

Walnut Basin High Priority Issue Watershed Restoration and Protection January 2009

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Issue

The restoration and protection of watersheds, particularly those watersheds above public water supply reservoirs and lakes, is a priority in the [Walnut basin](#). With growing [populations](#) in the northern portion of the basin and a corresponding increase in the demand for water, the restoration and protection of these watersheds and the reservoirs below them are of high importance.

Description

[El Dorado Reservoir](#) and Winfield City Lake are the two major sources of stored water supply in the basin. El Dorado Reservoir is operated by the U.S. Army Corps of Engineers (Corps). The City of El Dorado manages all of the water stored for public water supply. El Dorado Reservoir is used for public water supply programs that serve numerous cities and rural water districts (RWDs) in the basin, primarily in the rapidly growing areas in the northwest portion of the basin influenced by the Wichita metropolitan area. It is also managed by the Corps for [flood control](#) and [recreation](#). Winfield City Lake is owned and operated by the City of Winfield and is also heavily used for recreation.

Reservoir sedimentation and eutrophication are major water supply concerns. As sediment accumulates in a reservoir's multipurpose pool, the capacity for water supply storage is reduced. A recent bathymetric survey of El Dorado Reservoir did not result in a new sedimentation rate for the reservoir due to issues with equipment and accuracy of the original topographic maps. There was also uncertainty about quantities of sedimentation behind the several highway and road bridges, and in borrow pits resulting from dam construction that were not mapped. Future work will involve additional bathymetric surveys and sediment core samples to get a better idea of how capacity in the reservoir has changed since construction. Recent bathymetry in Winfield City Lake indicates that the lake has lost about 713 acre feet of storage to sediment accumulation, leaving approximately 17,921 acre-feet of storage, or about 95% of its original storage capacity, still available.

Zebra mussels

In 2003, the presence of Zebra mussels in El Dorado Reservoir was confirmed, and in 2005 their presence was confirmed in Winfield City Lake. Zebra mussels have also been found in the Walnut River. It is not yet known what the impacts on water quality and recreation in these reservoirs will be. The City of El Dorado, state

agencies including the Kansas Departments of Wildlife and Parks (KDWP) the Kansas Department of Health and Environment (KDHE), and the Corps are closely monitoring to identify affects of the mussels on water quality and biology, and to prevent their further spread throughout the basin and into other basins.

Water Quality Impairments

Water quality and related water resource issues are addressed through a combination of watershed restoration and protection efforts utilizing voluntary, incentive-based approaches, as well as regulatory programs.

Surface waters not meeting surface water quality standards in the basin are included on the 303(d) list. The KDHE has completed the first round of Total Maximum Daily Loads (TMDLs) within the Walnut basin based on the 1998 303(d) list, and an additional round of TMDL development was initiated in 2007. Many of the stream segments, configured in a watershed setting, have a TMDL applied to them as a whole. There are 14 approved TMDLs within the Walnut basin that describe the strategies and goals to reduce pollution to achieve water quality standards.⁽⁶⁾

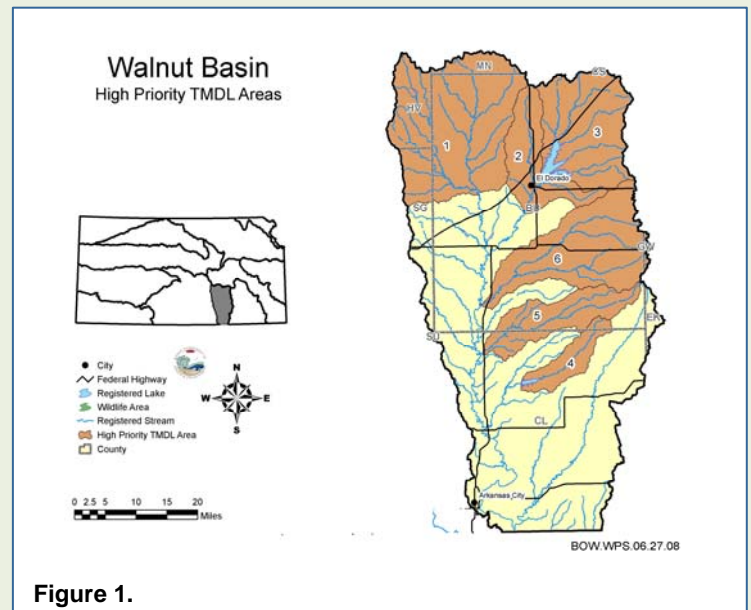


Figure 1.

The 2008 303(d) list submitted to the U.S. Environmental Protection Agency (EPA) identifies watersheds associated with six stream chemistry sampling stations as water quality impaired. There are three lakes in the Walnut basin listed as water quality impaired. Among the streams Atrazine, copper, sulfate and total phosphorus cause impairments. Among the lakes eutrophic conditions indicative of excessive algae production were the

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causes of impairment. Each parameter causing impairment requires a TMDL.

KDHE recently reviewed and revised Walnut basin TMDLs and submitted them to EPA in late summer 2008. A new high priority eutrophication TMDL for Winfield City Lake is proposed. The current El Dorado Reservoir TMDLs were evaluated during this round of TMDL submissions and no changes are recommended at this time. Dissolved oxygen (D.O.) and bacteria TMDLs were reviewed and revision of priorities have also been proposed.

High priority TMDL watersheds (Figure 1) are used to target technical and financial assistance for implementation of nonpoint source pollution management practices that can address designated pollutants. Table 1 describes the impairments in each watershed.

TABLE 1 Walnut BASIN HIGH PRIORITY TMDLS			
MAP ID	WATERBODY	IMPAIRMENTS	HUC 11 WATERSHEDS
STREAM SEGMENTS			
1	Whitewater River	FCB	11030017
2	Upper Walnut River	FCB	11030017
5	Rock Creek	E. coli	11030018
6	Little Walnut River	E. coli	11030018
LAKES			
3	El Dorado Lake	Eutrophication	11030017
3	El Dorado Lake	Silt	11030017
4	Winfield City Lake	Eutrophication	11030018

Key:
 E: Eutrophication, biological community impacts and excessive nutrient/organic loading
 FCB: Fecal Coliform Bacteria
 HUC: U.S. Geologic Survey Hydrologic Unit Code
 Silt: Observed siltation and/or chronic turbidity that impacts development of trophic state
 E. coli: Indicator organism within FCB

A component of the TMDL process is to quantify the cost to implement best management practices (BMPs) and technical assistance necessary to address the impairments. The State Conservation Commission (SCC) has prepared a “needs inventory” to estimate costs associated with reducing nonpoint source pollution in this basin, and guide implementation of BMPs. Programs are targeted at achieving high priority TMDL goals.

See the KDHE TMDL website listed in the resources for additional information.⁽⁶⁾

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. The Kansas Surface Water Nutrient Reduction Plan, developed by KDHE, outlines a statewide strategy for reducing the export of total nitrogen (TN) and total phosphorus (TP) in surface waters leaving the state.⁽⁵⁾ This involves additional reductions in nutrients from point source discharges through the National Pollutant Discharge Elimination System (NPDES) Program and reductions in non-point 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 (see maps in [Water Quality Policy Section](#)). In the Walnut basin, Butler County showed the highest improvement potential for TN. Both Butler and Cowley counties have high potential for improvement for phosphorus.

Nutrient sources within the Walnut basin include both point and nonpoint sources. The major point sources in the basin include large wastewater treatment plants, which are regulated under the NPDES Program (Figure 2).

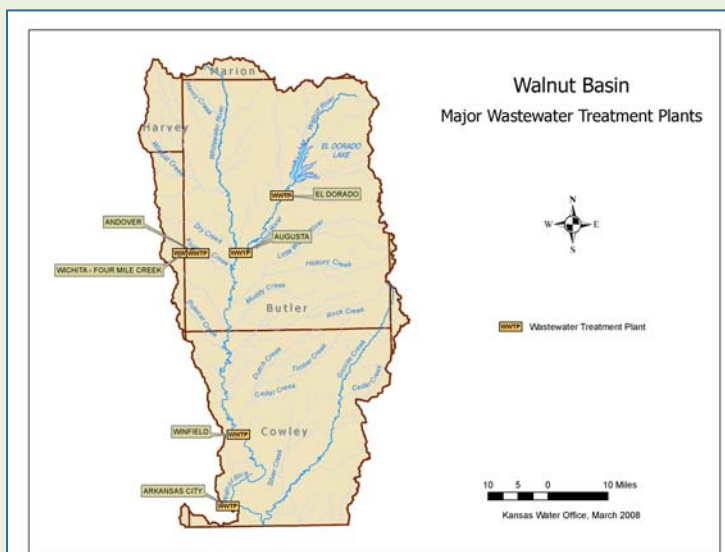


Figure 2. Major Wastewater Treatment Plants in the Walnut Basin

A major component of the Nutrient Reduction Plan involved looking at nitrogen transport to the Gulf of Mexico. In order to calculate the contribution of nitrogen to

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the Gulf, nitrogen concentrations of waters exiting the state borders were collected and estimated. Because the Walnut River confluences with the Arkansas River before leaving the state there are no “exit points” for the Walnut River. All contribution from the Walnut basin is added into the Arkansas basin (Upper and Lower) where the Arkansas River exits Kansas into Oklahoma. Therefore, for the purposes of this Plan, the [Walnut basin](#) contribution is combined with the [Upper](#) and [Lower Arkansas](#) basins.

Nonpoint sources of pollution include both agricultural and urban areas. Table 2 shows the relative contribution of point and nonpoint sources in the Lower and Upper Arkansas and Walnut basins for TP and TN leaving the state.

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

Statewide Perspective

Parameter	State Total	UA/LA/WAL	% of State Total
TN Leaving State (Ton/yr)	51,205	6,943	14%
TP Leaving State (Ton/yr)	7,670	1,582	21%
Point Source TN (Ton/yr)	10,600	3,503	33%
Point Source TP (Ton/yr)	2,836	886	31%
Nonpoint Source TN (Ton/yr)	40,605	3,440	8%
Nonpoint Source TP (Ton/yr)	4,834	696	14%

UA/LA/Walnut Basin Perspective

Parameter	Total	PS	PS %	NPS	NPS%
TN (Ton/yr)	6,943	3,503	50%	3,440	50%
TP (Ton/yr)	1,582	868	56%	696	44%

The KDHE Bureau of Water administers programs related to public water supplies, wastewater treatment systems, the disposal of sewage, and nonpoint sources of pollution. Programs are designed to provide safe drinking water, prevent water pollution, and assure compliance with state and federal laws and regulations such as the Clean Water Act and Safe Drinking Water Act. State Water Quality Standards include provisions for alternative disposal of treated wastewater and residue material resulting from the waste treatment process. KDHE’s minimum standards for the design of water pollution control facilities include guidelines for agricultural application of wastewater and sludge. Reuse of treated wastewater may contribute to water conservation within the basin.

Source Water Protection

All public water suppliers in the basin completed Source Water Assessments in cooperation with the KDHE in 2004.⁽³⁾ The next step, which is voluntary, is the development of source water protection plans.

Of the 12 [public water suppliers](#) in the basin which treat raw water, 3 use [surface water](#) and 9 use ground water. Most residents in the basin get water from the Walnut River, one of its major tributaries, El Dorado Reservoir or Winfield City Lake. While more suppliers use ground water than surface water, the populations served by surface water is larger.

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 susceptibility score was generated from the susceptibility analysis and 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).

Fifty-eight percent of the public water suppliers in the [Walnut basin](#) had moderate susceptibility scores. Of the public water suppliers in the basin using ground water, 22% had low susceptibility scores and 78% had moderate scores. All of the public water suppliers using surface water received low susceptibility scores.

The most commonly identified problems with ground water were volatile and synthetic organic compounds, pesticides and microbes. The most commonly identified problems with surface water were volatile and synthetic organic compounds, inorganic compounds, sediment and eutrophication (phosphorus). The highest potential non-regulatory source of contamination is single family housing.

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

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for their public water supply. The Walnut basin has no completed source water protection plan and none in progress.

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 BMPs. Water quality has been a primary focus with implementation efforts targeted to high priority TMDL watersheds (Figure 1). All conservation districts in the basin have developed wetland and riparian protection plans.

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 Kansas Water Office (KWO) has developed a 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 condition.

Watershed Restoration and Protection Strategies

WRAPS are 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.^(4, 9)

Two watershed planning studies have been conducted in the Walnut basin by the Tulsa District Corps. The first phase, a reconnaissance study, also called a Section 905(b) analysis, was conducted by the Corps to examine water resources problems and identify measures that would resolve problems. This effort was at full federal expense and covered the entire Walnut basin. Successful completion was realized with the identification of sev-



El Dorado Reservoir

eral potential solutions to water resource problems in the basin.

The second phase was completed in early 2008 and was conducted as a cost shared effort between the Corps, KWO, and the City of El Dorado.⁽⁸⁾ The study area for this phase shifted from the entire basin to the evaluation of the upper Walnut River basin consisting of the El Dorado Reservoir and its watershed. The purpose of the study was to identify and evaluate solutions to reservoir and watershed problems identified by the KWO and the City of El Dorado that could be implemented in small steps all leading toward long term watershed objectives. Two goals guided the study:

1. Identify effective reservoir restoration and protection measures to ensure long term availability of storage space for public water supplies in federal reservoirs, using El Dorado Reservoir as a pilot (eight objectives); and
2. Identify watershed restoration and protection needs and determine opportunities to implement effective management practices (four objectives).

The goals of the project were generally met, but some objectives were either not fully met or were not achievable within the time and budget resources of the study. The watershed management plan provided in the report provides information valuable for near term restoration and preservation planning and implementation. A software watershed model was developed using the Soil and Water Assessment Tool (SWAT) to satisfy several of the watershed objectives. A significant finding of the modeling was the consistent result that installation of

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grass filter strips as BMPs along streams and riparian areas and as field borders has the potential to reduce sediment delivery by 70% to 80%. The results of this effort will allow more strategic targeting of future BMPs.

The entire report is available on the KWO website.⁽¹⁰⁾ This report will serve as the basis for a WRAPS plan to be developed and implemented locally. Plans are under way to apply for funding to accomplish this. The Butler County Conservation District has been implementing BMPs in the watershed for almost 15 years and development of a WRAPS plan, using information contained in the report, will allow more targeted use of resources.

In Cowley County, the City of Winfield provides cost share funds to landowners in the Timber Creek watershed above Winfield City Lake to install BMPs to reduce pollution entering the lake, especially sediment and nutrients. A bathymetric survey completed in 2007 indicates that the lake has lost approximately 4% of its water storage capacity. Raw water from the lake experiences blue-green algae blooms that result in taste and odor occurrences in the finished drinking water. These blooms occur when excess nutrients are present in the water and other environmental conditions exist that lead to algae production.

An important consideration for watershed restoration and protection in this basin, particularly in the northern portion of the watershed, is [urbanization](#). Butler County is growing rapidly due to eastward expansion of the Wichita metropolitan area. This growth is affecting water supply infrastructure, water quality, natural resource conservation, and land use decisions. For example, 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 this issue.

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. 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.

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. Contracts on 4,476 acres expired on September 30, 2007 in Butler and Cowley counties. If land is taken out of permanent grass cover, implementation of BMPs will be needed to minimize potential adverse impacts to water resources within the basin.



Stone bridge over Badger Creek, Cowley, County.
Photo courtesy Kansas Geological Survey.

Other Watershed Related Activities

- Both Cowley and Butler counties have adopted local sanitary/environmental codes and participate in the Local Environmental Protection Program (LEPP).
- Butler County has countywide planning and zoning programs but Cowley County does not.
- Both conservation districts in the basin have adopted nonpoint source pollution management plans. A grant under the State Water Quality Buffer Initiative has also been awarded in Cowley County in the basin supporting buffer coordinators and facilitating enrollment of stream buffers in [continuous CRP](#).
- Of cities in the basin, Arkansas City, El Dorado, and Winfield are subject to the Phase II Permitted Municipal Separate Storm Sewer System under the NPDES Stormwater Program.
- As of December 2007, there were six active contamination sites being remediated through the State Water Plan Contamination Remediation Program. Most of

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the contamination is a result of hydrocarbon contamination by refineries.

- There are eight organized watershed districts in the basin.

Recommended Actions

1. Begin formation of a WRAPS group above El Dorado Reservoir. Work with stakeholders to incorporate TMDL implementation, nutrient and sediment reduction, and urban stormwater management goals into the WRAPS project. Coordinate with development of source water protection plans.
2. Continue to provide cost-share funds through the City of Winfield to landowners in the Winfield City Lake watershed to install BMPs to protect water quality.
3. Continue efforts to prevent the spread of Zebra mussels from infected water bodies.
4. Complete assessment of riparian and wetland areas and target resources to restoration or installation of grass filter strips along streams.
5. Coordinate with surrounding counties on urban growth issues.
6. Continue public outreach efforts to educate the public and landowners about the benefits of BMPs. Encourage other agencies and entities in partnerships and participation to support WRAPS initiatives, activities and funding.

and Protection Strategy, www.kdheks.gov/nps/wraps

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6. Kansas Department of Health and Environment. 2007. Bureau of Water, *Watershed Planning and TMDL Program*, www.kdheks.gov/tmdl
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8. U.S. Army Corps of Engineers, Tulsa District. January 2008. Walnut River Basin, Kansas. *Feasibility Report – El Dorado Lake, Kansas Watershed Management Plan*.
9. Kansas WRAPS. 2008. www.kswraps.org.
10. Kansas Water Office. [Reports and Publications](#).

Resources

1. Kansas Water Office. 2006. *Kansas Water Plan Water Quality Policy and Institutional Framework Section*.
2. Kansas Department of Health and Environment, Bureau of Environmental Remediation.. December 2007. *Basin Updates and Site Accomplishments*.
3. Kansas Department of Health and Environment, Bureau of Water. 2004. *Kansas Source Water Assessment Report*, www.kdheks.gov/nps/swap
4. Kansas Department of Health and Environment, Bureau of Water. 2007. *Kansas Watershed Restoration*