mile reach, blocking access to the river. Possible options to restore access to the river have been evaluated and recommendations as to the most cost effective solution have been provided and are under consideration. In addition, the USGS has installed several continuous monitoring stations in the watershed to gain a better understanding of sediment delivery dynamics to the reservoir. Efforts are underway to assess sub-watersheds within the basin to prioritize areas for streambank stabilization and riparian area improvement.

More information on project activities can be found at www.kwo.org.

Source Water Assessment Program⁽⁹⁾

Source Water Assessments were completed for all public water supplies across the state, either by the public water supplier or utility, or KDHE, in 2004. Source water may be ground water in the form of wells, [surface water](#) intakes on rivers and streams, or a combination of these. Source water assessments involve delineation of the source water assessment area, an inventory of potential contamination sources within the delineated area, and a susceptibility analysis and score. Assessments use a standardized system to identify all potential sources of pollution to [surface](#) and ground water within the contrib-



Figure 4. Neosho River Logjam. Photo courtesy TWI

uting watershed, and conduct a susceptibility analysis to evaluate the threat from each potential pollutant to the water supply. A susceptibility 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.

KDHE provided [public water suppliers](#) susceptibility scores in the following contaminant categories: microbiological, nitrates (applicable for ground water only), pesticides, inorganic compounds, synthetic organic compounds, volatile organic compounds, sedimentation (surface water only), and eutrophication-phosphorus (surface water only).

Of the 37 public water suppliers using ground water in the Neosho Basin, 68% had low susceptibility scores and 32% had moderate scores. Of public water suppliers using surface water, 32% had low scores, 53% had moderate scores and 16% 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, microbial contamination, and inorganic compounds. Of the 56 public water suppliers in the basin which treat raw water, 19 use surface water, 37 use ground water and one uses alluvial wells. Most residents in the basin get their water from the Cottonwood, Neosho, or Spring Rivers, ground water, or from one of the three major federal reservoirs. Ground water is a significant source in the southeastern part of the basin.

For communities using ground water, development of a wellhead protection plan is recommended. For communities using surface water, the development of a Water-

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shed Restoration and Protection Strategy (WRAPS) is the best mechanism to ensure water quality protection for their public water supply. The Neosho basin has nine complete and approved source water protection plans in place.

Under the Source Water Assessment Program, about two thirds of the Neosho basin has been designated as critical area for protecting public water supplies, as defined by the stream reaches with a 24-hour or less travel time to a surface water diversion point. Much of the information from the assessment and risk rating can be used to develop WRAPS plans that can work to meet both TMDL goals and protect public water supplies from sources of pollution.

Five public water supplies were recommended by the EPA for participation in a five year, 2003 Atrazine monitoring program. This Atrazine risk reduction program includes runoff prevention in watersheds feeding public water supplies. These types of activities can help reduce pollution loading in the watersheds. As of 2005⁽¹⁰⁾, the most recent year for which data are available, no system has exceeded the EPA criteria for Atrazine levels in public drinking water supplies.

Reservoir Sedimentation

Protection of the three federal reservoirs in this basin is another aspect of source water protection. The state has made significant investments in acquiring storage space in [Council Grove](#), [Marion](#), and [John Redmond](#) reservoirs for municipal and industrial use. Reducing sedimentation into the lakes is a water quality as well as water quantity issue. Efforts such as streambank stabilization can help reduce sedimentation.

Zebra mussels

Zebra mussels were confirmed to be present in Marion Reservoir in the summer of 2008. Despite efforts by the Kansas Department of Wildlife and Parks, and other agencies and organizations, to prevent infestations of the mussels spread from other reservoirs, this additional infestation is particularly troublesome due to the position of Marion Reservoir upstream from John Redmond Reservoir. John Redmond Reservoir supplements cooling water in the lake used by the Wolf Creek Nuclear Power Plant (Figure 5). Zebra mussels, once established, are almost impossible to eradicate, and cause hundreds of thousands of dollars, and sometimes millions of dollars, worth of damage to public water supply and industrial plant water intakes and other infrastructure. Efforts to

prevent infestation of the mussels into John Redmond Reservoir and the Wolf Creek Lake are of utmost importance.



Figure 5. Wolf Creek Nuclear Power Station.
Photo courtesy Kansas Geological Survey.

Wetland and Riparian Area Management

Wetland and riparian areas are another focus of watershed protection and restoration. 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 (BMPs). Wetland and riparian areas are transitional lands between aquatic and upland locations. Wetlands include areas with hydric soils where standing water or wet soil conditions predominate. Riparian areas include streamside and floodplain areas where the vegetation, soils, or topography are distinguishable from that on adjoining uplands. Healthy riparian areas are an important component in filtering out pollutants and sediment from the streams and lakes. Healthy riparian areas can also control bank erosion, provide habitat and slow surface water runoff that leads to flooding. An analysis of the Neosho basin⁽¹¹⁾ indicates about 23% of the streams have crop land as the riparian land use. Wetlands provide unique wildlife habitat, and serve as flood water detention areas. Wetlands and riparian areas also provide aesthetic value.

An emerging concern is management and maintenance of forested riparian areas to prevent the entry of debris (dead and fallen trees, etc.) into the tributary/river system. Due to recent ice storms and catastrophic flooding, along with unstable streambanks, the potential for woody debris to collect in and clog bridges and culverts has been elevated. Preventing entry of woody debris into the system can help to manage this. The log jam discussed above is a consequence of this condition.

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The KWO is proposing a new policy that will provide a systematic approach to the assessment, protection and restoration of wetland and riparian areas and for the restoration of stream channels. The policy promotes a comprehensive evaluation of stream reaches and watershed wetland and riparian area condition.

Watershed Restoration and Protection Strategy (WRAPS) Groups

Citizens in sub-watersheds of the Neosho basin have formed WRAPS stakeholder leadership teams to assess their watersheds, water quality impairments, habitat needs, and other issues, and develop goals and objectives for addressing them. WRAPS groups develop stakeholder driven watershed 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, reduced reservoir sedimentation, riparian and wetland management, and other natural resource objectives.

Watersheds above the three 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. Implementation plans are being developed that will assist local groups to make the best use of existing funds to address the most critical problem areas first. Figure 6 shows the status of WRAPS groups in the basin.

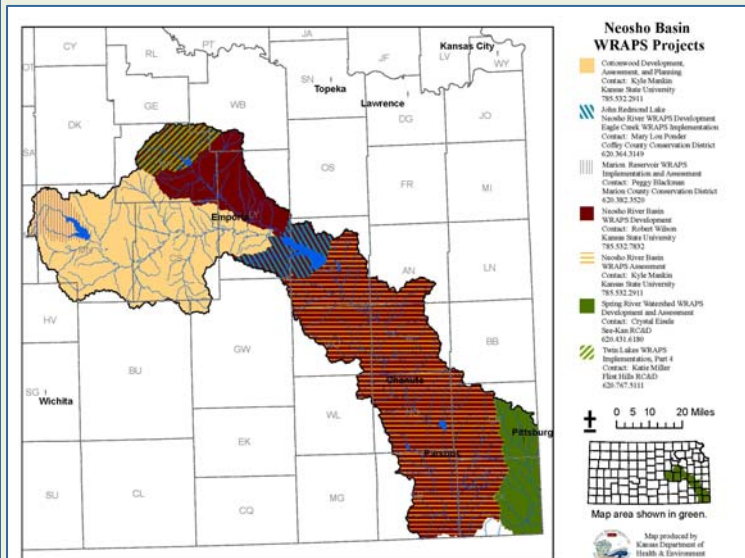


Figure 6. Watershed Restoration & Protection Strategy Groups

Several interstate groups have also formed to ensure high quality water in Grand Lake of the Cherokees in Oklahoma. A large part of the watershed draining into this highly used recreational and public water supply reservoir is in Kansas. An interstate effort involving Arkansas, Missouri, Oklahoma, and Kansas representatives is cooperatively developing a watershed based plan for the area. The efforts of WRAPS groups already underway in Kansas serve as a model for plan development and will be incorporated into the implementation plan.

A consideration for watershed restoration and protection in this basin is urbanization. As the amount of impervious surface in a watershed (i.e. rooftops, roads, parking lots, etc.) increases, water resources can be adversely impacted from increases in runoff volume and additional pollutants associated with urban environments. Efforts made by local governments and urban residents to minimize these adverse impacts through sound land use planning and stormwater management help to address these issues.

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. In the Neosho basin, the cities of Emporia, Parsons and Pittsburg are required by the EPA Phase II Stormwater Program to develop management plans to minimize pollution entering receiving waters from within the boundaries of their municipalities.

Another consideration for watershed restoration and protection in the basin is the potential for conversion of Conservation Reserve Program (CRP) acreage back to production agriculture as contracts expire. Recently with commodity prices on the rise, this is even more of a concern. In the 12 counties contained wholly or partly in the Neosho basin, contracts on 37,259 acres covering 891 contracts expired on September 30, 2007. Lyon County had the highest number of expired contracts at 10,078 acres. 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. CRP grass cover is very ef-

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fective at trapping sediment and nutrients.

Other Watershed Related Activities

- All counties, excluding Chase County, either wholly or partly within the basin have adopted local sanitary/environmental codes or participate in the Local Environmental Protection Program.
- Seven of the 12 counties have countywide planning and zoning programs.
- All conservation districts in the basin have adopted nonpoint source pollution control management plans. Grants under the State Water Quality Buffer Initiative have also been awarded in six counties supporting buffer coordinators and facilitating enrollment of stream buffers in continuous CRP in FY 2008.
- As of December 2007, there were 21 active contamination sites being remediated through the State Water Plan Contamination Remediation Program. Most of the contamination is from heavy metals resulting from past mining and smelting activities. Additional contamination is caused by volatile organic compounds, carbon tetrachloride and nitrate.
- There are 15 organized and active [watershed districts](#) in the basin.

Recommended Actions

1. Continue development and support of local WRAPS groups, with technical assistance from state and federal agencies to develop management plans. Coordinate funding from among sources to address highest priority problems first. Focus state resources towards high priority watersheds, particularly those that include high priority TMDLs, high biological priority, and source water protection.
2. Target resources to the improvement and management of riparian areas in priority watersheds.
3. Coordinate with the Kansas Department of Wildlife and Parks and other organizations and agencies to prevent the spread of Zebra mussels in the basin.
4. Continue cooperative inter-state efforts to improve water resource conditions in the entire Neosho/Grand River Lake of the Cherokees watershed.
5. Complete Corps John Redmond Feasibility study and incorporate results into WRAPS and other cooperative planning efforts.
6. Work with local governments, including conservation districts, local environmental protection programs, and stormwater utilities to develop and implement comprehensive urban stormwater and source water management plans.
7. Continue public outreach efforts to educate the public and landowners about the benefits of best management practices.
8. Encourage other agencies and entities in partnerships and participation to support WRAPS initiatives, activities and funding.

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Resources

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