

# Cedar Bluff Lake WRAPS

## 9 Element Watershed Protection Plan

### Water Quality Impairments Directly Addressed:

- Cedar Bluff Lake Eutrophication TMDL (Medium Priority)

### Other Impairments Which Stand to Benefit from Watershed Plan Implementation:

- Smoky Hill River Near Trego Dissolved Oxygen TMDL (Medium Priority)
- Smoky Hill River Near Trego Bacteria 303(d) listing

### Cedar Bluff Watershed



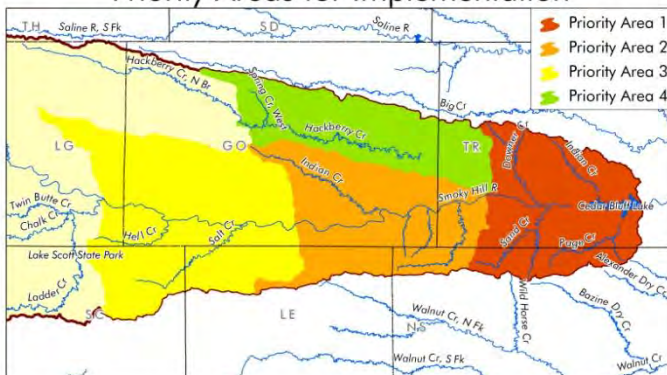
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October 2010

### Determination of Priority Areas

- Interpretation of KDHE water quality data included within watershed above Cedar Bluff Lake to identify watersheds/contributing areas to focus BMP implementation towards addressing nonpoint source impairment issues.
- Consideration of proximity to Cedar Bluff Lake for BMP implementation due to lack of surface water and rainfall/runoff events in watershed
  - All BMPs noted for implementation within this plan are scheduled to take place within the area identified as Priority Area 1

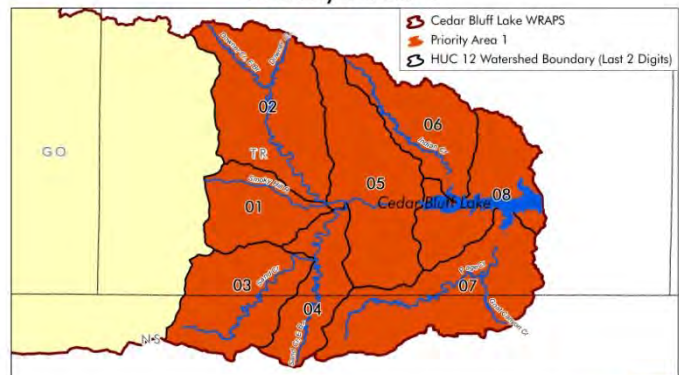
### Cedar Bluff Lake WRAPS Priority Areas for Implementation



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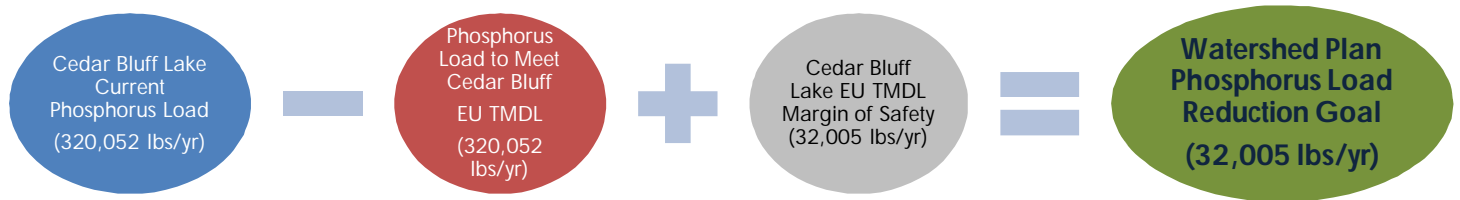
### Cedar Bluff Lake WRAPS Priority Area 1



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## Best Management Practice and Load Reduction Goals



### BMPs to be implemented in association with Watershed Plan:

- Cropland-related BMPs
  - Permanent vegetation
  - Grassed waterways
  - No-till cropland production
  - Terraces
  - Nutrient management
- Livestock-related BMPs
  - Vegetative filter strips
  - Relocate feeding pens
  - Relocate pasture feeding sites
  - Alternative watering systems

### Watershed Plan Duration and Costs

- Total plan length = 20 years
  - Load reduction goal of plan met during year 16
- Total plan cost = \$11,670,076
  - Cropland BMP Implementation
    - \$5,956,033
  - Livestock BMP Implementation
    - \$216,360
  - Information and Education
    - \$2,649,420
  - Technical Assistance
    - \$2,848,263

Year	Cropland BMP Implementation	Livestock BMP Implementation	Information and Education	Technical Assistance	Total Annual Cost
1	\$221,658	\$8,712	\$98,600	\$106,000	\$434,970
2	\$228,308	\$5,969	\$101,558	\$109,180	\$445,015
3	\$235,157	\$21,216	\$104,605	\$112,455	\$473,433
4	\$242,212	\$6,332	\$107,743	\$115,829	\$472,116
5	\$249,478	\$9,002	\$110,975	\$119,304	\$488,759
6	\$256,962	\$6,718	\$114,304	\$122,883	\$500,867
7	\$264,671	\$9,550	\$117,734	\$126,570	\$518,525
8	\$272,611	\$7,127	\$121,266	\$130,367	\$531,371
9	\$280,790	\$10,132	\$124,904	\$134,278	\$550,104
10	\$289,213	\$8,493	\$128,651	\$138,306	\$564,663
11	\$297,890	\$10,749	\$132,510	\$142,455	\$583,604
12	\$306,826	\$8,022	\$136,485	\$146,729	\$598,062
13	\$316,031	\$28,512	\$140,580	\$151,131	\$636,254
14	\$325,512	\$8,510	\$144,797	\$155,665	\$634,484
15	\$335,278	\$12,098	\$149,141	\$160,335	\$656,852
16	\$345,336	\$9,028	\$153,616	\$165,145	\$673,125
17	\$355,696	\$12,834	\$158,224	\$170,099	\$696,853
18	\$366,367	\$9,578	\$162,971	\$175,202	\$714,118
19	\$377,358	\$13,616	\$167,860	\$180,458	\$739,292
20	\$388,679	\$10,162	\$172,896	\$185,872	\$757,609
<b>Total</b>	<b>\$5,956,033</b>	<b>\$216,360</b>	<b>\$2,649,420</b>	<b>\$2,848,263</b>	<b>\$11,670,076</b>

# Cedar Bluff Lake WRAPS



**Smoky Hills**  
Resource, Conservation & Development Area Inc.

Funding for the development of this plan was provided through an EPA 319 grant 2007-0028 from the Kansas Department of Health and Environment.



## Stakeholder Leadership Team

Includes representatives from:

**Smoky Hills Resource Conservation and Development (RC&D) Area, Inc.**

**Smoky Solomon Resource Enhancement**

**County Conservation Districts**

**Northwest Kansas Conservation and Environmental Alliance**

**K-State Research and Extension**

**agriculture producers**

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## 1.0 Preface

The purpose of this Watershed Restoration and Protection Strategy (WRAPS) report for Cedar Bluff Lake Watershed is to outline a plan of restoration and protection goals and actions for the surface waters of the watershed. Watershed goals are characterized as “restoration” or “protection”. Watershed restoration is for surface waters that do not meet Kansas water quality standards, and for areas of the watershed that need improvement in habitat, land management, or other attributes. Watershed protection is needed for surface waters that currently meet water quality standards, but are in need of protection from future degradation.

The WRAPS development process involves local communities and governmental agencies working together toward the common goal of a healthy environment. Local participants or stakeholders provide valuable grass roots leadership, responsibility and management of resources in the process. They have the most “at stake” in ensuring the water quality existing on their land is protected. Agencies bring science-based information, communication, and technical and financial assistance to the table. Together, several steps can be taken towards watershed restoration and protection. These steps involve building awareness and education, engaging local leadership, monitoring and evaluation of watershed conditions, in addition to assessment, planning, and implementation of the WRAPS process at the local level. Final goals for the watershed at the end of the WRAPS process are to provide a sustainable water source for drinking and domestic use while preserving food, fiber, timber and industrial production. Other crucial objectives are to maintain recreational opportunities and biodiversity while protecting the environment from flooding, and negative effects of urbanization and industrial production. The ultimate goal is watershed restoration and protection that will be “locally led and driven” in conjunction with government agencies in order to better the environment for everyone.

This report is intended to serve as an overall strategy to guide watershed restoration and protection efforts by individuals, local, state, and federal agencies and organizations. The Cedar Bluff WRAPS process and the use of this report provides the Stakeholder Leadership Team (SLT) with the capability, capacity and confidence to make decisions that will restore and protect the water quality and watershed conditions of the Cedar Bluff Lake Watershed.

## 2.0 Priority Issues and Goals of the Stakeholder Leadership Team

The Cedar Bluff WRAPS Stakeholder Leadership Team (SLT) was formed out of concern for the health of the Cedar Bluff Lake. The Cedar Bluff Lake WRAPS SLT formed in 2006 and is made up of farmers, landowners, K-State Research and Extension Agents, business owners, recreation enthusiasts, and Conservation District representatives from counties in the WRAPS area.

The Cedar Bluff Lake WRAPS began work developing their WRAPS project in June 2006. In December 2006 and January 2007 public meetings were held in Sharon Springs, Healy, Oakley and WaKeeney to allow the public to voice issues and concerns dealing with water in the watershed. After the meetings, a full list of issues and concerns was compiled and surveys were mailed to those who attended the meetings to rank their top concerns.

Using meeting information and survey results, the SLT met in April 2007 and determined the following **top six watershed concerns**:

1. Overall water use
2. Contamination
3. Chemical and fertilizer use
4. Livestock waste
5. Erosion
6. Playa lakes

In Jan. 2004, KDHE approved TMDLs within the Cedar Bluff watershed that describe the strategies and goals to reduce pollution to achieve water quality standards. Impairments identified include: Sulfate, Selenium, Dissolved Oxygen, Fluoride, pH above 8.5 or less than 6.5, Aquatic Plants, and Eutrophication. <http://www.kdheks.gov/tmdl/sstmdl.htm>

A Rapid Watershed Assessment (RWA) was conducted by Natural Resources Conservation Service (NRCS), Kansas State Research and Extension, and Kansas Center for Agricultural Resources and the Environment (KCARE). Assessments were conducted in Hydrologic Unit Code 10260003 and 10260001. The reports for these assessments were released in December 2007, and are available at: [ftp://ftp-fc.sc.egov.usda.gov/KS/Outgoing/Web\\_Files/Technical\\_Resources/rwa/UpperSmokyHill\\_RWA.pdf](ftp://ftp-fc.sc.egov.usda.gov/KS/Outgoing/Web_Files/Technical_Resources/rwa/UpperSmokyHill_RWA.pdf) and [ftp://ftp-fc.sc.egov.usda.gov/KS/Outgoing/Web\\_Files/Technical\\_Resources/rwa/SmokyHillHeadwaters\\_RWA.pdf](ftp://ftp-fc.sc.egov.usda.gov/KS/Outgoing/Web_Files/Technical_Resources/rwa/SmokyHillHeadwaters_RWA.pdf)

Section 303(d) of the Clean Water Act requires states to identify all water bodies where state water quality standards are not being met. In response, Kansas has prepared lists of water quality impaired stream segments, wetlands, and lakes in 1994, 1996, 1998, 2002, 2004, 2008 and 2010. The EPA has requested that Kansas consolidate the 2006 and 2008 303(d) lists, therefore EPA did not rule on the Kansas 2006 303(d) list. KDHE's 2008 list of 303(d) waters added Cadmium, Arsenic, Total Suspended Solids and E. Coli to the list of impairments for the Cedar Bluff watershed.



Meetings to share watershed information and reports with the public were held in 2007 following the release of the RWA. The Cedar Bluff SLT meets regularly to develop the 9 Element Plan for Cedar Bluff Lake, monitor impairments in the watershed, and to hold demonstrations on best management practices that will address and improve identified impairments within the watershed.

Goals identified by the SLT are:

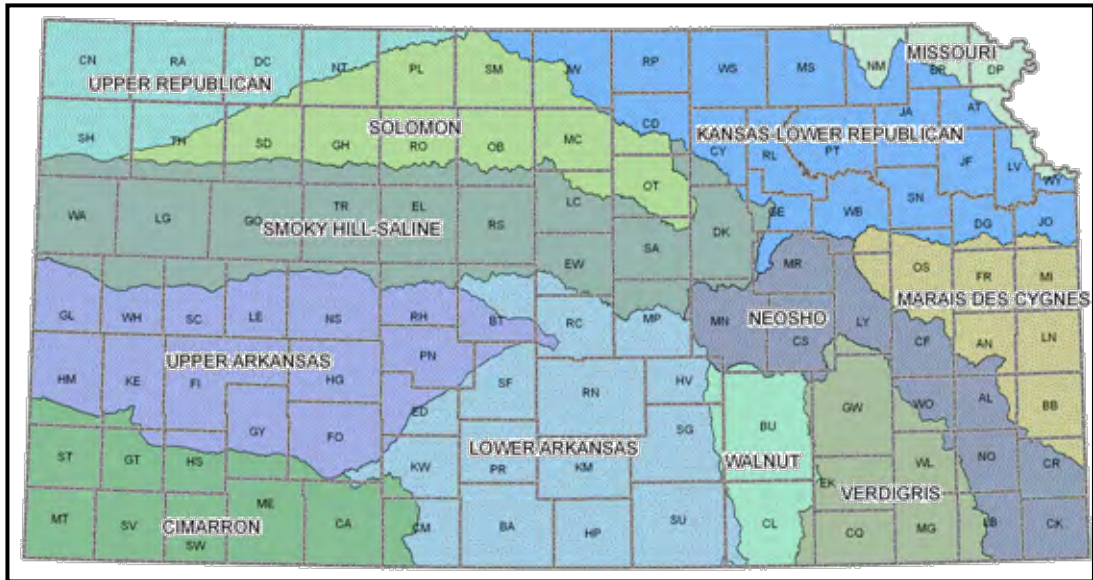
1. Protection of quality and quantity of public drinking water supplies
2. Protection of quality and quantity water supply for commercial use
3. Protection of groundwater quality and quantity
4. Restoration and protection of water quality in Cedar Bluff Lake
5. Restoration and protection of water quality in Smoky Hills River and tributary streams
6. Restoration and protection of riparian areas along Smoky Hills River and tributary streams
7. Protection of productivity of agricultural lands
8. Continue (or increase) sustainability of land and wildlife conservation
9. Increase public awareness and education about watershed/water quality issues.

### **3.0 Watershed Overview**

There are twelve river basins located in Kansas. The Smoky Hill-Saline Basin lies within the Great Plains and Central Lowland physiographic provinces. It is an elongated drainage area, which extends eastward from the Colorado border approximately 250 miles to the vicinity of Junction City, Kansas. Covering all or parts of 30 counties, the Smoky Hill-Saline Basin has a drainage area of about 8,810 square miles. The Smoky Hill River flows eastward to Junction City to the confluence with the Republican River. Below this point the river is known as the Kansas River. Three large federal irrigation and/or flood control projects are located in the Smoky Hill-Saline basin, Cedar Bluff Reservoir, Wilson Lake and Kanopolis. The scope of this WRAPS project is a portion of the Smoky Hill-Saline Basin in west central Kansas upstream of and including Cedar Bluff Lake. The Cedar Bluff dam is the geographical end point of this WRAPS project.

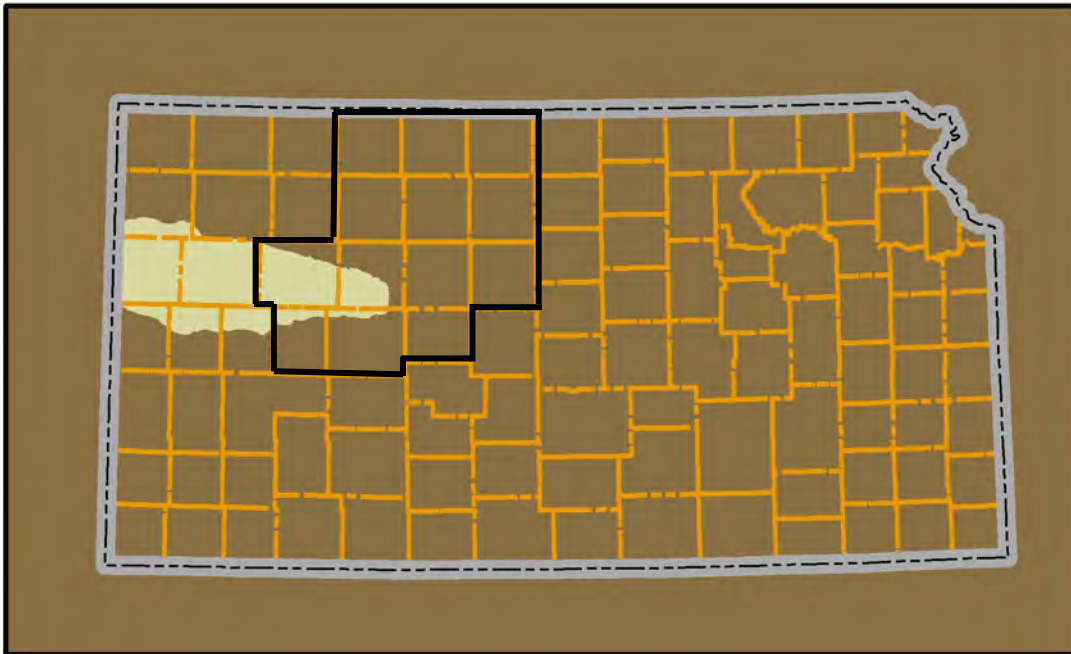
Small grains and row crops are grown on approximately 29% of the acres in the Upper Smoky Hill watershed with 7% of the cropland being irrigated by either surface or groundwater. The Upper Smoky Hill Intensive Groundwater Use Control Area (IGUCA) was established in July 1988 to limit the approval of new applications to divert water from the Smoky Hill River Basin above Cedar Bluff Dam to the headwaters near the Colorado border. These limits were imposed in response to observations of declining streamflow in the Smoky Hill River and Hackberry Creek and declining inflow of water into Cedar Bluff Lake.

Figure 1: Location of Smoky Hill-Saline river basin within the River Basins of Kansas  
<http://www.kwo.org/BACs/Basin%20Advisory%20Committees.htm>



The Cedar Bluff Lake Watershed is a large watershed located in western Kansas. This watershed covers portions of Sherman, Thomas, Wallace, Logan, Gove, Trego, Greeley, Wichita, Scott, Lane and Ness Counties for a total of 2,754,958 acres or roughly 4,304 square miles.

Figure 2. Location of the Cedar Bluff Lake watershed in relation to the Smoky Solomon Resource Enhancement and the State of Kansas



The Smoky Hills Resource Conservation and Development (RC&D) Area Inc. is a 501(c)(3) non-profit organization serving Gove, Trego, Ellis, Russell, Lane, Ness and Russ Counties in northwest central Kansas. As of Oct. 1, 2011 Smoky Hills RC&D has merged with Solomon Valley RC&D to form Smoky Solomon Resource Enhancement. The new non-profit's area is outlined in black. The Smoky Solomon Resource Enhancement manages and administers the Cedar Bluff Lake WRAPS project.

# Cedar Bluff Lake Watershed

The map displays the Cedar Bluff Lake Watershed in orange, spanning across the state boundary between Colorado and Kansas. The watershed covers parts of Kit Carson, Sherman, Thomas, Wallace, Logan, Gove, Trego, Cheyenne, Greeley, Wichita, Scott, Lane, and Ness counties. Cedar Bluff Lake is located in Trego County, Kansas. A legend in the top right corner identifies the symbols for State Boundary, County Boundary, and the Cedar Bluff Lake Watershed.

COLORADO	KANSAS				
Kit Carson	Sherman	Thomas			
Cheyenne	Wallace	Logan	Gove	Trego	Cedar Bluff Lake
	Greeley	Wichita	Scott	Lane	Ness

**Legend:**

- State Boundary
- County Boundary
- Cedar Bluff Lake Watershed

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**Kansas**  
Department of Health  
and Environment  
July 2011

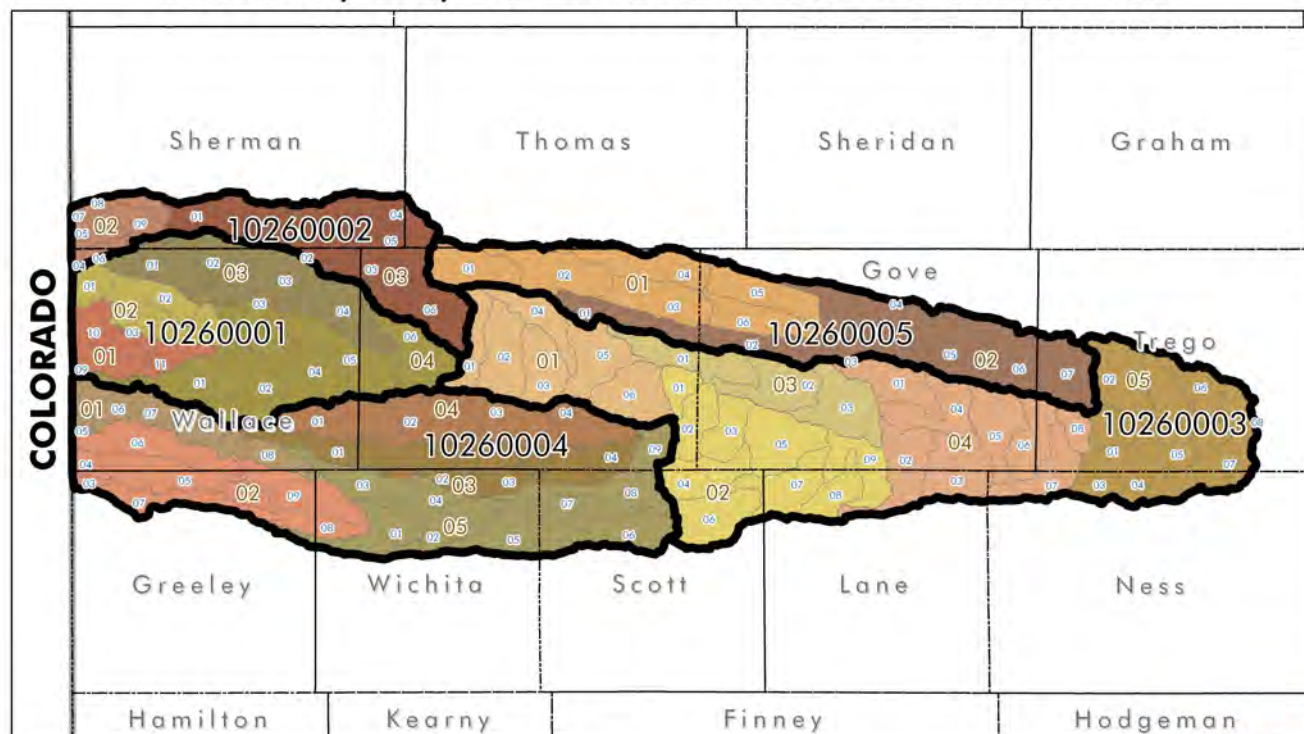
# Cedar Bluff Lake WRAPS Project Area





Figure 5. Cedar Bluff Lake WRAPS HUC Boundaries

## Cedar Bluff Lake WRAPS HUC 8/10/12 Watershed Boundaries



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**HUC** is an acronym for **H**ydrologic **U**nit **C**odes. HUCs are an identification system for watersheds. Each watershed has a unique HUC number in addition to a common name. As watersheds become smaller, the HUC number will become larger. For example, the Smoky Hill/Saline Basin is one of twelve basins in the state of Kansas. Within the Cedar Bluff Lake WRAPS are five HUC 8 classifications. HUC 8s can further be split into smaller watersheds that are given HUC 10 numbers and HUC 10 watersheds can be further divided into smaller HUC 12s.

According to the Kansas Unified Watershed Assessment (KDHE and USDA-NRCS, 1998), the Smoky Hill Headwaters (HUC-8 10260001), the Upper Smoky Hill (HUC-8 10260003), Ladder (HUC-8 10260004) and Hackberry (HUC-8 10260005) were determined to be Category I, or Watersheds in Need of Restoration, based on non-attainment of national clean water action goals. The watersheds were ranked 70th, 66th, 65th and 68th respectively within the state for watershed restoration priority.

The North Fork Smoky Hill (HUC-8 10260002) is designated as a Category IV watershed. A Category IV watershed has insufficient data to make an assessment of the watershed.



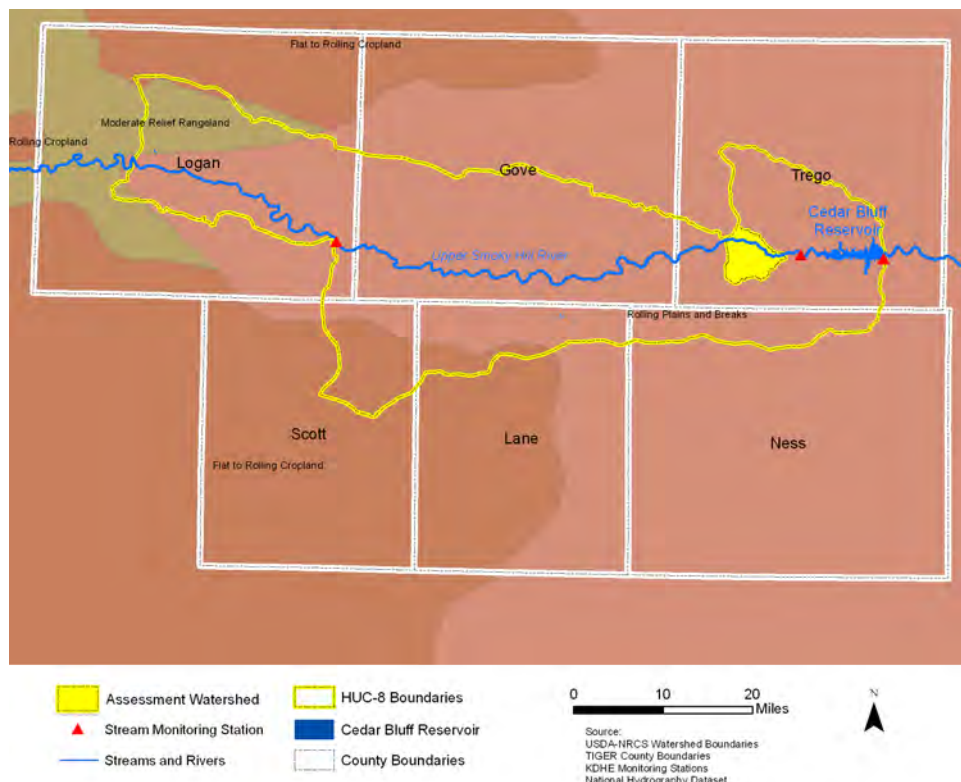
In October 2010, the Kansas Alliance of Wetlands and Streams (KAWS) conducted a GIS assessment of the Smoky Hill River and its tributaries within HUC 12 subwatershed 102600030501. During this assessment, aerial photography and land cover datasets were evaluated along the main stem of the Smoky Hill River as well as within 100 feet of either side of a National Hydrography Dataset (NHD) stream within the previously mentioned HUC 12. Outputs of this assessment activity yielded acres within the riparian region that are in need of rehabilitation or protection, locations of streambank in need of rehabilitation/stabilization, locations of animal feeding operations, as well as wastewater treatment lagoons located in the vicinity of streams. The final results of this assessment indicate the following BMP needs within the analyzed HUC 12:

- 124.3 acres of riparian region in need of rehabilitation
- 18.9 acres of riparian region in need of protection
- 1016.1 acres of riparian region in need of management
- 0 streambank erosion sites
- 10 animal feeding operations near or in riparian region
- 0 confined animal feeding operations
- 0 wastewater treatment lagoons

Information from the KAWS assessment was used to assist in determining the type and number of BMPs needed and identification of the Priority area where implementation of BMPs would have the greatest impact on TMDL needs.

Additional information regarding this assessment activity can be found at the following location: [http://www.kaws.org/files/kaws/Upper%20Smoky%20Hill%20River%20\(Cedar%20Bluff\)%20Level%20I%20Assessment.pdf](http://www.kaws.org/files/kaws/Upper%20Smoky%20Hill%20River%20(Cedar%20Bluff)%20Level%20I%20Assessment.pdf)

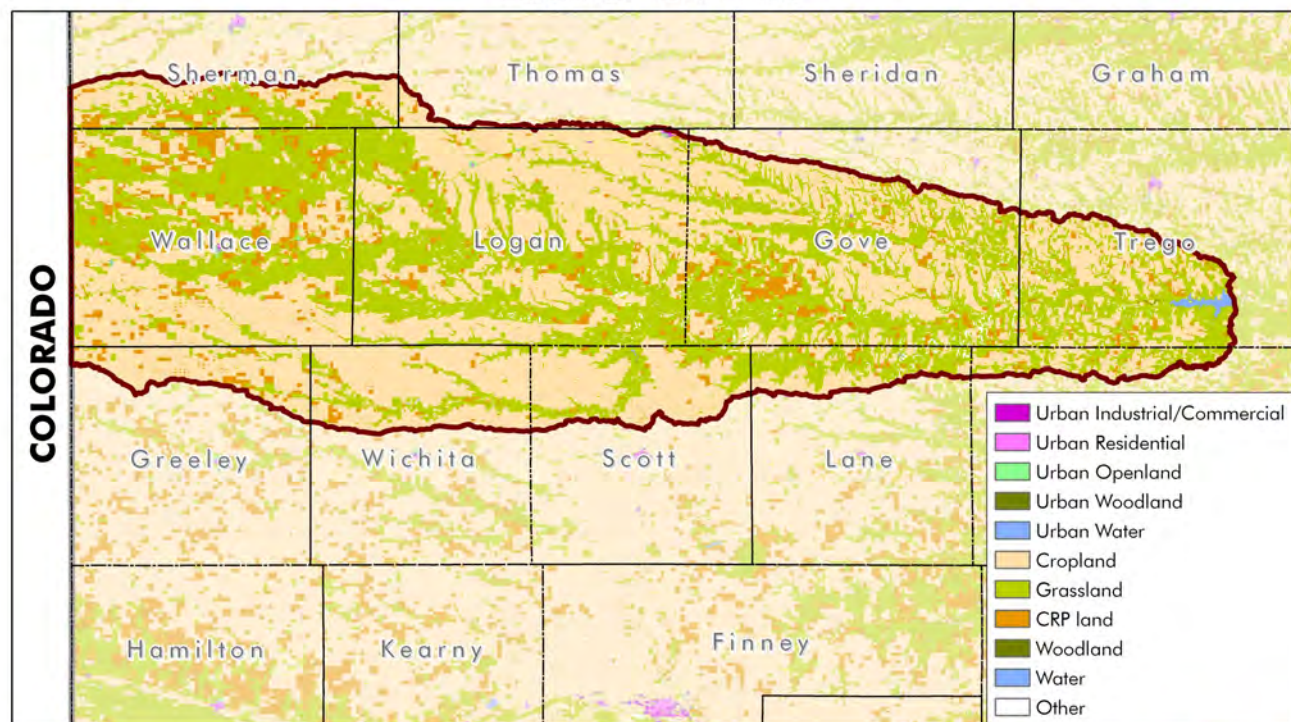
Figure 6. KAWS Assessment area along the Upper Smoky Hill River, including Cedar Bluff Lake.



### 3.1 Land Cover/Land Uses

Figure 7. Cedar Bluff Lake WRAPS Area Land Cover

## Cedar Bluff Lake WRAPS Land Cover



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Table 1. Upper Smoky Hill Land Cover and Land Use  
from USDA– KDHE Rapid Watershed Assessment 2007

Land Cover/Land Use	Ownership						Totals	%
	Public		Private		Tribal			
	Acres	%	Acres	%	Acres	%		
Open Water	4,600	*	0				4,600	*
Low Intensity Residential			256	*			256	*
High Intensity Residential			10	*			10	*
Commercial/Industrial/ Transportation			201	*			201	*
Bare Rock/Sand/Clay	1,500	*	13,550	1			15,050	2
Quarries/Strip Mines/Gravel Pits			43	*			43	*
Transitional			54	*			54	*
Deciduous Forest			651	*			651	*
Evergreen Forest			897	*			897	*
Mixed Forest			2	*			2	*
Shrubland			10,322	1			10,322	1
Grasslands/Herbaceous	6,000	1	606,239	65			612,239	65
Pasture/Hay			25,838	3			25,838	3
Row Crops			47,431	5			47,431	5
Small Grains			219,395	23			219,395	23
Fallow			7,515	1			7,515	1
Urban/Recreational	850	*	0				850	*
Woody Wetlands			30	*			30	*
Emergent Herbaceous Wetlands	280	*	0				280	*
Unknown			36	*			36	*
<b>HUC Totals<sup>a</sup></b>	<b>13,230</b>	<b>1</b>	<b>932,470</b>	<b>99</b>	<b>0</b>	<b>0</b>	<b>945,700</b>	<b>100</b>
<i>*Less than 1 percent of total acres</i>								
<i><sup>a</sup>Totals are approximate due to rounding an small, unknown acreages</i>								
<b><u>Special Considerations for This 8-Digit HUC:</u></b>								
<ul style="list-style-type: none"><li>▪ Small grains and row crops are the predominant commodities grown in rotation on 29 percent of the watershed (approx. 274,341 acres)</li><li>▪ Grasslands/Herbaceous and Pasture/Hay make up 68 percent of the watershed (approximately 638,077 acres)</li><li>▪ Forest makes up approximately 1 percent of the watershed (approximately 11,872 acres)</li><li>▪ Urban land comprises less than 1 percent of the watershed (approximately 467 acres)</li><li>▪ Cedar Bluff Reservoir and Wildlife Area information added to NLCD data. A discrepancy exists in the total land use and land cover estimates and needs to be evaluated further</li></ul>								
<b>Irrigated Lands<sup>4</sup></b>	<b>Percent of Cropland</b>			<b>Percent of HUC</b>				
Pressure	<b>2</b>			<b>1</b>				
Gravity	<b>5</b>			<b>&lt;3</b>				



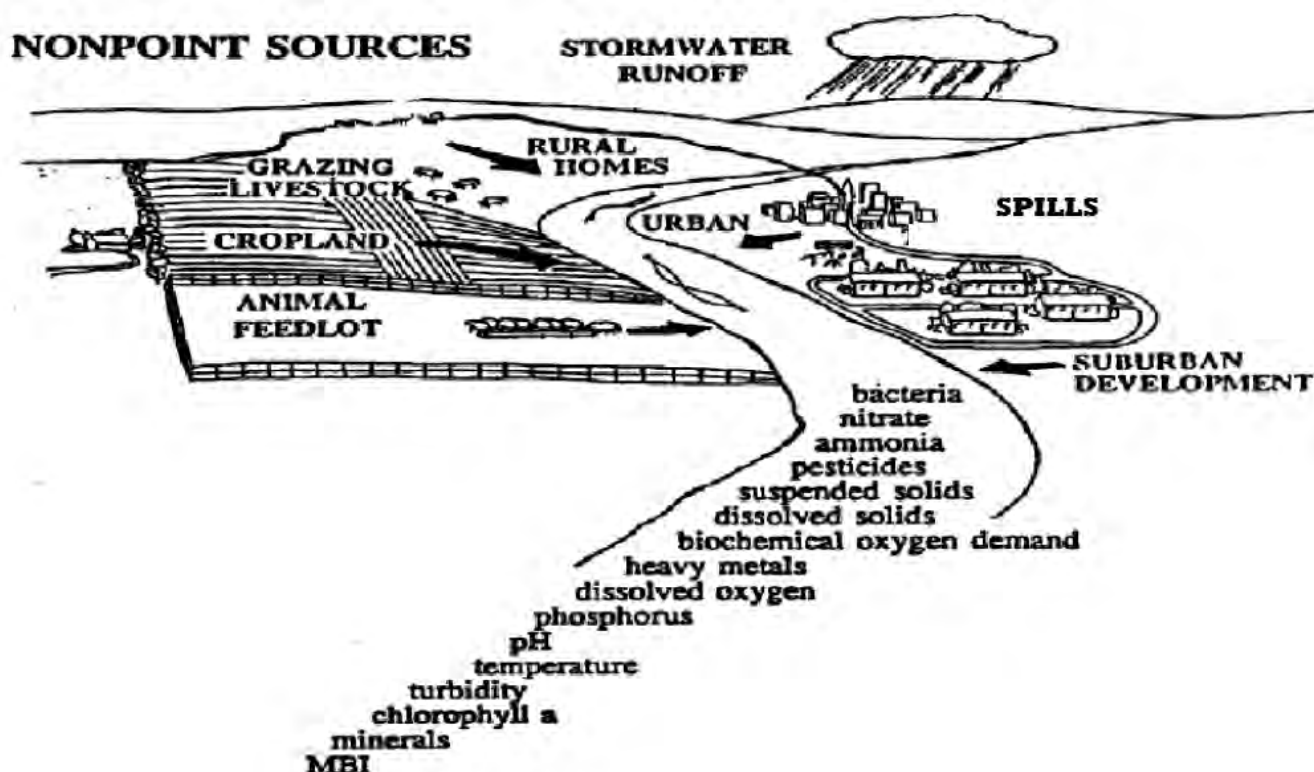
## Land Use Potential Contributions to Nonpoint Source Pollution

Nonpoint source pollution refers to the transport of natural and man-made pollutants by rainfall or snowmelt moving over and through the land surface and entering lakes, rivers, streams, wetlands or ground water. Atmospheric deposition and hydrologic modification are also sources of nonpoint pollution (EPA, 2003). The Kansas Surface Water Quality Standards state:

**“Nonpoint Source”** means any activity that is not required to have a national pollutant discharge elimination system permit and that results in the release of pollutants to waters of the state. This release may result from precipitation runoff, aerial drift and deposition from the air, or the release of subsurface brine or other contaminated groundwaters to surface waters of the state.” -KAR 28-16-28b(oo)

The following figure shows a conceptual diagram of common sources of nonpoint pollution and potential contaminants that can be transported to surface and ground waters.

Figure 8. Common Sources of Nonpoint Water Pollution



Source: [http://www.kdheks.gov/nps/resources/KSNPSMgmtPlan\\_04-29-2011\\_final.pdf](http://www.kdheks.gov/nps/resources/KSNPSMgmtPlan_04-29-2011_final.pdf)

Primary nonpoint source pollution concerns with cropland include excessive nutrient, pesticide, and organics in groundwater and surface water as well as suspended sediment and turbidity in surface water, streambank erosion, oxygen depletion due to organic matter decomposition and inefficient water use on non-irrigated land.



Land uses of grassland, herbaceous cover, pasture or hay will more than likely be used to support livestock production within this watershed. The predominate livestock raised within the Cedar Bluff watershed is cattle. Whether raised in confined feeding operations or allowed to roam in fenced grassland areas, livestock animal waste, if not properly managed, can be transported over the surface of agricultural land to nearby lakes and streams. The release of waste from animal feedlots to surface water, groundwater, soil, and air may be associated with a wide range of human health and ecological impacts and contribute to the degradation the Smoky Hill River and tributaries as well as Cedar Bluff Lake through nutrient and bacteria loading.

Good management practices for small open feedlots and winter feeding areas can minimize the potential for nonpoint source pollution. The key factor in controlling nonpoint pollution is controlling runoff and leaching. Many of the standard practices for erosion and sediment control will reduce losses of animal waste pollutants to surface water systems.

### 3.2 Designated Uses

The surface waters in the Cedar Bluff Watershed are generally used for aquatic life support, food procurement, domestic water supply, recreational use, groundwater recharge, industrial water supply, irrigation and livestock watering. Surface waters are given certain “designated uses” based on what the waters will be used for as stated in the Kansas Surface Water Register, 2009, issued by KDHE. For example, waters that will come into contact with human skin should be of higher quality than waters used for watering livestock. Therefore, each “designated use” category has a different water quality standard associated with it. When water does not meet its “designated use” water quality standard then the water is considered “impaired.”

Table 2. Cedar Bluff WRAPS area Lake/Stream Designated Uses

<u>Lake/Stream Name</u>	CUSEGA	CLAS	AL	CR	FP	DS	GR	IW	IR	LW
Big Windy Creek	1026000338	GP	E	b						
Capper Draw	10260001311	GP	S	b						
Chalk Creek	102600044	GP	E	b	O	O	X	O	O	X
Coon Creek	1026000120	GP	S	b						
Downer Cr, East Branch	1026000339	GP	E	b						
Downer Creek	1026000311	GP	E	C						
Eagletail Creek	1026000117	GP	S	a						
Goat Canyon Creek	1026000341	GP	E	b						
Goose Creek	102600015	GP	E	b						
Hackberry Cr, North Branch	102600055	GP	E	b						
Hackberry Creek	102600053	GP	E	b	X	X	X	X	X	X
Hackberry Creek, Middle Branch	102600054	GP	E	b						
Hell Creek	1026000325	GP	E	b						

<u>Lake/Stream Name</u>	CUSEGA	CLAS	AL	CR	FP	DS	GR	IW	IR	LW
Indian Creek	102600037	GP	E	b						
Indian Creek	1026000315	GP	E	b						
Ladder Cr, South	1026000412	GP	E	b						
Ladder Creek	102600041	GP	S	b	X	X	X	X	X	X
Ladder Creek	102600045	GP	S	a	X	X	X	X	X	X
Lake Creek	102600012	GP	E	b						
Lake Creek, South Fork	1026000118	GP	E	b						
Page Creek	1026000331	GP	E	b	X	O	O	O	O	X
Pond Creek	1026000121	GP	S	b						
Rose Creek	1026000119	GP	S	b						
Salt Creek	1026000326	GP	E	b						
Sand Cr, East Branch	1026000340	GP	E	C						
Sand Creek	1026000329	GP	E	b						
Sand Creek	1026000337	GP	E	b						
Six Mile Creek	1026000323	GP	E	b						
Smoky Hill River	102600011	GP	S	b	X	X	X	X	X	X
Smoky Hill River	102600039	GP	E	C	X	X	X	X	X	X
Smoky Hill River	1026000312	GP	E	b	X	X	X	X	X	X
Smoky Hill River	1026000313	GP	E	b	X	X	X	X	X	X
Smoky Hill River	1026000314	GP	E	b	X	X	X	X	X	X
Smoky Hill River	1026000316	GP	E	b	X	X	X	X	X	X
Smoky Hill River	1026000317	GP	E	b	X	X	X	X	X	X
Smoky Hill River	1026000319	GP	E	b	X	X	X	X	X	X
Smoky Hill River	1026000320	GP	E	b	X	X	X	X	X	X
Smoky Hill River	1026000321	GP	E	b	X	X	X	X	X	X
Smoky Hill River	1026000324	GP	E	b	X	X	X	X	X	X
Smoky Hill River, North Fork	102600021	GP	E	b	X	X	X	X	X	X
Smoky Hill River, North Fork	102600023	GP	E	a	X	O	X	X	X	X
Spring Cr, West	102600058	GP	E	b						
Twin Butte Creek	102600042	GP	S	b						
Wild Horse Creek	1026000328	GP	E	b	O	O	X	X	X	X
Willow Creek	102600017	GP	S	b						
Cedar Bluff Lake	N/A	GP	E	A	X	X	X	X	X	X
Lake Scott State Park	N/A	GP	S	A	X	X	X	X	O	X
Logan Co. State Fishing Lake	N/A	GP	E	B	X	O	O	O	O	O
Sherman Co. State Fishing Lake/ Wildlife Area	N/A	GP	E	B	X	O	X	O	O	O
Smoky Hill Garden Lake	N/A	GP	E	B	X	X	X	X	X	X

CUSEGA	=	channel unit segment
CLASS	=	antidegradation category
GP	=	general purpose waters
AL	=	designated for aquatic life use
S	=	special aquatic life use water
E	=	expected aquatic life use water
CR	=	designated for contact recreational use
A	=	Primary contact recreation stream segment/lake that is a public swimming area/has a posted public swimming area
B	=	Primary contact recreation stream segment/lake that is by law or written permission of the landowner open to and accessible by the public
C	=	Primary contact recreation stream segment/lake that is not open to and accessible by the public under Kansas law
a	=	Secondary contact recreation stream segment/lake that is by law or written permission of the landowner open to and accessible by the public
b	=	Secondary contact recreation stream segment/lake that is not open to and accessible by the public under Kansas law
FP	=	designated for food procurement use
DS	=	designated for domestic water supply
GR	=	designated for ground water recharge
IW	=	designated for industrial water supply use
IR	=	designated for irrigation use
LW	=	designated for livestock watering use
X	=	referenced stream segment/lake is assigned the indicated designated use
O	=	referenced stream segment/lake does not support the indicated designated use
<i>blank</i>	=	capacity of the referenced stream segment/lake to support the indicated designated use has not been determined by use attainability analysis

## Threatened and Endangered Species Status

The Endangered Species Act (ESA) and Kansas Environmental Coordination Act provide protection to animals and their habitat that are experiencing a decline in population, or nearing extinction. The table below lists species of concern and their federal and state designation(s).

Table 3. Threatened and Endangered species Cedar Bluff Lake WRAPS  
[ftp://ftp-fc.sc.egov.usda.gov/KS/Outgoing/Web\\_Files/Technical\\_Resources/rwa/UpperSmokyHill\\_RWA.pdf](ftp://ftp-fc.sc.egov.usda.gov/KS/Outgoing/Web_Files/Technical_Resources/rwa/UpperSmokyHill_RWA.pdf)

LISTED THREATENED AND ENDANGERED SPECIES			
Species Common Name ( <i>Scientific name</i> )	Threatened (T), Endangered (E), Proposed (P), Candidate (C), Species in Need of Conservation (SINC)	Designated Critical Habitat (Y)es/(N)o	Listing: Federal (F), State (S)
<b>Animals, Vertebrates – Fishes</b>			
River Shiner ( <i>Notropis blennius</i> )	SINC	N	S
Plains Minnow ( <i>Hybognathus placitus</i> )	SINC	N	S
Topeka Shiner ( <i>Notropis topeka</i> )	E/T	N	F/S
<b>Animals, Vertebrate – Birds</b>			
Bald Eagle ( <i>Haliaeetus leucocephalus</i> )*	T	Y	S
Black Tern ( <i>Chidonias niger</i> )	SINC	N	S
Curve-Billed Thrasher ( <i>Toxostoma curvirostre</i> )	SINC	N	S
Chihuahuan Raven ( <i>Corvus cryptoleucus</i> )	SINC	N	S
Ferruginous Hawk ( <i>Buteo regalis</i> )	SINC	N	S
Golden Eagle ( <i>Aquila chrysaetos</i> )	SINC	N	S
Least Tern ( <i>Sterna antillarum</i> )	E/E	N	F/S
Long-Billed Curlew ( <i>Numenius americanus</i> )	SINC	N	S
Mountain Plover ( <i>Charadrius montanus</i> )	SINC	N	S
Peregrine Falcon ( <i>Falco peregrinus</i> )	E	N	S
Piping Plover ( <i>Charadrius melodus</i> )	T/T	N	F/S
Short-Eared Owl ( <i>Asio flammeus</i> )	SINC	N	S
Snowy Plover ( <i>Charadrius alexandrinus</i> )	T	N	S
White-faced Ibis ( <i>Plegadis chihi</i> )	T	N	S
Whooping Crane ( <i>Grus Americana</i> )	E/E	N	F/S
<b>Animals, Vertebrate – Amphibians/Reptiles</b>			
Eastern Hognose Snake ( <i>Jeterodon platirrhinos</i> )	SINC	N	S
Glossy Snake ( <i>Arizona elegans</i> )	SINC	N	S
Western Hognose Snake ( <i>Heterodon nasicus</i> )	SINC	N	S
Western Green Toad ( <i>Bufo debilis insidiar</i> )	T	Y	S
<b>Animals, Vertebrate – Mammals</b>			
Black-footed Ferret ( <i>Mustela nigripes</i> )	E/E	N	F/S
Eastern Spotted Skunk ( <i>Spilogale putorius interrupta</i> )	T	Y	S
Franklin's Ground Squirrel ( <i>Spermophilus franklinii</i> )	SINC	N	S
<b>Animals, Invertebrate - Insects</b>			
Scott Riffle Beetle ( <i>Optioservus phaeus</i> )	T	Y	S
*The Bald Eagle has been de-listed nationally (2007) but remains as a state listed species. The Bald Eagle remains protected under the Bald and Golden Eagle Protection Act and the Migratory Bird Treaty Act.			



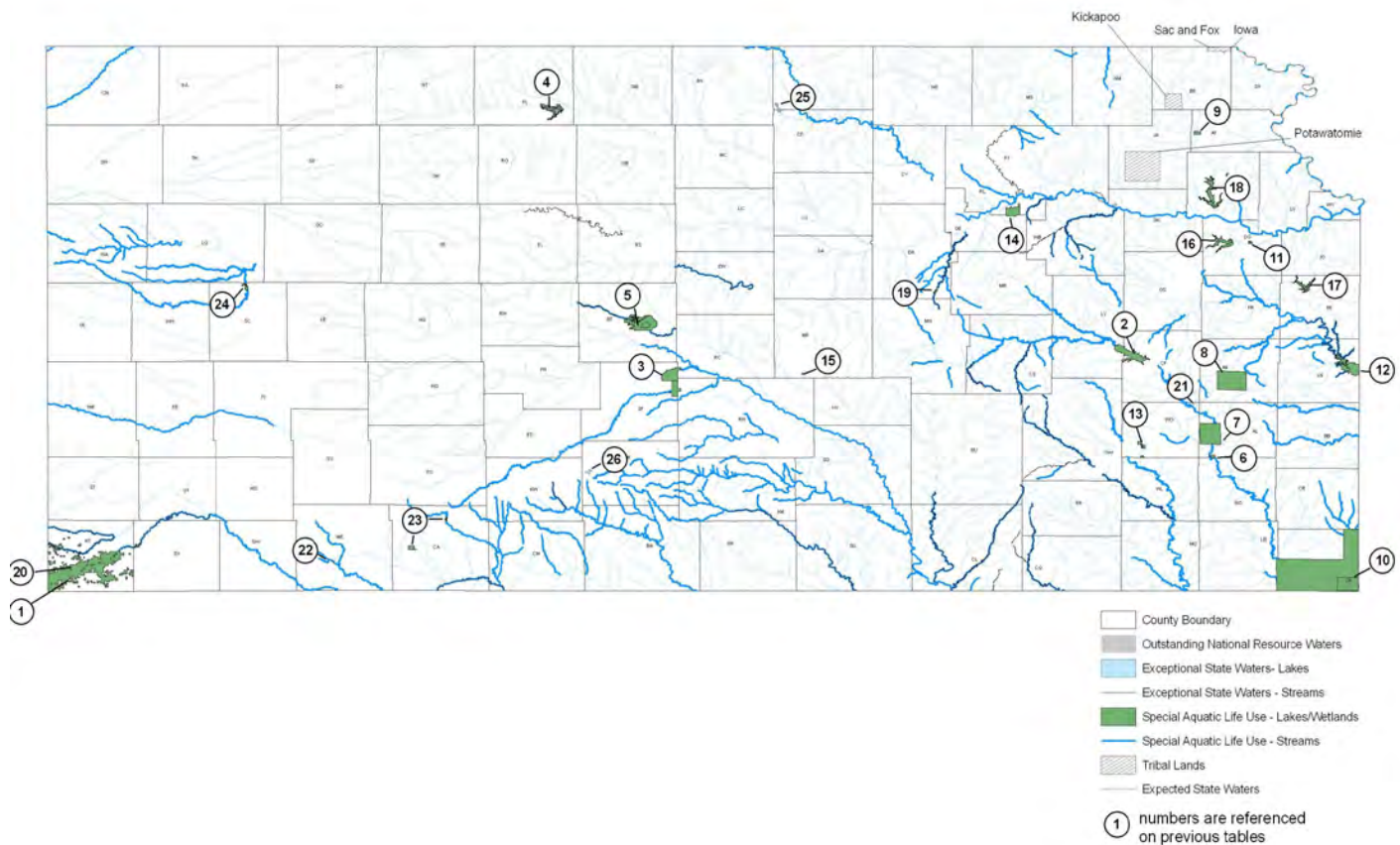
### 3.3 Special Aquatic Life Use Waters

Special aquatic life use waters are defined as “surface waters that contain combinations of habitat types and indigenous biota not found commonly in the state, or surface waters that contain representative populations of threatened or endangered species”. Ladder Creek (24 on figure 9) Lake Scott State Park, and Scott Wildlife Area and feeder Springs located in the western portion of the Cedar Bluff Lake watershed are designated Special Aquatic Life Use Waters.

Figure 9. Kansas Outstanding National Resource Waters, Exceptional State Waters, and Special Aquatic Life Use Waters

<http://www.kdheks.gov/nps/resources/specwaterinfo.pdf>

#### OUTSTANDING NATIONAL RESOURCE WATERS, EXCEPTIONAL STATE WATERS, AND SPECIAL AQUATIC LIFE USE WATERS

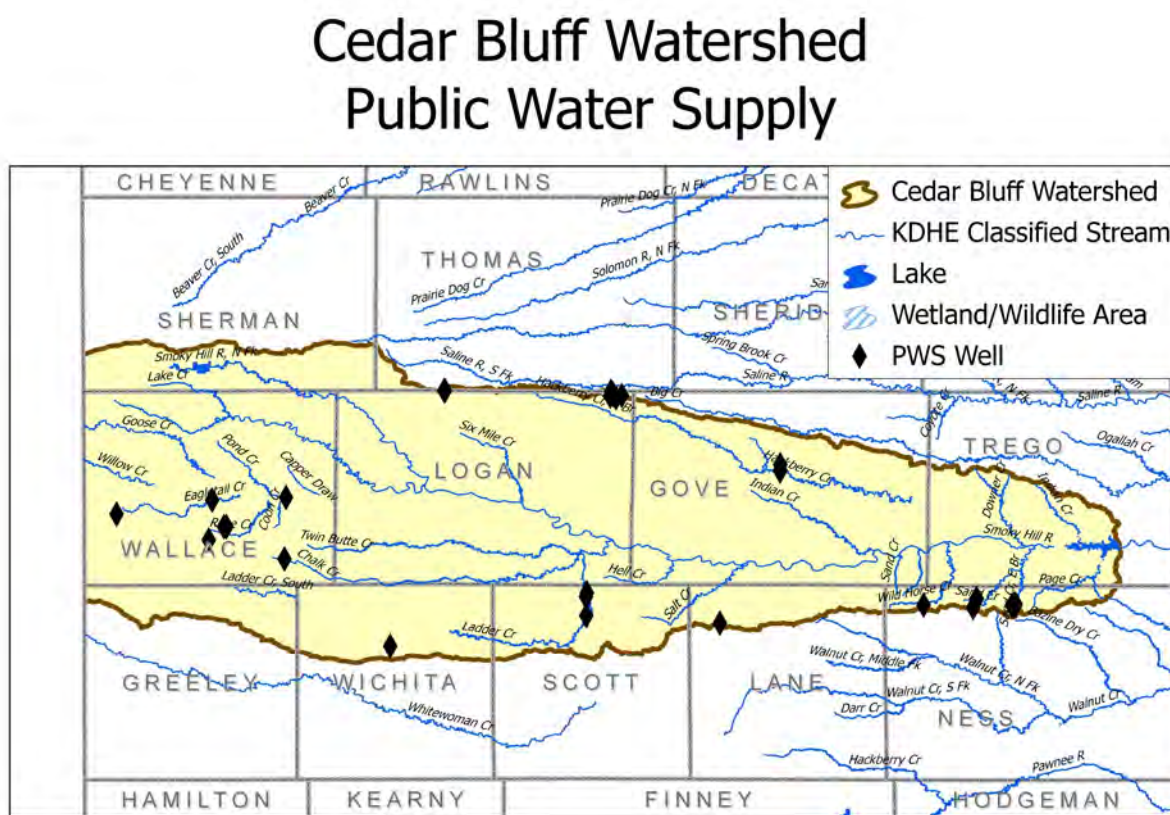


### 3.4 Public Water Supply (PWS) and National Pollutant Discharge Elimination System (NPDES)

In the state of Kansas, a public water supply system is defined by Kansas Statutes Annotated (K.S.A.) 65-162a and Kansas Administrative Regulations (K.A.R.) 28-15a-2 as a "system for delivery to the public of piped water for human consumption that has at least 10 service connections or regularly serves at least 25 individuals daily at least 60 days out of the year." These systems are regulated by the state to assure the citizenry safe and pathogen-free drinking water and are comprised of water intakes, wells, and water treatment facilities. The KDHE oversees more than 1,080 statewide public water supply systems including municipalities, rural water districts, and privately owned systems. These systems may serve a small community of several families to a city of more than 300,000 persons.

Groundwater wells are the source for a majority of the Public Water Supplies (PWS) in the Cedar Bluff Lake watershed. Water released from Cedar Bluff Lake effects downstream water users, thus any work done to benefit Cedar Bluff Lake PWSs will also benefit water users outside of the watershed.

Figure 10. Cedar Bluff Watershed Public Water Supply Sources



The purpose of this publication is to illustrate general watershed conditions in the state of Kansas. This map product is provided without representation or implied or expressed warranty of accuracy and is intended for watershed planning purposes only. The originating agency is not responsible for publication or use of this product for any other purpose. This product may be corrected or updated as necessary without prior notification.



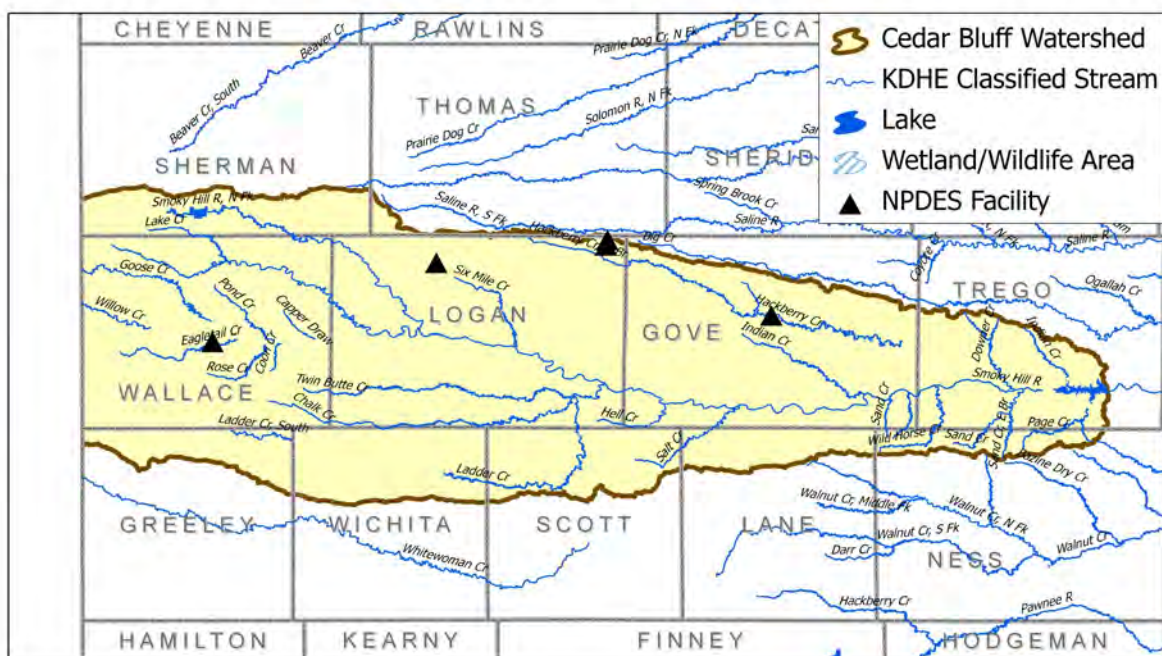
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Wastewater treatment facilities are permitted and regulated through KDHE. These facilities are considered point sources for pollutants. National Pollutant Discharge Elimination System (NPDES) permits specify the maximum amount of pollutants allowed to be discharged to surface waters. Having these point sources located on streams or rivers could potentially impact water quality within the waterways of the Cedar Bluff WRAPS Project Area. Pollutants originating from NPDES facilities within the watershed could include suspended solids, biological pollutants that reduce oxygen in the water column, and inorganic compounds or bacteria. Wastewater is treated to remove solids and organic materials, disinfected to kill bacteria and viruses, and discharged to surface waters. Any pollutant discharge from point sources that is allowed by the state is considered to be Wasteload Allocation and is reflected within TMDLs noted for the WRAPS Project Area.

Figure 11. Cedar Bluff Lake Watershed National Pollutant Discharge Elimination Systems

## Cedar Bluff Watershed National Pollutant Discharge Elimination System Facilities



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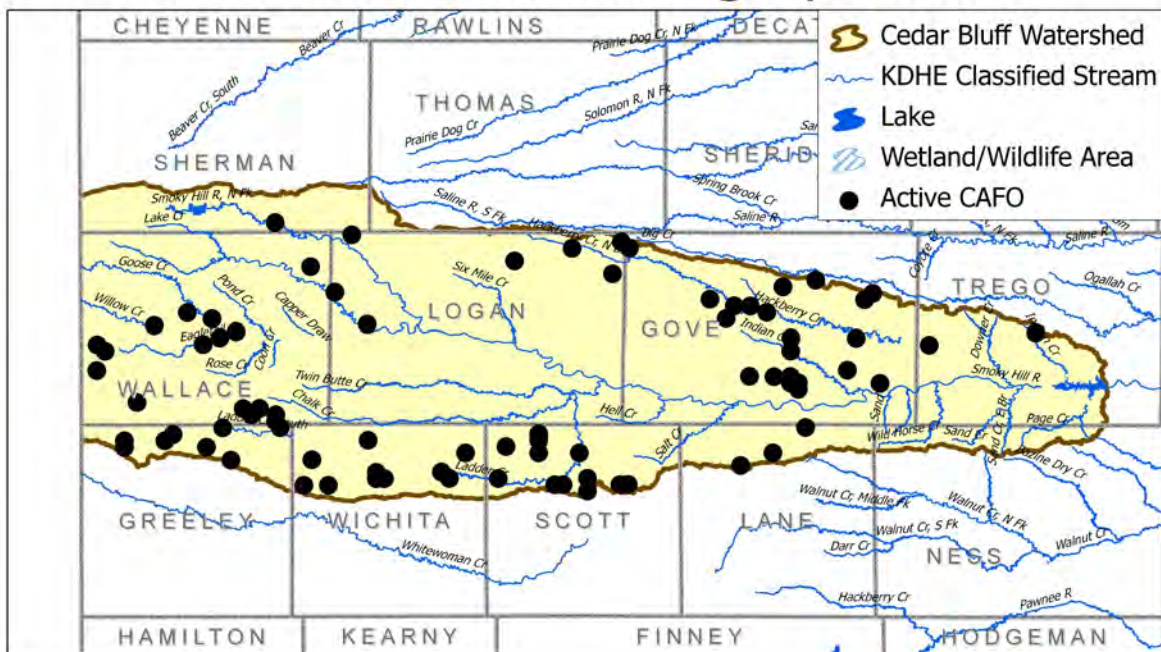
There are numerous onsite wastewater systems (OWS) present within the watershed. It is unknown at the current time the total number of systems present let alone the number which are currently failing or inadequately constructed. For systems which could be adversely affecting water quality and the surrounding environment, counties within the watershed have sanitary codes which provide authority to regulate the operation of OWSs.

### 3.5 Confined Animal Feeding Operations

Confined Animal Feeding Operations (CAFO), as defined by the Environmental Protection Agency (EPA), are agricultural operations where animals are kept and raised in confined situations. These facilities have animals, feed, manure and urine, dead animals, and production operations consolidated onto small areas of land. Within Kansas, operations with greater than 300 animal units must register with the Kansas Department of Health and Environment (KDHE). Those facilities with greater than 999 animal units are considered point sources of pollution and must be permitted by EPA. Within the Waconda Lake WRAPS Project Area there are numerous CAFOs. Those facilities within the watershed which are not considered potential point sources of pollution could potentially benefit from increased awareness and/or BMPs to be implemented as outlined within this plan. In the event these facilities were to make upgrades to their operations, both phosphorus and bacteria reductions would be realized due to these improvements. Pollutant load reductions resulting from this type of work would help to address both the bacteria water quality impairments noted for the Smoky Hill River and its tributaries as well as the excess nutrients contributing the Cedar Bluff Lake EU TMDL. The 303(d) listing for bacteria would also be positively influenced by improvements to CAFO facilities.

Figure 12. Cedar Bluff Watershed Active CAFOs

## Cedar Bluff Watershed Confined Animal Feeding Operations



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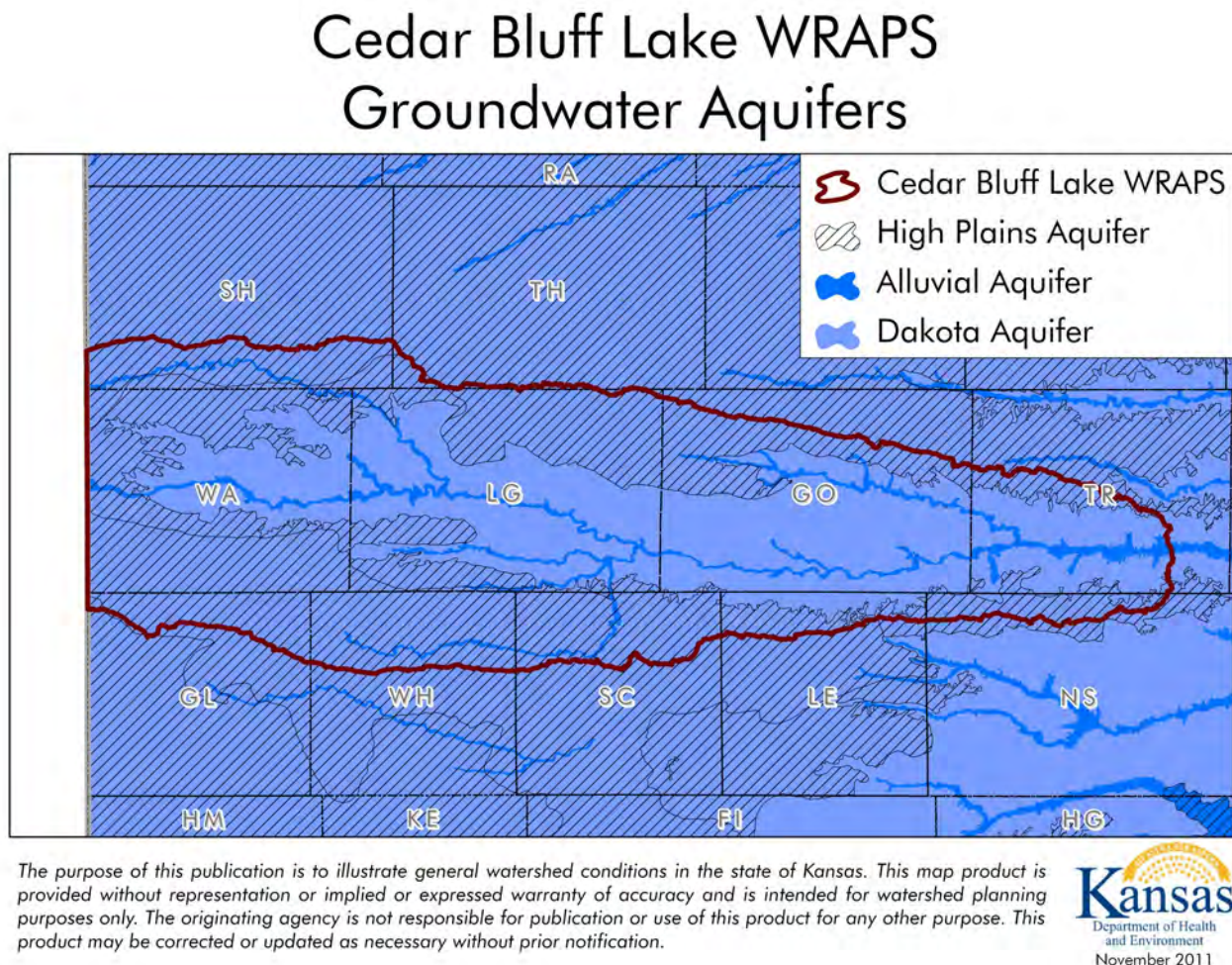
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### 3.6 Aquifers

Major groundwater aquifers underlying this watershed include the Dakota Aquifer and a small portion of the High Plains Aquifer along with alluvial aquifers of the Solomon River and its tributaries.

Figure 13. Cedar Bluff Lake WRAPS Area Groundwater Aquifer



### 3.7 Water Quality Impairments

A Total Maximum Daily Load (TMDL) designation sets the maximum amount of pollutant that a specific body of water can receive without violating the surface water-quality standards, resulting in failure to support their designated uses. TMDLs established by Kansas may be done on a watershed basis and may use a pollutant-by-pollutant approach or a biomonitoring approach or both as appropriate. TMDL establishment means a draft TMDL has been completed, there has been public notice and comment on the TMDL, there has been consideration of the public comment, any necessary revi-

sions to the TMDL have been made, and the TMDL has been submitted to EPA for approval. The desired outcome of the TMDL process is indicated, using the current situation as the baseline. Deviations from the water quality standards will be documented. The TMDL will state its objective in meeting the appropriate water quality standard by quantifying the degree of pollution reduction expected over time. Interim objectives will also be defined for midpoints in the implementation process. In summary, TMDLs provide a tool to target and reduce point and nonpoint pollution sources. The goal of the WRAPS process is to address high priority TMDLs. KDHE reviews TMDLs assigned in each of the twelve basins of Kansas every five years on a rotational schedule. The table below includes the review schedule for the Smoky Hill River Basin.

This TMDL review schedule will be taken into consideration when determining dates in which watershed plan review and revisions will take place. Once TMDLs within the Cedar Bluff WRAPS project area are reviewed and/or revised by KDHE, the Cedar Bluff WRAPS Project will evaluate the new TMDL information and make adjustments to water quality endpoints and watershed plan goal load reductions as needed.

*Table 4. TMDL Development Cycle for Smoky Hill River Basin*

Year Ending in Sept.	Implementation Period	Possible TMDLs to Revise	TMDLs to Evaluate
2009	2010-2019	2003	N/A
2014	2015-2020	2003, 2004	2003, 2004, 2005
2019	2020-2029	2003, 2004, 2009	2003, 2004, 2006, 2009

**NOTE:**

Total Maximum Daily Loads (TMDLs) are quantitative objectives and strategies needed to achieve water quality standards. The water quality standards constitute the goals of water quality adequate to fully support designated uses of streams, lakes, and wetlands. The process of developing TMDLs determines:

1. The pollutants causing water quality impairments
  2. The degree of deviation away from applicable water quality standards
  3. The levels of pollution reduction or pollutant loading needed to attain achievement of water quality standards
  4. Corrective actions, including load allocations, to be implemented among point and nonpoint sources in the watershed affecting the water quality limited water body
  5. The monitoring and evaluation strategies needed to assess the impact of corrective actions in achieving TMDLs and water quality standards
- Provisions for future revision of TMDLs based on those evaluations

Table 5. TMDL information for Cedar Bluff WRAPS Project Area.

<b>Cedar Bluff Lake WRAPS Project Area</b>				
<b>Impaired Waters with EPA Approved TMDLs</b>				
<b>Water Body</b>	<b>Impaired Use</b>	<b>Impairment</b>	<b>Priority</b>	<b>KDHE Monitoring Station(s)</b>
<i>North Fork Smoky Hill (10260002)</i>				
Smoky Hill Garden Lake	Aquatic Life	Eutrophication	Low	LM070101
<i>Upper Smoky Hill (10260003)</i>				
Smoky Hill River Near Gove	Aquatic Life	Dissolved Oxygen	Medium	SC739
Smoky Hill River Near Trego	Aquatic Life	Dissolved Oxygen	Medium	SC550
Cedar Bluff Lake	Aquatic Life	Eutrophication	Medium	LM013001
Smoky Hill River At Elkader	Water Supply	Fluoride	Low	SC224
Smoky Hill River At Elkader	Aquatic Life	Selenium	Low	SC224
Smoky Hill River Near Gove	Aquatic Life	Selenium	Low	SC739
Smoky Hill River Near Trego	Aquatic Life	Selenium	Low	SC550
Cedar Bluff Lake	Water Supply	Sulfate	Low	LM013001
Smoky Hill River At Elkader	Water Supply	Sulfate	Low	SC224
Smoky Hill River Near Gove	Water Supply	Sulfate	Low	SC739
Smoky Hill River Near Trego	Water Supply	Sulfate	Low	SC550
<i>Ladder Creek (10260004)</i>				
Lake Scott State Park	Recreation	Aquatic Plants	High	LM011201
Lake Scott State Park	Aquatic Life	Eutrophication	High	LM011201
Lake Scott State Park	Aquatic Life	pH	High	LM011201
Water quality impairments which are directly addressed from BMPs noted for implementation within watershed plan				
Water quality impairments which stand to benefit from BMPs noted for implementation within watershed plan				

Non-point source pollution is a contributor to the Dissolved Oxygen impairment noted for the Smoky Hill River near Trego. Nutrient-reducing BMPs for cropland and live-stock noted within this plan would help to address this impairment.

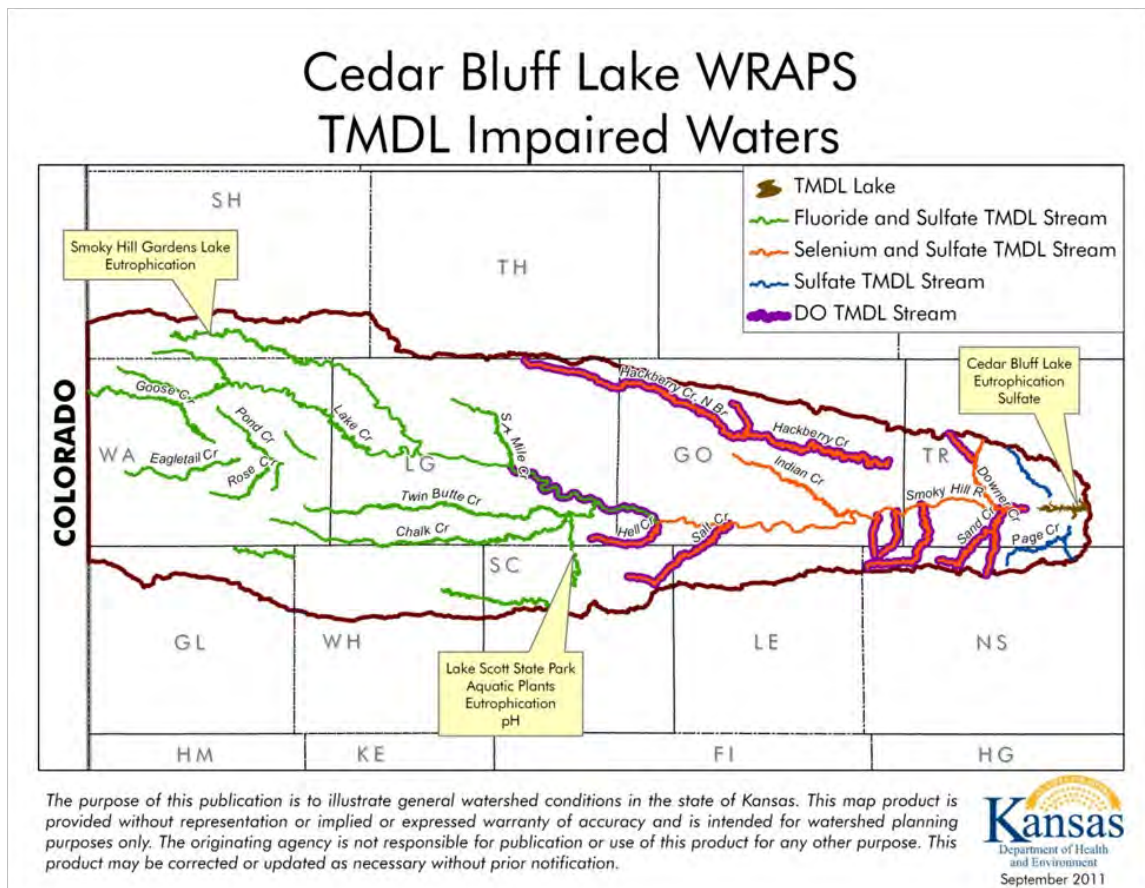
Implementation of BMPs that address cropland and livestock related runoff will help reduce the loading of nutrients that contribute to the EU TMDL.

Cedar Bluff Lake WRAPS, in consultation with the TMDL and Watershed Management Sections at KDHE, have determined that in the short term Lake Scott State Park will not be an impaired water which will be directly addressed by this watershed plan. It is thought that a primary contributing source to nutrient loading of this water body is abundant geese populations which occupy the vicinity of the lake in the late fall and winter months. Any work in the short term to improve water quality conditions at Lake Scott State Park would consist largely of collaboration with the Kansas Department of



Wildlife, Parks and Tourism to work to control geese populations in the vicinity of the lake. Cedar Bluff Lake WRAPS will continue to monitor water quality conditions of Lake Scott State Park with the help of KDHE for future improvements or further degradation. If water quality conditions continue to degrade at Lake Scott State Park, the WRAPS project could make appropriate changes to the BMP implementation schedule noted within the watershed when future watershed plan revisions are made.

Figure 14. Cedar Bluff WRAPS Project Area TMDL Impaired Waters



### 303(d) Listings in the Cedar Bluff Watershed

The Cedar Bluff Lake Watershed has numerous new listings on the 2010 "303d list". The 303d list of impaired waters is developed biennially and submitted by KDHE to EPA. To be included on the 303d list, samples taken during the KDHE monitoring program must show that water quality standards are not being met. This in turn means that designated uses are not met. TMDL development and revision for waters of the Cedar Bluff Lake Watershed last took place in 2009, and is scheduled to take place again in 2014. At that time, TMDLs will be developed for "high" priority impairments. Priorities are set by work schedule and TMDL development timeframe rather than severity of pollutant. If it will be greater than two years until the pollutant can be assessed, the priority will be listed as "low". Water bodies are assigned "categories" based on impairment status:

\*Category 5 – Waters needing TMDLs

\*Category 4a – includes waters that are threatened or impaired, but for which a TMDL has been completed and approved by EPA

\*Category 4b – includes waters that have required control measures that are expected to result in the attainment of an applicable WQS in a reasonable period of time

\*Category 4c – waters where the non-attainment of any applicable WQS for the waterbody is a result of pollution and is not caused by a pollutant

\*Category 3 – Waters that are indeterminate and need more data or information

\*Category 2 – Available data and/or information indicate that some, but not all of the designated uses are supported

\*Category 1 – All designated uses are supported, no use is threatened

\*[http://www.epa.gov/region07/newsevents/legal/pdf/KS\\_303d\\_decision\\_document\\_121808.pdf](http://www.epa.gov/region07/newsevents/legal/pdf/KS_303d_decision_document_121808.pdf)

Category 5 303(d) list impaired waters within the Cedar Bluff Lake WRAPS Project area include stream and lake impairments for arsenic, bacteria, low dissolved oxygen, fluoride, and total suspended solids. The following table and map depict Category 5 303(d) list information for streams and lakes within the project area.

Table 6. 303(d) List information for Cedar Bluff WRAPS Project Area.  
Please note this list contains only Category 5 waters.

<b>Cedar Bluff Lake WRAPS Project Area</b>				
<b>Non-TMDL Impaired Waters (303d List)</b>				
<b>Water Body</b>	<b>Category</b>	<b>Impaired Use</b>	<b>Impairment</b>	<b>KDHE Monitoring Station(s)</b>
<i>Smoky Hill Headwaters (10260001)</i>				
Willow Creek Near Weskan	5	Aquatic Life	Dissolved Oxygen	SC724
Willow Creek Near Weskan	5	Water Supply	Fluoride	SC724
<i>Upper Smoky Hill (10260003)</i>				
Smoky Hill River Near Trego	5	Recreation	E. coli	SC550
Smoky Hill River Near Gove	5	Water Supply	Fluoride	SC739
Smoky Hill River At Elkader	5	Aquatic Life	Total Suspended Solids	SC224
<i>Ladder Creek (10260004)</i>				
Lake Scott State Park	5	Water Supply	Arsenic	LM011201
Lake Scott State Park	5	Water Supply	Fluoride	LM011201
Water quality impairments which stand to benefit from BMPs noted for implementation within watershed plan				

BMPs noted for implementation in association with this watershed plan will help to reduce nutrient loading originating from cropland runoff as well as runoff from areas of pasture or rangeland which livestock grazing is taking place. These two types of nonpoint source pollution are thought to be two of the predominate types of pollution contributing to the eutrophication TMDL for Cedar Bluff Lake. Nonpoint source pollution is also thought to be a contributing factor to the dissolved oxygen TMDL and bacteria 303(d) listing noted on the Smoky Hill River above Cedar Bluff Lake as well. BMPs noted for implementation within this watershed plan will also have beneficial impacts towards addressing the medium priority TMDL and 303(d) listing for these two impairment types on the Smoky Hill River within the area identified as Priority Area 1 in this watershed plan.



Figure 15. Cedar Bluff WRAPS Project Area 303(d) List Category 5 Waters Map.

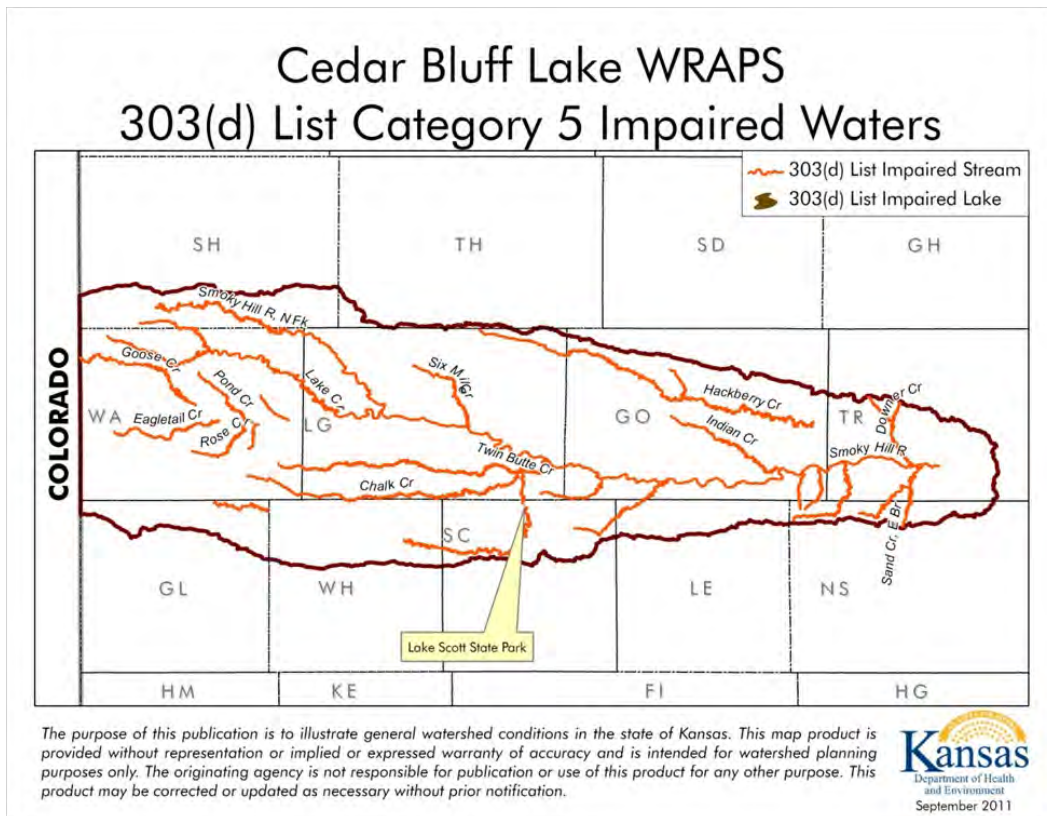


Figure 16. Cedar Bluff Lake Impaired Waters/Watershed Directly Addressed by Plan

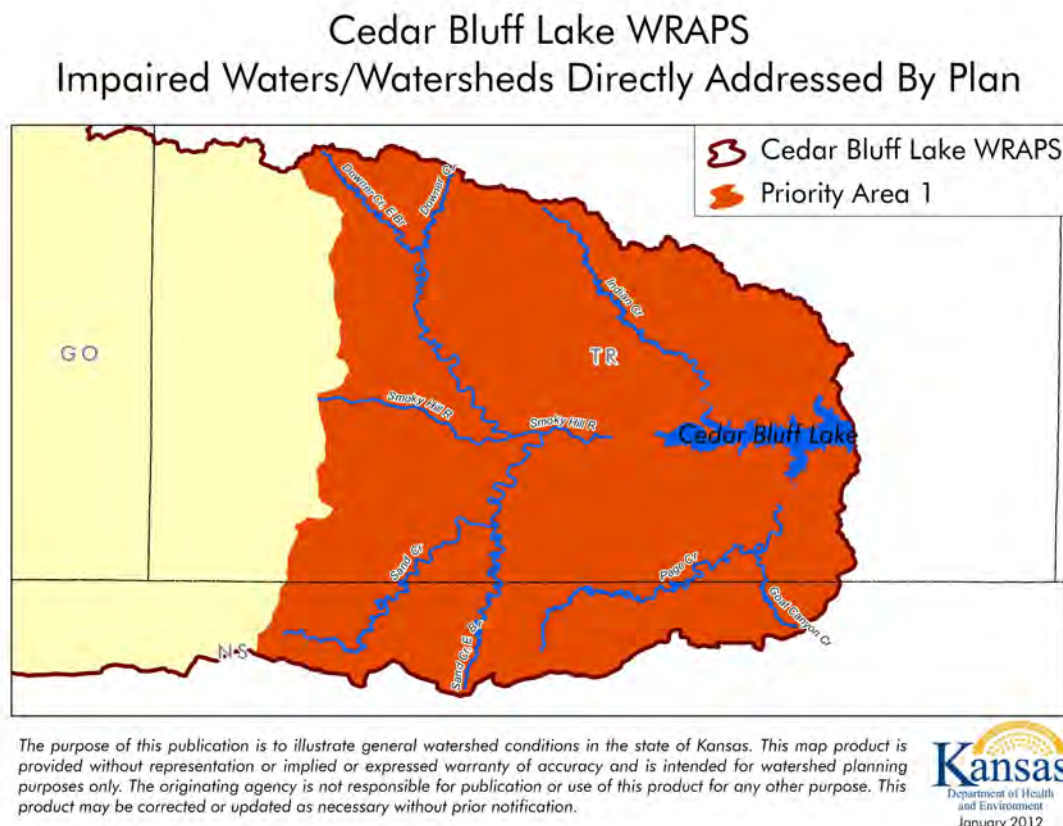
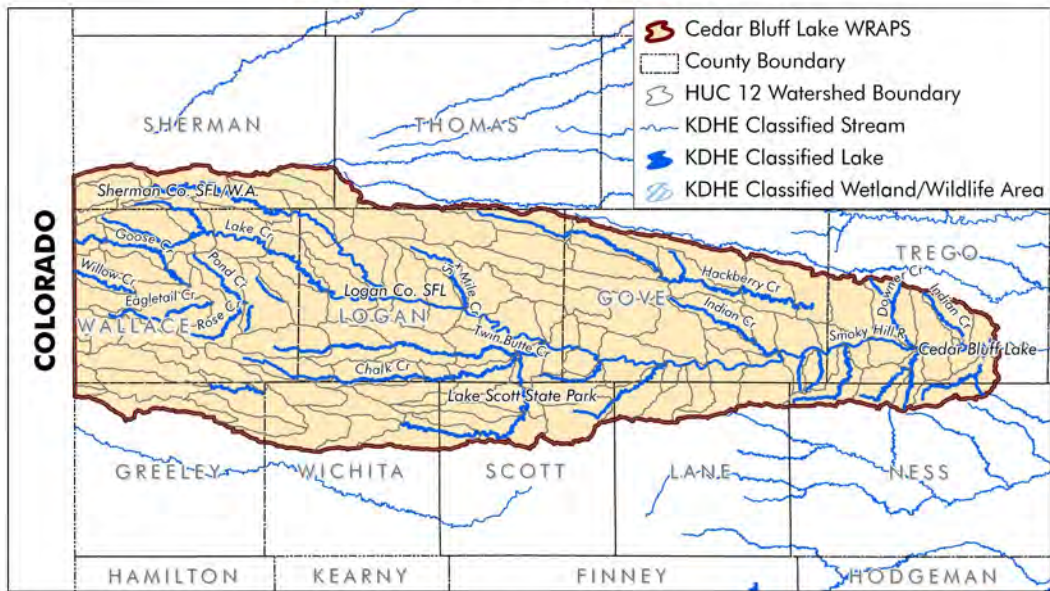


Figure 17. Cedar Bluff WRAPS KDHE Classified Waters

# Cedar Bluff Lake WRAPS KDHE Classified Waters

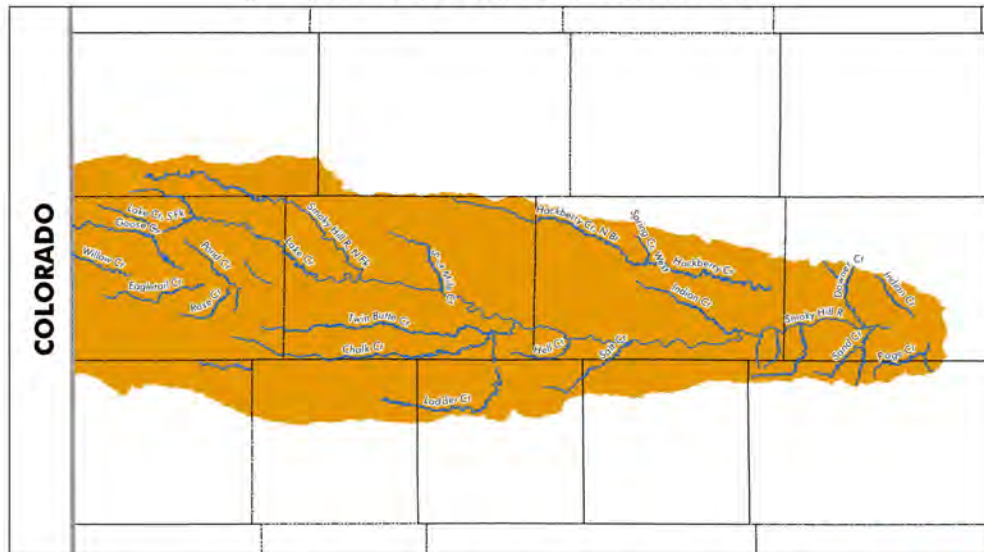


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Figure 18. Cedar Bluff WRAPS Project Area KDHE Classified Streams

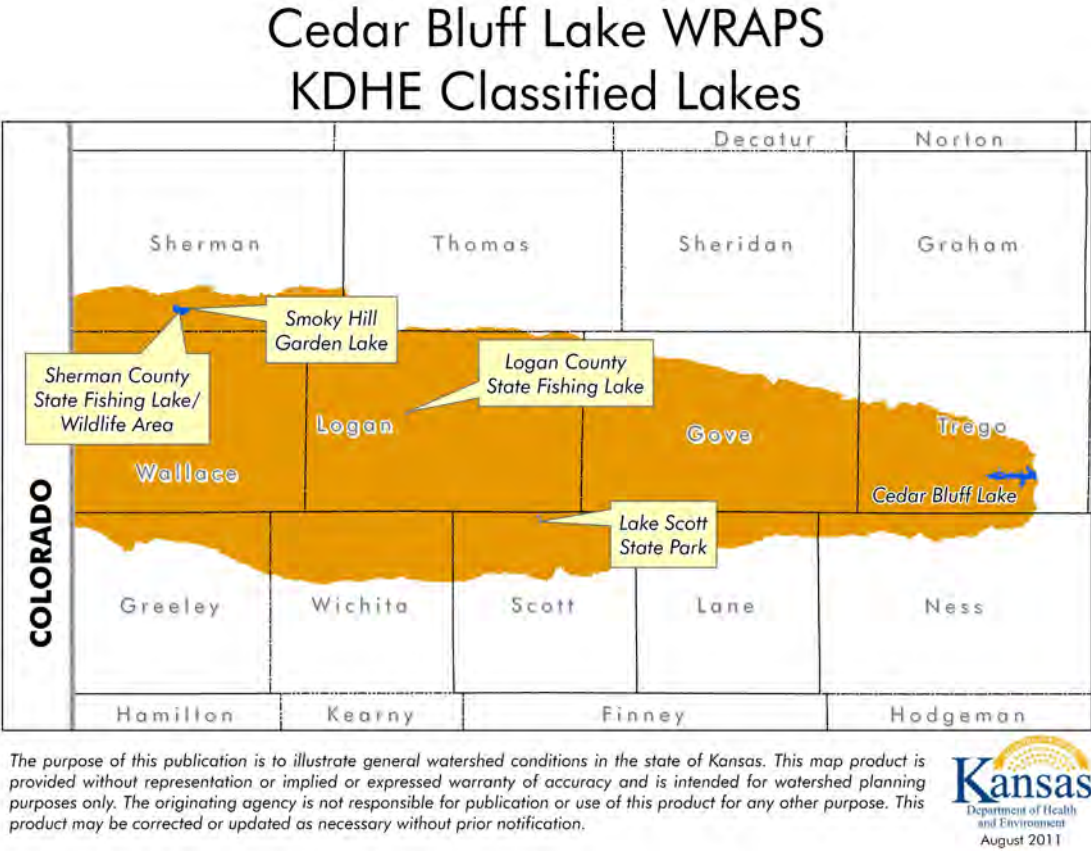
# Cedar Bluff Lake WRAPS KDHE Classified Streams



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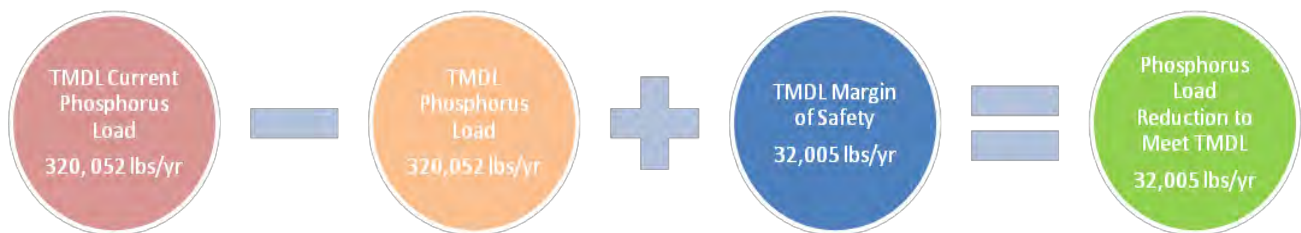
Figure 19. Cedar Bluff WRAPS Project Area KDHE Classified Lakes





### 3.8 TMDL Load Allocations

As previously stated within this watershed plan, the Cedar Bluff Lake WRAPS SLT has identified restoration and protection of water quality in Cedar Bluff Lake as well as within the Smoky Hill River and tributary systems as a goal. With both cropland and livestock contributing to nutrient and sediment loading entering Cedar Bluff Lake, all BMP work taking place within the Cedar Bluff Lake WRAPS Project Area would contribute to phosphorus reductions needed to meet the Cedar Bluff Lake Eutrophication TMDL. The overall load reduction goal of the Cedar Bluff Lake WRAPS watershed plan is to reduce phosphorus entering Cedar Bluff Lake by 32,005 lbs/yr, thus helping to address the Medium Priority Eutrophication TMDL. This reduction goal is the margin of safety noted within the Cedar Bluff Lake Eutrophication TMDL. With the margin of safety of this TMDL being the load reduction goal of this watershed plan, the plan will act to protect Cedar Bluff Lake from further degradation in the future.



Reductions in bacteria concentrations observed within the Smoky Hill River above Cedar Bluff Lake are also anticipated as a result of BMP implementation noted within this watershed plan. Other water quality impairments which stand to benefit from BMPs noted for implementation within the watershed plan include the Medium Priority impairment of Dissolved Oxygen on the Smoky Hill River near Trego as well as the 303d listing of *E. coli* bacteria in the same area.

With these goals in mind, best management practice (BMP) implementation schedules have been developed in consultation with the SLT and other technical advisors serving within the watershed to directly address the following water quality impairments:

- Cedar Bluff Lake Eutrophication (EU) Medium Priority TMDL
  - ◇ *Overall Watershed Plan Phosphorus Load Reduction Goal = 32,005 lbs/yr*

These BMP implementation schedules have been developed to address nutrient runoff originating from cropland as well as nutrients originating from livestock-related sources within the watershed. BMPs noted within Targeted Area 1 will produce nutrient load reductions to help address the necessary nonpoint source reduction needed to meet the Cedar Bluff Lake EU TMDL. Both cropland and livestock BMPs will be targeted to Priority Area 1.



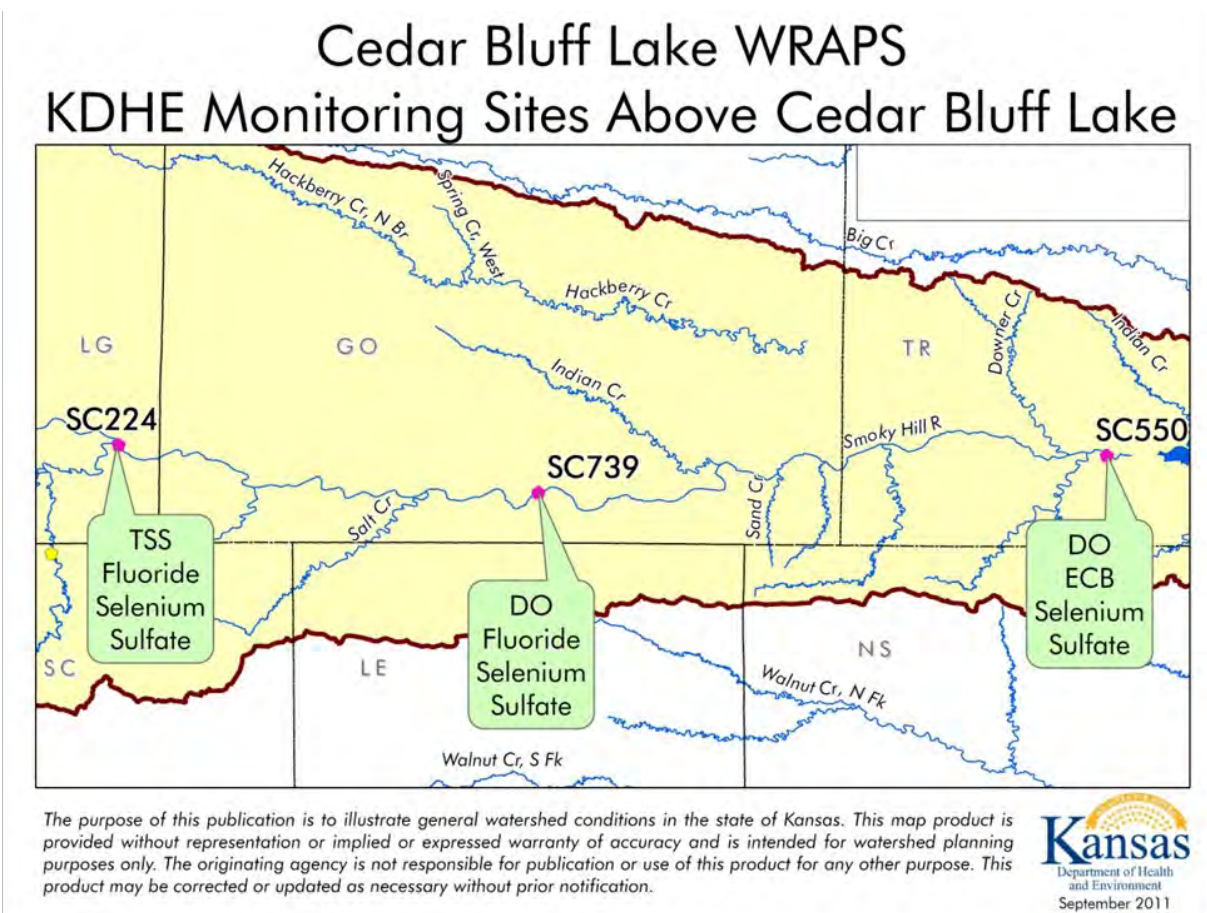
## 4.0 Determination of Critical Targeted Areas and BMP Needs

A component of an effective watershed plan is identification of priority areas in which to focus BMP implementation. Targeting implementation of BMPs within focused areas of a watershed helps to maximize water quality improvements noted for the receiving water bodies. For the Cedar Bluff Lake WRAPS watershed plan, targeted BMP implementation is necessary to efficiently reduce the phosphorus loading of Cedar Bluff Lake through inflow of the Smoky Hill River and tributaries which contribute to the eutrophication impairment for Cedar Bluff Lake. The primary nonpoint source contributors to phosphorus loading of Cedar Bluff Lake are likely runoff from cropland and livestock grazing/feeding operations. With these two sources of nutrients estimated to be contributing the majority of the phosphorus load entering Cedar Bluff Lake, BMP implementation will be focused on addressing cropland sources as well as those sources which introduce bacteria and associated nutrients to surface waters within the Cedar Bluff WRAPS project area. The following information provides details regarding the identification of priority areas in which BMP implementation will be focused to address the Cedar Bluff Lake eutrophication TMDL.

While assessment activities were conducted within the Cedar Bluff Lake WRAPS Project Area in the form of the KAWS GIS assessment, the scale of this assessment activity did not yield sufficient information to characterize sources of water quality pollution across the entire watershed. Because a single HUC 12 level GIS assessment does not provide enough information to guide focused BMP implementation within a project area which includes 105 HUC 12 subwatersheds, the SLT consulted with KDHE to determine other mechanisms which could be utilized to assist with determination of priority areas for BMP implementation. KDHE presented information regarding KDHE water quality monitoring data within the watershed as well as interpretation of the Cedar Bluff Lake eutrophication TMDL to help the SLT determine priority areas.

KDHE has a network of water quality monitoring data within the Cedar Bluff Lake WRAPS Project Area, with the majority of these monitoring sites located on the Smoky Hill River. A variety of water quality parameters are sampled at these monitoring stations, but several parameters are of particular interest when evaluating nonpoint source water quality pollution. Indicators of potential nutrient loading which would contribute to the Cedar Bluff Lake eutrophication TMDL include total phosphorus, nitrate, bacteria, and dissolved oxygen. When evaluating these parameters against the 2010 303(d) list, KDHE monitoring indicated a dissolved oxygen impairment at station SC739 and dissolved oxygen and E. coli bacteria water quality impairments at SC550. With this in mind it was determined that the initial area of focus would be the watershed below SC224. Above SC224, there are no nutrient-related impairments which can be directly tied to nonpoint source pollution. Thus, it is believed that the majority of the nutrient loading contributing to the Cedar Bluff Lake Eutrophication TMDL origination within the watershed below SC224.

Figure 20. KDHE stream monitoring stations above Cedar Bluff Lake with 303(d) list impairments noted.

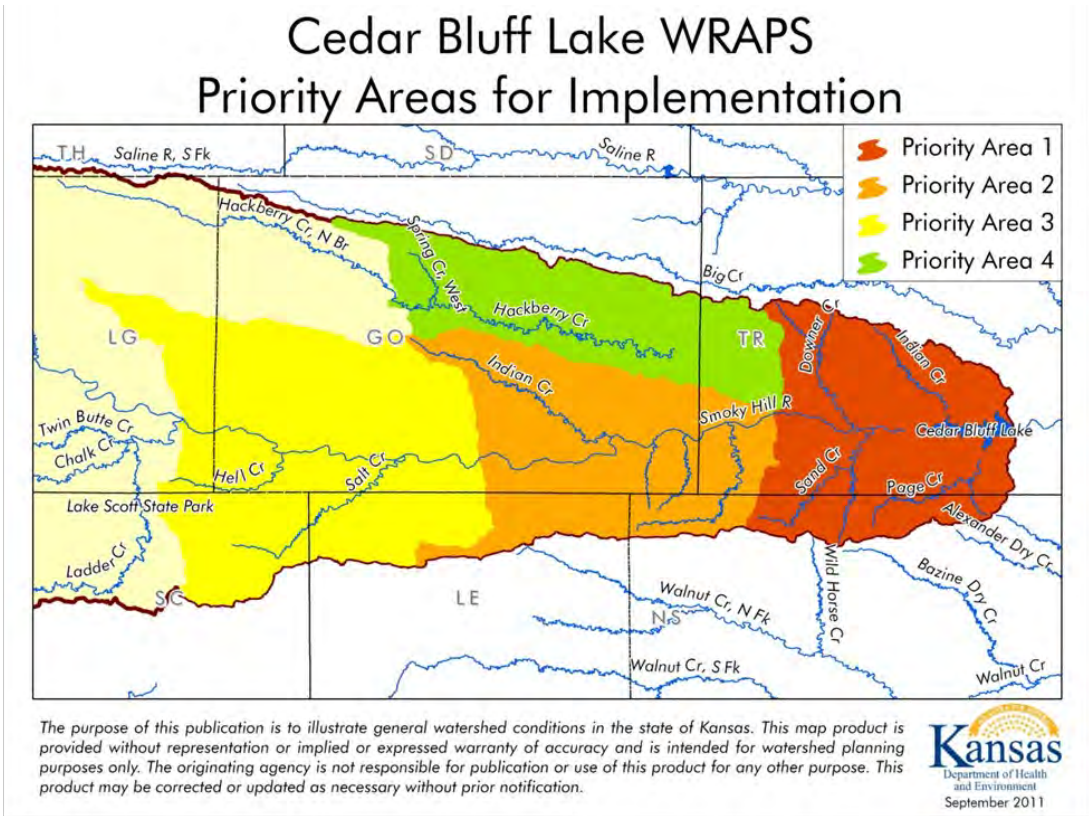


Further evaluation of 303(d) list information shows that station SC550 has an E coli bacteria impairment, while the monitoring station upstream of that (SC739) does not. An assumption that can be made when reviewing this information would be that somewhere between SC739 and SC550 there is enough of an increase in bacteria sources to warrant listing of SC550 as being impaired by bacteria. With this information in consideration, it was determined that the contributing area of SC550 below SC739 would be of higher priority than the contributing area of SC739 below SC224.

With SC550 being the closest monitoring site to the Cedar Bluff Lake, the impairments noted at this location led to the recommendation that the top priority area in which BMP implementation would be focused in the vicinity of this monitoring site as well as the areas surrounding Cedar Bluff Lake. The Cedar Bluff Lake eutrophication TMDL includes information which supports this focusing, indicating that HUC 11 watershed 10260003050 (which corresponds to HUC 10 watershed 1026000305) should be the top priority area in which BMP implementation should be focused to address this TMDL. Taking all of these factors into consideration, the TMDL and Watershed Management Sections of KDHE developed priority rankings for areas within the Cedar Bluff

Lake Watershed below monitoring site SC224. These priority areas are shown in the map below.

Figure 21. Cedar Bluff Lake WRAPS Priority Areas for BMP Implementation.

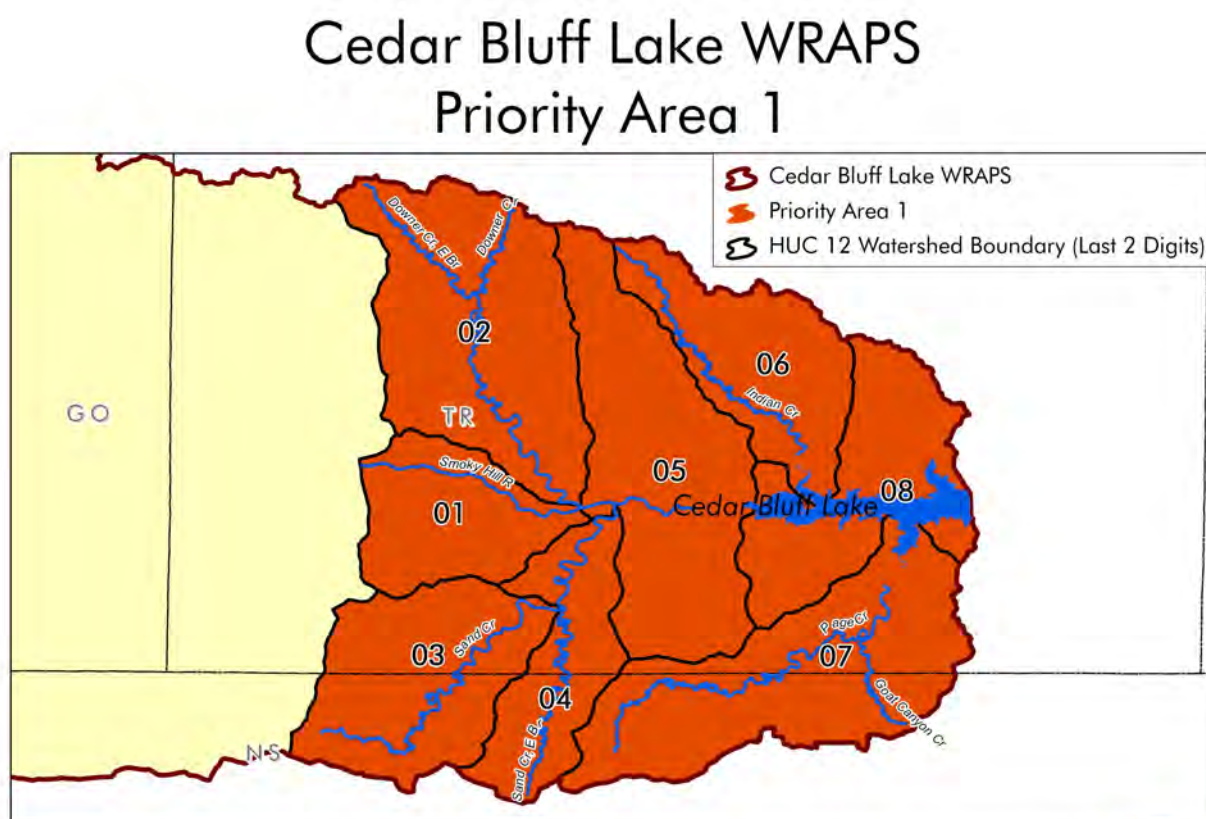


Listed below are the HUCs in the priority areas for the Cedar Bluff Plan. As the BMP schedules and associated load reductions from KSU indicate, the total load reduction goal for the plan will be met by focusing implementation activities within Priority Area 1. Within the entire Kansas portion of the Cedar Bluff Lake watershed there are 105 HUC 12 watersheds. Within Priority Area 1 there are 8 HUC 12 watersheds. By the prioritization of areas within the Cedar Bluff Lake WRAPS Project Area for BMP implementation, this watershed plan will focus BMP implementation within roughly 7.5% of the land area currently noted as the entire Cedar Bluff Lake WRAPS Project Area.

Priority Area 1	Priority Area 2	Priority Area 3	102600030301
102600030501	102600030401	102600030201	102600030302
102600030502	102600030402	102600030202	102600030303
102600030503	102600030403	102600030203	
102600030504	102600030404	102600030204	Priority Area 4
102600030505	102600030405	102600030205	102600050203
102600030506	102600030406	102600030206	102600050204
102600030507	102600030407	102600030207	102600050205
102600030508	102600030408	102600030208	102600050206
		102600030209	102600050207



Figure 22. Cedar Bluff Lake WRAPS Priority Area 1 with HUC 12s



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## 5.0 BMP Needs and Pollutant Load Reduction Methodology

One of the primary mechanisms the Cedar Bluff Watershed Plan will utilize to generate nutrient load reductions necessary to meet the Cedar Bluff Lake EU TMDL is implementation of both cropland and livestock BMPs. Types and quantities of BMPs to implement within the Cedar Bluff Lake WRAPS Project Area were determined through consultation with agency representatives from County Conservation Districts as well as NRCS staff who serve on the SLT. This feedback resulted in determination of annual rates of BMP implementation for specified practices which took into consideration local adoption rates of the identified practices.



Table 7. Cedar Bluff EU TMDL BMP Needs

Cedar Bluff EU TMDL					
BMP Needs					
<i>Land Cover Data - KLCP 2005</i>					
<i>BMP needs derived from Kansas Non-Point Source Needs Inventory and KAWS Level 1 Assessment</i>					
Land Cover/BMP Needs		Priority Area 1	Priority Area 2	Priority Area 3	Priority Area 4
<i>Cropland Needs</i>					
Acres of Cropland		94,757	104,417	145,320	87,687
Acres Needing New Terraces		4,075	4,490	6,249	8,330
Acres Needing Terrace Restoration		36,576	40,305	56,094	34,022
Acres of New Waterways		853	940	1,308	965
Acres of Waterway Restoration		95	104	145	88
Acres Needing Diversions		379	418	581	789
Acres Needing Grade Stabilization		5	5	7	4
Acres Needing Water/Sediment Control Basins		5	5	7	4
Acres Needing Enhanced Nutrient Management		19,615	21,614	30,081	14,030
Acres Needing Increased Crop Residue		6,823	7,518	10,463	0
Acres Needing Conversion to Perm. Veg. (Steep Slope)		1,611	1,775	2,470	1,228
Acres Needing Conversion to Wetland (swampy areas)		95	104	145	701
Acres of CRP		10,565	11,719	28,478	7,015
<i>Rangeland/Livestock Needs</i>					
Acres of Grassland		96,341	104,711	157,364	70,641
Acres of Grassland/Rangeland Needing Treatment		65,608	71,308	107,165	49,661
HUC 12 Watershed 102600030501 Grassland Acres	10,739				
Medium Priority AFOs (number identified)	2				
Low Priority AFOs (number identified)	6				
Medium Priority AFOs (number estimated)		12	13	20	9
Low Priority AFOs (number estimated)		37	40	60	28

The following information on BMPs was utilized when determining the types and quantities of BMPs to implement in the area. Cropland and livestock BMP implementation schedules are included within this section.

## **Cropland**

### **Permanent Vegetation**

- Planting a portion of or an entire field to grass.
- 95% erosion reduction efficiency, 95% phosphorous reduction efficiency.
- \$150 an acre, 50% cost-share available from NRCS.

### **Grassed Waterway**

- Grassed strip used as an outlet to prevent silt and gully formation.
- Can also be used as outlets for water from terraces.
- On average for Kansas fields, 1 acre waterway will treat 10 acres of cropland.
- 40% erosion reduction efficiency, 40% phosphorous reduction efficiency.
- \$1,600 an acre, 50% cost-share available from NRCS.

### **No-Till**

- A management system in which chemicals may be used for weed control and seed-bed preparation.
- The soil surface is never disturbed except for planting or drilling operations in a 100% no-till system.
- 75% erosion reduction efficiency, 40% phosphorous reduction efficiency.
- WRAPS groups and KSU Ag Economists have decided \$10 an acre for 10 years is an adequate payment to entice producers to convert, 50% cost-share available from NRCS.

### **Terraces**

- Earth embankment and/or channel constructed across the slope to intercept runoff water and trap soil.
- One of the oldest/most common BMPs
- 30% Erosion Reduction Efficiency, 30% phosphorous reduction efficiency
- \$1.00 per linear foot, 50% cost-share available from NRCS

### **Nutrient Management Plan**

- Managing the amount, source, placement, form and timing of the application of nutrients and soil amendments.
- Intensive soil testing
- 25% erosion and 25% P reduction efficiency.
- WRAPS groups and KSU Ag Economists have decided \$7.30 an acre for 10 years is an adequate payment to entice producers to convert, 50% cost-share is available from NRCS.

## Livestock

### Relocate Feeding Sites

- Feeding Pens- Move feedlot or pens away from a stream, waterway, or body of water to increase filtration and waste removal of manure. Highly variable in price, average of \$12,000 per unit.
- Pasture- Move feeding site that is in a pasture away from a stream, waterway, or body of water to increase the filtration and waste removal (eg. move bale feeders away from stream). Highly variable in price, average of \$2,203 per unit.
- Average P reduction: 30-80%

### Alternative (Off-Stream) Watering System

- Watering system so that livestock do not enter stream or body of water.
- Studies show cattle will drink from tank over a stream or pond 80% of the time.
- 10-25 year lifespan, average P reduction: 30-98% with greater efficiencies for limited stream access.
- \$3,795 installed for solar system, including present value of maintenance costs.

### Vegetative Filter Strip

- A vegetated area that receives runoff during rainfall from an animal feeding operation.
- Often require a land area equal to or greater than the drainage area (needs to be as large as the feedlot).
- 10 year lifespan, requires periodic mowing or haying, average P reduction: 50%.
- \$714 an acre

### Grazing management plan

- Grazing management plan to avoid over grazing of pastures.
- Average P reduction: 25-30%
- \$2,000 average cost

### Average Stocking Rates for Cedar Bluff Watershed

One pair on 9 acres of native grass.  
Average grazing dates: May 1-November 1

Table 8. Annual Adoption (treated acres) of Cropland BMPs.  
(Numbers are rounded to the nearest whole number.)

Priority Area #1 Annual Adoption (treated acres), Cropland BMPs						
Year	Permanent Vegetation	Grassed Waterways	No-Till	Terraces	Nutrient Management	Total Adoption
1	95	237	237	948	474	1,990
2	95	237	237	948	474	1,990
3	95	237	237	948	474	1,990
4	95	237	237	948	474	1,990
5	95	237	237	948	474	1,990
6	95	237	237	948	474	1,990
7	95	237	237	948	474	1,990
8	95	237	237	948	474	1,990
9	95	237	237	948	474	1,990
10	95	237	237	948	474	1,990
11	95	237	237	948	474	1,990
12	95	237	237	948	474	1,990
13	95	237	237	948	474	1,990
14	95	237	237	948	474	1,990
15	95	237	237	948	474	1,990
16	95	237	237	948	474	1,990
17	95	237	237	948	474	1,990
18	95	237	237	948	474	1,990
19	95	237	237	948	474	1,990
20	95	237	237	948	474	1,990
Total	1,900	4,740	4,740	18,960	9,480	39,800



Table 9. Annual Adoption rates of number of Livestock BMPs.

Priority Area #1 Annual Livestock BMP Adoption					
Year	Vegetative Filter Strip	Relocate Feeding Pens	Relocate Pasture Feeding Site	Alternative Watering System	Grazing Mgmt Plan
1	1		1	1	1
2			0	1	1
3		1	1	1	1
4			0	1	1
5			1	1	1
6			0	1	1
7			1	1	1
8			0	1	1
9			1	1	1
10	1		0	1	1
11			1	1	1
12			0	1	1
13		1	1	1	1
14			0	1	1
15			1	1	1
16			0	1	1
17			1	1	1
18			0	1	1
19			1	1	1
20			0	1	1
<i>Total</i>	2	2	10	20	20

Table 10. Annual Soil Erosion Reduction from Cropland BMPs

Priority Area #1 Annual Soil Erosion Reduction in tons						
Year	Permanent Vegetation	Grassed Waterways	No-Till	Terraces	Nutrient Management	Total
1	270	284	533	853	355	2,295
2	540	569	1,066	1,706	711	4,591
3	810	853	1,599	2,558	1,066	6,886
4	1,080	1,137	2,132	3,411	1,421	9,182
5	1,350	1,421	2,665	4,264	1,777	11,477
6	1,620	1,706	3,198	5,117	2,132	13,773
7	1,890	1,990	3,731	5,970	2,487	16,068
8	2,160	2,274	4,264	6,823	2,843	18,364
9	2,431	2,558	4,797	7,675	3,198	20,659
10	2,701	2,843	5,330	8,528	3,553	22,955
11	2,971	3,127	5,863	9,381	3,909	25,250
12	3,241	3,411	6,396	10,234	4,264	27,546
13	3,511	3,696	6,929	11,087	4,619	29,841
14	3,781	3,980	7,462	11,939	4,975	32,137
15	4,051	4,264	7,995	12,792	5,330	34,432
16	4,321	4,548	8,528	13,645	5,685	36,728
17	4,591	4,833	9,061	14,498	6,041	39,023
18	4,861	5,117	9,594	15,351	6,396	41,319
19	5,131	5,401	10,127	16,203	6,751	43,614
20	5,401	5,685	10,660	17,056	7,107	45,910
Totals	56,712	59,697	111,930	179,091	74,620	482,050

Table 11. Annual Phosphorous Runoff Reduction from Cropland BMPs

Priority Area #1 Annual Phosphorous Runoff Reduction in lbs.						
Year	Permanent Vegetation	Grassed Waterways	No-Till	Terraces	Nutrient Management	Total
1	216	227	227	682	284	1,637
2	432	455	455	1,365	569	3,275
3	648	682	682	2,047	853	4,912
4	864	910	910	2,729	1,137	6,550
5	1,080	1,137	1,137	3,411	1,421	8,187
6	1,296	1,365	1,365	4,094	1,706	9,824
7	1,512	1,592	1,592	4,776	1,990	11,462
8	1,728	1,819	1,819	5,458	2,274	13,099
9	1,944	2,047	2,047	6,140	2,558	14,737
10	2,160	2,274	2,274	6,823	2,843	16,374
11	2,377	2,502	2,502	7,505	3,127	18,011
12	2,593	2,729	2,729	8,187	3,411	19,649
13	2,809	2,956	2,956	8,869	3,696	21,286
14	3,025	3,184	3,184	9,552	3,980	22,924
15	3,241	3,411	3,411	10,234	4,264	24,561
16	3,457	3,639	3,639	10,916	4,548	26,198
17	3,673	3,866	3,866	11,598	4,833	27,836
18	3,889	4,094	4,094	12,281	5,117	29,473
19	4,105	4,321	4,321	12,963	5,401	31,111
20	4,321	4,548	4,548	13,645	5,685	32,748
Totals	45,370	47,758	47,758	143,275	59,697	343,854



Table 12. Annual Phosphorous Runoff Reduction from Livestock BMPs

Priority Area #1 Annual Livestock BMP P Load Reduction in lbs						
Year	Vegetative Filter Strip	Relocate Feeding Pens	Relocate Pasture Feeding Site	Alternative Watering System	Grazing Mgmt Plan	Total
1	638	0	38	38	173	887
2	638	0	38	76	346	1,098
3	638	797	76	115	519	2,145
4	638	797	76	153	692	2,356
5	638	797	115	191	865	2,606
6	638	797	115	229	1,038	2,817
7	638	797	153	268	1,211	3,066
8	638	797	153	306	1,383	3,277
9	638	797	191	344	1,556	3,527
10	1,276	797	191	382	1,729	4,376
11	1,276	797	229	420	1,902	4,625
12	1,276	797	229	459	2,075	4,836
13	1,276	1,595	268	497	2,248	5,883
14	1,276	1,595	268	535	2,421	6,094
15	1,276	1,595	306	573	2,594	6,343
16	1,276	1,595	306	611	2,767	6,555
17	1,276	1,595	344	650	2,940	6,804
18	1,276	1,595	344	688	3,113	7,015
19	1,276	1,595	382	726	3,286	7,265
20	1,276	1,595	382	764	3,459	7,476
Totals	19,778	20,730	4,204	8,025	36,317	89,051

## 6.0 BMP Implementation Milestones

Development of BMP implementation milestones provides for the opportunity to evaluate watershed plan implementation progress at given intervals over the duration of the plan. Once developed, these milestones give WRAPS projects and their respective SLTs a framework to evaluate progress of BMP implementation for the practices identified with the plan as well as insight as to whether or not BMP implementation schedules need to be adjusted to meet the overall implementation goals of the plan.

Table 13. Short, Medium and Long Term Annual Adoption rates (Treated Acres) of Cropland BMPs.

Priority Area #1 Annual Adoption (treated acres), Cropland BMPs							
	Year	Permanent Vegetation	Grassed Waterways	No-Till	Terraces	Nutrient Management	Total Adoption
Short Term	1	190	474	474	1,895	948	3,980
	2	190	474	474	1,895	948	3,980
	3	190	474	474	1,895	948	3,980
	4	190	474	474	1,895	948	3,980
	5	190	474	474	1,895	948	3,980
<b>Total</b>		<b>948</b>	<b>2,369</b>	<b>2,369</b>	<b>9,476</b>	<b>4,738</b>	<b>19,899</b>
Medium Term	6	190	474	474	1,895	948	3,980
	7	190	474	474	1,895	948	3,980
	8	190	474	474	1,895	948	3,980
	9	190	474	474	1,895	948	3,980
	10	190	474	474	1,895	948	3,980
<b>Total</b>		<b>1,895</b>	<b>4,738</b>	<b>4,738</b>	<b>18,951</b>	<b>9,476</b>	<b>39,798</b>
Long Term	11	190	474	474	1,895	948	3,980
	12	190	474	474	1,895	948	3,980
	13	190	474	474	1,895	948	3,980
	14	190	474	474	1,895	948	3,980
	15	190	474	474	1,895	948	3,980
	16	190	474	474	1,895	948	3,980
	17	190	474	474	1,895	948	3,980
	18	190	474	474	1,895	948	3,980
	19	190	474	474	1,895	948	3,980
	20	190	474	474	1,895	948	3,980
<b>Total</b>		<b>3,790</b>	<b>9,476</b>	<b>9,476</b>	<b>37,903</b>	<b>18,951</b>	<b>79,596</b>

Table 14. Short, Medium and Long Term Annual Adoption rates of Livestock BMPs.

Priority Area #1 Annual Livestock BMP Adoption						
	Year	Vegetative Filter Strip	Relocate Feeding Pens	Relocate Pasture Feeding Site	Alternative Watering System	Grazing Mgmt Plan
<b>Short-Term</b>	1	1		1	1	1
	2			0	1	1
	3		1	1	1	1
	4			0	1	1
	5			1	1	1
<i>Total</i>		1	1	3	5	5
<b>Medium-Term</b>	6			0	1	1
	7			1	1	1
	8			0	1	1
	9			1	1	1
	10	1		0	1	1
<i>Total</i>		2	1	5	10	10
<b>Long-Term</b>	11			1	1	1
	12			0	1	1
	13		1	1	1	1
	14			0	1	1
	15			1	1	1
	16			0	1	1
	17			1	1	1
	18			0	1	1
	19			1	1	1
	20			0	1	1
<i>Total</i>		2	2	10	20	20



Table 15. Annual Phosphorous load reduction

Phosphorous				
Year	Cropland Reduction (lbs)	Livestock Reduction (lbs)	Total Reduction (lbs)	% of TMDL
1	1,637	887	2,525	8%
2	3,275	1,098	4,373	14%
3	4,912	2,145	7,057	22%
4	6,550	2,356	8,906	28%
5	8,187	2,606	10,793	34%
6	9,824	2,817	12,641	39%
7	11,462	3,066	14,528	45%
8	13,099	3,277	16,377	51%
9	14,737	3,527	18,263	57%
10	16,374	4,376	20,750	65%
11	18,011	4,625	22,637	71%
12	19,649	4,836	24,485	77%
13	21,286	5,883	27,169	85%
14	22,924	6,094	29,018	91%
15	24,561	6,343	30,905	97%
<b>16</b>	<b>26,198</b>	<b>6,555</b>	<b>32,753</b>	<b>102%</b>
17	27,836	6,804	34,640	108%
18	29,473	7,015	36,488	114%
19	31,111	7,265	38,375	120%
20	32,748	7,476	40,224	126%
<b>Phosphorous TMDL:</b>		<b>32,005</b>	<b>Pounds</b>	

Note: Phosphorous reduction goal is met in year 16 of this plan

Table 16. Total Phosphorous load reduction after 20 years

Phosphorous		
Best Management Practice Category	Total Load Reduction (lbs)	% of Phosphorous TMDL
Livestock	7,476	23%
Cropland	32,748	102%
<b>Total</b>	<b>40,224</b>	<b>126%</b>

## 7.0 Costs of Implementing BMPs and Possible Funding Sources

### 7.1 Total BMP Cost Estimates

Table 17. Annual Cost of Cropland BMP Implementation before cost-share

Priority Area #1 Total Annual Cost Before Cost-Share, Cropland BMPs						
Year	Permanent Vegetation	Grassed Waterways	No-Till	Terraces	Nutrient Mgmt Plan	Total Cost
1	\$14,214	\$40,272	\$18,404	\$94,757	\$54,011	\$221,658
2	\$14,640	\$41,480	\$18,956	\$97,600	\$55,632	\$228,308
3	\$15,079	\$42,724	\$19,525	\$100,528	\$57,301	\$235,157
4	\$15,532	\$44,006	\$20,111	\$103,544	\$59,020	\$242,212
5	\$15,997	\$45,326	\$20,714	\$106,650	\$60,790	\$249,478
6	\$16,477	\$46,686	\$21,335	\$109,849	\$62,614	\$256,962
7	\$16,972	\$48,087	\$21,976	\$113,145	\$64,493	\$264,671
8	\$17,481	\$49,529	\$22,635	\$116,539	\$66,427	\$272,611
9	\$18,005	\$51,015	\$23,314	\$120,035	\$68,420	\$280,790
10	\$18,545	\$52,545	\$24,013	\$123,636	\$70,473	\$289,213
11	\$19,102	\$54,122	\$24,734	\$127,345	\$72,587	\$297,890
12	\$19,675	\$55,745	\$25,476	\$131,166	\$74,765	\$306,826
13	\$20,265	\$57,418	\$26,240	\$135,101	\$77,007	\$316,031
14	\$20,873	\$59,140	\$27,027	\$139,154	\$79,318	\$325,512
15	\$21,499	\$60,915	\$27,838	\$143,328	\$81,697	\$335,278
16	\$22,144	\$62,742	\$28,673	\$147,628	\$84,148	\$345,336
17	\$22,809	\$64,624	\$29,533	\$152,057	\$86,673	\$355,696
18	\$23,493	\$66,563	\$30,419	\$156,619	\$89,273	\$366,367
19	\$24,198	\$68,560	\$31,332	\$161,317	\$91,951	\$377,358
20	\$24,924	\$70,617	\$32,272	\$166,157	\$94,709	\$388,679
Totals	\$381,924	\$1,082,116	\$494,527	\$2,546,155	\$1,451,309	\$5,956,033

Table 18. Annual Cost of Cropland BMP Implementation after cost-share

Priority Area #1 Total Annual Cost After Cost-Share, Cropland BMPs						
Year	Permanent Vegetation	Grassed Waterways	No-Till	Terraces	Nutrient Mgmt Plan	Total Cost
1	\$3,553	\$10,068	\$11,227	\$23,689	\$16,203	\$64,741
2	\$3,660	\$10,370	\$11,563	\$24,400	\$16,690	\$66,683
3	\$3,770	\$10,681	\$11,910	\$25,132	\$17,190	\$68,683
4	\$3,883	\$11,002	\$12,268	\$25,886	\$17,706	\$70,744
5	\$3,999	\$11,332	\$12,636	\$26,662	\$18,237	\$72,866
6	\$4,119	\$11,671	\$13,015	\$27,462	\$18,784	\$75,052
7	\$4,243	\$12,022	\$13,405	\$28,286	\$19,348	\$77,304
8	\$4,370	\$12,382	\$13,807	\$29,135	\$19,928	\$79,623
9	\$4,501	\$12,754	\$14,221	\$30,009	\$20,526	\$82,011
10	\$4,636	\$13,136	\$14,648	\$30,909	\$21,142	\$84,472
11	\$4,775	\$13,530	\$15,088	\$31,836	\$21,776	\$87,006
12	\$4,919	\$13,936	\$15,540	\$32,791	\$22,429	\$89,616
13	\$5,066	\$14,354	\$16,006	\$33,775	\$23,102	\$92,305
14	\$5,218	\$14,785	\$16,487	\$34,788	\$23,795	\$95,074
15	\$5,375	\$15,229	\$16,981	\$35,832	\$24,509	\$97,926
16	\$5,536	\$15,686	\$17,491	\$36,907	\$25,244	\$100,864
17	\$5,702	\$16,156	\$18,015	\$38,014	\$26,002	\$103,890
18	\$5,873	\$16,641	\$18,556	\$39,155	\$26,782	\$107,006
19	\$6,049	\$17,140	\$19,112	\$40,329	\$27,585	\$110,216
20	\$6,231	\$17,654	\$19,686	\$41,539	\$28,413	\$113,523
Totals	\$95,478	\$270,529	\$301,662	\$636,536	\$435,391	\$1,739,605

Table 19. Annual Cost of Livestock BMP Implementation before cost-share

Priority Area #1 Annual Livestock BMP Cost Before Cost-Share						
Year	Vegetative Filter Strip	Relocate Feeding Pens	Relocate Pasture Feeding Site	Alternative Watering System	Grazing Mgmt Plan	Total
1	\$714	\$0	\$2,203	\$3,795	\$2,000	\$8,712
2	\$0	\$0	\$0	\$3,909	\$2,060	\$5,969
3	\$0	\$12,731	\$2,337	\$4,026	\$2,122	\$21,216
4	\$0	\$0	\$0	\$4,147	\$2,185	\$6,332
5	\$0	\$0	\$2,479	\$4,271	\$2,251	\$9,002
6	\$0	\$0	\$0	\$4,399	\$2,319	\$6,718
7	\$0	\$0	\$2,630	\$4,531	\$2,388	\$9,550
8	\$0	\$0	\$0	\$4,667	\$2,460	\$7,127
9	\$0	\$0	\$2,791	\$4,807	\$2,534	\$10,132
10	\$932	\$0	\$0	\$4,952	\$2,610	\$8,493
11	\$0	\$0	\$2,961	\$5,100	\$2,688	\$10,749
12	\$0	\$0	\$0	\$5,253	\$2,768	\$8,022
13	\$0	\$17,109	\$3,141	\$5,411	\$2,852	\$28,512
14	\$0	\$0	\$0	\$5,573	\$2,937	\$8,510
15	\$0	\$0	\$3,332	\$5,740	\$3,025	\$12,098
16	\$0	\$0	\$0	\$5,912	\$3,116	\$9,028
17	\$0	\$0	\$3,535	\$6,090	\$3,209	\$12,834
18	\$0	\$0	\$0	\$6,273	\$3,306	\$9,578
19	\$0	\$0	\$3,750	\$6,461	\$3,405	\$13,616
20	\$0	\$0	\$0	\$6,655	\$3,507	\$10,162
Totals	\$1,646	\$29,840	\$29,159	\$101,972	\$53,742	\$216,360



Table 20. Annual Cost of Livestock BMP Implementation after cost-share

Priority Area #1 Annual Livestock BMP Cost After Cost-Share						
Year	Vegetative Filter Strip	Relocate Feeding Pens	Relocate Pasture Feeding Site	Alternative Watering System	Grazing Mgmt Plan	Total
1	\$357	\$0	\$1,102	\$1,898	\$1,000	\$4,356
2	\$0	\$0	\$0	\$1,954	\$1,030	\$2,984
3	\$0	\$6,365	\$1,169	\$2,013	\$1,061	\$10,608
4	\$0	\$0	\$0	\$2,073	\$1,093	\$3,166
5	\$0	\$0	\$1,240	\$2,136	\$1,126	\$4,501
6	\$0	\$0	\$0	\$2,200	\$1,159	\$3,359
7	\$0	\$0	\$1,315	\$2,266	\$1,194	\$4,775
8	\$0	\$0	\$0	\$2,334	\$1,230	\$3,564
9	\$0	\$0	\$1,395	\$2,404	\$1,267	\$5,066
10	\$466	\$0	\$0	\$2,476	\$1,305	\$4,246
11	\$0	\$0	\$1,480	\$2,550	\$1,344	\$5,374
12	\$0	\$0	\$0	\$2,627	\$1,384	\$4,011
13	\$0	\$8,555	\$1,570	\$2,705	\$1,426	\$14,256
14	\$0	\$0	\$0	\$2,787	\$1,469	\$4,255
15	\$0	\$0	\$1,666	\$2,870	\$1,513	\$6,049
16	\$0	\$0	\$0	\$2,956	\$1,558	\$4,514
17	\$0	\$0	\$1,768	\$3,045	\$1,605	\$6,417
18	\$0	\$0	\$0	\$3,136	\$1,653	\$4,789
19	\$0	\$0	\$1,875	\$3,230	\$1,702	\$6,808
20	\$0	\$0	\$0	\$3,327	\$1,754	\$5,081
Totals	\$823	\$14,920	\$14,580	\$50,987	\$26,873	\$108,179

## 7.2 Potential BMP Funding Sources

Potential Funding Sources	Potential Funding Programs
Natural Resources Conservation Service	Environmental Quality Incentives Program (EQIP) Wetland Reserve Program (WRP) Conservation Reserve Program (CRP) Wildlife Habitat Incentive Program (WHIP) Cooperative Conservation Partnership Initiative (CCPI) State Acres for Wildlife Enhancement (SAFE) Grassland Reserve Program (GRP) Farmable Wetlands Programs (FWP)
EPA/KDHE	319 Funding Grants KDHE WRAPS Funding Clean Water Neighbor Grants
KS Dept. of Wildlife and Parks	Partnering for Wildlife
Kansas Alliance for Wetlands & Streams	
KDA – Division of Conservation	
No-till on the Plains	
Conservation District	
Kansas Rural Center	River Friendly Farms Program
Kansas Forest Service	Forest Legacy Program (US Forest Service & Kansas Forest Service)
US Fish and Wildlife	

## 8.0 Water Quality Milestones to Determine Improvements

The primary goal that is focused on within the Cedar Bluff Lake WRAPS Watershed Plan is restoration of water quality of Cedar Bluff Lake for designated uses supportive of aquatic life, domestic water supply, recreation, and other designated uses for the Cedar Bluff Lake watershed. The plan specifically addresses several TMDLs and 303 (d) listings for Cedar Bluff Lake and the Smoky Hill River. The following is a list of the impairments being directly addressed by the plan:

### **Cedar Bluff Lake (KDHE Station LM013001)**

Medium Priority Eutrophication TMDL

Several other impairments stand to benefit from BMP implementation activities noted within the watershed plan. These impairments are listed below:

### **Smoky Hill River Near Trego (KDHE Station SC550)**

E. coli bacteria 303(d) list

Medium Priority Dissolved Oxygen TMDL

In order to reach the load reduction goals associated with the Cedar Bluff Lake WRAPS Project Area impairments, an implementation schedule for BMP implementation spanning 20 years has been developed.

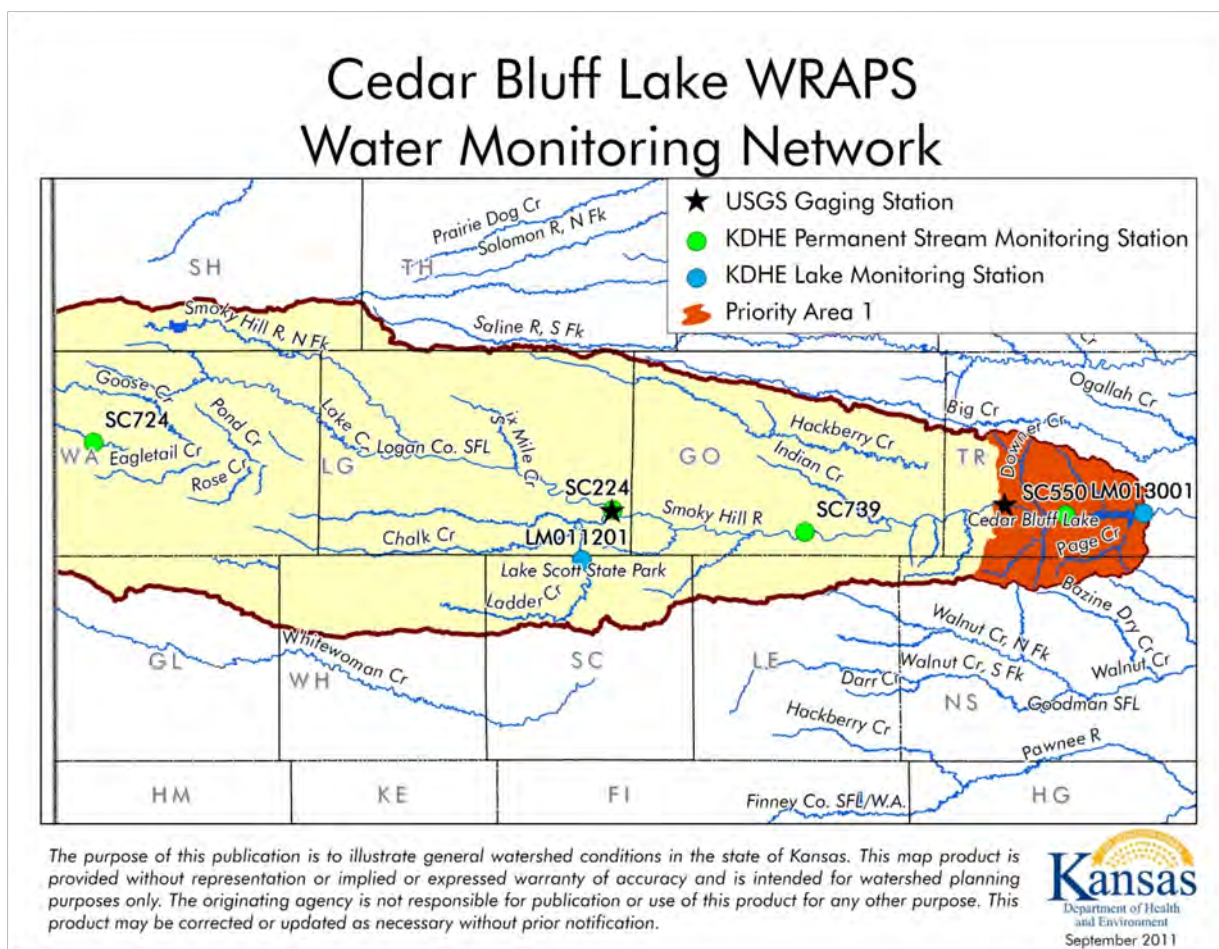
The selected practices included in the plan will be implemented throughout the targeted areas within the Cedar Bluff Lake watershed. Water quality milestones have been developed for Cedar Bluff Lake as well as the Smoky Hill River as indicators to evaluate improvements in water quality conditions towards meeting the Cedar Bluff Lake eutrophication TMDL . The purpose of the milestones and indicators is to measure water quality improvements associated with the implementation schedule contained in this plan.

## 8.1 Monitoring Sites in the Cedar Bluff Lake WRAPS Project Area

Water quality milestones contained in this section are tied to the sampling stations that KDHE continues to monitor for water quality in each of the water bodies that will be positively affected by the BMP implementation schedule included in this plan. KDHE has several monitoring stations located with the Cedar Bluff Lake WRAPS Project Area. The stations listed below will be utilized to measure water quality improvements throughout the implementation of the plan towards reducing nutrients entering Cedar Bluff Lake.

Station ID	Water Body	Type of Station
SC550	Smoky Hill River Near Trego	Permanent
LM013001	Cedar Bluff Lake	Lake

Figure 23. Cedar Bluff Lake WRAPS Water Monitoring Network



The previous map shows KDHE stream monitoring stations as well as monitored lakes located within the Cedar Bluff Lake WRAPS Project Area as well as the targeted areas for implementation that have been identified and discussed in previous sections of this plan. The permanent monitoring sites are continuously sampled, while the rotational sites are typically sampled every four years. The stream monitoring sites are sampled for nutrients, *E. Coli* bacteria, chemicals, turbidity, alkalinity, dissolved oxygen, pH, ammonia and metals. The KDHE lake monitoring sites are typically sampled once every 3 years between April and October. Lake monitoring sites are sampled for chlorophyll a, total nitrogen (TN), total phosphorus (TP), total suspended solids (TSS), turbidity, dissolved oxygen, and secchi disk depth. The pollutant indicators tested for at each site may vary depending on the season at collection time and other factors.

In addition to the KDHE monitoring stations, the Cedar Bluff Lake Watershed has several USGS gaging stations located within the watershed that provide real-time flow information. Streamflow information for these sites as well as other gaging stations within Kansas can be found at <http://ks.water.usgs.gov/>.



## 8.2 Water Quality Milestones for Cedar Bluff Lake WRAPS Project Area

As previously stated, this plan estimates that it will take 20 years to implement the planned BMPs necessary to meet the load reduction goals for the impairments being addressed in the Cedar Bluff Lake WRAPS Project Area. Several water quality milestones and indicators have been developed, as included herein. The tables below include short term, mid-term, and long term water quality goals for various parameters monitored in the watershed.

Table 21. Water Quality Milestones for Cedar Bluff Lake

Water Quality Milestones for Cedar Bluff Lake								
	Current Condition (2000 - 2010) Average TP	Mid Term Goal		Long Term Goal		Current Con- dition (2000 - 2010) Secchi (Avg)	Mid Term Goal	Long Term Goal
		Improved Condition (2011 - 2020) Average	Total Reduc- tion Needed *	Improved Condition Average TP	Total Reduc- tion Needed *		Improved Condition (2011 - 2020) Secchi (Avg)	Improved Condition Secchi (Avg)
Sampling Site	Total Phosphorus (average of data collected during indicated period), µg/L					Secchi (average of data collected during indicated period), m		
Cedar Bluff Lake LM013001	51	48	6%	44	14%	2.56	Maintain Secchi depth > 2.56	Maintain Secchi depth > 2.56
	Current Condition (2000 - 2010) Chlorophyll a	Mid Term Goal		Long Term Goal				
		Improved Condition (2011 - 2020) Chlorophyll a		Improved Condition Chlorophyll a				
Sampling Site	Chlorophyll a (average of data collected during indicated period), µg/L							
Cedar Bluff Lake LM013001	6.6	Maintain Chlorophyll a < or = 6.6		Maintain Chlorophyll a < or = 6.6				

Table 22. Water Quality Milestones for Smoky Hill River

Water Quality Milestones for Smoky Hill River					
	Current Condition (2001 - 2010) Median TP	10-Year Goal		Long Term Goal	
		Improved Condition (2011 - 2020) Median TP	Total Reduction Needed	Improved Condition Median TP	Total Reduction Needed
Sampling Site	Total Phosphorus (median of data collected during indicated period), µg/L				
Smoky Hill River Near Trego SC550	53	51	4%	48	10%

### 8.3 Additional Water Quality Indicators

In addition to the monitoring data, other water quality indicators can be utilized by KDHE and the SLT. Such indicators may include anecdotal information from the SLT and other citizen groups within the watershed (skin rash outbreaks, fish kills, nuisance odors), which can be used to assess short-term deviations from water quality standards. These additional indicators can act as trigger-points that might initiate further revisions or modifications to the WRAPS plan by KDHE and the SLT.

Occurrence of algal blooms in Cedar Bluff Lake

Visitor traffic to Cedar Bluff Lake

Boating traffic in Cedar Bluff Lake

Trends of quantity and quality of fishing in Cedar Bluff Lake

Beach closings

## 8.4 Evaluation of Monitoring Data

Monitoring data in the Cedar Bluff Lake watershed will be used to determine water quality progress, track water quality milestones, and to determine the effectiveness of the implementation of conservation practices outlined in the plan. The schedule of review for the monitoring data will be tied to the water quality milestones that have been developed, as well as the frequency of the sampling data.

The implementation schedule and water quality milestones for the Cedar Bluff Lake watershed extend through a 20-year period from 2011 to 2030. Throughout that period, KDHE will continue to analyze and evaluate the monitoring data collected. After the first ten years of monitoring and implementation of conservation practices, KDHE will evaluate the available water quality data to determine whether the water quality milestones have been achieved. If milestones are not achieved, KDHE will assist the Cedar Bluff Lake WRAPS group to analyze and understand the context for non-achievement, as well as the need to review and/or revise the water quality milestones included in the plan. KDHE and the SLT can address any necessary modifications or revisions to the plan based on the data analysis. In 2030, at the end of the plan, a final determination can be made as to whether the water quality standards have been attained for Cedar Bluff Lake as well as the Smoky Hill River.

In addition to the planned review of the monitoring data and water quality milestones, KDHE and the SLT may revisit the plan in shorter increments. This would allow the group to evaluate newer available information, incorporate any revisions to applicable TMDLs, or address any potential water quality indicators that might trigger an immediate review.

## 9.0 Information/Education and Technical Assistance Plan

### 9.1 Information/Education and technical assistance schedule with cost estimates

The SLT has determined which information and education activities will be needed in the watershed. These activities are important in providing the residents of the watershed with a higher awareness of watershed issues. This will lead to an increase in adoption rates of BMPs. Additional watershed issues identified by the Cedar Bluff Lake WRAPS SLT will be addressed through information/education activities included in this plan. Listed below are the activities and events along with their costs and possible sponsoring agencies. All activities will be focused in the WRAPS high priority project areas.

BMP	Target Audience	Activity/Event Technical Assistance	Time Frame	Estimated Costs	Sponsor/ Responsible Agency
Livestock BMP Implementation					
Relocate Pasture Feeding Sites/Pens	Livestock Producers/ Landowners	Tour/Field Day	Annual-Summer	\$5,000	Kansas Rural Center K-State Research and Extension Conservation Districts Smoky Hills RC&D
	Livestock Producers/ Landowners	Demonstration Project	Annual-Summer	\$5,000	Kansas Rural Center K-State Research and Extension Conservation Districts Smoky Hills RC&D
	Livestock Producers/ Landowners	Scholarships to Grazing Schools and Workshops	Annual-Ongoing	5 per year, \$100 per scholarship: \$500 total	Kansas Rural Center K-State Research and Extension KS Grazing Lands Coalition
	Livestock Producers/ Landowners	One-on-one technical assistance for producers to implement live- stock BMPs in targeted areas	Annual – Ongoing	Watershed Specialist \$20,000	K-State Research and Extension Conservation Districts
	Livestock Producers/ Landowners	One-on-one technical assistance to remove livestock from riparian areas	Annual – Ongoing	\$5,000	Kansas Forest Service Conservation Districts
Off-stream/ Alternative Watering Systems	Livestock Producers/ Landowners	Tour/Field Day	Annual-Summer	Included above	Kansas Rural Center K-State Research and Extension Conservation Districts NRCS Smoky Hills RC&D
	Livestock Producers/ Landowners	Demonstration Project	Annual-Summer	\$5,000	Kansas Rural Center K-State Research and Extension Conservation Districts NRCS Smoky Hills RC&D



Livestock BMP Implementation					
Off-stream/ Alternative Watering Systems	Livestock Producers/ Landowners	Scholarships to Grazing Schools and Workshops	Annual-Ongoing	Included above	Kansas Rural Center K-State Research and Extension KS Grazing Lands Coalition
	Livestock Producers/ Landowners	One-on-one technical assistance for producers to implement live- stock BMPs in targeted areas	Annual, Ongoing	Included above	K-State Research and Extension Conservation Districts
Rotational Grazing	Livestock Producers/ Landowners	Tour/Field Day/Workshop	Annual-Summer	\$5,000	Kansas Rural Center K-State Research and Extension NRCS Smoky Hills RC&D
	Livestock Producers/ Landowners	One-on-one technical assistance for producers to implement live- stock BMPs in targeted areas	Annual, Ongoing	Included above	K-State Research and Extension NRCS Conservation Districts
Grazing Management Plans (critical area planting & brush man- agement)	Livestock Producers/ Landowners	Tour/Field Day/Workshop	Annual-Summer	\$5,000	Kansas Rural Center K-State Research and Extension Conservation Districts NRCS Smoky Hills RC&D
	Livestock Producers/ Landowners	One-on-one technical assistance for producers to implement live- stock BMPs in targeted areas	Annual, Ongoing	Included above	K-State Research and Extension Conservation districts NRCS
		Sub-Total if fully implemented	Annual	\$50,500	

Cropland BMP Implementation					
Permanent Vegetation	Farmers/Landowners	Workshop/Field Day/Tour	Annual, Spring	\$5,000	K-State Research and Extension Conservation districts NRCS Smoky Hills RC&D
	Farmers/Landowners	Forestry Field Day	Annual	\$5,000	Kansas Forest Service Smoky Hills RC&D
Grassed Waterways	Farmers/Landowners	One-on-one technical assistance for farmers/landowners to implement waterways in targeted areas	Annual	No Cost	Conservation Districts NRCS
	Farmers/Landowners	Scholarships for farmers/landowners to attend No-Till on the Plains Annual Conference	Annual, Winter	5 per year, \$150 per scholarship: \$750	No-Till on the Plains Conservation Districts
No-Till	Farmers/Landowners	Workshop/Field Day/Tour	Annual, Spring	\$5,000	No-Till on the Plains Conservation Districts K-State Research and Extension Smoky Hills RC&D
	Farmers/Landowners	One-on-one technical assistance for farmers/landowners to implement no-till in targeted areas	Annual-Ongoing	\$20,000	No-Till on the Plains K-State Research and Extension Conservation Districts NRCS
Nutrient Management Plans	Farmers/Landowners	Workshop/Field Day	Annual, Spring	\$5,000	Conservation Districts K-State Research and Extension, NRCS Smoky Hills RC&D
	Farmers/Landowners	One-on-one technical assistance for farmers to implement NMPs in targeted areas	Annual	Included above	Conservation Districts K-State Research and Extension, NRCS Conservation Districts
Terraces	Farmers/Landowners	Workshop/Field Day/Tour	Annual, Spring	\$5,000	K-State Research and Extension Conservation districts NRCS Smoky Hills RC&D
		Sub-Total if fully implemented	Annual	\$45,750	

General / Watershed Wide Information and Education					
Educational Activities Targeting Youth	Educators, K-12 Students	Envirothon	Annual	\$1,000	Conservation Districts NRCS Smoky Hills RC&D
		Eco-Meet	Annual	\$1,000	Conservation Districts NRCS Smoky Hills RC&D
		Range Youth Camp	Annual	5 Scholarships @\$220/ea. \$1,100	Conservation Districts NRCS Producer Organizations
		Poster, essay, and speech contests	Annual	No Cost	Conservation Districts Smoky Hills RC&D
		Water Festival	Annual	\$5,000	Northwest KS Conservation & Environmental Alliance
		EARTH	Annual	\$5,000	E.A.R.T.H. program
Educational Activities Targeting Adults	Watershed residents	BMP Auction Technical Assistance (To be conducted in targeted watersheds only)	Annual	\$9,000	K-State Research and Extension Conservation Districts
		River Friendly Farms (To be conducted in targeted watersheds only)	Annual	\$20,000	Kansas Rural Center
		Newsletters, press releases, advertisements, and producer mailings Web Sites	As needed	\$1,000	K-State Research and Extension Conservation Districts KAWS Kansas Rural Center Smoky Hills RC&D
		Presentation at Annual meetings	Annual – Winter	No Charge	Conservation District Smoky Hills RC&D
		Displays at community events and county fairs	Annual	\$500	Conservation District K-State Research and Extension Smoky Hills RC&D
		Sub-Total if fully implemented	Annual	\$43,600	

Watershed Issues Information and Education					
Groundwater	Watershed residents	Newsletters, press releases, advertisements, and producer mailings Web Sites	As needed	Included above	K-State Research and Extension Conservation Districts KAWS Kansas Rural Center Smoky Hills RC&D
		Presentation at Annual meetings	Annual – Winter	No Charge	Conservation District Smoky Hills RC&D
		Displays at community events and county fairs	Annual	\$500	Conservation District K-State Research and Extension Smoky Hills RC&D
		Water well decommissioning demonstration	Annual	\$5,000	Conservation District K-State Research and Extension Smoky Hills RC&D
		One-on-one technical assistance for farmers/ Landowners in targeted areas to test water wells, record data, and educate on protecting water quality	On-going	\$10,000	Conservation District K-State Research and Extension Smoky Hills RC&D
Degraded Streams and Rivers	Watershed residents	Ground water quality and protection demonstrations using an Envision Groundwater model and providing written information	On-going – in conjunction with other demonstrations and meetings	\$5,000	Conservation District K-State Research and Extension NRCS Smoky Hills RC&D Producer membership Organizations
		Publicize and promote streambank BMPs	Annual	\$500	Conservation Districts KAWS Kansas Forest Service Smoky Hills RC&D



<b>Urban Areas</b>	Watershed residents	Publicize and promote Water Quality BMPs for urban areas	Annual	\$500	Conservation Districts Smoky Hills RC&D
<b>Flooding</b>	City/County, Watershed Landowners	Onsite visits	As needed	\$250	Conservation Districts
<b>Biological Items of Concern</b>	Watershed residents	Publicize and promote management practices that protect native and endangered species	Annual	\$500	KDWP US Fish & Wildlife
<b>Water Quantity</b>	Watershed residents	Publicize and promote drought management practices	As needed	\$500	Conservation Districts Smoky Hills RC&D
		Sub-Total if fully implemented	Annual	\$22,750	

### Project Coordination & Grant Management

Project management	WRAPS Coordinator	Annual	\$30,000	Smoky Hills RC&D
Grant management	0.50 FTE RC&D	Annual	\$12,000	Smoky Hills RC&D
	Sub-total if fully implemented	Annual	\$42,000	
	<b>Total if fully implemented</b>	<b>Annual</b>	<b>\$204,600</b>	

Table 23. Cedar Bluff WRAPS Total Annual Cost before Cost Share by Category

Total Annual WRAPS Cost before Cost Share by BMP Category					
Year	Cropland BMP Implementation	Livestock BMP Implementation	Information and Education	Technical Assistance	Total Annual Cost
1	\$221,658	\$8,712	\$98,600	\$106,000	\$434,970
2	\$228,308	\$5,969	\$101,558	\$109,180	\$445,015
3	\$235,157	\$21,216	\$104,605	\$112,455	\$473,433
4	\$242,212	\$6,332	\$107,743	\$115,829	\$472,116
5	\$249,478	\$9,002	\$110,975	\$119,304	\$488,759
6	\$256,962	\$6,718	\$114,304	\$122,883	\$500,867
7	\$264,671	\$9,550	\$117,734	\$126,570	\$518,525
8	\$272,611	\$7,127	\$121,266	\$130,367	\$531,371
9	\$280,790	\$10,132	\$124,904	\$134,278	\$550,104
10	\$289,213	\$8,493	\$128,651	\$138,306	\$564,663
11	\$297,890	\$10,749	\$132,510	\$142,455	\$583,604
12	\$306,826	\$8,022	\$136,485	\$146,729	\$598,062
13	\$316,031	\$28,512	\$140,580	\$151,131	\$636,254
14	\$325,512	\$8,510	\$144,797	\$155,665	\$634,484
15	\$335,278	\$12,098	\$149,141	\$160,335	\$656,852
16	\$345,336	\$9,028	\$153,616	\$165,145	\$673,125
17	\$355,696	\$12,834	\$158,224	\$170,099	\$696,853
18	\$366,367	\$9,578	\$162,971	\$175,202	\$714,118
19	\$377,358	\$13,616	\$167,860	\$180,458	\$739,292
20	\$388,679	\$10,162	\$172,896	\$185,872	\$757,609
<b>Total</b>	<b>\$5,956,033</b>	<b>\$216,360</b>	<b>\$2,649,420</b>	<b>\$2,848,263</b>	<b>\$11,670,076</b>

Table 24. Cedar Bluff WRAPS Total Annual Cost after Cost Share by Category

Total Annual WRAPS Cost after Cost Share by BMP Category					
Year	Cropland BMP Implementation	Livestock BMP Implementation	Information and Education	Technical Assistance	Total Annual Cost
1	\$64,741	\$4,356	\$98,600	\$106,000	\$273,697
2	\$66,683	\$2,984	\$101,558	\$109,180	\$280,405
3	\$68,683	\$10,608	\$104,605	\$112,455	\$296,351
4	\$70,744	\$3,166	\$107,743	\$115,829	\$297,482
5	\$72,866	\$4,501	\$110,975	\$119,304	\$307,646
6	\$75,052	\$3,359	\$114,304	\$122,883	\$315,599
7	\$77,304	\$4,775	\$117,734	\$126,570	\$326,382
8	\$79,623	\$3,564	\$121,266	\$130,367	\$334,818
9	\$82,011	\$5,066	\$124,904	\$134,278	\$346,258
10	\$84,472	\$4,246	\$128,651	\$138,306	\$355,675
11	\$87,006	\$5,374	\$132,510	\$142,455	\$367,346
12	\$89,616	\$4,011	\$136,485	\$146,729	\$376,841
13	\$92,305	\$14,256	\$140,580	\$151,131	\$398,271
14	\$95,074	\$4,255	\$144,797	\$155,665	\$399,791
15	\$97,926	\$6,049	\$149,141	\$160,335	\$413,451
16	\$100,864	\$4,514	\$153,616	\$165,145	\$424,138
17	\$103,890	\$6,417	\$158,224	\$170,099	\$438,630
18	\$107,006	\$4,789	\$162,971	\$175,202	\$449,968
19	\$110,216	\$6,808	\$167,860	\$180,458	\$465,342
20	\$113,523	\$5,081	\$172,896	\$185,872	\$477,371
Totals	\$1,739,605.00	\$108,179.00	\$2,649,420.00	\$2,848,263.00	\$7,345,462.00

## 9.2 Evaluation of Information and Education Activities

All service providers conducting Information and Education (I&E) activities funded through the Cedar Bluff WRAPS will be required to include an evaluation component in their project proposals and Project Implementation Plans. The evaluation methods will vary based on the activity. At a minimum, all I&E projects must include participant learning objectives as the basis for the overall evaluation. Depending on the scope of the project, development of a basic logic model identifying long-term, medium-term, and short-term behavior changes or other outcomes that are expected to result from the I&E activity may be required.

Specific evaluation tools or methods may include (but are not limited to):

- \* Feedback forms allowing participants to provide rankings of the content, presenters, usefulness of information, etc.
- \* Pre and post surveys to determine amount of knowledge gained, anticipated behavior changes, need for further learning, etc.
- \* Follow up interviews (one-on-one contacts, phone calls, e-mails) with selected participants to gather more in-depth input regarding the effectiveness of the I&E activity.

All service providers will be required to submit a brief written evaluation of their I&E activity, summarizing how successful the activity was in achieving the learning objectives, and how the activity contributed to achieving the long-term WRAPS goals and/or objectives for pollutant load reductions.

## 10.0 Review of the Watershed Plan

In the year 2015, the plan will be reviewed and revised according to results acquired from monitoring data. At this time, the SLT will review the following criteria in addition to any other concerns that may occur at that time:

1. The SLT will request a report from KDHE on water quality conditions in the watershed.
2. The SLT will request a report from KDHE concerning the 2014 TMDL revisions.
3. The SLT will request reports from US Army Corps of Engineers (USACE) and Kansas Department of Wildlife and Parks concerning water quality and quantity, wildlife, and any other concerns or observations Cedar Bluff Lake.
4. The SLT will request reports from NRCS and the Conservation Districts concerning BMP adoption rates and any other water quality and quantity issues.
5. The SLT will use all data and assistance available to determine progress toward achieving implementation milestones in Section 6.0 of this report and progress toward achieving the water quality milestones listed in Section 8.0 of this report.
6. The SLT will discuss impairments on the 303d list and the possibility of addressing these impairments prior to them being listed as TMDLs.
7. The SLT will discuss the possible need for additional assessment data.
8. The SLT will discuss the possible need for revision of the pollution load reduction goals and BMP implementation schedule.
9. The SLT will discuss necessary adjustments and revisions needed to this plan to reach pollution load reduction goals.



## 11.0 Appendix

### 11.1 Glossary of Terms

Impairment definitions: (Dec. 2007 RWA)

**Arsenic:** A highly poisonous metallic element having three allotropic forms, yellow, black, and gray, of which the brittle, crystalline gray is the most common. Arsenic and its compounds are used in insecticides, weed killers, solid-state doping agents, and various alloys.

**Best Management Practices (BMP):** Environmental protection practices used to control pollutants, such as sediment or nutrients, from common agricultural or urban land use activities.

**Biological Oxygen Demand (BOD):** Measure of the amount of oxygen removed from aquatic environments by aerobic microorganisms for their metabolic requirements.

**Biology:** Excess nutrients and organic enrichment in stream water can have a negative influence on aquatic populations. Nitrogen and phosphorus can originate from agricultural fertilizers, urban fertilizers, failing septic systems and livestock or wildlife manure in the stream

**Biota:** Plant and animal life of a particular region.

**Chlorophyll a:** Common pigment found in algae and other aquatic plants that is used in photosynthesis

**Dissolved Oxygen (DO):** Amount of oxygen dissolved in water. Oxygen available to aquatic life with the water column. State water quality standards require a stream or lake to have at least 5mg/L of dissolved oxygen.

**E. coli bacteria:** Bacteria indicators (either fecal coliform or *E. coli*) are found in the digestive systems of warm-blooded animals. Some strains cause diarrheal diseases. In surface waters, *E. coli* bacteria are an indicator of potential disease causing organisms. Potential sources of bacteria contamination in surface waters include municipal wastewater, livestock, septic systems, pets, and wildlife.

**Eutrophication (E):** Excess of mineral and organic nutrients that promote a proliferation of plant life in lakes and ponds. The enrichment of bodies of fresh water due to increases in inorganic plant nutrient loading (e.g. nitrate, phosphate) and low in oxygen content. It may occur naturally but can also be the result of human activity (cultural eutrophication from fertilizer runoff and sewage discharge) and is particularly evident in slow-moving rivers and shallow lakes.

**Fecal coliform bacteria (FCB):** Bacteria that originate in the intestines of all warm-blooded animals.

**Municipal Water System:** Water system that serves at least 25 people or has more than 15 service connections.

**NPDES (National Pollutant Discharge Elimination System) Permit:** Required by Federal law for all point source discharges into waters.

**Nitrates:** Final product of ammonia's biochemical oxidation. Primary source of nitrogen for plants. Originates from manure and fertilizers.

**Nitrogen (N or TN):** Element that is essential for plants and animals. TN or total nitrogen is a chemical measurement of all nitrogen forms in a water sample.

**Nutrients:** Nitrogen and phosphorus in water source.

**Phosphorus (P or TP):** One of the primary nutrients required for the growth of plants. Element in water that, in excess, can lead to increased biological activity in water. TP or total phosphorus is a chemical measurement of all phosphorus forms in a water sample.

**Riparian Zone:** Margin of vegetation within approximately 100 feet of waterway.

**Secchi Disk:** Circular plate 10-12" in diameter with alternating black and white quarters used to measure water clarity by measuring the depth at which it can be seen.

**Sedimentation:** Deposition of silt, clay or sand in slow moving waters.

**Selenium:** A naturally occurring metal in marine shale that serves as a micronutrient. Excessive amounts impair aquatic life and bioaccumulation up the food chain occurs causing toxicity to birds, mammals, and humans. Kansas water quality standards are an average of 5ppb and a maximum of 20ppb.

**Stakeholder Leadership Team (SLT):** Organization of watershed residents, landowners, farmers, ranchers, agency personnel and all persons with an interest in water quality.

**Sulfate:** Sulfate is a naturally occurring mineral that can cause taste and odor problems in drinking water. Sulfates are dissolved into groundwater as the water moves through gypsum rock formations. The water quality standard for sulfate in Kansas is 250ug/L.

**Suspended Solids:** Solids which are not in true solution and which can be removed by filtration. Such suspended solids usually contribute directly to turbidity. Defined in waste management, these are small particles of solid pollutants that resist separation by conventional methods. Suspended solids (along with Biochemical Oxygen Demand - BOD) is a measurement of water quality and an indicator of treatment plant efficiency.

**Total Maximum Daily Load (TMDL):** Maximum amount of pollutant that a specific body of water can receive without violating the surface water-quality standards, resulting in failure to support their designated uses

**Total Suspended Solids (TSS):** Measure of the suspended organic and inorganic solids in water. Used as an indicator of sediment or silt.

## 11.2 BMP Definitions:

(Some information from Kansas NRCS Field Office Technical Guide)

### Cropland

#### Grassed Waterway

##### **DEFINITION**

A natural or constructed channel that is shaped or graded to required dimensions and established with suitable vegetation.

##### **PURPOSES**

This practice may be applied as part of a conservation management system to support one or more of the following purposes:

- To convey runoff from terraces, diversions, or other water concentrations without causing erosion or flooding

- To reduce gully erosion
- To protect/improve water quality

### **CONDITIONS WHERE PRACTICE APPLIES**

In areas where added water conveyance capacity and vegetative protection are needed to control erosion resulting from concentrated runoff and where such control can be achieved by using this practice alone or combined with other conservation practices.

## **Terraces**

### **DEFINITION**

An earth embankment or a combination ridge and channel constructed across the field slope.

### **PURPOSE**

This practice may be applied as part of a resource management system to support one or both of the following:

- Reduce soil erosion
- Retain runoff for moisture conservation

### **CONDITIONS WHERE PRACTICE APPLIES**

This practice applies where:

- Soil erosion by water is a problem.
- There is a need to conserve water.
- The soils and topography are such that terraces can be constructed and farmed with reasonable effort.
- A suitable outlet can be provided.
- Excess runoff is a problem.
- There is a need to improve overall water quality.

## **No-Till**

### **DEFINITION**

Managing the amount, orientation, and distribution of crop and other plant residue on the soil surface year-round, while limiting soil-disturbing activities to only those necessary to place nutrients, condition residue, and plant crops.

### **PURPOSE**

- Reduce sheet and rill erosion
- Reduce wind erosion
- Improve soil organic matter content
- Reduce CO<sub>2</sub> losses from the soil
- Reduce soil particulate emissions
- Increase plant-available moisture
- Provide food and escape cover for wildlife

### **CONDITIONS WHERE PRACTICE APPLIES**

- This practice applies to all cropland and other land where crops are planted.
- This practice includes planting methods commonly referred to as no-till, strip till, di-

rect seed, zero till, slot till, or zone till. Approved implements are: No-till and strip-till planters, certain drills and air seeders, strip-type fertilizer and manure injectors and applicators, in-row chisels, and similar implements that only disturb strips and slots. All others are considered to be full-width or capable of full disturbance and therefore not compatible.

## **Riparian Buffer**

### **DEFINITION**

Grasses, grass-like plants, and forbs that are tolerant of intermittent flooding or saturated soils and that are established or managed in the transitional zone between terrestrial and aquatic habitats.

### **PURPOSE**

To provide the following functions:

- Provision of food, shelter, shading substrate, access to adjacent habitats, nursery habitat, and pathways for movement by resident and nonresident aquatic, semi-aquatic, and terrestrial organisms.
- Improve and protect water quality by reducing the amount of sediment and other pollutants such as pesticides, organic materials, and nutrients in surface runoff as well as nutrients and chemicals in shallow ground-water flow.
- Help stabilize streambank and shorelines.
- Increase net carbon storage in the biomass and soil.

### **CONDITIONS WHERE PRACTICE APPLIES**

- Areas adjacent to perennial and intermittent watercourses or water bodies where the natural plant community is dominated by herbaceous vegetation that is tolerant of periodic flooding or saturated soils. For seasonal or ephemeral watercourses and waterbodies, this zone extends to the center of the channel or basin.
- Where the riparian area has been altered and the potential natural plant community has changed or converted to cropland, pastureland, rangeland, or other commercial/agricultural uses.
- Where channel and streambank stability is adequate to support this practice.

## **Livestock**

### **Rotational Grazing**

### **DEFINITION**

Managing the controlled harvest of vegetation with grazing animals by rotating livestock within a pasture to spread manure more uniformly and allow the forage to regenerate. May involve significant cross fencing and additional watering sites.

### **PURPOSE**

- Improve or maintain the health and vigor of plant communities
- Improve or maintain quantity and quality of forage for livestock health and productivity
- Improve or maintain water quality and quantity

- Reduce accelerated soil erosion, and maintain or improve soil condition
- Improve or maintain the quantity and quality of food and/or cover available for wildlife
- Promote economic stability through grazing land sustainability

#### **CONDITIONS WHERE PRACTICE APPLIES**

This practice applies to all lands where grazing animals are managed.

### **Brush Management**

#### **DEFINITION**

Removal, reduction, or manipulation of non-herbaceous plants

#### **PURPOSES**

This practice may be applied to accomplish one or more of the following purposes:

- Restore natural plant community balance
- Create the desired plant community
- Reduce competition for space, moisture, and sunlight between desired and unwanted plants
- Manage noxious woody plants
- Restore desired vegetative cover to protect soils, control erosion, reduce sediment, improve water quality, and enhance stream flow
- Maintain or enhance wildlife habitat including that associated with threatened and endangered species
- Improve forage accessibility, quality, and quantity for livestock
- Protect life and property from wildfire hazards
- Improve visibility and access for handling livestock

#### **CONDITIONS WHERE THIS PRACTICE APPLIES**

- On rangeland, native or naturalized pasture, and pasture and haylands where removal or reduction of excessive woody (non-herbaceous) plants is desired
- Where adjustments in grazing management, prescribed burning, and other conservation practices will not restore the kind of plant cover needed to attain conservation objectives within a reasonable time frame
- Where brush management will improve areas for wildlife, recreation, or natural beauty
- Where control of woody species is necessary to conserve moisture
- Where a reduction of brush is necessary for the safety of life and property in areas of high wildfire hazard.

**Alternative (Off-Stream) Watering System** (which may include any or all of the following components)

### **Watering Facility**

#### **DEFINITION**

A permanent or portable device to provide an adequate amount and quality of drinking water for livestock and/or wildlife.



**PURPOSE**

To provide access to drinking water for livestock and/or wildlife in order to:

- Meet daily water requirements
- Improve animal distribution

**CONDITIONS WHERE PRACTICE APPLIES**

This practice applies to all land uses where there is a need for new or improved watering facilities for livestock and/or wildlife.

**Pumping Plant****DEFINITION**

A pumping facility installed to transfer water for a conservation need.

**PURPOSE**

Provide a dependable water source or disposal facility for water management.

**CONDITIONS WHERE PRACTICE APPLIES**

Wherever water must be pumped to accomplish a conservation objective, which may include (but is not limited to) one of the following:

- To provide a water supply for such purposes as irrigation, recreation, livestock, or wildlife
- To maintain critical water levels in swamps, marshes, open water, or newly constructed wetlands and ponds
- To transfer wastewater for utilization as part of a waste management system
- To provide drainage by the removal of surface runoff water or groundwater

**Pipeline****DEFINITION**

Pipeline having an inside diameter of 8 inches or less.

**PURPOSE**

To convey water from a source of supply to points of use for livestock, wildlife, or recreation areas.

**CONDITIONS WHERE PRACTICE APPLIES**

Where it is desirable or necessary to convey water in a closed conduit from one point to another.

Water quality and quantity shall be adequate for the pipeline to facilitate the conservation use of forage resources by livestock.

Water for distribution can be from wells, springs, flowing streams, ponds, or rural water districts.

**Critical Area Planting****DEFINITION**

Establishment of adapted perennial vegetation such as grasses, forbs, legumes, shrubs, and trees.

**PURPOSES**

This practice may be applied as part of a conservation management system to accom-

plish one or more of the following purposes:

- Restore a plant community similar to its historic climax or the desired plant community.
- Provide or improve forages for livestock.
- Provide or improve forage, browse, or cover for wildlife.
- Reduce erosion by wind and/or water.
- Improve water quality and quantity.
- Increase carbon sequestration.

#### **CONDITIONS WHERE PRACTICE APPLIES**

On rangeland, native or naturalized pasture, grazed forest, or other suitable location where the principal method of vegetation management will be with herbivores. This practice shall be applied where desirable vegetation is below the acceptable level for natural reseeding to occur, or where the potential for enhancement of the vegetation by grazing management is unsatisfactory.

### **Stream Fencing – Livestock Exclusion**

#### **DEFINITION**

A constructed barrier to prevent livestock from entering streams and ponds

#### **PURPOSES**

- To improve water quality by reducing sediment, nutrient, organic, and inorganic loading of the stream.
- To reduce streambank and streambed erosion.
- To facilitate the accomplishment of conservation objectives by providing a means to control movement of animals.

#### **CONDITIONS WHERE PRACTICE APPLIES**

This practice may be applied on any area where management of animal movement is needed. Fences are not needed where natural barriers will serve the purpose.

### **Stream Crossing – Livestock Exclusion**

#### **DEFINITION**

A stabilized area or structure constructed across a stream to provide a travel-way for people, livestock, equipment, or vehicles.

#### **PURPOSES**

- To improve water quality by reducing sediment, nutrient, organic, and inorganic loading of the stream.
- To reduce streambank and streambed erosion.
- To provide crossing for access to another land unit.

#### **CONDITIONS WHERE PRACTICE APPLIES**

This practice applies to all land uses where an intermittent or perennial watercourse exists and a ford, bridge, or culvert type crossing is desired for livestock, people, and / or equipment.

## **Relocate Feeding Sites**

### **DEFINITION**

- Feedlot- Move feedlot or pens away from a stream, waterway, or body of water to increase filtration and waste removal of manure.

- Pasture- Move feeding site that is in a pasture away from a stream, waterway, or body of water to increase the filtration and waste removal (e.g. move bale feeders away from stream).

### **PURPOSE**

To improve water quality by reducing loading of nutrients, organics, pathogens, and other contaminants associated with livestock, poultry, and other agricultural operations.

### **CONDITIONS WHERE PRACTICE APPLIES**

This practice can be applied where the location of livestock in conjunction with a stream, waterway, or body of water can contribute to loading of nutrients, organics, pathogens, and other contaminants.

### 11.3 Service Providers\*

\* All service providers are responsible for evaluation of the installed or implemented BMPs and/or other services provided and will report to SLT for completion approval.

<u>Organization</u>	Programs	Purpose	Technical or Financial Assistance	Website address
<b>Environmental Protection Agency</b>	Clean Water State Revolving Fund Program  Watershed Protection	Provides low cost loans to communities for water pollution control activities.  To conduct holistic strategies for restoring and protecting aquatic resources based on hydrology rather than political boundaries.	Financial	<a href="http://www.epa.gov">www.epa.gov</a>
<b>Kansas Alliance for Wetlands and Streams</b>	Streambank Stabilization  Wetland Restoration  Cost share pro-	The Kansas Alliance for Wetlands and Streams (KAWS) organized in 1996 to promote the protection, enhancement, restoration and establishment wetlands and streams in Kansas.	Technical	<a href="http://www.kaws.org">www.kaws.org</a>
<b>Kansas Dept. of Agriculture</b>	Watershed structures permitting.	Available for watershed districts and multipurpose small lakes development.	Technical and Financial	<a href="http://www.accesskansass.org/kda">www.accesskansass.org/kda</a>
<b>Kansas Dept. of Health and Environment</b>	Nonpoint Source Pollution Program Municipal and livestock waste  Livestock waste Municipal waste  State Revolving Loan Fund	Provide funds for projects that will reduce nonpoint source pollution.  Compliance monitoring.  Makes low interest loans for projects to improve and protect water quality.	Technical and Financial	<a href="http://www.kdheks.gov">www.kdheks.gov</a>
<b>Northwest Kansas Conservation and Environmental Alliance</b>	Natural resource development and protection.	Plan and implement projects and programs that improve environmental quality of life.	Technical	





<b><u>Organization</u></b>	<b>Programs and Technical Assistance</b>	<b>Purpose</b>	<b>Technical or Financial Assistance</b>	<b>Website address</b>
<b>Kansas State Research and Extension</b>	<p>Water Quality Programs, Waste Management Programs</p> <p>Kansas Center for Agricultural Resources and Environment (KCARE)</p> <p>Kansas Environmental Leadership Program (KELP)</p> <p>Kansas Local Government Water Quality Planning and Management</p> <p>Rangeland and Natural Area Services (RNAS)</p> <p>WaterLINK</p> <p>Kansas Pride: Healthy Ecosystems/Healthy Communities</p> <p>Citizen Science</p>	<p>Provide programs, expertise and educational materials that relate to minimizing the impact of rural and urban activities on water quality.</p> <p>Educational program to develop leadership for improved water quality.</p> <p>Provide guidance to local governments on water protection programs.</p> <p>Reduce non-point source pollution emanating from Kansas grasslands.</p> <p>Service-learning projects available to college and university faculty and community watersheds in Kansas.</p> <p>Help citizens appraise their local natural resources and develop short and long term plans and activities to protect, sustain and restore their resources for the future.</p> <p>Education combined with volunteer soil and water testing for enhanced natural resource stewardship.</p>	Technical	<p><a href="http://www.kcare.ksu.edu">www.kcare.ksu.edu</a></p> <p><a href="http://www.ksu.edu/kelp">www.ksu.edu/kelp</a></p> <p><a href="http://www.ksu.edu/olg">www.ksu.edu/olg</a></p> <p><a href="http://www.k-state.edu/waterlink/">www.k-state.edu/waterlink/</a></p> <p><a href="http://www.kansasprideprogram.ksu.edu/healthyecosystems/">www.kansasprideprogram.ksu.edu/healthyecosystems/</a></p> <p><a href="http://www.ksu.edu/kswater/">www.ksu.edu/kswater/</a></p>
<b>Kansas Water Office</b>	Public Information and Education	Provide information and education to the public on Kansas Water Resources	Technical and Financial	<a href="http://www.kwo.org">www.kwo.org</a>
<b>No-Till on the Plains</b>	Field days, seasonal meetings, tours and technical consulting.	Provide information and assistance concerning continuous no-till farming practices.	Technical	<a href="http://www.notill.org">www.notill.org</a>
<b>Smoky Hills RC&amp;D</b>	Natural resource development and protection.	Plan and implement projects and programs that improve environmental quality of life.	Technical	<a href="http://www.smokyhillsrcd.org">www.smokyhillsrcd.org</a>

<b><u>Organization</u></b>	<b>Programs and Technical Assistance</b>	<b>Purpose</b>	<b>Technical or Financial Assistance</b>	<b>Website address</b>
<b>State Conservation Commission and Conservation Districts</b>	Water Resources Cost Share	Provide cost share assistance to land-owners for establishment of water conservation practices.	Technical and Financial	<a href="http://www.accesskansas.org/ksec">www.accesskansas.org/ksec</a>
	Nonpoint Source Pollution Control Fund	Provides financial assistance for non-point pollution control projects which help restore water quality.		<a href="http://www.kacdnet.org">www.kacdnet.org</a>
	Riparian and Wetland Protection Program	Funds to assist with wetland and riparian development and enhancement.		
	Stream Rehabilitation Program	Assist with streams that have been adversely altered by channel modifications.		
	Kansas Water Quality Buffer Initiative	Compliments Conservation Reserve Program by offering additional financial incentives for grass filters and riparian forest buffers.		
	Watershed district and multipurpose lakes	Programs are available for watershed district and multipurpose small lakes.		
<b>US Army Corps of Engineers</b>	Planning Assistance to States	Assistance in development of plans for development, utilization and conservation of water and related land resources of drainage	Technical	<a href="http://www.usace.army.mil">www.usace.army.mil</a>
	Environmental Restoration	Funding assistance for aquatic ecosystem restoration.		
<b>US Fish and Wildlife Service</b>	Fish and Wildlife Enhancement Program	Supports field operations which include technical assistance on wetland design.	Technical	<a href="http://www.fws.gov">www.fws.gov</a>
	Private Lands Program	Contracts to restore, enhance, or create wetlands.		
<b>US Geological Survey</b>	National Streamflow Information Program	Provide streamflow data	Technical	<a href="http://ks.water.usgs.gov">ks.water.usgs.gov</a>
	Water Cooperative Program	Provide cooperative studies and water-quality information		<a href="http://Nrtwq.usgs.gov">Nrtwq.usgs.gov</a>

<b><u>Organization</u></b>	<b>Programs and Technical Assistance</b>	<b>Purpose</b>	<b>Technical or Financial Assistance</b>	<b>Website address</b>
<b>USDA- Natural Resources Conservation Service and Farm Service Agency</b>	<p>Conservation Compliance</p> <p>Conservation Operations</p> <p>Watershed Planning and Operations</p> <p>Wetland Reserve Program</p> <p>Wildlife Habitat Incentives Program</p> <p>Grassland Reserve Program, EQIP, and Conservation Reserve Program</p>	<p>Primarily for the technical assistance to develop conservation plans on cropland.</p> <p>To provide technical assistance on private land for development and application of Resource Management Plans.</p> <p>Primarily focused on high priority areas where agricultural improvements will meet water quality objectives.</p> <p>Cost share and easements to restore wetlands.</p> <p>Cost share to establish wildlife habitat which includes wetlands and riparian areas.</p> <p>Improve and protect rangeland resources with cost-sharing practices, rental agreements, and easement purchases.</p>	Technical and Financial	<a href="http://www.ks.nrcs.usda.gov">www.ks.nrcs.usda.gov</a> <a href="http://www.fsa.usda.gov/ks">www.fsa.usda.gov/ks</a>
KS Grazing Lands Coalition	Regenerating Kansas grazing lands	Regenerate Kansas grazing land resources through cooperative management, economics, ecology, production, education, and technical assistance programs.	Technical	<a href="http://www.kglc.org">www.kglc.org</a>
Local FFA Chapters	Youth Education Programs	Make a positive difference in the lives of students. . .through ag education	Technical	