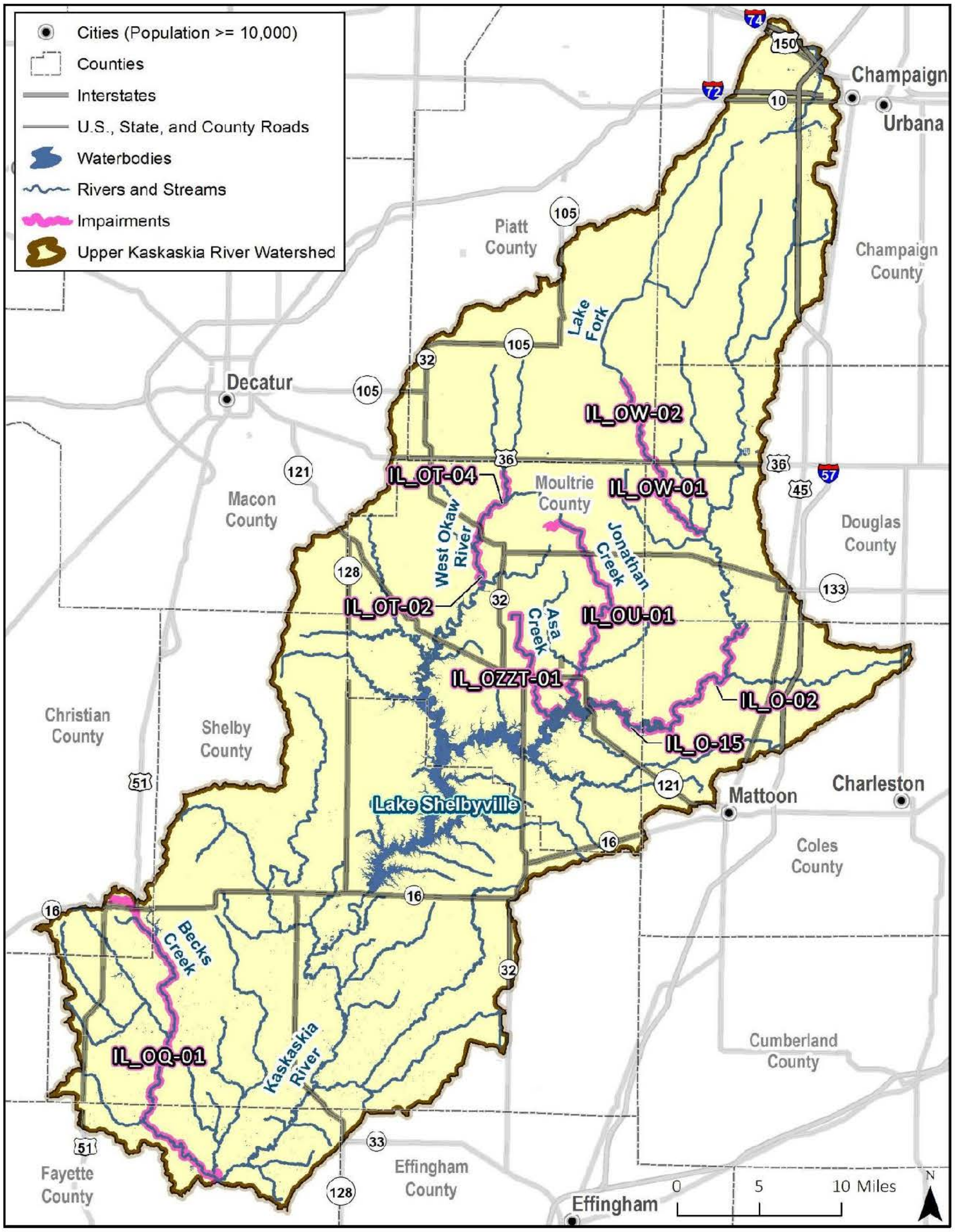
Illinois
Environmental
Protection Agency

Bureau of Water
P.O. Box 19276 Springfield, IL
62794-9276
www.epa.illinois.gov

September 2018

IEPA/BOW/18-006

Upper Kaskaskia River Watershed TMDL Report



Upper Kaskaskia River Watershed

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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 5
77 WEST JACKSON BOULEVARD
CHICAGO, IL 60604-3590

SEP 24 2018

REPLY TO THE ATTENTION OF:
WW-16J

Sanjay Sofat, Chief
Bureau of Water, Illinois Environmental Protection Agency
P.O. Box 19276
Springfield, Illinois 62794-9276

Dear Mr. Sofat:

The U.S. Environmental Protection Agency has conducted a complete review of the final Total Maximum Daily Loads (TMDL) and the Nine Element Watershed Implementation Plan for the Upper Kaskaskia River watershed (UKRW), including support documentation and follow up information. The UKRW is in central Illinois in portions of Champaign, Christian, Coles, Douglas, Effingham, Fayette, Macon, Moultrie, Piatt and Shelby Counties. The UKRW TMDLs address impaired primary contact recreation due to excessive bacteria.

EPA has determined that the UKRW TMDLs meet the requirements of Clean Water Act (CWA) Section 303(d) and EPA's implementing regulations set forth at 40 C.F.R. Part 130. EPA is approving Illinois's five bacteria TMDLs. The statutory and regulatory requirements, and EPA's review of Illinois's compliance with each requirement, are described in the enclosed decision document.

EPA has also determined that the UKRW Nine Element Watershed Implementation Plan is consistent with EPA's Nine Key Elements for Watershed Based Plans and therefore, eligible for CWA Section 319 funding.

We wish to acknowledge Illinois's efforts in submitting these TMDLs and associated implementation plan and look forward to future submissions by the State of Illinois. If you have any questions, please contact Mr. Peter Swenson, Chief of the Watersheds and Wetlands Branch, at 312-886-0236.

Sincerely,

Linda Holst

Linda Holst
Acting Division Director
Water Division

TMDL: Upper Kaskaskia River watershed bacteria TMDLs, Champaign, Christian, Coles, Douglas, Effingham, Fayette, Macon, Moultrie, Piatt and Shelby Counties, IL
Date: September 24, 2018

DECISION DOCUMENT
FOR THE UPPER KASKASKIA RIVER WATERSHED TMDLS, CHAMPAIGN, CHRISTIAN, COLES, DOUGLAS, EFFINGHAM, FAYETTE, MACON, MOULTRIE, PIATT & SHELBY COUNTIES, IL

Section 303(d) of the Clean Water Act (CWA) and EPA's implementing regulations at 40 C.F.R. Part 130 describe the statutory and regulatory requirements for approvable TMDLs. Additional information is generally necessary for EPA to determine if a submitted TMDL fulfills the legal requirements for approval under Section 303(d) and EPA regulations, and should be included in the submittal package. Use of the verb "must" below denotes information that is required to be submitted because it relates to elements of the TMDL required by the CWA and by regulation. Use of the term "should" below denotes information that is generally necessary for EPA to determine if a submitted TMDL is approvable. These TMDL review guidelines are not themselves regulations. They are an attempt to summarize and provide guidance regarding currently effective statutory and regulatory requirements relating to TMDLs. Any differences between these guidelines and EPA's TMDL regulations should be resolved in favor of the regulations themselves.

1. Identification of Water body, Pollutant of Concern, Pollutant Sources, and Priority Ranking

The TMDL submittal should identify the water body as it appears on the State's/Tribe's 303(d) list. The water body should be identified/georeferenced using the National Hydrography Dataset (NHD), and the TMDL should clearly identify the pollutant for which the TMDL is being established. In addition, the TMDL should identify the priority ranking of the water body and specify the link between the pollutant of concern and the water quality standard (see Section 2 below).

The TMDL submittal should include an identification of the point and nonpoint sources of the pollutant of concern, including location of the source(s) and the quantity of the loading, e.g., lbs/per day. The TMDL should provide the identification numbers of the NPDES permits within the water body. Where it is possible to separate natural background from nonpoint sources, the TMDL should include a description of the natural background. This information is necessary for EPA's review of the load and wasteload allocations, which are required by regulation.

The TMDL submittal should also contain a description of any important assumptions made in developing the TMDL, such as:

(1) the spatial extent of the watershed in which the impaired water body is located;
(2) the assumed distribution of land use in the watershed (e.g., urban, forested, agriculture);
(3) population characteristics, wildlife resources, and other relevant information affecting the characterization of the pollutant of concern and its allocation to sources;
(4) present and future growth trends, if taken into consideration in preparing the TMDL (e.g., the TMDL could include the design capacity of a wastewater treatment facility); and

(5) an explanation and analytical basis for expressing the TMDL through *surrogate measures*, if applicable. *Surrogate measures* are parameters such as percent fines and turbidity for sediment impairments; chlorophyll a and phosphorus loadings for excess algae; length of riparian buffer; or number of acres of best management practices.

Comment:

Location Description/Spatial Extent:

The Upper Kaskaskia River Watershed (UKRW) (HUC-8 #07140201) covers approximately 1,568 square miles (approx. 1,003,631 acres) in central Illinois in portions of Champaign, Christian, Coles, Douglas, Effingham, Fayette, Macon, Moultrie, Piatt and Shelby Counties. The UKRW is in the Mississippi River Basin and surface waters in the UKRW generally flow from northeast to the southwest. The main stem of the Kaskaskia River eventually empties into the main stem of the Mississippi River just south of St. Louis, Missouri.

The Illinois UKRW TMDLs address five segments impaired due to excessive bacteria (Table 1 of this Decision Document).

Table 1: Upper Kaskaskia River Watershed impaired waters addressed by this TMDL

Water body name	Assessment Unit ID	Affected Use	Pollutant or stressor	TMDL
Kaskaskia River	IL_O-02	Primary Contact Recreation	Fecal Coliform	Fecal Coliform TMDL
Kaskaskia River	IL_O-15	Primary Contact Recreation	Fecal Coliform	Fecal Coliform TMDL
Becks Creek	IL_OQ-01	Primary Contact Recreation	Fecal Coliform	Fecal Coliform TMDL
West Okaw River	IL_OT-02	Primary Contact Recreation	Fecal Coliform	Fecal Coliform TMDL
Johnathon Creek	IL_OU-01	Primary Contact Recreation	Fecal Coliform	Fecal Coliform TMDL

Land Use:

Land use in the UKRW is predominantly agricultural, 74% of the land use in the UKRW is classified as cultivated crop lands (Table 2 of this Decision Document). The UKRW also is comprised of deciduous forest (10.05%), hay/pasture lands (5.73%), developed/open space (4.06%), developed/low intensity (3.13%), open waters (1.33%) and other land uses at less than 1% of the total land area in the UKRW (Table 2 of this Decision Document).

Table 2: Upper Kaskaskia River Watershed Land Cover - based on 2011 National Land Cover Database (NLCD)

Land Use / Land Cover Category	Acreage	Percentage
Cultivated Crops	747,974	74.53%
Deciduous Forest	100,864	10.05%
Hay/Pasture	57,469	5.73%
Developed, Open Space	40,779	4.06%
Developed, Low Intensity	31,399	3.13%
Open Water	13,357	1.33%
Developed, Medium Intensity	4,940	0.49%
Wood Wetlands	3,289	0.33%
Herbaceous	1,775	0.18%
Developed, High Intensity	1,446	0.14%
Emergent Herbaceous Wetlands	118	0.01%

Barren Land	113	0.01%
Evergreen Forest	107	0.01%
Shrub/Scrub	1	0.00%
TOTALS	1,003,631	100%

Problem Identification:

Bacteria TMDL: The five impaired segments in the UKRW were included on the draft 2016 Illinois 303(d) list due to excessive bacteria. Water quality monitoring within the UKRW indicated that these segments were not attaining their designated aquatic recreation uses due to exceedances of the bacteria criteria. Excessive bacteria can negatively impact recreational uses (swimming, wading, boating, fishing etc.) and public health. At elevated levels, bacteria may cause illness within humans who have contact with or ingest bacteria laden water. Recreation-based contact can lead to ear, nose, and throat infections, and stomach illness.

Priority Ranking:

The water bodies addressed by the UKRW TMDLs were given a priority ranking for TMDL development due to: the impairment impacts on recreation, the public value of the impaired water resource and completing TMDLs as part of the Illinois basin monitoring process.

Pollutants of Concern:

The pollutant of concern is bacteria (fecal coliform).

Source Identification (point and nonpoint sources):

Point Source Identification: The potential point sources to the UKRW are:

UKRW bacteria TMDLs:

National Pollutant Discharge Elimination Systems (NPDES) permitted facilities: NPDES permitted facilities may contribute bacteria loads to surface waters through discharges of wastewater. Permitted facilities must discharge wastewater according to their NPDES permit. Illinois Environmental Protection Agency (IEPA) determined that the facilities in Table 3 of this Decision Document were contributing bacteria to waters in the UKRW and assigned these facilities a portion of the bacteria wasteload allocation (WLA).

Table 3: NPDES facilities which contribute pollutant loading in the Upper Kaskaskia River Watershed TMDLs

Facility Name	Permit Number	Impaired Reach
Equistar Chemicals LP - Tuscola	IL0000141	IL_O-02 & IL_O-15
Panhandle Eastern Tuscola	IL0000221	
Kraft Foods Global - Champaign	IL0004227	
Village of Arthur	IL0021741	
Village of Atwood	IL0025097	
Urbana-Champaign SD SW STP	IL0031526	
Village of Bement	IL0032549	
Marathon Petroleum-Champaign	IL0062812	
Commercial Flooring, Inc.	IL0067202	
Village of Humboldt	ILG580051	
[redacted]		

City of Pana	IL0022314	IL_OQ-01
Oak Terrace Sanitary System Inc.	IL0066672	
Loving STP	IL0024210	IL_OT-02
Village of Hammond	IL0027197	

Municipal Separate Storm Sewer Systems (MS4): Stormwater from MS4s can transport bacteria to surface water bodies during or shortly after storm events. IEPA identified five MS4 permittees in the UKRW (Table 4 of this Decision Document) which were assigned a portion of the WLA (Table 6 of this Decision Document).

Table 4: MS4 Communities in the Upper Kaskaskia River Watershed which received a portion of a WLA

MS4 Community	Permit Number	Subwatershed
City of Champaign	ILR400313	IL_O-2 & IL_O-15
Champaign County (road authority)	ILR400256	
Champaign Township	ILR400026	
Village of Bondville	ILR400621	
Illinois Department of Transportation (road authority)	ILR400493	

Concentrated Animal Feedlot Operations (CAFOs): IEPA determined that the UKRW does not have CAFOs (Section 3.2 of the final TMDL document) which contribute bacteria to waters of the UKRW.

Combined Sewer Overflows (CSOs) and Sanitary Sewer Overflows (SSOs): IEPA determined that the UKRW does not have CSOs nor SSOs which contribute bacteria to waters of the UKRW.

Nonpoint Source Identification: The potential nonpoint sources to the UKRW are:

UKRW bacteria TMDLs:

Stormwater from agricultural land use practices and feedlots near surface waters: Animal Feeding Operations (AFOs) in close proximity to surface waters can be a source of bacteria to water bodies in the UKRW. These areas may contribute bacteria via the mobilization and transportation of pollutant laden waters from feeding, holding and manure storage sites. Runoff from agricultural lands may contain significant amounts of bacteria which may lead to impairments in the UKRW. Feedlots generate manure which may be spread onto fields. Runoff from fields with spread manure can be exacerbated by tile drainage lines, which channelize the stormwater flows and reduce the time available for bacteria to die-off.

Unrestricted livestock access to streams: Livestock with access to stream environments may add bacteria directly to the surfaces waters or resuspend particles that had settled on the stream bottom. Direct deposition of animal wastes can result in very high localized bacteria counts and may contribute to downstream impairments. Smaller animal facilities may add bacteria to surface waters via wastewater from these facilities or stormwater runoff from near-stream pastures.

Discharges from septic systems or unsewered communities: Failing septic systems are a potential source of bacteria within the UKRW. Septic systems generally do not discharge directly into a water body, but effluents from septic systems may leach into groundwater or pond at the surface where they can be washed into surface waters via stormwater runoff events. Age, construction and use of septic systems can vary throughout a watershed and influence the bacteria contribution from these systems.

Non-regulated urban runoff: Runoff from urban areas (urban, residential, commercial or industrial land uses) can contribute bacteria to local water bodies. Stormwater from urban areas, which drain impervious surfaces, may introduce bacteria (derived from wildlife or pet droppings) to surface waters.

Wildlife: Wildlife is a known source of bacteria in water bodies as many animals spend time in or around water bodies. Deer, geese, ducks, raccoons, and other animals all create potential sources of bacteria. Wildlife contributes to the potential impact of contaminated runoff from animal habitats, such as urban park areas, forest, and rural areas.

Future Growth:

Most counties which have land in the UKRW showed a slight increase in population over the 2000 and 2010 census cycles (Table 2 of the final TMDL document). Population growth in the UKRW was fairly small and IEPA did not account for any future growth as it developed the bacteria TMDLs for the UKRW. The WLA and load allocations (LA) for the UKRW TMDLs were calculated for all current and future sources. Any expansion of point or nonpoint sources will need to comply with the respective WLA and LA values calculated in the UKRW TMDLs.

The EPA finds that the TMDL document submitted by IEPA satisfies the requirements of the first criterion.

2. Description of the Applicable Water Quality Standards and Numeric Water Quality Target

The TMDL submittal must include a description of the applicable State/Tribal water quality standard, including the designated use(s) of the water body, the applicable numeric or narrative water quality criterion, and the antidegradation policy (40 C.F.R. §130.7(c)(1)). EPA needs this information to review the loading capacity determination, and load and wasteload allocations, which are required by regulation.

The TMDL submittal must identify a numeric water quality target(s) – a quantitative value used to measure whether or not the applicable water quality standard is attained. Generally, the pollutant of concern and the numeric water quality target are, respectively, the chemical causing the impairment and the numeric criteria for that chemical (e.g., chromium) contained in the water quality standard. The TMDL expresses the relationship between any necessary reduction of the pollutant of concern and the attainment of the numeric water quality target. Occasionally, the pollutant of concern is different from the pollutant that is the subject of the numeric water quality target (e.g., when the pollutant of concern is phosphorus and the numeric water quality target is expressed as Dissolved Oxygen (DO) criteria). In such cases, the TMDL submittal should explain the linkage between the pollutant of concern and the chosen numeric water quality target.

Comment:

Section 4 of the final TMDL document explains that water bodies in the UKRW are not meeting their General Use designation. The Illinois Pollution Control Board (IPCB) defines General Use standards as those that:

> *"will protect the state's water for aquatic life, wildlife, agricultural use, secondary contact use and most industrial uses, and ensure the aesthetic quality of the state's aquatic environment."*

Under the General Use classification, waters are further designated as impaired for aquatic life use, aesthetic quality use and primary contact recreational use. Table 1 of this Decision Document shows the various water body segments and their associated impaired uses.

Primary contact uses, defined as

> *"any recreational or other water use in which there is prolonged and intimate contact with the water (where the physical configuration of the water body permits it) involving considerable risk of ingesting water in quantities sufficient to pose a significant health hazard, such as swimming and water skiing"* (35 Ill. Adm. Code 301.355)

are protected for all General Use waters.

The applicable General Use water quality standards (WQS) for the UKRW TMDL water bodies are established in Illinois Administrative Rules Title 35, Environmental Protection; Subtitle C, Water Pollution; Chapter I, Pollution Control Board; Part 302, Water Quality Standards, Subpart B. Table 5 of this Decision Document lists applicable water quality standards of the UKRW TMDLs.

Table 5: Water Quality Standards Applicable in the Upper Kaskaskia River Watershed TMDL

Parameter	Units	Water Quality Standard	Illinois Code - Regulatory Reference
Total Fecal Coliform[1]	# / 100 mL	400 in < 10% of samples[2]	302.209
		Geometric Mean[3] < 200	

[1] = Fecal Coliform standards apply only between May 1 and October 31

[2] = Standard shall not be exceeded by more than 10% of the samples collected during any 30-day period

[3] = Geometric mean based on minimum of 5 samples taken over not more than a 30-day period

Bacteria TMDL target: The bacteria TMDL target employed for the UKRW bacteria TMDL is the 200 colony forming units (cfu) per 100 mL (200 cfu/100 mL) portion of the standard. IEPA believes that using the 200 cfu/100 mL portion of the standard for TMDL calculations will result in the greatest bacteria reductions within the UKRW and will result in the attainment of the 400 cfu/100 mL portion of the standard. While the bacteria TMDLs will focus on the geometric mean portion of the water quality standard, attainment of both parts of the water quality standard is required.

The EPA finds that the TMDL document submitted by IEPA satisfies the requirements of the second criterion.

3. Loading Capacity - Linking Water Quality and Pollutant Sources

A TMDL must identify the loading capacity of a water body for the applicable pollutant. EPA regulations define loading capacity as the greatest amount of a pollutant that a water can receive without violating water quality standards (40 C.F.R. §130.2(f)).

The pollutant loadings may be expressed as either mass-per-time, toxicity or other appropriate measure (40 C.F.R. §130.2(i)). If the TMDL is expressed in terms other than a daily load, e.g., an annual load, the submittal should explain why it is appropriate to express the TMDL in the unit of measurement chosen. The TMDL submittal should describe the method used to establish the cause-and-effect relationship between the numeric target and the identified pollutant sources. In many instances, this method will be a water quality model.

The TMDL submittal should contain documentation supporting the TMDL analysis, including the basis for any assumptions; a discussion of strengths and weaknesses in the analytical process; and results from any water quality modeling. EPA needs this information to review the loading capacity determination, and load and wasteload allocations, which are required by regulation.

TMDLs must take into account *critical conditions* for steam flow, loading, and water quality parameters as part of the analysis of loading capacity (40 C.F.R. §130.7(c)(1)). TMDLs should define applicable *critical conditions* and describe their approach to estimating both point and nonpoint source loadings under such *critical conditions*. In particular, the TMDL should discuss the approach used to compute and allocate nonpoint source loadings, e.g., meteorological conditions and land use distribution.

Comment:

UKRW bacteria TMDL: IEPA used the geometric mean (**200 cfu/100 mL**) of the bacteria (fecal coliform) WQS to calculate loading capacity values for the bacteria TMDLs. IEPA believes the geometric mean of the bacteria WQS provides the best overall characterization of the status of the watershed. EPA agrees with this assertion, as stated in the preamble of, *"The Water Quality Standards for Coastal and Great Lakes Recreation Waters Final Rule"* (69 FR 67218-67243, November 16, 2004) on page 67224, "…the geometric mean is the more relevant value for ensuring that appropriate actions are taken to protect and improve water quality because it is a more reliable measure, being less subject to random variation, and more directly linked to the underlying studies on which the 1986 bacteria criteria were based." IEPA stated that the bacteria TMDLs will focus on the geometric mean portion of the water quality standard (200 cfu/100 mL) and that it expects that by attaining the 200 cfu/100 mL portion of the bacteria (fecal coliform) WQS the 400 cfu /100 mL portion of the bacteria (fecal coliform) WQS will also be attained. EPA finds these assumptions to be reasonable.

Typically loading capacities are expressed as a mass per time (e.g., pounds per day). However, for fecal coliform loading capacity calculations, mass is not always an appropriate measure because fecal coliform is expressed in terms of colony forming units. This approach is consistent with the EPA's regulations which define "load" as "an amount of matter that is introduced into a receiving water" (40 CFR §130.2). To establish the loading capacities for the UKRW bacteria TMDLs, IEPA used Illinois's WQS for fecal coliform (200 cfu/100 mL). A loading capacity is, "the greatest amount of loading that a water can receive without violating water quality standards." (40 CFR §130.2). Therefore, a loading capacity set at the WQS will assure that the water does not violate WQS. IEPA's bacteria (fecal coliform) TMDL approach is based upon the premise that all discharges (point and nonpoint) must meet the WQS when entering the water body. If all sources meet the WQS at discharge, then the water body should meet the WQS and the designated use.

Flow duration curves (FDC) were created for the five segments in the UKRW which had bacteria TMDLs calculated to address their bacteria impaired waters. The FDCs were developed using flow data collected at a four different USGS gages; #03378365 (for IL_OQ-01), #05591200 (for IL_O-02 and IL_O-15), #05591550 (for IL_OU-01) and #05591700 (for IL_OT-02) (Table 27 of the final TMDL document). None of the bacteria impaired segments in the UKRW had a USGS gage located in their direct subwatershed, and IEPA employed USGS gages in nearby subwatersheds to estimate flows at ungaged locations in the UKRW. IEPA used the following drainage area ratio equation to estimate flows in unaged subwatersheds

$$Q_{ungaged} = (A_{ungaged} / A_{gaged}) * Q_{gaged}$$

where,

$Q_{ungaged}$ = Flow at the ungaged location
Q_{gaged} = Flow at USGS gage station (e.g., #03378365 for IL_OQ-01)
$A_{ungaged}$ = Drainage area of the ungaged location
A_{gaged} = Drainage area of the USGS gage location (e.g., #03378365 for IL_OQ-01)

Flow data focused on dates within the recreation season (May 1 to October 31). Daily stream flows were necessary to implement the load duration curve approach.

FDCs graphs have flow duration interval (percentage of time flow exceeded) on the X-axis and discharge (flow per unit time) on the Y-axis. The FDC were transformed into a load duration curve (LDC) by multiplying individual flow values by the bacteria WQS (200 cfu/100 mL) and then multiplying that value by a conversion factor. The resulting points are plotted onto a load duration curve graph. The LDC graph for the Kaskaskia River (IL_O-02) segment has flow duration interval (percentage of time flow exceeded) on the X-axis and bacteria (fecal coliform) concentrations (number of bacteria per unit time) on the Y-axis (Figure 25 of the final TMDL document). The LDCs for the bacteria impaired segments of the UKRW used fecal coliform measurements in millions of bacteria per day. The curved line on a LDC graph represents the TMDL of the respective flow conditions observed at that location.

Water quality monitoring was completed for the bacteria impaired segments of the UKRW and measured fecal coliform concentrations were converted to individual sampling loads by multiplying the sample concentration by the instantaneous flow measurement observed/estimated at the time of sample collection. The individual sampling loads were plotted on the same figure with the created LDC (Figures 25-29 of the final TMDL document).

LDC plots were subdivided into five flow regimes; high flow conditions (exceeded 0–10% of the time), moist flow conditions (exceeded 10–40% of the time), mid-range flow conditions (exceeded 40–60% of the time), dry flow conditions (exceeded 60–90% of the time), and low flow conditions (exceeded 90–100% of the time). LDC plots can be organized to display individual sampling loads with the calculated

LDC. Watershed managers can interpret LDC graphs with individual sampling points plotted alongside the LDC to understand the relationship between flow conditions and water quality exceedances within the watershed. Individual sampling loads which plot above the LDC represent violations of the WQS and the allowable load under those flow conditions at those locations. The difference between individual sampling loads plotting above the LDC and the LDC, measured at the same flow, is the amount of reduction necessary to meet WQS.

The strengths of using the LDC method are that critical conditions and seasonal variation are considered in the creation of the FDC by plotting hydrologic conditions over the flows measured during the recreation season. Additionally, the LDC methodology is relatively easy to use and cost-effective. The weaknesses of the LDC method are that nonpoint source allocations cannot be assigned to specific sources, and specific source reductions are not quantified. Overall, IEPA believes and EPA concurs that the strengths outweigh the weaknesses for the LDC method.

Implementing the results shown by the LDC requires watershed managers to understand the sources contributing to the water quality impairment and which Best Management Practices (BMPs) may be the most effective for reducing bacteria loads based on flow magnitudes. Different sources will contribute bacteria loads under varying flow conditions. For example, if exceedances are significant during high flow events this would suggest storm events are the cause and implementation efforts can target BMPs that will reduce stormwater runoff and consequently bacteria loading into surface waters. This allows for a more efficient implementation effort.

The calculated bacteria TMDLs for the 5 bacteria impaired segments of the UKRW are presented in Table 6 of this Decision Document. The load allocations were calculated after the determination of the WLA, and the Margin of Safety (MOS) (10% of the loading capacity). Load allocations (e.g., stormwater runoff from agricultural land use practices and feedlots, septic systems, wildlife inputs etc.) were not split among individual nonpoint contributors. Instead, load allocations were combined together into a categorical LA to cover all nonpoint source contributions.

Table 6: Bacteria (fecal coliform) TMDLs (based on geometric mean - 200 cfu/100 mL) for the Upper Kaskaskia River Watershed

Allocation	**Flow Zone**	**High**	**Moist**	**Mid-Range**	**Dry**	**Low Flow**
	Flow Exceedance Range (%)	**0 - 10**	**10 - 40**	**40 - 60**	**60 - 90**	**90 - 100**
	Source	Fecal coliform *(billions of fecal coliform colonies/day)*				
Kaskaskia River (IL_O-02)						
Wasteload Allocation	Equistar Chemicals LP - Tuscola (IL0000141)	92.4	22.7	22.7	22.7	#
	Panhandle Eastern Tuscola (IL0000221)	0.1	0.1	0.1	0.1	#
	Kraft Foods Global - Champaign (IL0004227)	2.2	2.2	2.2	2.2	#
	Village of Arthur (IL0021741)	9.5	3.8	3.8	3.8	#
	Village of Atwood (IL0025097)	3.8	1.5	1.5	1.5	#
	Urbana-Champaign SD SW STP (IL0031526)	130.6	60.4	60.4	60.4	#
	Village of Bement (IL0032549)	3.6	1.3	1.3	1.3	#

	Marathon Petroleum-Champaign (IL0062812)	0.1	0.1	0.1	0.1	#
	Commercial Flooring, Inc. (IL0067202)	0.1	0.1	0.1	0.1	#
	Village of Humboldt (ILG580051)	1.3	0.5	0.5	0.5	#
	MS4 - City of Champaign (ILR400313)	134.0	36.0	13.0	1.77	-
	MS4 - Champaign County (road authority) (ILR400256)	1.0	0.4	0.1	0.02	-
	MS4 - Champaign Township (ILR400026)	86.0	23.1	8.3	1.14	-
	MS4 - Village of Bondville (ILR400621)	4.0	1.0	0.4	0.05	-
	MS4 - Illinois Department of Transportation (road authority) (ILR400493)	2.0	0.5	0.2	0.02	-
	WLA TOTAL	470.7	153.7	114.7	95.7	0.0
Load Allocation	***LA TOTAL***	7,483.0	1,999.0	708.0	110.0	64.0
Margin of Safety (10%)		884.0	239.0	91.0	23.0	7.0
Loading Capacity		**8,837.7**	**2,391.7**	**913.7**	**228.7**	**71.0**
Estimated Load Reduction (%) - based on observed 90th percentile load in each flow regime *(See Table 30 of final TMDL document)*		76%	82%	19%	71%	--
Kaskaskia River (IL_O-15)						
Wasteload Allocation	Equistar Chemicals LP - Tuscola (IL0000141)	92.4	22.7	22.7	22.7	#
	Panhandle Eastern Tuscola (IL0000221)	0.1	0.1	0.1	0.1	#
	Kraft Foods Global - Champaign (IL0004227)	2.2	2.2	2.2	2.2	#
	Village of Arthur (IL0021741)	9.5	3.8	3.8	3.8	#
	Village of Atwood (IL0025097)	3.8	1.5	1.5	1.5	#
	Urbana-Champaign SD SW STP (IL0031526)	130.6	60.4	60.4	60.4	#
	Village of Bement (IL0032549)	3.6	1.3	1.3	1.3	#
	Marathon Petroleum-Champaign (IL0062812)	0.1	0.1	0.1	0.1	#
	Commercial Flooring, Inc. (IL0067202)	0.1	0.1	0.1	0.1	#
	Village of Humboldt (ILG580051)	1.3	0.5	0.5	0.5	#
	MS4 - City of Champaign (ILR400313)	135.0	36.0	13.0	1.77	-
	MS4 - Champaign County (road authority) (ILR400256)	1.0	0.4	0.1	0.02	-
	MS4 - Champaign Township (ILR400026)	86.0	23.1	8.3	1.14	-
	MS4 - Village of Bondville (ILR400621)	4.0	1.0	0.4	0.05	-
	MS4 - Illinois Department of Transportation (road authority) (ILR400493)	2.0	0.5	0.2	0.02	-
	WLA TOTAL	471.7	153.7	114.7	95.7	0.0
Load Allocation	***LA TOTAL***	7,936.0	2,122.0	754.0	122.0	67.0
Margin of Safety (10%)		934.0	253.0	97.0	24.0	8.0
Loading Capacity		**9,341.7**	**2,528.7**	**965.7**	**241.7**	**75.0**
Estimated Load Reduction (%) - based on observed 90th percentile load in each flow regime *(See Table 34 of final TMDL document)*		--	5%	--	--	--

Becks Creek (IL_OQ-01)						
Wasteload Allocation	City of Pana (IL0022314)	23.7	8.9	8.9	8.9	#
	Oak Terrace Sanitary System Inc. (IL0066672)	2.7	0.7	0.7	0.7	#
	WLA TOTAL	26.4	9.6	9.6	9.6	0.0
Load Allocation	***LA TOTAL***	3,792.0	503.0	144.0	22.0	3.0
Margin of Safety (10%)		424.0	57.0	17.0	3.0	0.3
Loading Capacity		**4,242.4**	**569.6**	**170.6**	**34.6**	**3.3**
Estimated Load Reduction (%) - based on observed 90th percentile load in each flow regime *(See Table 38 of final TMDL document)*		82%	23%	80%	74%	92%
West Okaw River (IL_OT-02)						
Wasteload Allocation	Loving STP (IL0024210)	3.8	1.5	1.5	1.5	-
	Village of Hammond (IL0027197)	1.3	0.5	0.5	0.5	-
	WLA TOTAL	5.1	2.0	2.0	2.0	-
Load Allocation	***LA TOTAL***	2,464.0	573.0	216.0	15.0	-
Margin of Safety (10%)		274.0	64.0	24.0	2.0	-
Loading Capacity		**2,743.1**	**639.0**	**242.0**	**19.0**	**-**
Estimated Load Reduction (%) - based on observed 90th percentile load in each flow regime *(See Table 41 of final TMDL document)*		--	--	26%	--	--
Johnathon Creek (IL_OU-01)						
Wasteload Allocation	***WLA TOTAL***	0.0	0.0	0.0	0.0	0.0
Load Allocation	***LA TOTAL***	1,057.0	221.0	88.0	5.0	-
Margin of Safety (10%)		118.0	24.0	10.0	1.0	-
Loading Capacity		**1,175.0**	**245.0**	**98.0**	**6.0**	**-**
Estimated Load Reduction (%) - based on observed 90th percentile load in each flow regime *(See Table 44 of final TMDL document)*		--	--	64%	96%	--

= The permitted wastewater treatment facility average design flows exceed the long-term monitored stream flow in the low flow regime. NPDES permitted facilities can discharge under these flow conditions if meeting permit conditions. WLAs are expressed as an equation, WLA = (flow contribution from a given source) * (200 counts per 100 mL)

Table 6 of this Decision Document reports multiple points on the loading capacity curve. However, it should be understood that the components of the TMDL equation could be illustrated for any point on the entire loading capacity curve. The LDC method can be used to display collected bacteria monitoring data and allows for the estimation of load reductions necessary for attainment of the bacteria WQS. Using this method, daily loads were developed based upon the flow in the water body. Loading capacities were determined for the segment for multiple flow regimes. This allows the TMDL to be represented by an allowable daily load across all flow conditions. Table 6 of this Decision Document identifies the loading capacity for the water body at each flow regime. Although there are numeric loads for each flow regime, the actual LDC is what is being approved for this TMDL.

Table 6 of the Decision Document presents IEPA's loading reduction estimates for the bacteria TMDL. These loading reductions (i.e., the percent reduction row at the bottom of each TMDL table) were calculated based on the observed 90th percentile load in each flow regime. IEPA explained that its load reduction estimates are likely more conservative since they are based on a limited water quality data set.

EPA concurs with the data analysis and LDC approach utilized by IEPA in its calculation of loading capacities, wasteload allocations, load allocations and the margin of safety for the bacteria TMDLs of the UKRW. The methods used for determining the TMDL are consistent with U.S. EPA technical memos.[1]

The EPA finds that the TMDL document submitted by IEPA satisfies the requirements of the third criterion.

4. Load Allocations (LA)

EPA regulations require that a TMDL include LAs, which identify the portion of the loading capacity attributed to existing and future nonpoint sources and to natural background. Load allocations may range from reasonably accurate estimates to gross allotments (40 C.F.R. §130.2(g)). Where possible, load allocations should be described separately for natural background and nonpoint sources.

Comment:
IEPA determined the LA calculations for each of the TMDLs based on the applicable WQS. IEPA recognized that LAs for each of the individual TMDLs addressed by the UKRW TMDLs can be attributed to different nonpoint sources. The calculated LA values for the bacteria TMDLs are applicable across all flow conditions (Table 6 of this Decision Document). IEPA identified several nonpoint sources which contribute bacteria loads to the surface waters of the UKRW, including; non-regulated urban stormwater runoff, stormwater from agricultural and feedlot areas, failing septic systems and wildlife (deer, geese, ducks, raccoons, turkeys and other animals).

IEPA did not determine individual load allocation values for each of these potential nonpoint source considerations, but aggregated the nonpoint sources into a categorical LA value.

EPA finds IEPA's approach for calculating the LA to be reasonable and consistent with EPA guidance.

The EPA finds that the TMDL document submitted by IEPA satisfies the requirements of the fourth criterion.

5. Wasteload Allocations (WLAs)

EPA regulations require that a TMDL include WLAs, which identify the portion of the loading capacity allocated to individual existing and future point source(s) (40 C.F.R. §130.2(h), 40 C.F.R. §130.2(i)). In

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[1] U.S. Environmental Protection Agency. August 2007. *An Approach for Using Load Duration Curves in the Development of TMDLs*. Office of Water. EPA-841-B-07-006. Washington, D.C.

some cases, WLAs may cover more than one discharger, e.g., if the source is contained within a general permit.

The individual WLAs may take the form of uniform percentage reductions or individual mass based limitations for dischargers where it can be shown that this solution meets WQSs and does not result in localized impairments. These individual WLAs may be adjusted during the NPDES permitting process. If the WLAs are adjusted, the individual effluent limits for each permit issued to a discharger on the impaired water must be consistent with the assumptions and requirements of the adjusted WLAs in the TMDL. If the WLAs are not adjusted, effluent limits contained in the permit must be consistent with the individual WLAs specified in the TMDL. If a draft permit provides for a higher load for a discharger than the corresponding individual WLA in the TMDL, the State/Tribe must demonstrate that the total WLA in the TMDL will be achieved through reductions in the remaining individual WLAs and that localized impairments will not result. All permittees should be notified of any deviations from the initial individual WLAs contained in the TMDL. EPA does not require the establishment of a new TMDL to reflect these revised allocations as long as the total WLA, as expressed in the TMDL, remains the same or decreases, and there is no reallocation between the total WLA and the total LA.

Comment:

IEPA identified NPDES permitted facilities (Table 7 of this Decision Document) which contribute bacteria loads to the UKRW bacteria TMDLs (Table 6 of this Decision Document). Each facility's maximum design flow was used to calculate the WLA for the high flow regime of the LDC. The facility's average design flow was used to calculate the WLA for the moist, mid-range and dry flow regimes of the LDC (Table 6 of this Decision Document). WLA calculations were based on either the maximum design flow or the average design flow, multiplied by the fecal coliform WQS (200 cfu/100 mL). In a few instances the facility's design maximum flow was not reported by the facility and IEPA elected to use the facility's design average flow to calculate its WLA across all flow regimes of the LDC (see footnote 'a' in Table 7 of this Decision Document).

Table 7: NPDES facilities which contribute pollutant loading in the Upper Kaskaskia River Watershed TMDLs

Permit #	Facility Name	Impaired Reach	Fecal coliform load (billions of fecal coliform colonies/day)			
			High Flow Conditions on LDC		Moist to Low Flow Conditions on LDC	
			Design Max. Flow (MGD)	Geomean Standard	Design Average Flow (MGD)	Geomean Standard
			(MGD)	WLA	(MGD)	WLA
IL0000141	Equistar Chemicals LP - Tuscola	IL_O-02 & IL_O-15	12.2	92.4	3.0	22.7
IL0000221	Panhandle Eastern Tuscola		0.01254[a]	0.1	0.01254[a]	0.1
IL0004227	Kraft Foods Global - Champaign		0.289[a]	2.2	0.289[a]	2.2
IL0021741	Village of Arthur		1.3	9.5	0.5	3.8
IL0025097	Village of Atwood		0.5	3.8	0.2	1.5
IL0031526	Urbana-Champaign SD SW STP		17.3	130.6	8.0	60.4
IL0032549	Village of Bement		0.5	3.6	0.2	1.3

IL0062812	Marathon Petroleum-Champaign		0.0073[a]	0.1	0.0073[a]	0.1
IL0067202	Commercial Flooring, Inc.		0.008[a]	0.1	0.008[a]	0.1
ILG580051	Village of Humboldt		0.175	1.3	0.07	0.5
WLA TOTALS			**--**	**243.7**	**--**	**92.7**
IL0022314	City of Pana	IL_OQ-01	3.1	23.7	1.2	8.9
IL0066672	Oak Terrace Sanitary System Inc.		0.4	2.7	0.1	0.7
WLA TOTALS			**--**	**26.4**	**--**	**9.6**
IL0024210	Loving STP	IL_OT-02	0.5	3.8	0.2	1.5
IL0027197	Village of Hammond		0.2	1.3	0.1	0.5
WLA TOTALS			**--**	**5.1**	**--**	**2.0**

a = Design maximum flow not reported for this facility, IEPA used the facility's design average flow to calculate WLAs across all flow regimes of the LDC.

Five regulated MS4s (Tables 4 & 6 of this Decision Document) are in the UKRW and each received an individual WLA based on the area of the regulated MS4 community (Table 29 of the final TMDL document). The jurisdictional areas of townships and municipalities were used as surrogates for the regulated area of each MS4. These areas were then used to calculate WLAs based on the proportion of the upstream drainage area located within the MS4 boundaries by multiplying that proportional area by the loading capacity of the assessment location.

For the regulated road authorities (e.g., Champaign County and the Illinois Department of Transportation) the MS4 area was determined using the length of applicable roads and estimated right-of-way width. WLAs are not assigned to MS4s under low flow hydrologic conditions as these discharges are stormwater driven and it was assumed that stormwater was not contributing to stream flow under these conditions.

EPA finds IEPA's approach for calculating the WLA for the UKRW bacteria TMDLs to be reasonable and consistent with EPA guidance.

The EPA finds that the TMDL document submitted by IEPA satisfies the requirements of the fifth criterion.

6. Margin of Safety (MOS)

The statute and regulations require that a TMDL include a margin of safety (MOS) to account for any lack of knowledge concerning the relationship between load and wasteload allocations and water quality (CWA §303(d)(1)(C), 40 C.F.R. §130.7(c)(1)). EPA's 1991 TMDL Guidance explains that the MOS may be implicit, i.e., incorporated into the TMDL through conservative assumptions in the analysis, or explicit, i.e., expressed in the TMDL as loadings set aside for the MOS. If the MOS is implicit, the conservative assumptions in the analysis that account for the MOS must be described. If the MOS is explicit, the loading set aside for the MOS must be identified.

Comment:
The UKRW bacteria TMDLs incorporated an explicit Margin of Safety (MOS). The explicit MOS was applied by reserving approximately 10% of the total loading capacity, and then allocating the remaining loads to point (WLA) and nonpoint sources (LA) (Table 6 of this Decision Document). The use of the LDC approach minimized variability associated with the development of the UKRW TMDLs because the calculation of the loading capacity was a function of flow multiplied by the target value. The MOS was set at 10% to account for uncertainty due to field sampling error, basing assumptions on water quality monitoring with low sample sizes, and imperfect WQT. A 10% MOS was considered appropriate, because the target values used in this TMDL had a firm technical basis and the estimated flows are believed to be relatively accurate because they were estimated based on a USGS gage located with or just outside of the subwatershed with the impaired bacteria segments.

An additional conservative assumption which was applied to the bacteria TMDL development was that IEPA did not use a rate of decay, or die-off rate of pathogen species, in the TMDL calculations or in the creation of load duration curve for fecal coliform. Bacteria have a limited capability of surviving outside their hosts, and normally a rate of decay would be incorporated into the TMDL development process. IEPA determined that it was more conservative to use the WQS (200 cfu/100 mL) and not to apply a rate of decay, which could result in a discharge limit greater than the WQS.

As stated in *EPA's Protocol for Developing Pathogen TMDLs* (EPA 841-R-00-002), many different factors affect the survival of pathogens, including the physical condition of the water. These factors include, but are not limited to sunlight, temperature, salinity, and nutrient deficiencies. These factors vary depending on the environmental condition/circumstances of the water, and therefore it would be difficult to assert that the rate of decay caused by any given combination of these environmental variables was sufficient to meet the WQS of 200 cfu/100 mL. Thus, it is more conservative to apply the State's WQS as the water quality target for TMDL development, because this standard must be met at all times under all environmental conditions.

The EPA finds that the TMDL document submitted by IEPA contains an appropriate MOS satisfying the requirements of the sixth criterion.

7. Seasonal Variation

The statute and regulations require that a TMDL be established with consideration of seasonal variations. The TMDL must describe the method chosen for including seasonal variations. (CWA §303(d)(1)(C), 40 C.F.R. §130.7(c)(1)).

Comment:
The LDC process for bacteria TMDL efforts accounted for seasonal variation by utilizing streamflows over a wide range. For bacteria, runoff is the main transport mechanism which delivers pollutant loading into surface water environments. LDC graphs can provide insight toward understanding under which flow regimes/conditions exceedances of the WQS or water quality targets are occurring, and whether or not there is any seasonal flow component to those flow conditions (i.e., spring melt, summer precipitation events during lower flow periods, etc.)

Bacterial loads vary by season, typically reaching higher numbers in the dry summer months when low flows and bacterial growth rates contribute to their abundance, and reaching relatively lower values in colder months when bacterial growth rates attenuate and loading events, driven by stormwater runoff events aren't as frequent. Bacterial WQS need to be met between May 1st to October 31st, regardless of the flow condition. The development of the LDCs utilized estimated flow data from the nearby USGS gages (Table 27 of the final TMDL document). Flow data from the USGS gages represent a variety of flow conditions occurring in the recreation season. LDCs incorporated this flow information which was deemed representative of differing flow conditions and seasonal variability observed during the recreation season.

The EPA finds that the TMDL document submitted by IEPA satisfies the requirements of the seventh criterion.

8. Reasonable Assurance

When a TMDL is developed for waters impaired by point sources only, the issuance of a NPDES permit(s) provides the reasonable assurance that the wasteload allocations contained in the TMDL will be achieved. This is because 40 C.F.R. 122.44(d)(1)(vii)(B) requires that effluent limits in permits be consistent with, "the assumptions and requirements of any available wasteload allocation" in an approved TMDL.

When a TMDL is developed for waters impaired by both point and nonpoint sources, and the WLA is based on an assumption that nonpoint source load reductions will occur, EPA's 1991 TMDL Guidance states that the TMDL should provide reasonable assurances that nonpoint source control measures will achieve expected load reductions in order for the TMDL to be approvable. This information is necessary for EPA to determine that the TMDL, including the load and wasteload allocations, has been established at a level necessary to implement water quality standards.

EPA's August 1997 TMDL Guidance also directs Regions to work with States to achieve TMDL load allocations in waters impaired only by nonpoint sources. However, EPA cannot disapprove a TMDL for nonpoint source-only impaired waters, which do not have a demonstration of reasonable assurance that LAs will be achieved, because such a showing is not required by current regulations.

Comment:

The UKRW bacteria TMDLs provide reasonable assurance that actions identified in the implementation section of the final TMDL (i.e., Section 10 of the final TMDL document), will be applied to attain the loading capacities and allocations calculated for the impaired reaches within the UKRW. Discussions in Section 10 of the final TMDL document describe suggested BMPs and potential funding opportunities which could be employed to address implementation efforts in the identified impaired segments of Table 1 of this Decision Document. The recommendations made by IEPA will be successful at improving water quality if the appropriate local groups, such as Kaskaskia Watershed Association (KWA), work to implement these recommendations. IEPA developed a robust list of potential partners in implementation efforts in Section 10.5.3 of the final TMDL document and their participation would have significant benefits toward improving water quality in the UKRW.

Implementation practices will be implemented over the next several years. The following groups are expected to work closely with one another to ensure that pollutant reduction efforts via BMPs are being implemented within the UKRW: the KWA, Upper Kaskaskia Ecoregion Partnership (UKEP), Heartlands Conservatory, Lake Shelbyville Development Association, local county Soil and Water Conservation Districts (SWCD) (e.g., Douglas County SWCD), Illinois Farm Bureau, county level health departments, etc. Those mitigation suggestions, which fall outside of regulatory authority, will require commitment from state agencies and local stakeholders to carry out the suggested actions.

The UKRW TMDL submittal contains a detailed implementation discussion which was developed to meet EPA's required *Nine Minimum Elements* of a watershed management plan (i.e., the Nine Element Plan). The final TMDL document contains a greater level of detail related to the discussions of reasonable assurance and implementation efforts than a typical TMDL submittal from IEPA. The UKRW TMDL document integrated nonpoint source implementation efforts with TMDL efforts to create a hybrid TMDL/NPS deliverable. EPA has determined that the UKRW Nine Element Watershed Implementation Plan is consistent with EPA's Nine Key Elements for Watershed Based Plans and therefore, eligible for CWA Section 319 funding.

Reasonable assurance that the WLA set forth will be implemented is provided by regulatory actions. According to 40 CFR 122.44(d)(1)(vii)(B), NPDES permit effluent limits must be consistent with assumptions and requirements of all WLAs in an approved TMDL. IEPA's NPDES permit program is one of the implementing programs for ensuring WLA are consistent with the TMDL. Current NPDES permits will remain in effect until the permits are reissued, provided that IEPA receives the NPDES permit renewal application prior to the expiration date of the existing NPDES permit.

Reasonable assurances that nonpoint source reductions will be achieved for bacteria (*E. coli*) are described in Section 10 of the TMDL. The UKRW TMDL implementation efforts will be achieved through federal, state and local action. Federal funding, via the Section 319 grants program, can provide money to implement voluntary nonpoint source programs within the UKRW.

Section 10 of the TMDL discusses various BMPs that, when implemented in identified critical areas will reduce bacteria inputs to surface waters of the UKRW. In Table 64 of Section 10.5.1 of the final TMDL document, IEPA lists site-specific BMP costs and the expected return of pollutant removed via those BMPs (e.g., pound of pollutant removed). Section 10.5.2 of the final TMDL document describes financial programming which may assist with funding implementation activities in the UKRW. These programs include USDA-NRCS Environmental Quality Incentives Program (EQIP), USDA-NRCS Conservation Stewardship Program (CSP), USDA-NRCS Agricultural Conservation Easement Program (ACEP), USDA-NRCS Conservation Reserve Program (CRP), the Conservation Reserve Enhancement Program (CREP) and other programs at the state level. Table 67 of the TMDL provides an estimated implementation schedule of actions and activities in the watershed that can reduce bacteria loads into water bodies in the UKRW. These actions address immediate (1-4 years), mid-term (5-10 years) and long-term (continuous) timeframes.

IEPA has also developed Load Reduction Strategies (LRS) for various pollutants in the watershed. These LRSs address impairments where numeric criteria have not been developed (e.g., total phosphorus and sedimentation/siltation). Although these are not TMDLs, the LRS discuss sources and reductions needed for the various pollutants which impact overall water quality in the

UKRW. IEPA has concluded that reducing these pollutants will improve water quality in UKRW and assist in implementing BMPs in the watershed.

The EPA finds that this criterion has been adequately addressed.

9. Monitoring Plan to Track TMDL Effectiveness

EPA's 1991 document, *Guidance for Water Quality-Based Decisions: The TMDL Process* (EPA 440/4-91-001), recommends a monitoring plan to track the effectiveness of a TMDL, particularly when a TMDL involves both point and nonpoint sources, and the WLA is based on an assumption that nonpoint source load reductions will occur. Such a TMDL should provide assurances that nonpoint source controls will achieve expected load reductions and, such TMDL should include a monitoring plan that describes the additional data to be collected to determine if the load reductions provided for in the TMDL are occurring and leading to attainment of water quality standards.

Comment:

Section 10.9 of the final TMDL document contains discussion on future monitoring within the UKRW and milestones (Section 10.8 of the final TMDL document). Continued water quality monitoring within the basin is supported by IEPA. Additional water quality monitoring results could provide insight into the success or failure of BMP systems designed to reduce bacteria loading into the surface waters of the watershed. Local watershed managers would be able to reflect on the progress of the various pollutant removal strategies and would have the opportunity to change course if observed progress is unsatisfactory.

Progress of TMDL implementation will be measured through monitoring efforts focused on:

- Tracking implementation of BMPs in the watershed;
- Estimating the effectiveness of BMPs;
- Additional monitoring of point source discharges in the watershed;
- Continued monitoring of impaired stream segments and tributaries;
- Monitoring storm-based high flow events; and
- Low flow monitoring in impaired stream segments.

IEPA anticipates continuing its ambient water quality monitoring in the UKRW. The state conducts routine water quality monitoring (i.e., physical, chemical and biological parameters) on a rotating watershed basis. In addition to state efforts U.S. Army Corps of Engineers (USACE), U.S. Geological Survey (USGS) and various wastewater treatment facilities are expected to continue their monitoring efforts in the UKRW. Continuation of IEPA water quality monitoring efforts and coordinating data sharing with other entities in the UKRW (e.g., USACE and USGS) will provide water quality information for IEPA and local watershed managers to evaluate whether nor not water quality is improving in the UKRW over time.

Water quality monitoring is a critical component of the adaptive management strategy employed as part of the implementation efforts utilized in the UKRW. Water quality information will aid watershed managers in understanding how BMP pollutant removal efforts are impacting water quality.

The EPA finds that this criterion has been adequately addressed.

10. Implementation

EPA policy encourages Regions to work in partnership with States/Tribes to achieve nonpoint source load allocations established for 303(d)-listed waters impaired by nonpoint sources. Regions may assist States/Tribes in developing implementation plans that include reasonable assurances that nonpoint source LAs established in TMDLs for waters impaired solely or primarily by nonpoint sources will in fact be achieved. In addition, EPA policy recognizes that other relevant watershed management processes may be used in the TMDL process. EPA is not required to and does not approve TMDL implementation plans.

Comment:
IEPA outlined its approach to addressing point and nonpoint source pollution with the TMDL and Implementation Plan (Section 10 of the final TMDL document) for the UKRW. The findings from the UKRW TMDLs will be used to inform the selection of implementation activities in the watershed. The TMDL outlined some implementation strategies in Section 10 of the final TMDL document. IEPA outlined the importance of prioritizing areas within the UKRW, education and outreach efforts with local partners, and partnering with local stakeholders to improve water quality within the watershed. The potential BMPs which, if installed and maintained in identified critical areas, would likely result in decreases in bacteria to surface waters of the UKRW are:

- ***Filter strips and riparian buffers***– Can filter storm event runoff from cropland via vegetation which enhances infiltration and traps pollutant loads from overland flow.
- ***Exclusion fencing*** – Reducing livestock access to stream environments will lower the opportunity for direct transport of bacteria to surface waters. The installation of exclusion fencing near stream and river environments prevent direct access for livestock.
- ***Feedlot BMPs*** - installing alternative water supplies, and installing stream crossings between pastures, would work to reduce the influxes of bacteria and improve water quality within the watershed.
- ***Private septic system inspection and maintenance program*** - Septic systems are believed to be a source of bacteria to waters in the UKRW. Failing systems are expected to be identified and addressed via upgrades to those septic systems not meeting local health ordinances. Septic system improvement priority should be given to those failing systems adjacent to surface waters (i.e., streams or lakes).
- ***Pasture management*** - Introducing rotational grazing to increase grass coverage in pastures, and maintaining appropriate numbers of livestock per acre for grazing, can also aid in the reduction of bacteria inputs.
- ***Agricultural stormwater BMPs –*** Conservation tillage and or cover crop usage will slow overland flow during storm events.
- ***Education and Outreach Efforts -*** Increased education and outreach efforts to the general public bring greater awareness to the issues surrounding bacteria contamination, and strategies for reducing loading and transport of these pollutants should be prioritized as part of the overall implementation strategy.

EPA's TMDL and Nonpoint Source programs jointly reviewed draft versions of the UKRW TMDL document to ascertain whether those draft documents met the requirements of the TMDL program and were consistent with EPA's Nine Key Elements for Watershed Based Plans. EPA TMDL and NPS staff presented comments to IEPA regarding the scale and scope of information presented in Section 10 of earlier versions of the TMDL document and requested that IEPA update certain discussions within Section 10 with relevant critical area information. IEPA's implementation discussion in Section 10 of the final TMDL is consistent with EPA's Nine Key Elements for Watershed Based Plans and therefore, eligible for CWA Section 319 funding.

The EPA finds that this criterion has been adequately addressed.

11. Public Participation

EPA policy is that there should be full and meaningful public participation in the TMDL development process. The TMDL regulations require that each State/Tribe must subject calculations to establish TMDLs to public review consistent with its own continuing planning process (40 C.F.R. §130.7(c)(1)(ii)). In guidance, EPA has explained that final TMDLs submitted to EPA for review and approval should describe the State's/Tribe's public participation process, including a summary of significant comments and the State's/Tribe's responses to those comments. When EPA establishes a TMDL, EPA regulations require EPA to publish a notice seeking public comment (40 C.F.R. §130.7(d)(2)).

Provision of inadequate public participation may be a basis for disapproving a TMDL. If EPA determines that a State/Tribe has not provided adequate public participation, EPA may defer its approval action until adequate public participation has been provided for, either by the State/Tribe or by EPA.

Comment:

The public participation section of the TMDL submittal is found in Section 9 of the final TMDL document. Throughout the development of the UKRW TMDLs the public was given various opportunities to participate. An initial public meeting was held in at the University of Illinois Extension building in Arthur, Illinois in October of 2016, where IEPA described the watershed plan and TMDL process. The public comment period for the draft TMDL opened on June 25, 2018 and closed on July 25, 2018. IEPA posted the draft TMDL online at (http://epa.illinois.gov/Assets/iepa/water-quality/watershed-management/tmdls/reports/upper-kaskaskia/draft-stage-3-report.pdf) for the public comment period. IEPA held a public meeting on June 25, 2018 in Arthur, IL to present its public notice TMDL draft and discuss its findings.

IEPA received public comments during the public comment period and those comments and IEPA's responses to those comments are presented in Appendix D – Responsiveness Summary of the final TMDL report. Some of the comments requested clarification on BMP recommendations outlined in IEPA's draft TMDL report. IEPA provided responses to these comments and adjusted its TMDL document accordingly. Other comments acknowledged local implementation efforts currently underway and linked those efforts to recommendations made in the TMDL document. IEPA was supportive of existing implementation efforts, especially those which address bacteria inputs.

EPA reviewed the comments and responses, and has determined that IEPA responded appropriately to the comments. IEPA submitted all comments received during the public notice period and its response summary with the final TMDL submittal packet received by the EPA on August 30, 2018.

The EPA finds that the TMDL document submitted by IEPA satisfies the requirements of this eleventh element.

12. Submittal Letter

A submittal letter should be included with the TMDL submittal, and should specify whether the TMDL is being submitted for a *technical review* or *final review and approval*. Each final TMDL submitted to EPA should be accompanied by a submittal letter that explicitly states that the submittal is a final TMDL submitted under Section 303(d) of the Clean Water Act for EPA review and approval. This clearly establishes the State's/Tribe's intent to submit, and EPA's duty to review, the TMDL under the statute. The submittal letter, whether for technical review or final review and approval, should contain such identifying information as the name and location of the water body, and the pollutant(s) of concern.

Comment:

The EPA received the final Upper Kaskaskia River watershed TMDL document, submittal letter and accompanying documentation from IEPA on August 30, 2018. The submittal letter explicitly stated that the final TMDLs referenced in Table 1 of this Decision Document were being submitted to EPA pursuant to Section 303(d) of the Clean Water Act for EPA review and approval. The submittal letter also included the name and location of the water bodies and the causes/pollutants of concern. This TMDL was submitted per the requirements under Section 303(d) of the Clean Water Act and 40 CFR 130.

The EPA finds that the TMDL transmittal letter submitted for the Upper Kaskaskia River watershed TMDLs by IEPA satisfies the requirements of this twelfth element.

13. Conclusion

After a full and complete review, the EPA finds that the five (5) bacteria TMDLs satisfy all elements of approvable TMDLs. This TMDL approval is for **5 TMDLs**, addressing segments for primary contact recreation use impairments (Table 1 of this Decision Document).

The EPA's approval of these TMDLs extends to the water bodies which are identified above with the exception of any portions of the water bodies that are within Indian Country, as defined in 18 U.S.C. Section 1151. The EPA is taking no action to approve or disapprove TMDLs for those waters at this time. The EPA, or eligible Indian Tribes, as appropriate, will retain responsibilities under the CWA Section 303(d) for those waters.

Upper Kaskaskia River Watershed Total Maximum Daily Load and Load Reduction Strategies

Final Report

1021 North Grand Avenue East
P.O. Box 19276
Springfield, Illinois 62794-9276

Report prepared by:

TETRA TECH

With assistance from:

Prairie Engineers
OF ILLINOIS, P.C.

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Contents

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Acronyms and Abbreviations

AFOs	animal feeding operations
AUID	assessment unit identification
AWQMN	Ambient Water Quality Monitoring Network
BMP	best management practice
BST	bacterial source tracking
CAFO	confined animal feeding operation
CFR	Code of Federal Regulation
CFU	colony forming units
CWA	Clean Water Act
DAF	average design flow
DMF	maximum design flow
fIBI	fish Index of Biological Integrity
GLO	General Land Office
HSG	hydrologic soil group
HUC	hydrologic unit code
IEPA	Illinois Environmental Protection Agency
IPCB	Illinois Pollution Control Board
ISGS	Illinois State Geological Survey
LA	load allocation
LID	low impact development
LRS	load reduction strategy
MGD	millions of gallons per day
mIBI	macroinvertebrate index of biological integrity
ml	milliliter
MOS	margin of safety
MS4	municipal separate storm sewer system
N/A	not applicable
NLCD	National Land Cover Database
NLRS	Nutrient Loss Reduction Strategy
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Service
NWIS	National Water Information System
STEPL	Spreadsheet Tool for the Estimation of Pollutant Load
STP	sewage treatment plant
SWCD	Soil and Water Conservation District
TMDL	total maximum daily load
TSS	total suspended solids
U.S. ACE	United States Army Corps of Engineers
U.S. EPA	United States Environmental Protection Agency
USGS	United States Geological Survey
WLA	wasteload allocation
WQS	water quality standards
WWTP	wastewater treatment plant

Executive Summary

The Clean Water Act and U.S. Environmental Protection Agency (EPA) regulations require that Total Maximum Daily Loads (TMDLs) be developed for waters that do not support their designated uses. In simple terms, a TMDL is a plan to attain and maintain water quality standards in waters that are not currently meeting them. In addition to TMDL development, load reduction strategies (LRS) are included to address additional pollutants in the watershed that do not have water quality standards, namely sediment.

This TMDL and LRS study addresses the approximately 1,568 square miles Upper Kaskaskia River watershed located in central Illinois. Nine stream segments within the watershed have been placed on the State of Illinois §303(d) list; eight of these segments were verified as impaired as part of this study. Many of the impaired waters are upstream of Shelbyville Lake, a large reservoir along the mainstem of the Kaskaskia River.

The sources of pollutants in the watershed include NPDES permitted facilities such as wastewater treatment facilities and regulated stormwater. In addition, nonpoint pollution resulting from several key sources including stormwater runoff, erosion from fields and streambanks, onsite wastewater treatment systems, animal feeding operations, and livestock populations.

A TMDL or LRS identifies the total allowable load that a waterbody can assimilate (the loading capacity) and still meet water quality standards or targets. The loading capacity for each stream is determined using a load duration curve framework. TMDLs and LRSs are presented in Section 8. A TMDL is equal to the loading capacity for a waterbody, and that loading capacity is distributed among load allocations to nonpoint and background sources and wasteload allocations to point sources. The required pollutant reductions vary between zero and 96 percent, depending on the waterbody and pollutant.

An implementation plan is provided in Section 10 which includes potential implementation activities to address sources of pollutants. This plan, when combined with the entire TMDL/LRS study, is provided to meet U.S. EPA’s Nine Minimum Elements for Clean Water Act section 319 funding requirements and includes an analysis of critical areas, extent of needed implementation, schedule, milestones, partners, and estimated costs.

The State of Illinois uses a three-stage approach to develop TMDLs and LRSs for a watershed:

Stage 1 – Watershed characterization, historical dataset evaluation, data analysis, methodology selection, data gap identification
Stage 2 – Data collection to fill in data gaps, if necessary
Stage 3 – Model calibration, TMDL scenarios, and implementation plan

This final report represents a compilation of Stage 1, 2, and 3.

1. Introduction

The Clean Water Act and U.S. Environmental Protection Agency (U.S. EPA) regulations require that Total Maximum Daily Loads (TMDLs) be developed for waters that do not support their designated uses. In simple terms, a TMDL is a plan to attain and maintain water quality standards in waters that are not currently meeting them. In addition to TMDL development, load reduction strategies (LRS) are included to address additional pollutants in the watershed that do not have water quality standards, namely nutrients and sediment in streams. This TMDL and LRS study addresses the approximately 1,568 square miles Upper Kaskaskia River watershed located in central Illinois. Several waters within the Upper Kaskaskia River watershed area have been placed on the State of Illinois 303(d) list, and require the development of a TMDL or LRS.

1.1 TMDL Development Process

The TMDL process establishes the allowable loading of pollutants or other quantifiable parameters for a water body based on the relationship between pollution sources and instream conditions. This allowable loading represents the maximum quantity of the pollutant that the waterbody can receive without exceeding water quality standards. The TMDL also takes into account a margin of safety, which reflects scientific uncertainty, as well as the effects of seasonal variation. By following the TMDL process, States can establish water quality-based controls to reduce pollution from both point and nonpoint sources, and restore and maintain the quality of their water resources (U.S. EPA 1991).

The Illinois Environmental Protection Agency (IEPA) will be working with stakeholders to implement the necessary controls to improve water quality in the impaired waterbodies and meet water quality standards. It should be noted that the controls for nonpoint sources (e.g., agriculture) will be strictly voluntary.

1.2 Water Quality Impairments

Several waters within the Upper Kaskaskia River watershed have been placed on the State of Illinois §303(d) list (Table 1, Figure 1, and Figure 2). This project is intended to address documented water quality problems in the Upper Kaskaskia River watershed. TMDLs and LRSs are not developed for the West Okaw River (OT-04) or for pH in Asa Creek. Additional details on these segments and the rationale for not being included in this study can be found in Section 5 and 7.

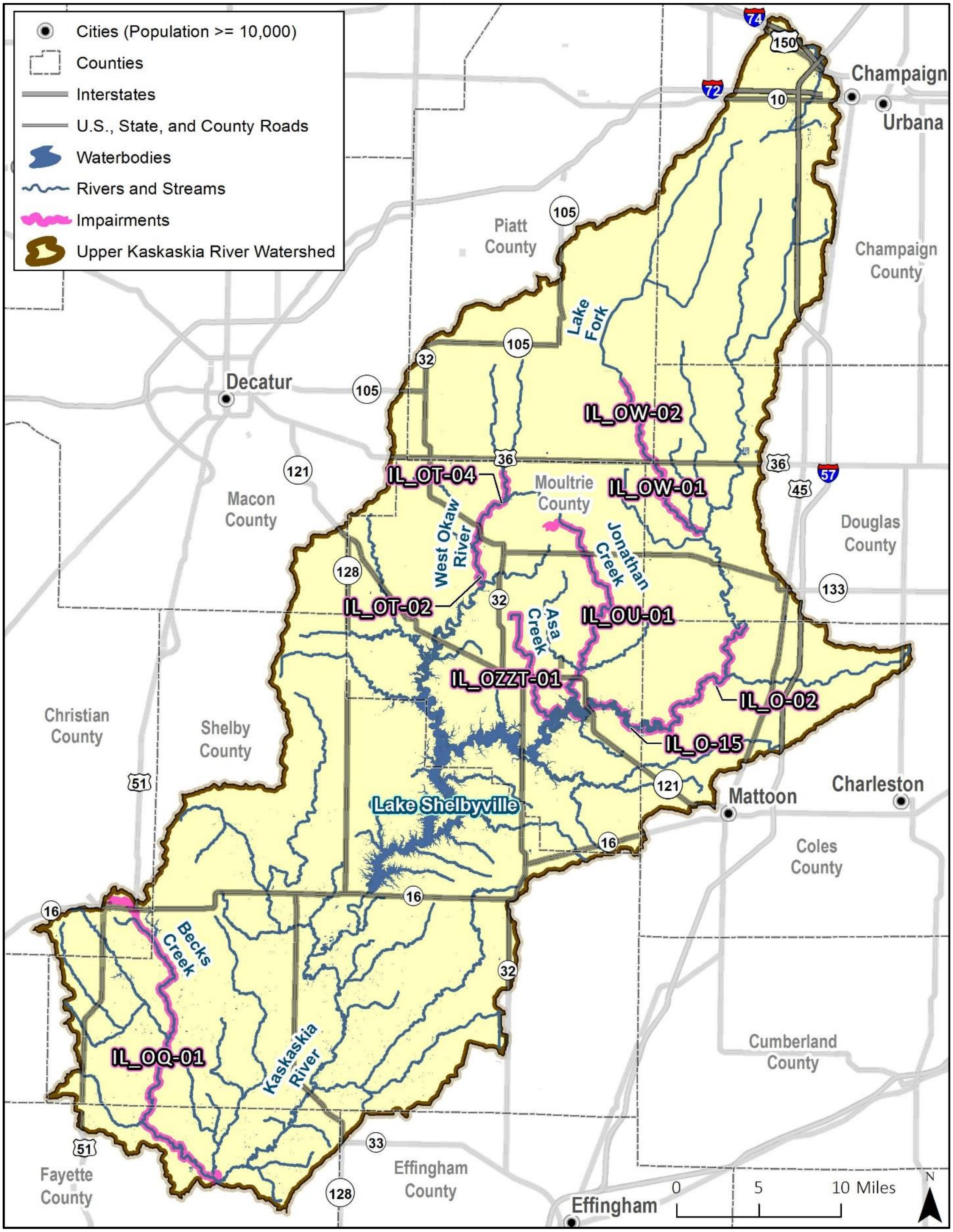


Figure 1. Upper Kaskaskia River watershed, TMDL/LRS project area.

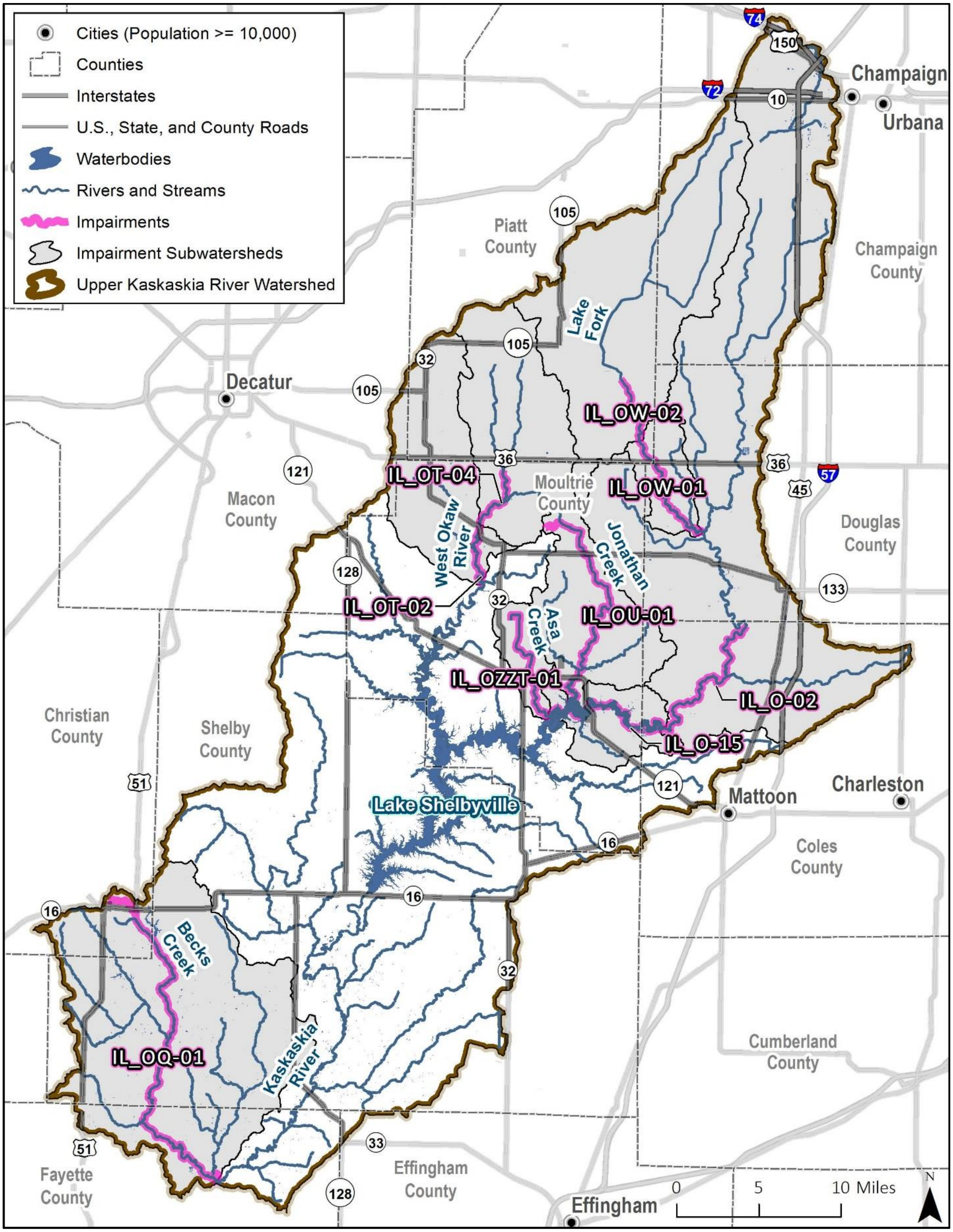


Figure 2. Upper Kaskaskia River watershed, TMDL/LRS impairment subwatersheds.

Table 1. Upper Kaskaskia River watershed impairments and pollutants (2014 Illinois 303(d) Draft List)

Name	Segment ID	Segment Length (Miles)	Watershed Area (Sq. Miles)	Designated Uses	TMDL Parameters	LRS Parameters
Kaskaskia River	IL_O-02	13.53	491	Primary contact recreation	**Fecal coliform**	-
Kaskaskia River	IL_O-15	13.85	519	Primary contact recreation	**Fecal Coliform**	-
Becks Creek	IL_OQ-01	29.8	204	Primary contact recreation	**Fecal Coliform**	--
West Okaw River	IL_OT-02	5.39	142	Primary contact recreation	**Fecal Coliform**	--
West Okaw River	IL_OT-04	5.07	76	Aquatic life	*Dissolved Oxygen, pH*	*Total Phosphorus*
Jonathon Creek	IL_OU-01	19.25	58	Primary contact recreation	**Fecal Coliform**	--
Lake Fork	IL_OW-01	9.72	171	Aquatic life	--	**Sedimentation/Siltation**
Lake Fork	IL_OW-02	4.91	150	Aquatic life	--	**Sedimentation/Siltation**
Asa Creek	IL_OZZT-01	9.22	15	Aquatic life	*pH*	**Sedimentation/Siltation**

Italics – No TMDL/LRS provided. The West Okaw River (OT-04) impairments are expected to be delisted as described in Section 5.3.1. pH in Asa Creek was determined to meet water quality standards (see Section 5).
BOLD – TMDLs (for fecal coliform impairments) and LRSs (from sedimentation/siltation impairments) are provided in Section 7.

2. Watershed Characterization

The Upper Kaskaskia River watershed is located in central Illinois (Figure 1 and Figure 2). The headwaters for the watershed begin near Champaign, IL. The Upper Kaskaskia River then flows through Shelbyville Lake in the central portion of the watershed and Becks Creek joins the river at the southern end of the watershed. Downstream of the watershed, the Kaskaskia River flows through Carlyle Lake and eventually joins the Mississippi River south of St. Louis, Missouri. The watershed covers nearly 1,568 square miles; major tributaries along this stretch of the river include the Lake Fork of Kaskaskia River, Johnathon Creek, Asa Creek, Whitley Creek, West Okaw River, Robinson Creek, Richland Creek and Becks Creek.

The U.S. Army Corps of Engineers (USACE) is conducting a Feasibility Study that will result in a comprehensive watershed plan that will help to restore, preserve, and protect the Kaskaskia River basin. The comprehensive plan will address improving water quality within the basin, amongst other priorities. This plan is anticipated to be completed in 2018.

2.1 Jurisdictions and Population

Counties with land located in the watershed area include Champaign, Christian, Coles, Douglas, Effingham, Fayette, Macon, Moultrie, Piatt and Shelby. A portion of the city of Champaign is located in the headwaters of the watershed and the city itself accounts for approximately half of the population of Champaign County. Champaign is the only major government unit with jurisdiction in the Upper Kaskaskia River watershed area. Populations are area weighted to the watershed in Table 2. The Champaign County population numbers were adjusted to only account for the portion of the city of Champaign in the watershed.

Table 2. Area weighted county populations within project area

County	2000	2010	Percent Change
Champaign	25,008	27,533	10%
Christian	905	890	-2%
Coles	12,632	12,793	1%
Douglas	5,767	5,783	0%
Effingham	179	178	0%
Fayette	1,879	1,908	2%
Macon	4,051	3,912	-3%
Moultrie	14,286	14,845	4%
Piatt	6,071	6,206	2%
Shelby	15,933	15,564	-2%
TOTAL	***86,710***	***89,613***	***3%***

Source: U.S. Census Bureau

2.2 Climate

Climate data are available from the National Oceanic and Atmospheric Administration (NOAA) Global Historical Climatology Network Database; Station USC00117876 is located at Shelbyville Dam, IL in the central portion of the watershed. Monthly data from 1941-2014 for precipitation and snowfall and 1973-2014 for temperature are summarized in Table 3. In general, the climate of the region is continental with hot, humid summers and cold winters. The average high winter temperature was 38.1 °F and the average high summer temperature was 85.2 °F. The annual average precipitation at Shelbyville Dam was approximately 38 inches, including approximately 10 inches of snowfall. In general, larger volumes of precipitation tend to occur between the months of April and September.

Table 3. Climate summary for Shelbyville Dam (1941-2014)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Average High ºF	35	40	51	64	75	83	86	86	81	67	53	39
Average Low ºF	18	22	32	43	54	63	66	65	57	44	34	23
Mean Temperature ºF	27	31	41	54	64	73	76	76	69	55	43	31
Average Precipitation (in)	2.0	2.4	2.7	3.3	4.3	4.4	3.6	2.9	2.9	3.4	3.4	2.7
Average snowfall (in)	2.9	2.9	1.8	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.2	2.1

Source: NOAA Global Historical Climatology Network Database

2.3 Land Use and Land Cover

Land use in the watershed is heavily influenced by agriculture (Figure 3). There is a small amount of urban area surrounding Champaign and other small towns in the watershed. Land use within the watershed includes agriculture – cultivated crops and pasture/hay (approximately 80 percent), forest (approximately 10 percent), and urban (approximately 8 percent). Corn and soybeans are the most common crops, although wheat is also farmed in Shelby and Fayette counties. Table 4 presents area and percent by land cover type as provided in the 2011 National Land Cover Database (NLRC 2015). Table 5 summarizes land covers that are contributing to each of the impaired segments.

Table 4. Watershed land use summary

Land Use / Land Cover Category	Acres	Percentage
Cultivated Crops	747,974	74.5%
Deciduous Forest	100,864	10.0%
Hay/Pasture	57,469	5.7%
Developed, Open Space	40,779	4.1%
Developed, Low Intensity	31,399	3.1%
Open Water	13,357	1.3%
Developed, Medium Intensity	4,940	0.5%
Woody Wetlands	3,289	0.3%
Herbaceous	1,775	0.2%
Developed, High Intensity	1,446	0.1%
Emergent Herbaceous Wetlands	118	<0.1%
Barren Land	113	<0.1%
Evergreen Forest	107	<0.1%
Shrub/Scrub	1	<0.1%
Total	**1,003,631**	**100.0%**

Source: 2011 National Land Cover Database

Table 5. Land use by impaired segment

Watershed	Segment	Watershed Area (square miles)	Cultivated Crops	Pasture /Hay	Developed	Forest	Grassland/ Herbaceous/ Shrub/Scrub	Barren Land	Wetlands and Water
			%						
Kaskaskia River	IL_O-02	491	91.4	1.2	6.1	1.2	0	0	0.1
Kaskaskia River	IL_O-15	519	85.1	2.7	9.5	2	0.1	0	0.6
Becks Creek	IL_OQ-01	204	51.7	15.9	7.7	23.7	0.3	0	0.7
West Okaw River	IL_OT-02	142	91.4	1.2	6.1	1.2	0	0	0.1
West Okaw River [a]	IL_OT-04	76	92.8	1	5.6	0.5	0	0	0.1
Jonathon Creek	IL_OU-01	58	87.8	4.5	5.3	2.1	0.1	0	0.2
Lake Fork	IL_OW-01	171	92	1	6.1	0.6	0	0	0.3
Lake Fork	IL_OW-02	150	93.5	0.5	5.7	0.2	0	0	0.1
Asa Creek	IL_OZZT-01	15	76.5	1.6	20.4	1.3	0.2	0	0

Source: 2011 National Land Cover Database

a. No TMDLs developed for OT-04, see Section 5.3.1.

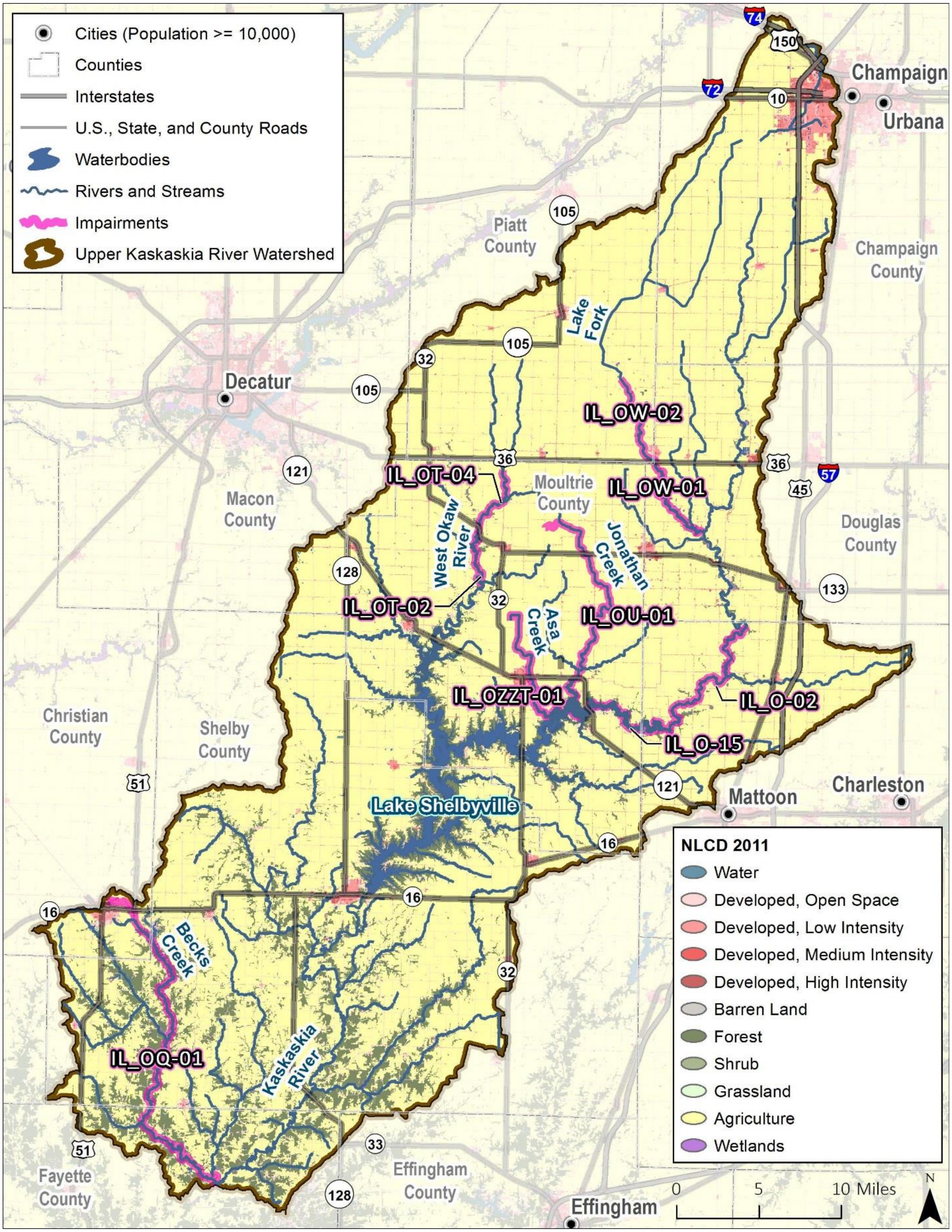


Figure 3. Upper Kaskaskia River watershed land cover (2011 National Land Cover Database).

2.4 Topography

Topography is an important factor in watershed management because stream types, precipitation, and soil types can vary dramatically by slope and elevation. The Upper Kaskaskia River watershed varies in elevation from 486 to 857 feet (Figure 4). The Upper Kaskaskia River water elevation varies from 810 feet to 600 feet and is 75 miles long upstream of Shelbyville Lake and water elevation varies from 560 feet to 498 feet and is 39 miles long downstream of Shelbyville Lake, resulting in an upper watershed stream gradient of 2.8 feet per mile and lower watershed stream gradient of 1.6 feet per mile.

2.5 Soils

The National Cooperative Soil Survey publishes soil surveys for each county within the U.S. These soil surveys contain predictions of soil behavior for selected land uses. The surveys also highlight limitations and hazards inherent in the soil, general improvements needed to overcome the limitations, and the impact of selected land uses on the environment. The soil surveys are designed for many different uses, including land use planning, the identification of special practices needed to ensure proper performance, and mapping of hydrologic soil groups (HSGs).

HSGs refer to the grouping of soils according to their runoff potential. Soil properties that influence the HSGs include depth to seasonal high water table, infiltration rate and permeability after prolonged wetting, and depth to a slower permeable layer (e.g., finer grained). There are four groups of HSGs: Group A, B, C, and Group D. Table 6 describes those HSGs found in the Upper Kaskaskia River project area. Figure 5 and Table 7 summarizes the composition of HSGs per watershed. Soils are predominantly B and B/D in the upper part of the watershed and transition to C and D type soils below Shelbyville Lake. The high proportion of B/D type soils coupled with agricultural land uses indicate the likelihood of tile drainage.

Table 6. Hydrologic soil group descriptions

HSG	Group Description
A	Sand, loamy sand or sandy loam types of soils. Low runoff potential and high infiltration rates even when thoroughly wetted. Consist chiefly of deep, well to excessively drained sands or gravels with a high rate of water transmission.
B	Silt loam or loam. Moderate infiltration rates when thoroughly wetted. Consist chiefly or moderately deep to deep, moderately well to well drained soils with moderately fine to moderately coarse textures.
C	Soils are sandy clay loam. Low infiltration rates when thoroughly wetted. Consist chiefly of soils with a layer that impedes downward movement of water and soils with moderately fine to fine structure.
D	Soils are clay loam, silty clay loam, sandy clay, silty clay or clay. Group D has the highest runoff potential. Low infiltration rates when thoroughly wetted. Consist chiefly of clay soils with a high swelling potential, soils with a permanent high water table, soils with a claypan or clay layer at or near the surface and shallow soils over nearly impervious material.
A-C/D	Dual Hydrologic Soil Groups. Certain wet soils are placed in group D based solely on the presence of a water table within 24 inches of the surface even though the saturated hydraulic conductivity may be favorable for water transmission. If these soils can be adequately drained, then they are assigned to dual hydrologic soil groups (A/D, B/D, and C/D) based on their saturated hydraulic conductivity and the water table depth when drained. The first letter applies to the drained condition and the second to the undrained condition.

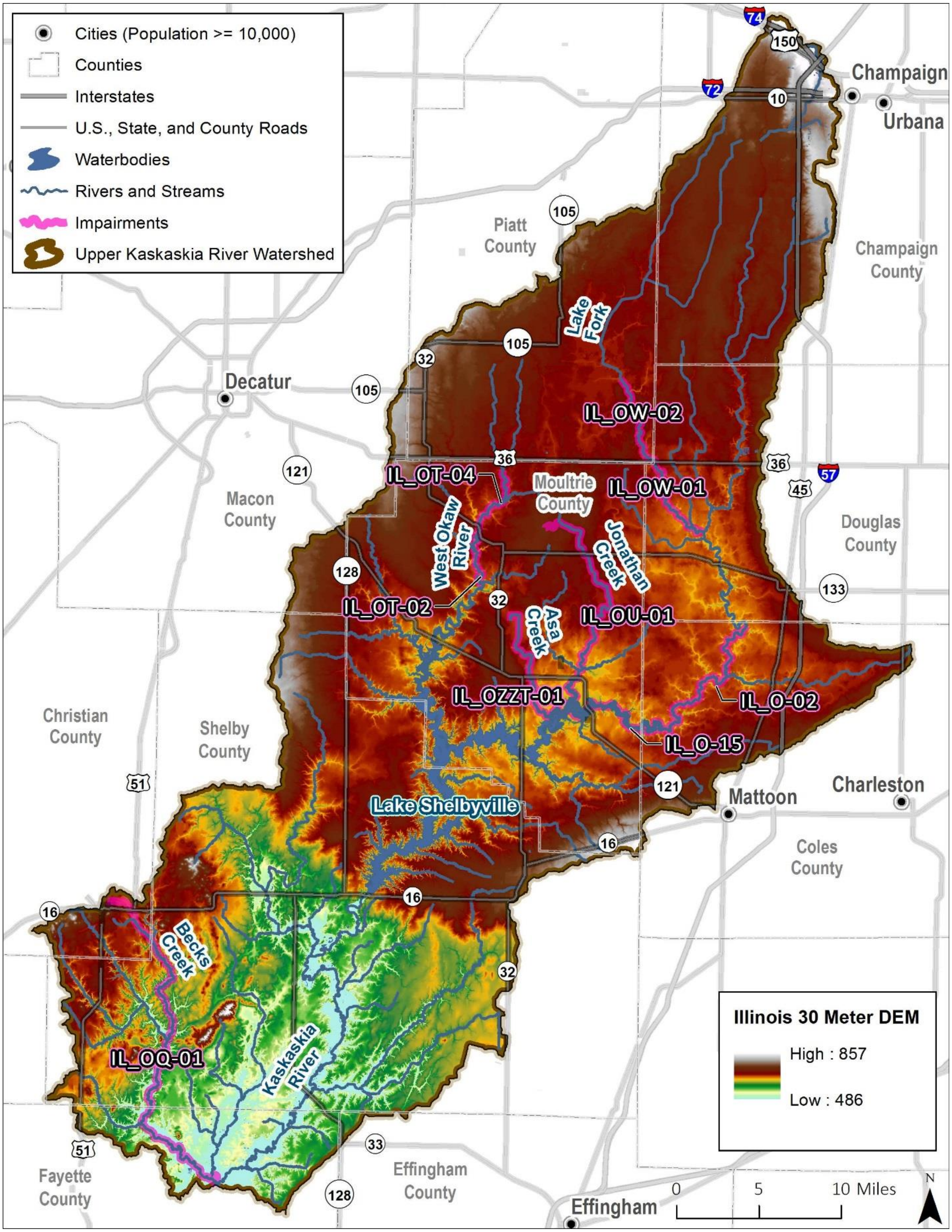


Figure 4. Upper Kaskaskia River watershed land elevations (ISGS 2003).

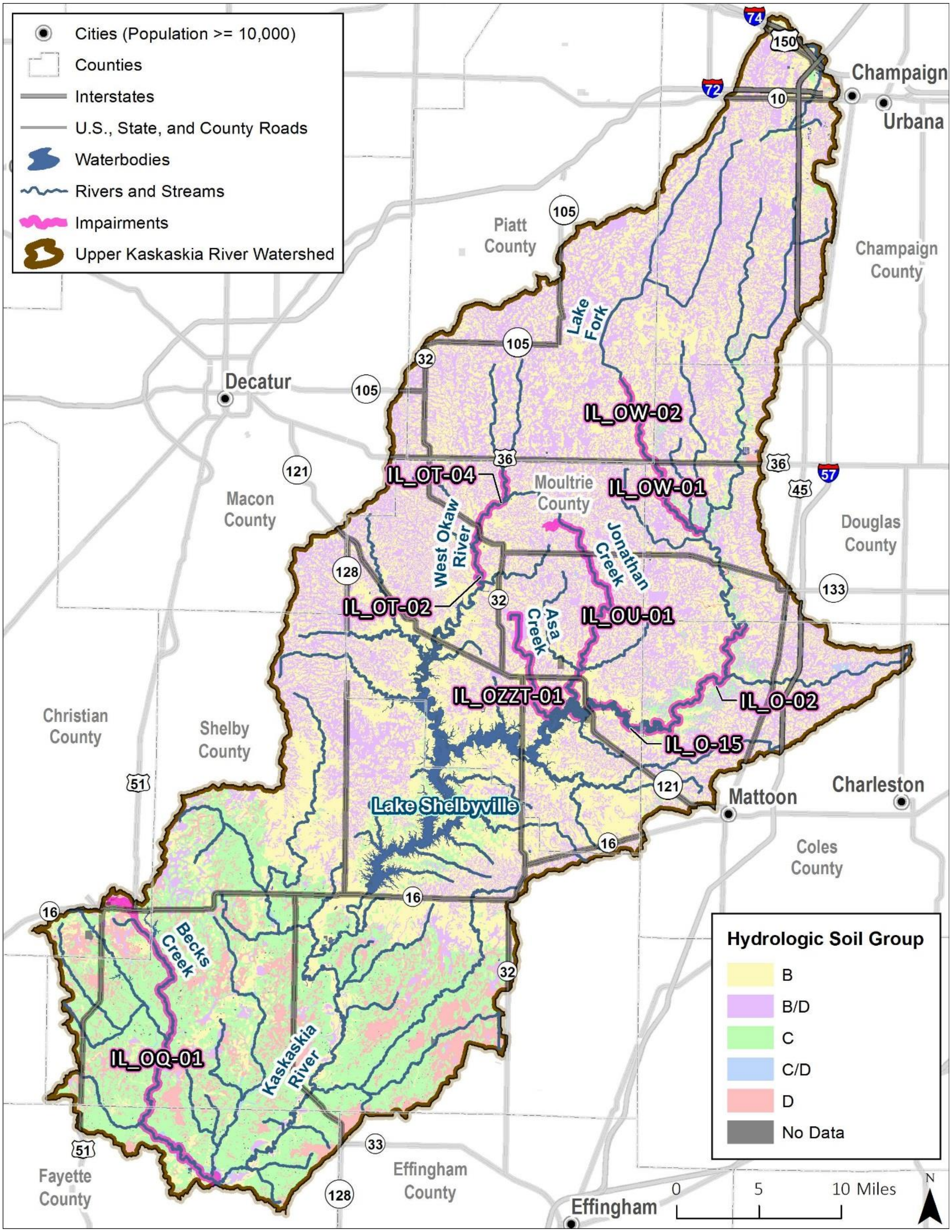


Figure 5. Upper Kaskaskia River watershed hydrologic soil groups (Soil Surveys for Champaign, Christian, Coles, Douglas, Fayette, Macon, Moultrie, Piatt and Shelby Counties, Illinois; NRCS SSURGO Database 2011).

Table 7. Percent composition of hydrologic soil group per watershed

Watershed	Segment	B	B/D	C	C/D	D	No Data
		%					
Kaskaskia River	IL_O-02	47.4	48.5	2.6	0.5	0.8	0.2
Kaskaskia River	IL_O-15	48.4	47.3	2.7	0.5	0.8	0.3
Becks Creek	IL_OQ-01	13.1	4.7	58.8	1.1	21.7	0.6
West Okaw River	IL_OT-02	48.6	51.1	0	0.3	0	0
West Okaw River [a]	IL_OT-04	46	53.7	0	0.3	0	0
Jonathon Creek	IL_OU-01	51.9	47.4	0.1	0.3	0.2	0.1
Lake Fork	IL_OW-01	47.4	50.7	1	0.4	0.5	0
Lake Fork	IL_OW-02	47.7	51.9	0.1	0.3	0	0
Asa Creek	IL_OZZT-01	57.6	42.3	0	0	0	0.1

Source: NRCS SSURGO Database 2011

a. No TMDLs developed for OT-04, see Section 5.3.1.

A commonly used soil attribute is the K-factor. The K-factor:

> *indicates the susceptibility of a soil to sheet and rill erosion by water. (The K-factor) is one of six factors used in the Universal Soil Loss Equation to predict the average annual rate of soil loss by sheet and rill erosion. Losses are expressed in tons per acre per year. These estimates are based primarily on percentage of silt, sand, and organic matter (up to 4 percent) and on soil structure and permeability. Values of K range from 0.02 to 0.69. The higher the value, the more susceptible the soil is to sheet and rill erosion by water (NRCS 2005).*

The distribution of K-factor values in the Upper Kaskaskia River watershed range from 0.17 to 0.55, with an average value of 0.35 (Figure 6).

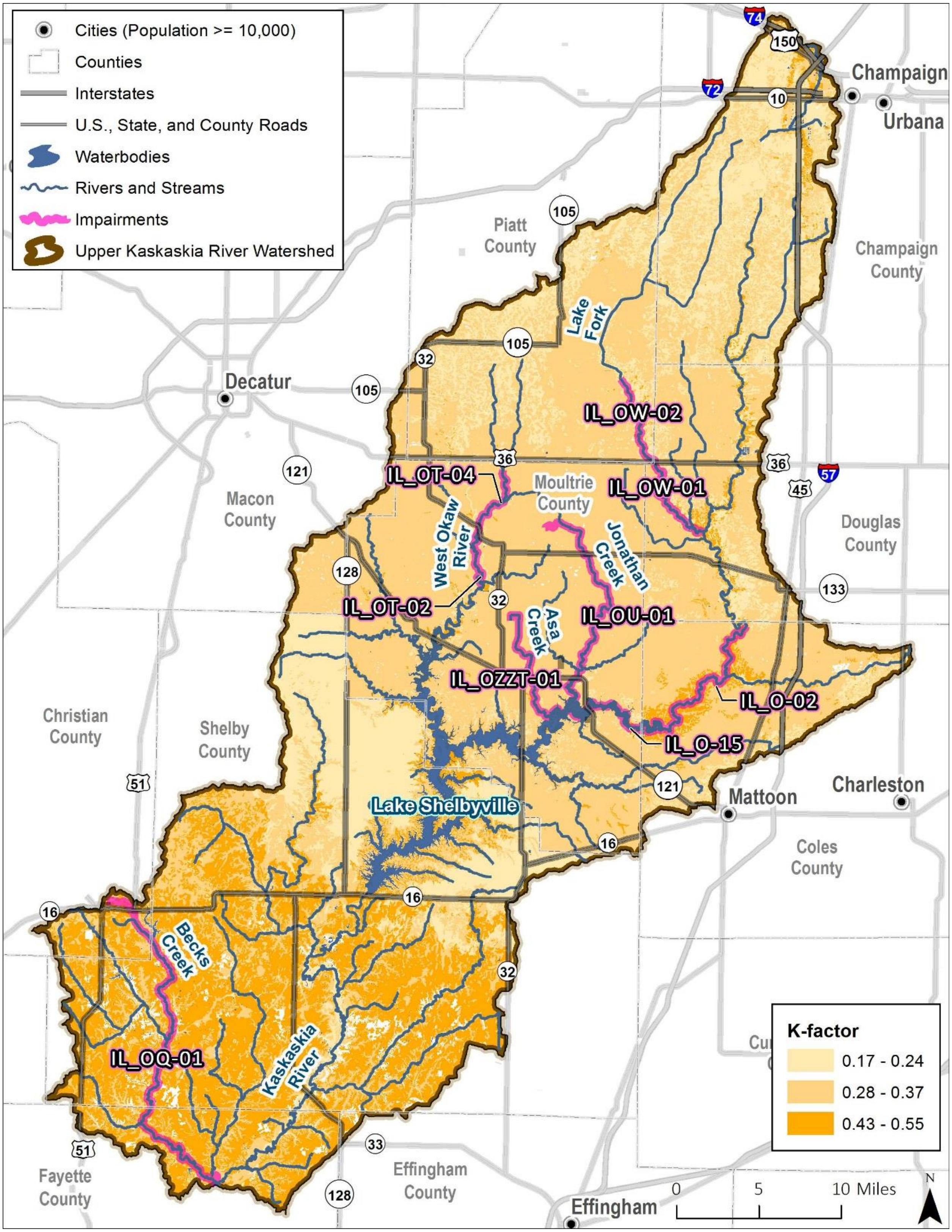


Figure 6. Upper Kaskaskia River watershed soil K-factor values (Soil Surveys for Champaign, Christian, Coles, Douglas, Fayette, Macon, Moultrie, Piatt and Shelby Counties, Illinois; NRCS SSURGO Database 2011).

2.6 Hydrology and Water Quality

Hydrology plays an important role in evaluating water quality. The hydrology of the Upper Kaskaskia River watershed is driven by local climate conditions and the landscape. The U.S. Geological Survey (USGS) has been collecting flow and water quality data in this watershed since the 1940s, while IEPA has been collecting water quality data since the early 1970s.

2.6.1 USGS Flow Data

The USGS has monitored flow at several locations in the watershed (Table 8 and Figure 7). The daily average, peak history, and monthly flow data show the inherent variability associated with hydrology. Flow duration curves provide a way to address that variability and flow related water quality patterns. Duration curves describe the percentage of time during which specified flows are equaled or exceeded. Flow duration analysis looks at the cumulative frequency of historic flow data over a specified period, based on measurements taken at uniform intervals (e.g., daily average or 15-minute instantaneous). Duration analysis results in a curve that relates flow values to the percent of time those values have been met or exceeded. Low flows are exceeded a majority of the time, whereas floods are exceeded infrequently. Flow duration curves for the active USGS gages are presented in Figure 8.

Table 8. USGS stream gages within project area

Gage ID	Watershed Area *(mi.^{2})*	Location	Period of Record	Impaired Segment
05590000	12.4	Kaskaskia Ditch at Bondville, IL	1948-1990	-
05590050	**8**	**Copper Slough at Champaign, IL**	**2005-2015**	**-**
05590400	109	Kaskaskia River near Pesotum, IL	1964-1979	-
05590420	113	Kaskaskia River near Tuscola, IL	1979-1997[a]	-
05590520	**124.4**	**Kaskaskia River below Ficklin, IL**	**2012-2015**	**-**
05590800	**149**	**Lake Fork at Atwood, IL**	**1972-2015**	**IL_OW-01**
05590950	**358**	**Kaskaskia River at Chesterville, IL**	**1995-2015**	**-**
05591200	**473**	**Kaskaskia River at Cooks Mill, IL**	**1970-2015**	**IL_O-02**
05591300	506	Kaskaskia River at Allenville, IL	1980-1997[a]	IL_O-15
05591400	54.7	Johnathon Creek near Sullivan, IL	1980-1997[a]	IL_OU-01
05591500	8	Asa Creek at Sullivan, IL	1950-1997	IL_OZZT-01
05591550	**34.6**	**Whitley Creek near Allenville, IL**	**1980-2015**	**-**
05591700	**112**	**West Okaw River Near Lovington, IL**	**1980-2015**	**IL_OT-02**
05592000	**1,054**	**Kaskaskia River at Shelbyville, IL**	**1940-2015**	**-**
05592050	**93.1**	**Robinson Creek near Shelbyville, IL**	**1979-2015**	**-**
05592100	**1,330**	**Kaskaskia River near Cowden, IL**	**1970-2015**	**-**
05592195	97	Beck Creek at Herrick, IL	1979-2013	IL_OQ-01

BOLD – indicates active USGS gage

a. Water quality data only, no flow data available

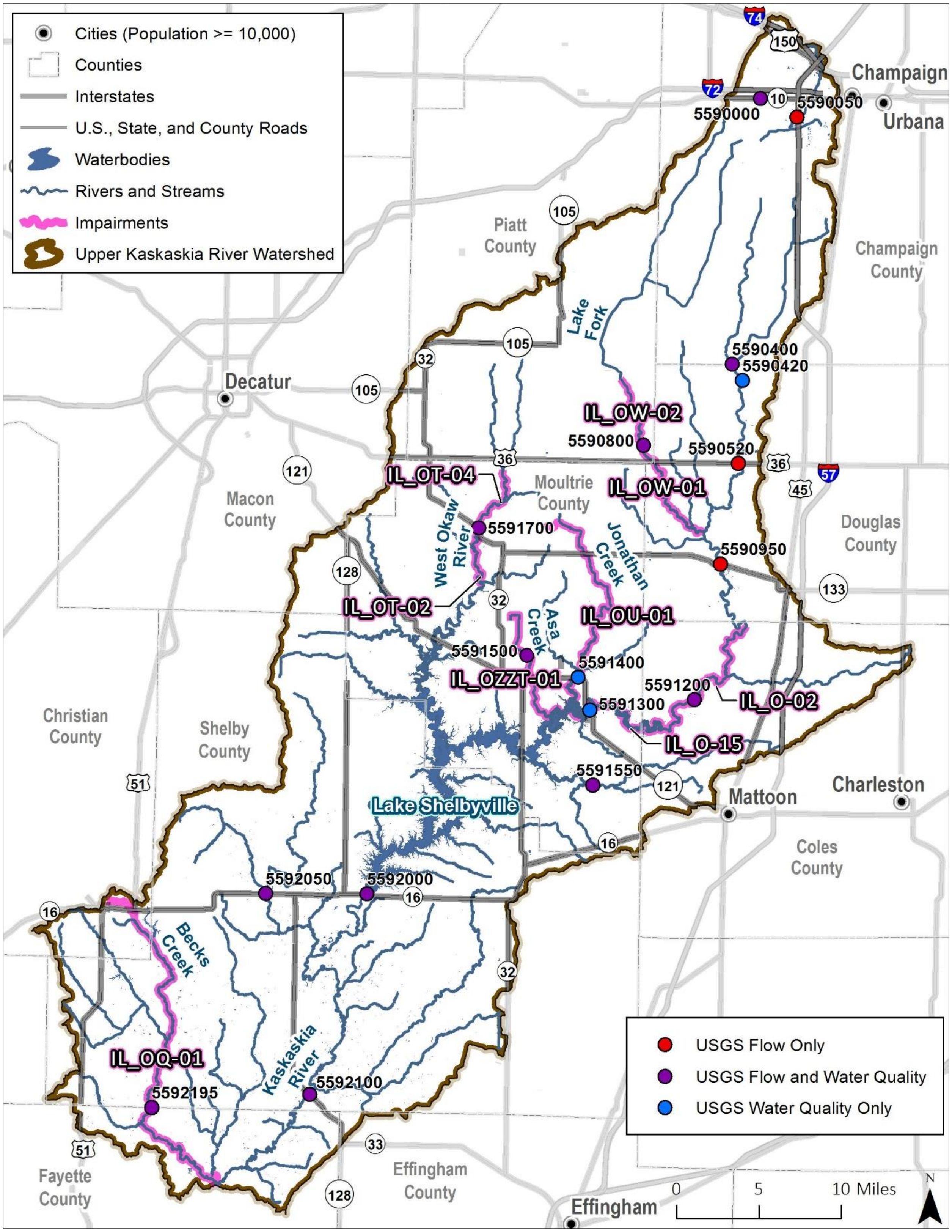


Figure 7. USGS stream gages within watershed.

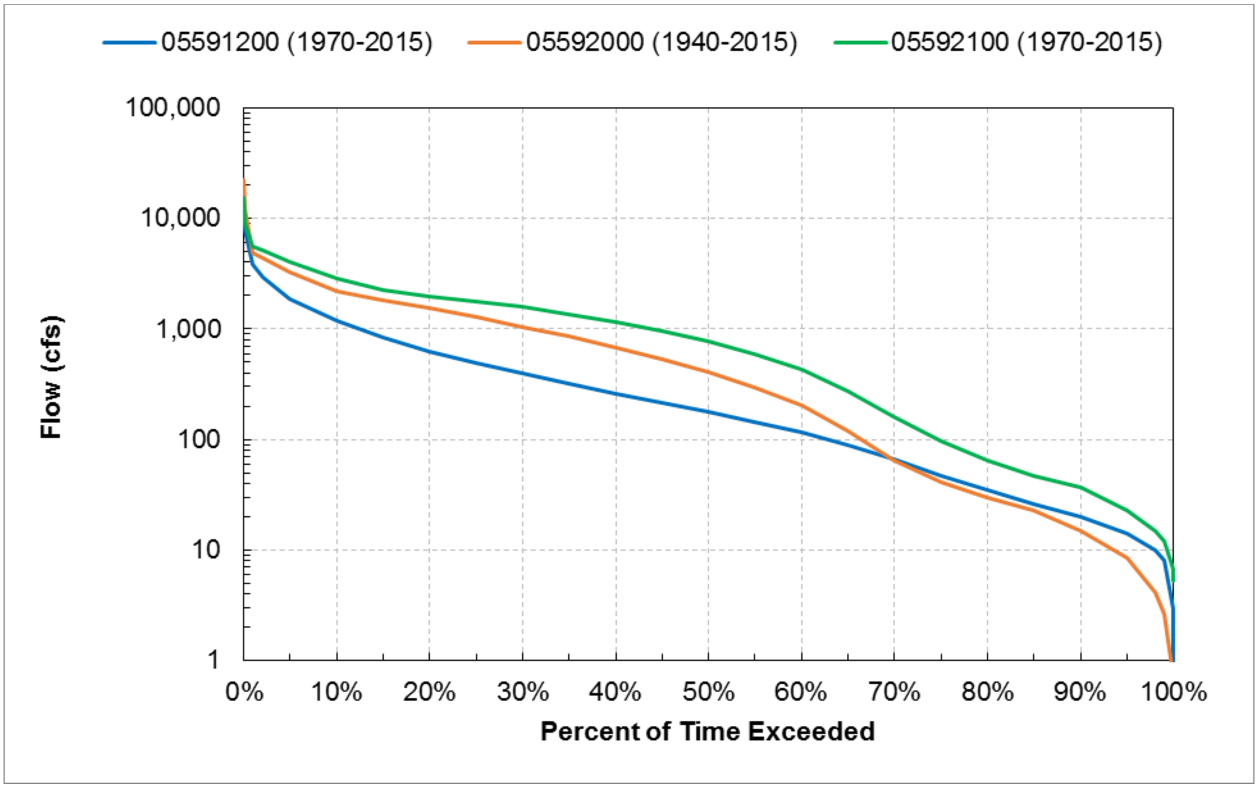


Figure 8. Flow duration curves for three active USGS gages in the Upper Kaskaskia River watershed area. Moderation of flows due to the Shelbyville Dam is clear at gages 05592000 and 05592100; both sites are located downstream of the reservoir.

An evaluation of annual flow at USGS gages 05591200, 05592000 and 05592100 on the Upper Kaskaskia River from 1970 to 2015, 1940 to 2015 and 1970-2015, respectively showed that annual flow in 2001 was nearly at the median; thus, it is assumed that 2001 is a typical year. Flow during 2001 at USGS gages 05591200, 05592000 and 05592100 are plotted with precipitation from the NOAA Global Historical Climatology Network Database Station USC00117876 (Shelbyville Dam) in Figure 9 to demonstrate flow during a typical year. Moderation of flows due to Shelbyville Dam is clear at gage 0559200.

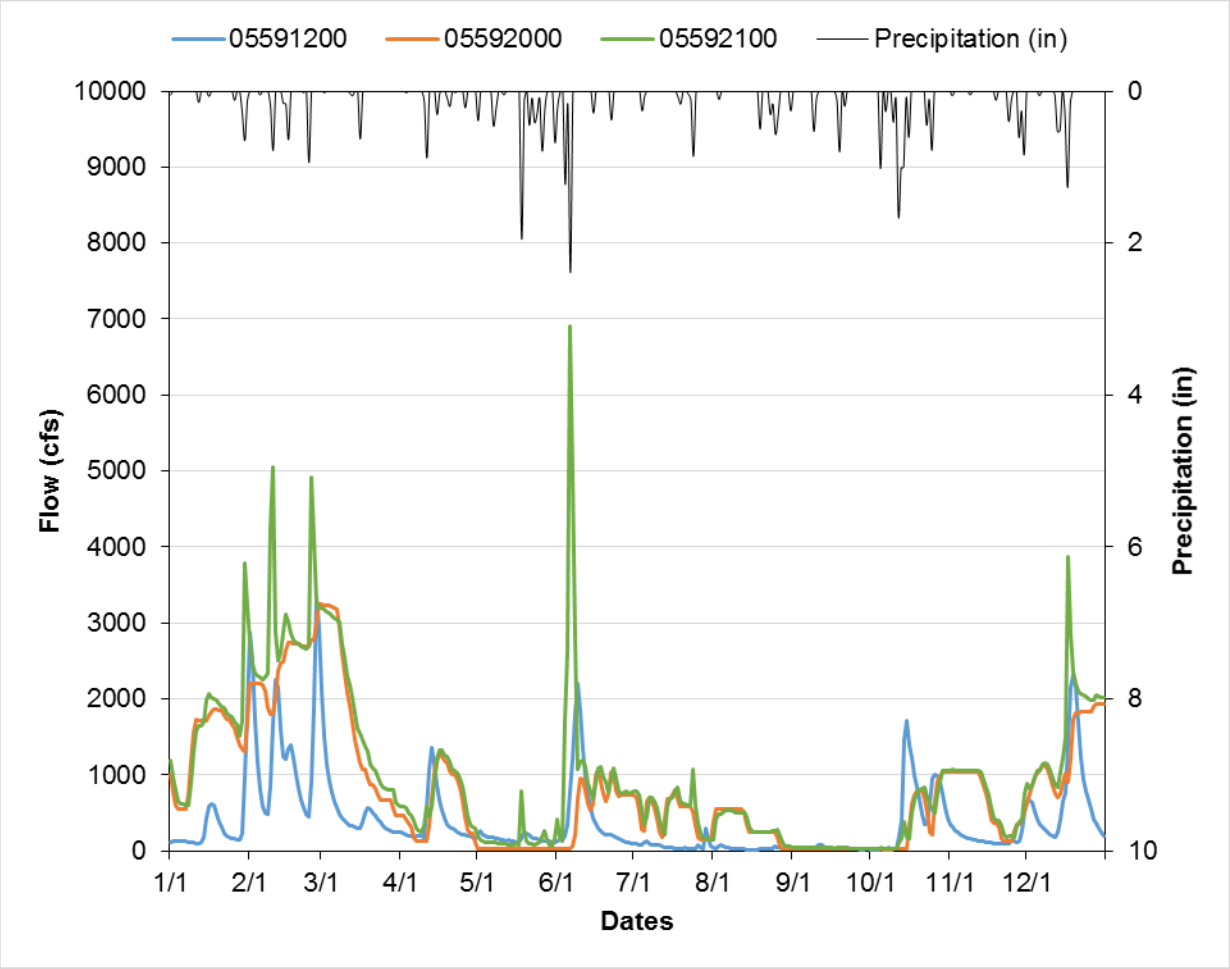


Figure 9. Daily flow in the Upper Kaskaskia River with daily precipitation at Shelbyville Dam (USC00117876), 2001.

2.6.2 IEPA Water Quality Monitoring

Routine water quality monitoring is a key part of the IEPA assessment program. The goals of IEPA surface water monitoring programs are to determine whether designated uses are supported, identify causes of pollution (toxics, nutrients, sedimentation) and sources (point or nonpoint) of surface water impairments, determine the overall effectiveness of pollution control programs, and identify long term resource quality trends. IEPA has operated a widespread, active long-term monitoring network in Illinois since 1977, known as the Ambient Water Quality Monitoring Network (AWQMN). Table 9 includes all of the chemical parameters that are collected and analyzed as part of the AWQMN program. In addition, dissolved oxygen, specific conductivity, temperature, and pH are measured in the field at the time of sample collection. The AWQMN is utilized by the IEPA to provide baseline water quality information, to characterize and define trends in the physical, chemical and biological conditions of the state’s waters, to identify new or existing water quality problems, and to act as a triggering mechanism for special studies or other appropriate actions.

Table 9. Summary of Illinois EPA laboratory methods for parameters in the AWQMN

Parameter	Sample Container	Chemical/Thermal Preservation	Method of Analysis	Units of Measure	Holding Time
Fecal Coliform Bacteria	120 ml plastic	Contains sodium thiosulfate; Cool, < 6 °C	SM 9222D	no./100ml	24 hours monitoring
Total Suspended Solids (TSS)	500 ml PE	Cool, < 6 °C	SM 2540D	mg/L	7 days
Total Nitrate+Nitrite-N (NO3+NO2-N)	250/500 ml HDPE	Contains sulfuric acid; Cool, < 6 °C	USEPA 353.2	mg/L	28 days
Ammonia-N (NH3+NH4-N)	250/500 ml HDPE	Contains sulfuric acid; Cool, < 6 °C	USEPA 350.1	mg/L	28 days
Pesticides	1 gallon amber glass	Cool, < 6 °C	USEPA 8081	µg/l	7 days collection-prep; 40 days prep-analysis
Total Organic Carbon (TOC)	Three 40-ml amber vials	Contains phosphoric acid; Cool, < 6 °C	SM 5310C	mg/L	28 days
Chlorophyll	1 L plastic amber	Contains magnesium carbonate; filter in field; freeze filter, -20 °C	SM 10200H	µg/l	28 days collection-prep; 365 days prep-analysis
Total Kjeldahl Nitrogen (TKN)	250/500 ml HDPE	Contains sulfuric acid; Cool, < 6 °C	USEPA 351.2	mg/L	28 days
Total Phosphorus	250/500 ml HDPE	Contains sulfuric acid; Cool, < 6 °C	USEPA 365.1	mg/L	28 days
Dissolved Phosphorus	250 ml HDPE	Contains sulfuric acid; filter in field; Cool, < 6 °C	USEPA 365.1	mg/L	28 days
Total ICP*:* (Pb, Cu, Fe, Mn, Cd, Cr, Mg, Zn, K, Ba, Be, Co, Ni, Sr, Ca, Na, Al, B, Ag, V, Se, As)	250 ml PE	Preserved in lab with nitric acid; no thermal preservation required	USEPA 200.7, 200.8	µg/l	6 months
Dissolved ICP*:* (Pb, Cu, Fe, Mn, Cd, Cr, Mg, Zn, K, Ba, Be, Co, Ni, Sr, Ca, Na, Al, B, Ag, V, Se, As)	250 ml PE	Preserved in lab with nitric acid; filter in field; no thermal preservation required	USEPA 200.7, 200.8	µg/l	6 months
Sulfate (SO4)	500 ml PE	Cool, < 6 °C	USEPA 375.2	mg/L	28 days
Total Dissolved Solids (TDS)	500 ml PE	Cool, < 6 °C	SM 2540C	mg/L	7 days
Cyanide	250 ml PE	Contains sodium hydroxide; Cool, < 6 °C	USEPA 335.4	mg/L	14 days
Chloride	500 ml PE	No thermal preservation required	SM 4500Cl-E	mg/L	28 days
Total Alkalinity	500 ml PE	Cool, < 6 °C	EPA 310.2	mg/L	14 days
Total Mercury	60 ml glass vial	Preserved in lab with nitric acid; no thermal preservation required	USEPA 245.1/7470	µg/l	28 days
Total Hardness (calculated)	250 ml PE	Preserved in lab with nitric acid; no thermal preservation required	SM 2340B	mg/L	6 months
Fluoride	500 ml PE	No thermal preservation required	SM 4500F-C	mg/L	28 days
Phenol	250 ml glass	Contains sulfuric acid; Cool, < 6 °C	USEPA 420.4	µg/l	28 days

Notes: Dissolved metals and phosphorus are filtered through a 0.45 µm nitrocellulose membrane filter.

**General use* water quality standards based on Section 302(subpart B) of Title 35*:* Subtitle C*:* Chapter I, Illinois Pollution Control Board. June 1998. H = hardness dependent acute and chronic standards. a = acute, c = chronic

Note that sample containers have changed somewhat over time. For example, the quart polyethylene bottle was replaced by a 500 ml bottle because the smaller bottle contained enough material for analysis and was less expensive to ship to the laboratory.

Additional uses of the data collected by the IEPA through the AWQMN program include the review of existing water quality standards and establishment of water quality based effluent limits for NPDES permits. The AWQMN is integrated with other IEPA chemical and biological stream monitoring programs including Intensive River Basin Surveys, Facility –Related Stream Surveys, Fish Contaminant Monitoring, Toxicity Testing Program and Pesticide Monitoring Subnetwork which are more regionally based (specific watersheds or point source receiving stream) and cover a shorter span of time (e.g. one year) to evaluate compliance with water quality standards and determine designated use support. Information from this program is compiled by IEPA into a biennial report, known as the Illinois Integrated Water Quality Report and Section 303(d) List, required by the Federal Clean Water Act.

Within the Upper Kaskaskia River project area, data were found for numerous stations that are part of AWQMN (Figure 10 and Table 10). Parameters sampled on the streams include field measurements (e.g., water temperature) as well as those that require lab analyses (e.g., fecal coliform, nutrients, and total suspended solids). Many sites have historical data that are greater than 10 years old. Data were obtained directly from IEPA.

Additional water quality data are also available at several USGS stations (Figure 7 and Table 10). Parameters sampled include suspended and dissolved solids, nutrients, dissolved oxygen, turbidity, fecal coliform, and metals.

Table 10. Upper Kaskaskia River watershed water quality data

Water Body	Impaired Segment	AWQMN Sites (USGS Gage)	Location	Period of Record
Kaskaskia River	O-02	O-02 (05591200)	RM 238.1 CO Rd. 300E Br. at Cooks Mills	*1970-1997*, *1999*-2013
	O-15	O-15 (05591300)	RM 224.4, RT 121 Br. 1 Mi. N of Allenville	*1980-1997*, *1999*-2007, 2012
Becks Creek	OQ-01	OQ-01 (05592195)	CO Rd. 3300N Br. 2 Mi. W of Herrick	*1979*-2013
West Okaw River	OT-04 [a]	-- (05591700)	West Okaw River near Lovington, IL	*1980-1997*
	OT-02	OT-02	CR 2200N Br., 0.5 Mi. W of SR 32 and 1.5 Mi. NW of Lovington	*1999*-2007
Jonathon Creek	OU-01	OU-01 (05591400)	RT 121 Br. 2.5 Mi. E of Sullivan	*1980-1997*, *1999*-2007, 2012
Lake Fork	OW-02	-- (05590800)	Lake Fork at Atwood, IL	*1972-1983*
	OW-01	OW-01	RT 36 Br. at Atwood	*2002*, 2007, 2012
	OW-02	OW-03	5 Mi. NW Atwood	2007
Asa Creek	OZZT-01	OZZT-01 (05591500)	Hamblin Rd. (1100E) Br., 0.2 Mi. S of CR 1500N and 0.8 Mi. N of Sullivan	*1964-1997,1999*-2007

Italics – Data are greater than 10 years old
RM – River Mile
DNS – Downstream
STP – Sewage treatment plant
a. No TMDLs developed for OT-04, see Section 5.3.1.

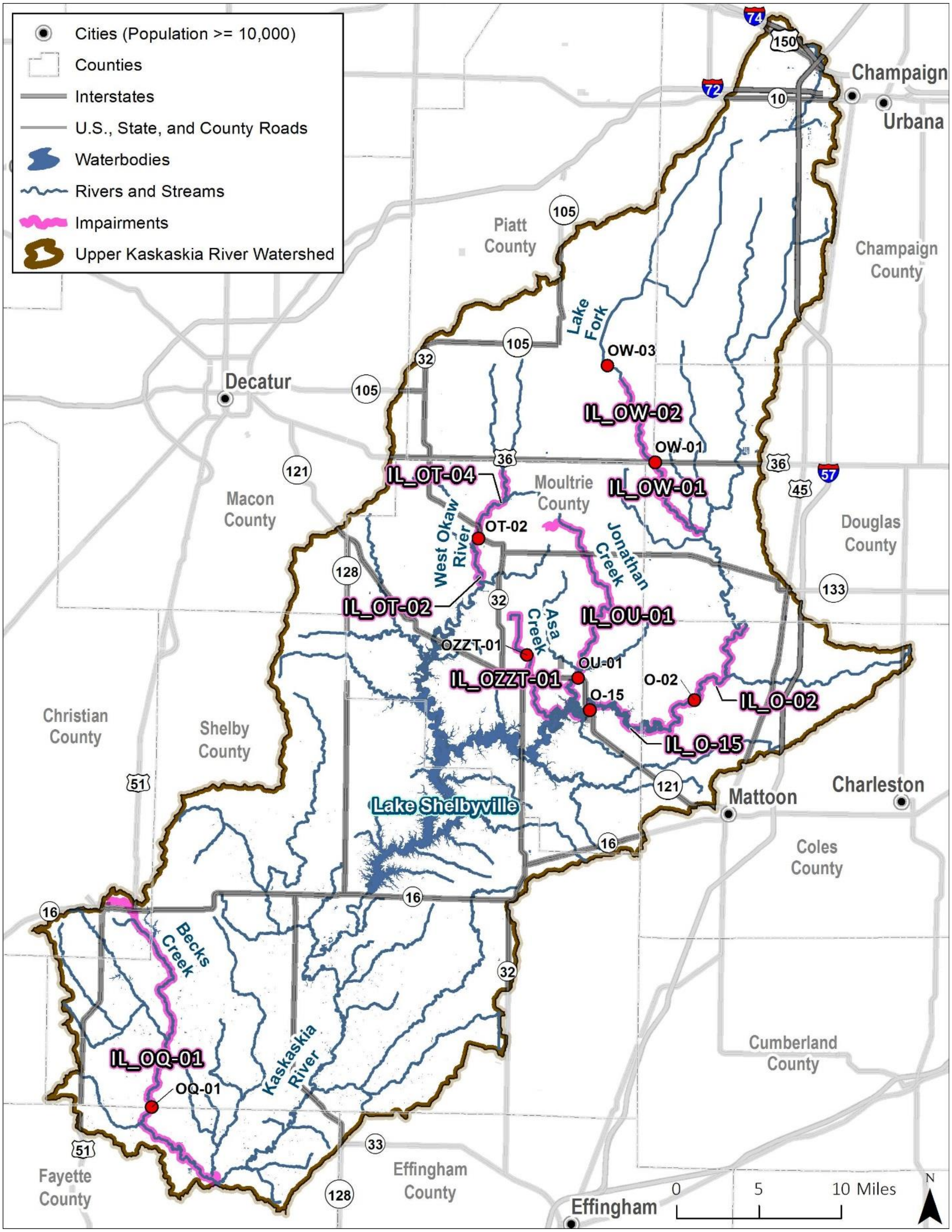


Figure 10. IEPA water quality sampling sites within watershed.

2.7 Watershed Studies and Other Watershed Information

This section describes several of the studies that have been completed in the watershed. In addition to these studies, the USACE is also currently conducting a watershed planning study that will help to restore, preserve, and protect the Kaskaskia River basin. The comprehensive plan is anticipated to be completed in 2018.

- **Historical River Morphology Study of the Kaskaskia River – Headwaters to Lake Shelbyville** (USACE 2010)

  Study conducted by USACE, St. Louis District from 2007-2010 to evaluate changes in stream morphology along 75 miles of the Kaskaskia River upstream of Lake Shelbyville and along Lake Fork and West Okaw River. Aerial photos and General Land Office (GLO) maps from 1821 to 2007 were used to plot channel location and determine changes over time.

- **Shelbyville Lake Annual Water Quality Reports** (USACE 2011-2015)

  The USACE conducts annual water quality sampling in Lake Shelbyville and in tributaries to the lake. Three or more sampling events are conducted during the calendar year at sites to assess water quality (e.g., bacteria, phosphorus). Annual monitoring does not provide data specific to TMDL impairments (sample stations and parameters are not coincident with impairments), but does provide watershed context as relates to watershed pollutants of concern. Overall, agricultural nutrient runoff is identified as a primary concern for Lake Shelbyville.

- **Water Quality Analysis of the Kaskaskia River Watershed** (Williard and Shrestha 2016)

  Water quality trend analysis between 2005 and 2014 for the Kaskaskia River Watershed. Water quality data were obtained from IEPA databases; no new sampling was conducted to support this analysis. Water quality analyzed in conjunction with land cover data for four ecosystem partnership areas within the larger Kaskaskia River Watershed including the Upper Kaskaskia River Ecosystem Partnership. Data from three monitoring stations in the Upper Kaskaskia (two on the main stem of the Kaskaskia River and one on the West Okaw River) were evaluated for trends and results were used to identify specific best management practices that can be used to address impairments within each area.

3. Watershed Source Assessment

Source assessments are an important component of water quality management plans and TMDL/LRS development. This section provides a summary of potential sources that contribute listed pollutants to the Upper Kaskaskia River watershed.

3.1 Pollutants of Concern

Pollutants of concern evaluated within this source assessment include fecal coliform, phosphorus, and sediment. In addition to these pollutants, low dissolved oxygen and pH impairments are often linked to biochemical oxygen demand and ammonia in streams. These pollutants can originate from an array of sources including point and nonpoint sources. Point sources typically discharge at a specific location from pipes, outfalls, and conveyance channels. Nonpoint sources are diffuse sources that have multiple routes of entry into surface waters, particularly overland runoff. This section provides a summary of potential point and nonpoint sources that contribute pollutants to the impaired waterbodies.

3.2 Point Sources

Point source pollution is defined by the Federal Clean Water Act (CWA) §502(14) as:

> *any discernible, confined and discrete conveyance, including any ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock, concentrated animal feeding operation [CAFO], or vessel or other floating craft, from which pollutants are or may be discharged. This term does not include agriculture storm water discharges and return flow from irrigated agriculture.*

Point sources can include facilities such as municipal wastewater treatment plants (WWTPs), industrial facilities, CAFOs, or regulated storm water including municipal separate storm sewer systems (MS4s). There are no permitted CAFOs in the watershed. Under the CWA, all point sources are regulated under the NPDES program. NPDES permit holders in the watershed are discussed below.

3.2.1 NPDES Facilities (Non-Stormwater)

A municipality, industry, or operation must apply for an NPDES permit if an activity at that facility discharges wastewater to surface water. Examples of NPDES facilities within the study area include municipal and industrial wastewater treatment plants. Bacteria and nutrients can be found in these discharges. In addition, permitted facilities can contribute to low dissolved oxygen and pH impairments.

There are 16 individual NPDES permitted facilities that drain to impaired waters. Table 11 and Figure 11 includes each NPDES permitted facility within the watershed. Average and maximum design flows and downstream impairments are included in the facility summaries. Note that there are additional NPDES permitted facilities in the watershed, but these do not discharge or drain to an impaired water.

Twelve WWTPs have disinfection exemptions in the watershed which allow a facility to discharge wastewater without disinfection. Facilities with disinfection exemptions may be required to provide IEPA with updated information to demonstrate compliance with these requirements and facilities directly discharging into a fecal coliform impaired segment may have their disinfection exemption reviewed through future NPDES permitting actions.

Table 11. Individual NPDES permitted facilities discharging to impaired segments

IL Permit ID	Facility Name	Type of Discharge	Receiving Water	Downstream Impairment(s)	Design Avg Flow (MGD)	Design Maximum Flow (MGD)	Disinfection Exemption
IL0000141	Equistar Chemicals, LP-Tuscola	Mix of sanitary, industrial, and stormwater	Unnamed trib to Kaskaskia River	O-02, O-15	3	12.2	Yes
IL0000221	Panhandle Eastern-Tuscola	Groundwater infiltration and stormwater	Kaskaskia River	O-02, O-15	0.01254	Not reported	NA [a]
IL0004227	Kraft Foods Global-Champaign	Stormwater and non-contact cooling water	Copper Slough	O-02, O-15	0.289	Not reported	NA [a]
IL0021741	Arthur, Village of	STP	Kaskaskia River	O-02, O-15	0.5	1.25	Yes
IL0021806	Sullivan STP	STP	Asa Creek – Kaskaskia River	OZZT-01	0.75	0.75	Yes
IL0022314	Pana, City of	STP	Coal Creek (Kaskaskia Basin)	OQ-01	1.17	3.13	Yes
IL0024210	Lovington STP	STP	Unnamed trib-West Okaw Rvr-Kaskaskia Rvr	OT-02	0.2	0.317	No
IL0025097	Atwood, Village of	STP	Lake Fork Branch of Kaskaskia River	OW-01, O-02, O-15	0.2	0.5	Yes
IL0027197	Village of Hammond	STP	Hammond Mutual Ditch	OT-02	0.07	0.175	Yes
IL0031526	Urbana-Champaign SD SW STP	STP	Copper Slough	O-02, O-15	7.98	17.25	Yes
IL0032549	Bement, Village of	STP	Unnamed trib of W Branch Lake Fork	OW-02, O-02, O-15	0.176	0.48	Yes
IL0062812	Marathon Petroleum-Champaign	Hydrostatic test water and stormwater	Unnamed ditch	O-02, O-15	0.0073 (sum of outfall 001 and 002)	Not reported	NA [a]
IL0066672	Oak Terrace Sanitary System Inc.	STP	Unnamed trib of Coal Creek	OQ-01	0.09	0.36	Yes
IL0067202	Commercial Flooring, Inc.	Treated sanitary waste and water soften backwash	Unnamed stream trib to Kaskaskia River	O-02, O-15	0.008	Not reported	Yes
ILG580051	Humboldt, Village of	STP	Flat Branch	O-02, O-15	0.07	0.175	Yes
ILG640209	Ivesdale, Village of	Public water supply	East Lake Fork of Kaskaskia River	OW-02, O-02, O-15	0.0014	Not reported	NA [a]

STP – Sewage treatment plant MGD – Million gallons per day

a. These facilities are not expected to contribute fecal coliform.

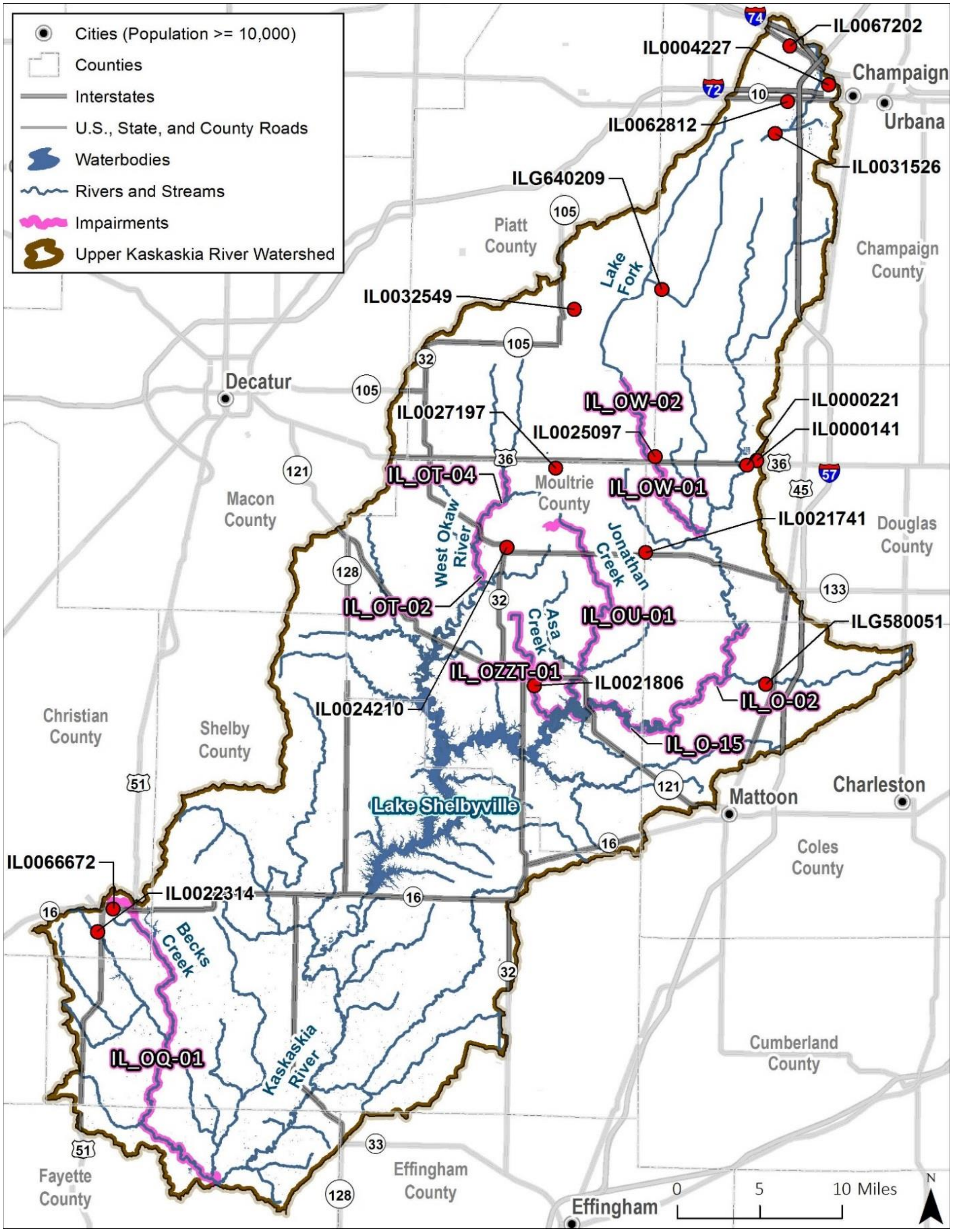


Figure 11. NPDES permitted facilities upstream of impaired segments.

3.2.2 Municipal Separate Storm Sewer Systems

Regulated storm water runoff can contribute to impairments in the project area. As development increases in the watershed, additional pressure will be placed on receiving waters due to storm water. Impervious areas associated with developed land uses can result in higher peak flow rates, higher runoff volumes and larger pollutant loads. Storm water runoff often contains sediment, nutrients, and bacteria amongst other pollutants. With regard to bacteria, die off of bacteria does occur downstream of the source, for example between the MS4s and O-15, however this process has not been quantified in the watershed.

Under the NPDES program, municipalities serving populations over 100,000 people are considered Phase I MS4 communities. Within the project area, there are no Phase I communities. Municipalities serving populations under 100,000 people are considered Phase II communities. Within Illinois, Phase II communities are allowed to operate under the statewide General Storm Water Permit (ILR40) which requires dischargers to file a Notice of Intent, acknowledging that discharges shall not cause or contribute to a violation of water quality standards.

To assure pollution is controlled to the maximum extent practical, regulated entities operating under the General Storm Water Permit (ILR40) are required to implement six control measures including public education, public involvement, illicit discharge and detection programs, control of construction site runoff, post construction storm water management in new development and redevelopment, and pollution prevention/good housekeeping for municipal operations. Regulated entities operating under the General Storm Water Permit within the watershed area are identified in Table 12 and Figure 12.

Table 12. Permitted MS4s

Permit ID	Regulated Entity	Receiving Waters
ILR400313	City of Champaign	Kaskaskia River (IL_O-02 & IL_O-15)
ILR400256	Champaign County (road authority)	Kaskaskia River (IL_O-02 & IL_O-15)
ILR400026	Champaign Township	Kaskaskia River (IL_O-02 & IL_O-15)
ILR400621	Village of Bondville	Kaskaskia River (IL_O-02 & IL_O-15)
ILR400493	Illinois Department of Transportation (road authority)	Kaskaskia River (IL_O-02 & IL_O-15)

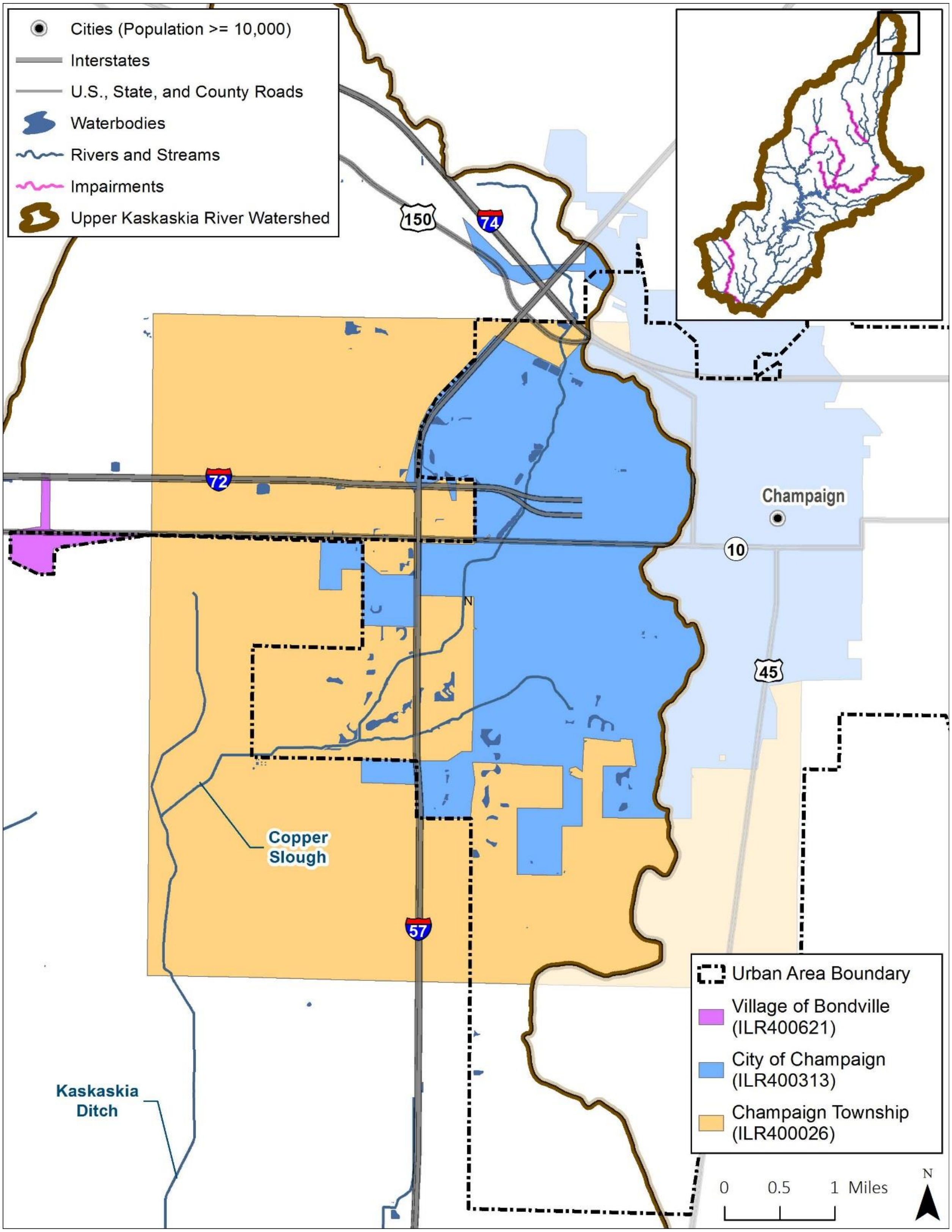


Figure 12. Regulated MS4s within the Upper Kaskaskia River watershed.

Champaign County and ILDOT are also regulated MS4s.

3.3 Nonpoint Sources

The term nonpoint source pollution is defined as any source of pollution that does not meet the legal definition of point sources. Nonpoint source pollution typically results from overland stormwater runoff that is diffuse in origin, as well as background conditions. It should be noted that stormwater collected and conveyed through a regulated MS4 is considered a controllable point source. With agricultural practices such as crop cultivation (74 percent) and pasture/hay (6 percent) covering an estimated 80 percent of the project area, nonpoint source pollution may contribute a significant amount of the total pollutant load. In addition to runoff and erosion, significant nonpoint sources also include septic systems and animal agriculture (i.e., livestock and feedlots). IEPA has identified several sources as contributing to the Upper Kaskaskia River watershed impairments (Table 13).

Table 13. Potential sources in project area based on the Draft 2014 305(b) list

Watershed	Segment	Causes	Sources
Kaskaskia River	IL_O-02	Fecal Coliform	Source Unknown
Kaskaskia River	IL_O-15	Fecal Coliform	Source Unknown
Becks Creek	IL_OQ-01	Fecal Coliform	Source Unknown
West Okaw River	IL_OT-02	Fecal Coliform	Source Unknown
West Okaw River [a]	IL_OT-04	Dissolved Oxygen, pH and Phosphorus (Total)	Crop Production (Crop Land or Dry Land) and Source Unknown
Jonathon Creek	IL_OU-01	Fecal Coliform	Source Unknown
Lake Fork	IL_OW-01	Alteration in stream-side or littoral vegetative covers and Sedimentation/Siltation	Channelization, Crop Production (Crop Land or Dry Land), and Source Unknown
Lake Fork	IL_OW-02	Alteration in stream-side or littoral vegetative covers and Sedimentation/Siltation	Channelization, Crop Production (Crop Land or Dry Land), and Source Unknown
Asa Creek	IL_OZZT-01	Sedimentation/Siltation and pH	Source Unknown

Mercury and polychlorinated biphenyls are also causes of impairments for several segments; these causes and their sources are not addressed in this report.

a. No TMDLs developed for OT-04, see Section 5.3.1.

3.3.1 Stormwater Runoff

During wet-weather events (snowmelt and rainfall), pollutants are incorporated into runoff and can be delivered to downstream waterbodies. The resultant pollutant loads are linked to the land uses and practices in the watershed. Agricultural and developed areas can have significant effects on water quality if proper best management practices are not in place. The main pollutants of concern associated with agricultural runoff are sediment, nutrients, pesticides, and bacteria. Storm water from developed areas can be contaminated with oil, grease, chlorides, pesticides, herbicides, nutrients, viruses, bacteria, metals, and sediment. In some areas, some connections to storm sewers can be illicit, which includes residences and businesses that discharge untreated wastewater to the storm sewers.

In addition to pollutants, alterations to a watershed’s hydrology as a result of land use changes can detrimentally affect habitat and biological health. Imperviousness associated with developed land uses and agricultural field tiling can result in increased peak flows and runoff volumes and decreased base flow as a result of reduced ground water discharge. The increased peak flows and runoff volumes tend to increase streambank erosion. These more powerful flows have more capacity to move larger sediment particles farther, which may result in downstream sedimentation when the in-stream flow decreases and slows down. Drain tiles also transport agricultural runoff directly to ditches and streams, whereas runoff flowing over the land surface may infiltrate to the subsurface and may flow through riparian areas.

3.3.2 Erosion

Sedimentation and siltation were identified as causes of impairment for several streams in the project area. For sedimentation (i.e., deposition of sediment) to occur, a source of sediment must be present. Various forms of erosion are a common source of sediment. Typically, erosion will increase as stream velocity and peak flow increases. Runoff over impervious surfaces and through agricultural drain tiles will have higher velocities and peak flows, and thus, increase erosion.

Sheet erosion is the detachment of soil particles by raindrop impact, and their removal by water flowing overland as a sheet instead of in channels or rills. Rill erosion refers to the development of small, ephemeral concentrated flow paths, which function as both sediment source and sediment delivery systems for erosion on hillsides. Sheet and rill erosion occur more frequently in areas that lack or have sparse vegetation. Bank and channel erosion refers to the wearing away of the banks and channel of a stream or river. High rates of bank and channel erosion can often be associated with water flow and sediment dynamics being out of balance that can result from land use activities that either alter flow regimes, adversely affect the floodplain and streamside riparian areas, or a combination of both. Hydrology is a major driver for both sheet/rill and stream channel erosion.

The USACE completed a study in 2010 on the historical river morphology of the Upper Kaskaskia River (USACE 2010). This study included detailed analysis of stream morphology in Lake Fork and West Okaw River that included cross section measurements and channel evolution analysis. The data indicated that Lake Fork is down cutting in the upper reaches (above river mile 8.8 that is roughly the upper third of the stream) and that below river mile 8.88 the stream is stable and connected to the floodplain. West Okaw River was identified as a stable channel with portions that are widening. Cross section data that were collected in these two rivers could be used in the future to determine erosion rates and changes in stream morphology over time.

3.3.3 Onsite Wastewater Treatment Systems

Onsite wastewater treatment systems (e.g., septic systems) that are properly designed and maintained should not serve as a source of contamination to surface waters. However, onsite systems do fail for a variety of reasons. Common soil-type limitations which contribute to failure include seasonally high water tables, compact glacial till, bedrock, and fragipan. When these septic systems fail hydraulically (surface breakouts) or hydrogeologically (inadequate soil filtration) there can be adverse effects to surface waters (Horsely and Witten 1996). Septic systems contain all the water discharged from homes and business and can be significant sources of pollutants. County health departments were contacted for information on septic systems and unsewered communities. Responses were received from several counties. Effingham County reported that 4,682 septic systems have been installed in the county since the 1970s, with an average of 10 failure complaints per year. No other counties were able to provide an inventory of septic systems or information on system failure rates.

Due to a lack of information available from county health departments, county-wide estimates from the National Environmental Service Center for 1992 and 1998 and through direct correspondence with Effingham County were area weighted to estimate the number of septic systems in each watershed (Table 14). An estimated 19,835 septic systems are in the watershed and the septic system density is 12.6 per square mile.

Table 14. Estimated (area weighted) septic systems

Watershed	Segment	Number of septic systems	Septic systems per square mile
Kaskaskia River	IL_O-02	6,356	13
Kaskaskia River	IL_O-15	6,801	13
Becks Creek	IL_OQ-01	2,074	10
West Okaw River	IL_OT-02	2,045	14
West Okaw River [a]	IL_OT-04	1,043	14
Jonathon Creek	IL_OU-01	922	16
Lake Fork	IL_OW-01	2,180	13
Lake Fork	IL_OW-02	1,947	13
Asa Creek	IL_OZZT-01	244	16

Source: NESC 1992 and 1998 (data obtained from EPA Region 5 STEPL Model database); a. No TMDLs developed for OT-04, see Section 5.3.1.

3.3.4 Animal Feeding Operations (AFOs)

Animal feeding operations that are not classified as CAFOs are known as animal feeding operations (AFOs) in Illinois. Non-CAFO AFOs are considered nonpoint sources by U.S. EPA. AFOs in Illinois do not have state permits. However, they are subject to state livestock waste regulations and may be inspected by the IEPA, either in response to complaints or as part of the Agency’s field inspection responsibilities to determine compliance by facilities subject to water pollution and livestock waste regulations.

The animals raised in AFOs produce manure that is stored in pits, lagoons, tanks and other storage devices. The manure is then applied to area fields as fertilizer. When stored and applied properly, this beneficial re-use of manure provides a natural source for crop nutrition. It also lessens the need for fuel and other natural resources that are used in the production of fertilizer. AFOs, however, can pose environmental concerns, including the following:

- Manure can leak or spill from storage pits, lagoons, tanks, etc.
- Improper application of manure can contaminate surface or ground water.
- Manure over application can adversely impact soil productivity.

Livestock are potential sources of bacteria and nutrients to streams, particularly when direct access is not restricted and/or where feeding structures are located adjacent to riparian areas. Watershed specific data are not available for livestock populations. However, county wide data available from the 2012 Census of Agriculture were downloaded and area weighted to estimate the animal population in the watershed (Table 15). An estimated 100,228 animals are in the watershed.

Table 15. Estimated (area weighted) livestock animals

Watershed	Segment	Cattle	Poultry	Sheep	Hogs	Horses
Kaskaskia River	IL_O-02	6,282	7,786	223	3,048	1,131
Kaskaskia River	IL_O-15	6,557	8,124	253	3,146	1,222
Becks Creek	IL_OQ-01	3,969	221	211	16,150	127
West Okaw River	IL_OT-02	807	992	99	352	262
West Okaw River [a]	IL_OT-04	340	413	46	108	109
Jonathon Creek	IL_OU-01	611	809	66	238	210
Lake Fork	IL_OW-01	1,482	1,714	65	808	235
Lake Fork	IL_OW-02	948	807	57	607	106
Asa Creek	IL_OZZT-01	163	222	18	67	58

Source: 2012 Census of Agriculture (Illinois); a. No TMDLs developed for OT-04, see Section 5.3.1.

4. TMDL Endpoints and LRS Targets

This section presents information on the water quality impairments within the Upper Kaskaskia River watershed and the associated water quality standards (WQS) and targets.

4.1 Applicable Standards

WQS are designed to protect beneficial uses. The authority to designate beneficial uses and adopt WQS is granted through Title 35 of the Illinois Administrative Code. Designated uses to be protected in surface waters of the state are defined under Section 303, and WQS are designated under Section 302 (Water Quality Standards). Designated uses and water quality criteria are discussed below.

4.1.1 Designated Uses

IEPA uses rules and regulations adopted by the Illinois Pollution Control Board (IPCB) to assess the designated use support for Illinois waterbodies. The following are the use support designations provided by the IPCB that apply to water bodies in the Upper Kaskaskia River watershed:

General Use Standards – These standards protect for aquatic life, wildlife, agricultural uses, primary contact (where physical configuration of the waterbody permits it, any recreational or other water use in which there is prolonged and intimate contact with the water involving considerable risk of ingesting water in quantities sufficient to pose a significant health hazard, such as swimming and water skiing), secondary contact (any recreational or other water use in which contact with the water is either incidental or accidental and in which the probability of ingesting appreciable quantities of water is minimal, such as fishing, commercial and recreational boating, and any limited contact incident to shoreline activity), and most industrial uses. These standards are also designed to ensure the aesthetic quality of the state’s aquatic environment.

4.1.2 Water Quality Criteria and TMDL Endpoints

Environmental regulations for the State of Illinois are contained within the Illinois Administrative Code, Title 35. Specifically, Title 35, Part 302 contains water quality standards promulgated by the Illinois Pollution Control Board. This section presents the standards applicable to impairments within the study area. Water quality standards and TMDL endpoints to be used for TMDL development in the Upper Kaskaskia River watershed are listed in Table 16. Impairments of primary contact recreation and aquatic life designated uses are present in the watershed.

Table 16. Summary of water quality standards for the Upper Kaskaskia River watershed

Parameter	Units	General Use Water Quality Standard
Fecal Coliform [a]	#/100 ml	400 in <10% of samples [b]
		Geometric mean < 200 [c]
Dissolved Oxygen [d]	mg/L	For most waters: March-July > 5.0 min. and > 6.0- 7-day mean Aug-Feb > 3.5 min, > 4.0- 7-day mean and > 5.5- 30-day mean For enhanced protection waters (OT-04 only): March-July > 5.0 min. and > 6.25- 7-day mean Aug-Feb > 4.0 min, > 4.5- 7-day mean and > 6.0- 30-day mean
pH	s.u.	Within the range of 6.5 – 9.0 except for natural causes
Sedimentation / Siltation	N/A	No numeric standard
Total Phosphorus	N/A	No numeric standard

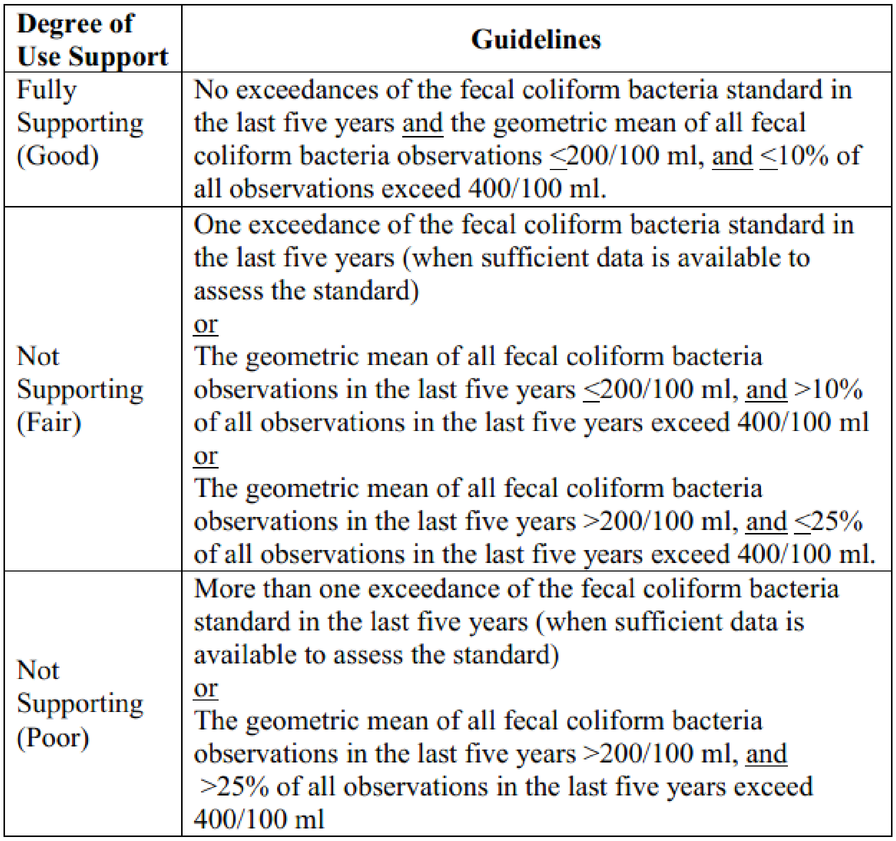
a. Fecal coliform standards are applicable for the recreation season only (May through October).
b. Standard shall not be exceeded by more than 10% of the samples collected during a 30-day period.
c. Geometric mean based on minimum of 5 samples taken over not more than a 30-day period.
d. Applies to the dissolved oxygen concentration in the main body of all streams, in the water above the thermocline of thermally stratified lakes and reservoirs, and in the entire water column of unstratified lakes and reservoirs. Enhanced dissolved oxygen criteria are found in 35 Ill Adm. Code 302.206, including the list of waters with enhanced dissolved oxygen protection and methods for assessing attainment of dissolved oxygen minimum and mean values

According to Illinois water quality standards, primary contact means *...any recreational or other water use in which there is prolonged and intimate contact with the water involving considerable risk of ingesting water in quantities sufficient to pose a significant health hazard, such as swimming and water skiing* (35 Ill. Adm. Code 301.355). The assessment of primary *contact* use is based on fecal coliform bacteria data. The General Use Water Quality Standard for fecal coliform bacteria specifies that during the months of May through October, based on a minimum of five samples taken over not more than a 30-day period, fecal coliform bacteria counts shall not exceed a geometric mean of 200/100 ml, nor shall more than 10 percent of the samples during any 30-day period exceed 400/100 ml (35 Ill. Adm. Code 302.209). This standard protects primary contact use of Illinois waters by humans.

Due to limited state resources, fecal coliform bacteria are not normally sampled at a frequency necessary to apply the General Use standard, i.e., at least five times per month during May through October, and very little data available from others are collected at the required frequency. Therefore, assessment guidelines are based on application of the standard when sufficient data is available to determine standard exceedances; but, in most cases, attainment of primary contact use is based on a broader methodology intended to assess the likelihood that the General Use standard is being attained.

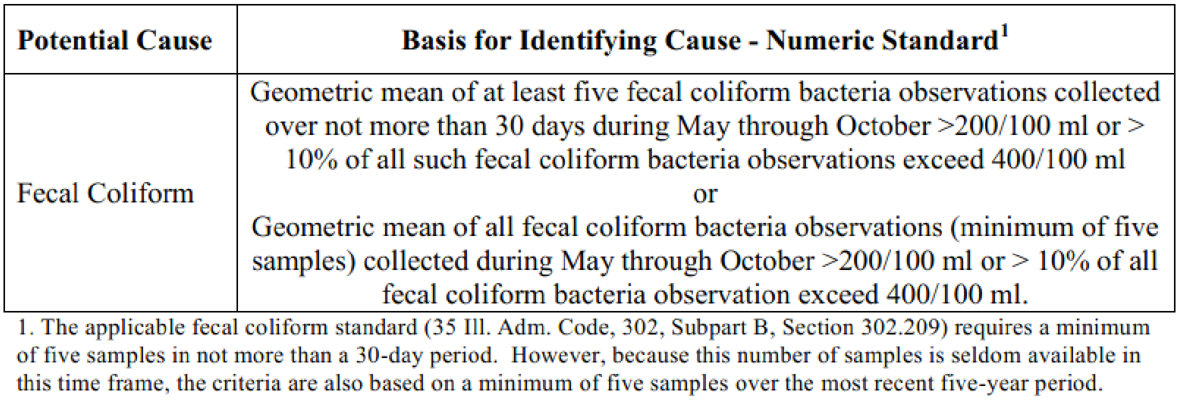
To assess primary contact use, IEPA uses all fecal coliform bacteria from water samples collected in May through October, over the most recent five-year period. Based on these water samples, geometric means and individual measurements of fecal coliform bacteria are compared to the concentration thresholds in Table 17 and Table 18. To apply the guidelines, the geometric mean of fecal coliform bacteria concentration is calculated from the entire set of May through October water samples, across the five years. No more than 10 percent of all the samples may exceed 400/100 ml for a water body to be considered Fully Supporting.

Table 17. Guidelines for assessing primary contact use in Illinois streams and inland lakes



Degree of Use Support	**Guidelines**
Fully Supporting (Good)	No exceedances of the fecal coliform bacteria standard in the last five years and the geometric mean of all fecal coliform bacteria observations ≤200/100 ml, and ≤10% of all observations exceed 400/100 ml.
Not Supporting (Fair)	One exceedance of the fecal coliform bacteria standard in the last five years (when sufficient data is available to assess the standard) or The geometric mean of all fecal coliform bacteria observations in the last five years ≤200/100 ml, and >10% of all observations in the last five years exceed 400/100 ml or The geometric mean of all fecal coliform bacteria observations in the last five years >200/100 ml, and ≤25% of all observations in the last five years exceed 400/100 ml.
Not Supporting (Poor)	More than one exceedance of the fecal coliform bacteria standard in the last five years (when sufficient data is available to assess the standard) or The geometric mean of all fecal coliform bacteria observations in the last five years >200/100 ml, and >25% of all observations in the last five years exceed 400/100 ml

Table 18. Guidelines for identifying potential causes of impairment of primary contact use in Illinois streams and freshwater lakes



Potential Cause	**Basis for Identifying Cause - Numeric Standard**[1]
Fecal Coliform	Geometric mean of at least five fecal coliform bacteria observations collected over not more than 30 days during May through October >200/100 ml or > 10% of all such fecal coliform bacteria observations exceed 400/100 ml or Geometric mean of all fecal coliform bacteria observations (minimum of five samples) collected during May through October >200/100 ml or > 10% of all fecal coliform bacteria observation exceed 400/100 ml.

1. The applicable fecal coliform standard (35 Ill. Adm. Code, 302, Subpart B, Section 302.209) requires a minimum of five samples in not more than a 30-day period. However, because this number of samples is seldom available in this time frame, the criteria are also based on a minimum of five samples over the most recent five-year period.

Aquatic life use assessments in streams are typically based on the interpretation of biological information, physicochemical water data and physical-habitat information from the Intensive Basin Survey, Ambient Water Quality Monitoring Network or Facility-Related Stream Survey programs. The primary biological measures used are the fish Index of Biotic Integrity (fIBI; Karr et al. 1986; Smogor 2000, 2005), the macroinvertebrate Index of Biotic Integrity (mIBI; Tetra Tech 2004) and the Macroinvertebrate Biotic Index (MBI; IEPA 1994). Physical habitat information used in assessments includes quantitative or qualitative measures of stream bottom composition and qualitative descriptors of channel and riparian conditions. Physicochemical water data used include measures of ―conventional parameters (e.g., dissolved oxygen, pH and temperature), priority pollutants, non-priority pollutants, and other pollutants (USEPA, 2002a and www.epa.gov/waterscience/criteria/wqcriteria.html). In a minority of streams for which biological information is unavailable, aquatic life use assessments are based primarily on physicochemical water data.

When a stream segment is determined to be Not Supporting aquatic life use, generally, one exceedance of an applicable Illinois water quality standard (related to the protection of aquatic life) results in identifying the parameter as a potential cause of impairment. Additional guidelines used to determine potential causes of impairment include site-specific standards (35 Ill. Adm. Code 303, Subpart C), or adjusted standards (published in the Illinois Pollution Control Board's Environmental Register at http://www.ipcb.state.il.us/ecll/environmentalregister.asp).

4.2 Load Reduction Strategy Targets

As described below, load reduction strategy (LRS) targets are defined for sediment and phosphorus which are lacking numeric criteria (Table 19).

Table 19. Load reduction strategies targets

LRS Parameter	Stream Water Quality Targets
Phosphorus, Total (mg/L)	0.312
Suspended Solids, Total (mg/L)	27.75
Non-Volatile Suspended Solids (mg/L)	25.82

To arrive at water quality targets to support LRSs, IEPA completed the following three tasks: Identification, Analysis, and Application.

Identification:

1. For each TMDL watershed, the US Geological Survey ten-digit Hydrologic Unit Code, or HUC10 was identified.
2. Within each HUC10, each and every stream segment or lake was identified.
3. Each stream segment or lake was checked against the IEPA Assessment Data Base (or ADB) to determine those segments and lakes that are in full support for aquatic life.
4. For each HUC10 basin, full-support stream segments and lakes were grouped to show where each unique watershed is at its best in providing a healthy environment for aquatic plants and animals. A statewide “one size fits all” approach was purposefully avoided to allow the distinct nature of each watershed to become apparent.

Analysis:

1. For each stream segment or lake that fully supports designated uses, the water quality data from 2001 through 2013 were compiled. This includes data from the IEPA’s Surface Water Section’s ambient monitoring, intensive basin surveys, and special studies. The pollutants (or parameters) for which data compiled data are total phosphorus, total suspended solids, and non-volatile suspended solids, those pollutants requiring an LRS be developed.
2. These data underwent a quality control check and carefully discriminated against any data that did not pass the rigorous quality assurance checks. Only the data that passed all checks were used to calculate the water quality targets.
3. Mathematical operations were kept to a minimum in order to establish targets which are as accurate and relevant as possible. For each stream segment, the raw average of all available data from 2001 through 2013 was calculated for each parameter.

Application:

1. For each stream segment, an average concentration for total phosphorus, non-volatile suspended solids, and/or total suspended solids over the entire time period (2001-2013) was calculated.
2. Within each unique watershed, these long-term results for all the fully supporting segments and streams in the watershed were averaged. This allows the healthy waters to most accurately represent the level of aquatic life support the watershed is capable of providing.
3. The average concentrations for the aquatic-life-supporting streams were then assigned as targets for all remaining streams in the watershed. The rationale for assigning this average is that within a given watershed, all streams, for example, share similar geology, soil type, land use, agricultural practices, and topography.

Finally, the average of these long-term concentrations can be used as the target concentrations for impaired stream segments requiring an LRS be developed.

5. Data Analysis

An important step in the TMDL and LRS development process is the review of water quality conditions, particularly data and information used to list segments. Examination of water quality monitoring data is a key part of defining the problem that the TMDL or LRS is intended to address. This section provides a brief review of available water quality information provided by the IEPA and USGS through 2015. The period of record used to assess impairment is 2011-2015 for fecal coliform and 2006-2015 for all other pollutants. Note that additional data were collected in 2016 for select impairments, see Section 6 for a summary of this information. Each data point was reviewed to ensure the use of quality data in the analysis below.

5.1 Kaskaskia River

The Kaskaskia River is listed as being impaired along two segments – O-02 and O-15. Segment O-02 is impaired for primary contact recreation due to fecal coliform. Segment O-15 is downstream of O-02 and is also listed as impaired due to fecal coliform. There is one IEPA sampling site on each of the impaired reaches.

One hundred fecal coliform samples have been collected at O-02 between 1990 and 2010 and 88 samples have been collected at O-15 between 1990 and 2006 (Figure 13 and Figure 14). However, all samples collected are greater than 5 years old. Since more recent data have not been collected on segments O-02 and O-15, additional data collection is recommended to confirm impairment. Section 6 discusses specific information relevant to additional data collection.

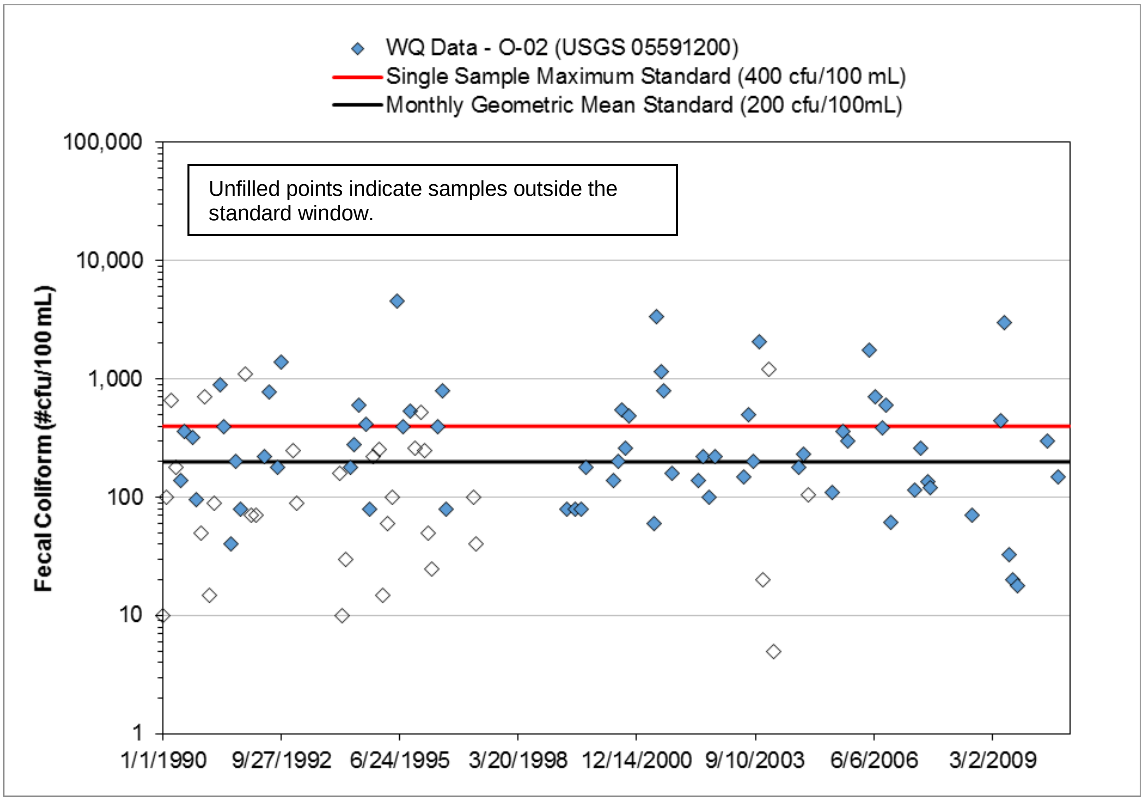


Figure 13. Fecal coliform water quality time series, Kaskaskia River O-02 segment.

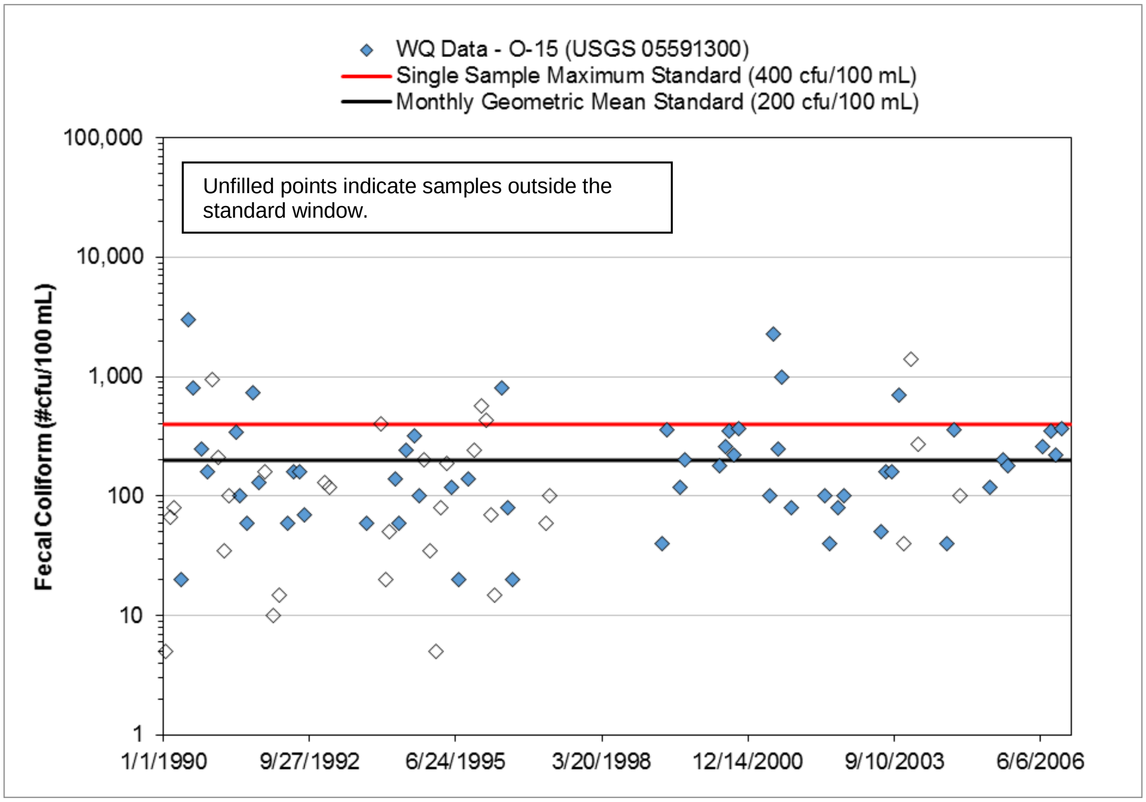


Figure 14. Fecal coliform water quality time series, Kaskaskia River O-15 segment.

A recently completed water quality trend analysis for station O-02 noted the highest fecal coliform concentrations within the entire Kaskaskia River Watershed are found along O-02 and indicated that management practices should focus on manure management and limiting access of animals to water resources (Williard and Shrestha 2016).

Possible causes for high bacteria concentrations within O-02 and O-15 are upstream sewage treatment plants, livestock, and onsite wastewater treatment systems. Wildlife can also contribute to impairment, however less than 3 percent of the watershed consists of forest, grassland, and wetlands and therefore is not considered a significant source. One point source is located in the direct drainage area of these segments, and six others are located upstream of the impaired segments. In addition to STPs, AFOs and onsite wastewater treatment systems are present within the impairment watersheds. In total, it is estimated that there are approximately 40 livestock animal units and 13 onsite wastewater treatment systems per square mile potentially contributing fecal coliform to the watershed.

5.2 Becks Creek (OQ-01)

Becks Creek (OQ-01) is listed as being impaired for primary contact recreation due to fecal coliform. One IEPA sampling site was identified on Becks Creek, OQ-01. Thirteen samples have been collected at the site from 2011-2015 (Table 20 and Figure 15). There are 2 reported exceedances of the 400 cfu/100 mL standard, with an average reported value above the standard at 409 cfu/100 mL. Historical data collected at site OQ-01 from 1990-2010 have an average fecal coliform concentration of 1,475 cfu/100 mL, well above the standard. Recreational use impairment is verified in this this stream.

Table 20. Data summary, Becks Creek OQ-01

Sample Site	No. of samples	Minimum (cfu/100 mL)	Average (cfu/100 mL)	Maximum (cfu/100 mL)	CV (standard deviation/ average)	Number of exceedances of single sample maximum standard (400 cfu/100 mL)
Fecal Coliform						
OQ-01 (USGS 05592195)	13	2	409	3,300	2.07	2
OQ-01 (USGS 05592195)[a]	93	5	1,475	36,000	3.37	28

a. Data from 1990-2010; greater than 5 years old, not used to assess impairment.

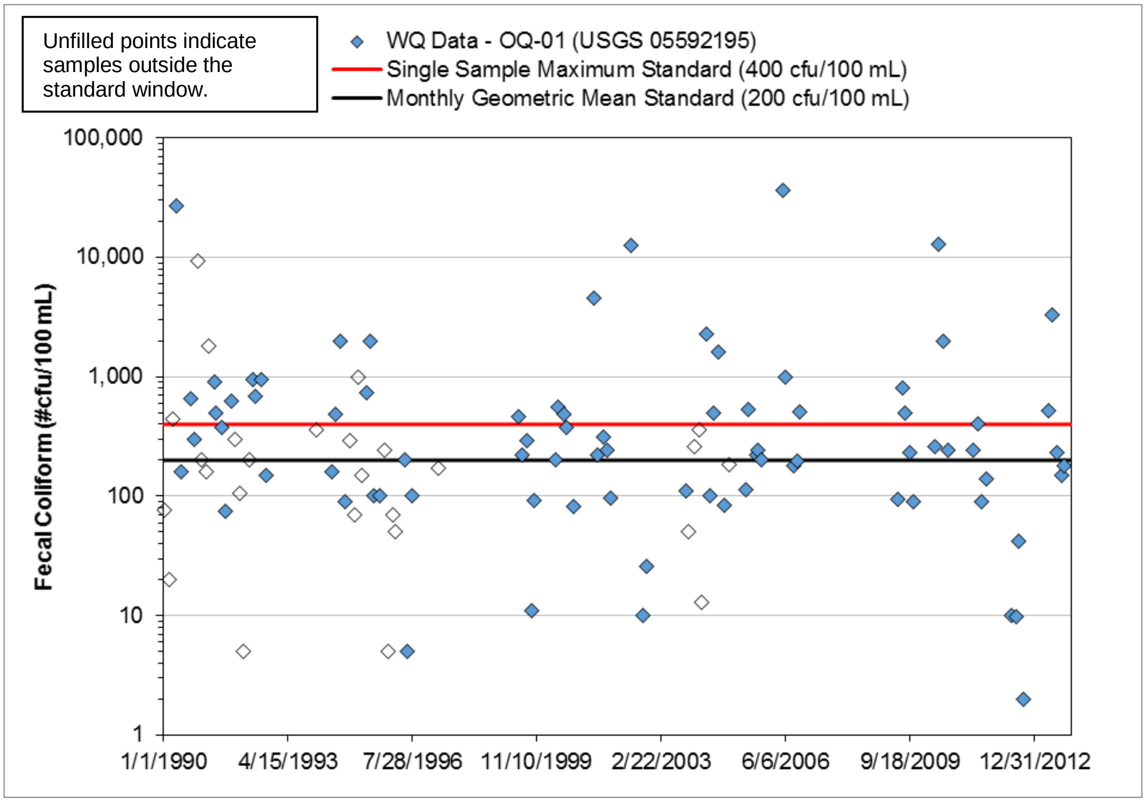


Figure 15. Fecal coliform water quality time series, Becks Creek OQ-01.

Possible bacteria sources within the watershed include livestock and onsite wastewater treatment systems. It is estimated that cattle and pigs make up the majority of the livestock in the Becks Creek watershed with a combined 100 animal units per square mile. In comparison, the density of onsite wastewater treatment systems is also estimated to be relatively high at 10 systems per square mile. Though not necessarily directly discharging to Becks Creek, the total number and density of both of these sources can potentially produce a large amount of fecal coliform within the watershed. Wildlife may also contribute to high fecal coliform concentrations.

5.3 West Okaw River

The West Okaw River is listed as being impaired along two segments: OT-04 and OT-02. OT-04 is listed as impaired for aquatic life due to low dissolved oxygen, elevated levels of phosphorus, and pH outside the range of general use water quality standards. OT-02 is downstream of OT-04 and is listed as impaired for primary contact recreation due to fecal coliform. There is one IEPA sampling site located on impairment OT-02 (OT-02) and no IEPA sampling sites located on OT-04.

5.3.1 OT-04

This segment was originally assessed for the 2006 303d List based on data collected on downstream station OT-02. No recent assessments have been made based on data collected on OT-04. During the 2010 assessment (2010 303(d) List) for segment OT-02, Aquatic Life Use was listed as Full Support and DO, pH, and phosphorus impairments were removed, however segment OT-04 was not updated accordingly. Additional review of the data in 2016 also identified errors in the dataset for DO, conductivity, and pH. Based on this information, segment OT-04 will be corrected by delisting the causes of DO, pH, and phosphorus, and therefore no TMDL will be developed.

5.3.2 OT-02

Eighty-six (86) fecal coliform samples have been collected at OT-02 from 1990-2006 (Figure 16). However, all samples collected are greater than 5 years old. Since more recent data have not been collected on the segment, additional data collection is recommended to confirm impairment. Section 6.2 discusses specific information relevant to additional data collection.

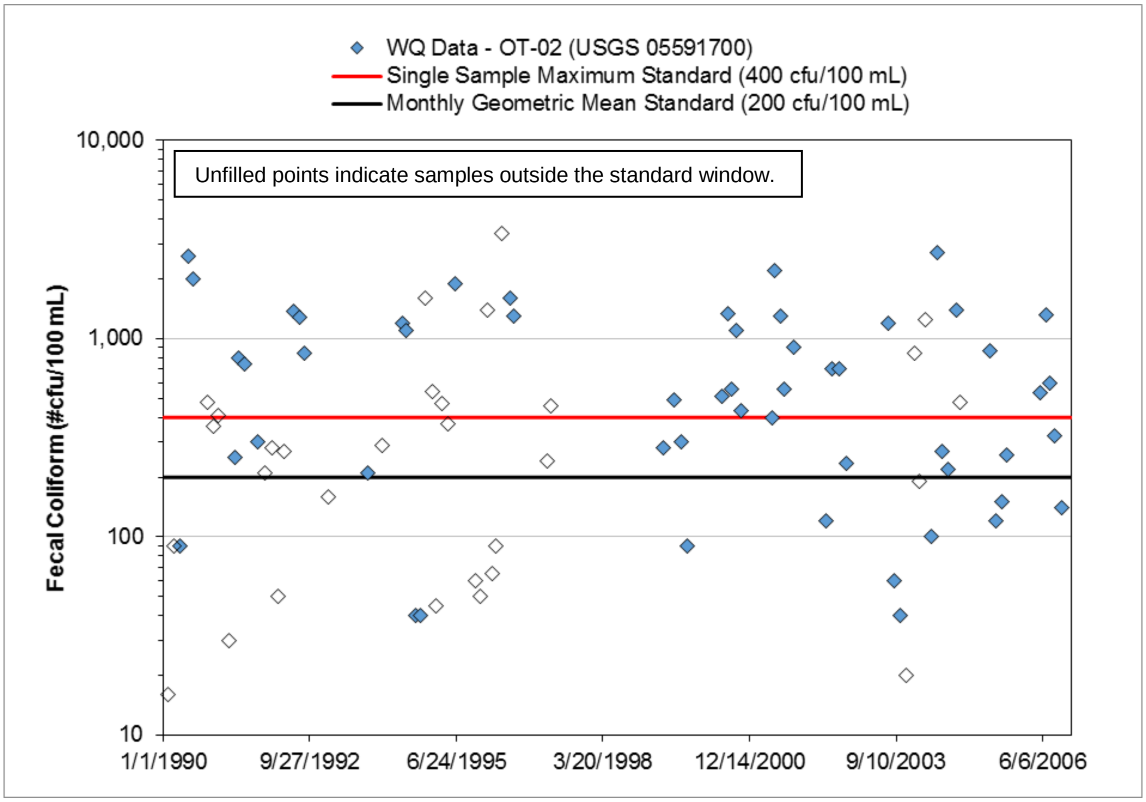


Figure 16. Fecal coliform water quality time series, West Okaw River OT-02.

Potential sources of bacteria include both the Lovington STP (IL0024210; no fecal coliform permit limit prior to 2016) and Village of Hammond STP (IL0027197; no fecal coliform permit limit), livestock, onsite wastewater treatment systems, and wildlife. The Lovington STP has been required to reduce fecal coliform concentrations as part of a new permit that was issued March 30, 2016. Though neither STP drains directly to West Okaw River, any high outputs of fecal coliform from the STPs could raise the concentration in the river. In addition to STPs, it is estimated that there are approximately 14 onsite wastewater treatment systems and 15 animal units per square mile in the impairment watershed. Both of these sources can potentially produce a large amount of fecal coliform within the watershed and increase the total amount reaching the river.

5.4 Johnathon Creek (OU-01)

Johnathon Creek (OU-01) is listed as being impaired for primary contact recreation due to fecal coliform. One IEPA sampling site was identified on Johnathon Creek, OU-01. 91 fecal coliform samples have been collected at the site from 1990-2006 (Figure 17). All samples collected are greater than 5 years old, additional data collection is recommended to confirm impairment. Section 6.2 discusses specific information relevant to additional data collection.

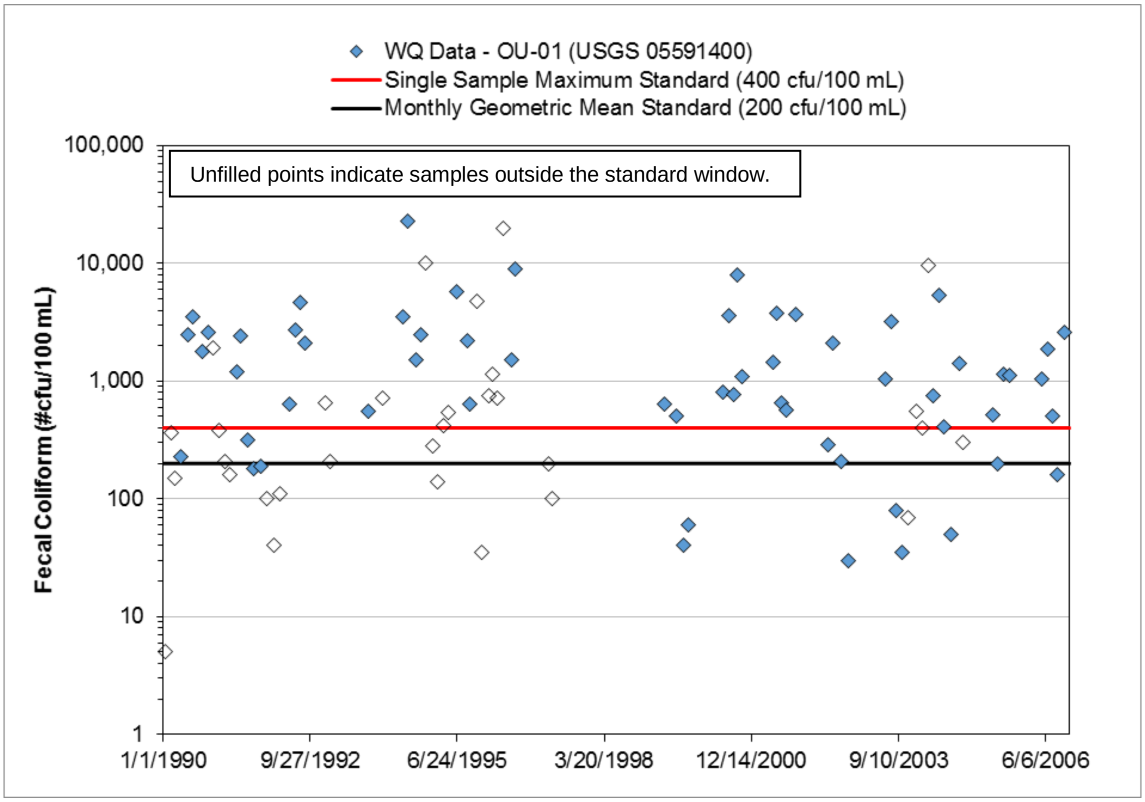


Figure 17. Fecal coliform water quality time series, Johnathon Creek OU-01.

Possible bacteria sources within the watershed include onsite wastewater treatment systems, livestock, and wildlife. It is estimated that there are a total of 16 onsite wastewater treatment systems and 40 animal units per square mile potentially contributing fecal coliform to the impairment watershed. Though not necessarily directly discharging to Johnathon Creek, the total number and density of both of these sources can produce a large amount of fecal coliform within the watershed.

5.5 Lake Fork (OW-01 and OW-02)

Lake Fork is listed as being impaired along two segments: OW-01 and OW-02. OW-02 is impaired for aquatic life use with elevated sediment and siltation. OW-01 is downstream of OW-02 and is also listed as impaired due to elevated sediment and siltation. There is one IEPA sampling site on OW-01 (OW-01) and one IEPA sampling site located one mile upstream of OW-02 (OW-03). A total of eight TSS samples have been collected at OW-01 in 2007 and 2012 and a total of three samples have been collected at OW-03 in 2007 (Table 21, Figure 18 and Figure 19). All eight TSS samples collected at OW-01 exceeded the LRS stream water quality target, with an average reported value above the target at 59 mg/L. Only one of the samples at OW-03 exceeded the LRS target, with an average reported value below the target at 20 mg/L. No non-volatile suspended solids samples were available at either sampling site. Data verify TSS concentrations are above the target criteria on both segments.

Table 21. Data summary, Lake Fork OW-01 and OW-02 segments

Sample Site	No. of samples	Minimum (mg/L)	Average (mg/L)	Maximum (mg/L)	CV (standard deviation/ average)	Number of exceedances of LRS stream water quality target (27.75 mg/L)
Total Suspended Solids						
OW-01	8	31	59	109	0.37	8
OW-03	3	12	20	30	0.38	1

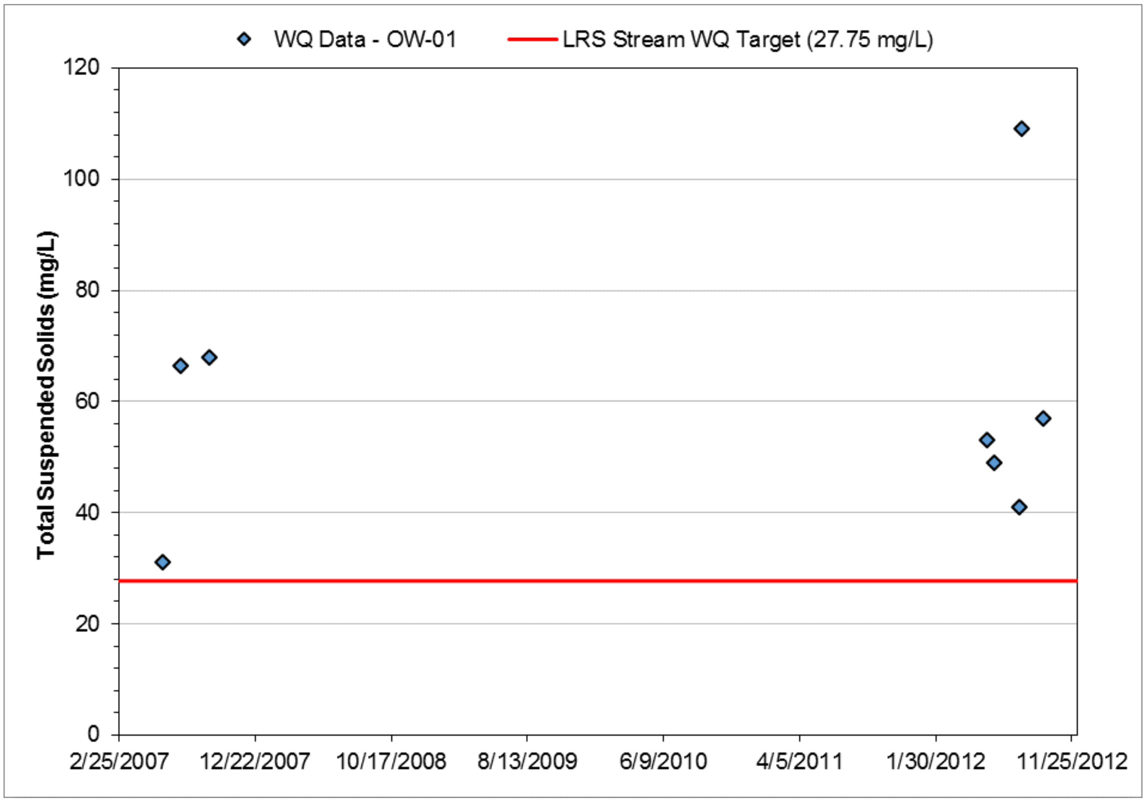


Figure 18. Total suspended solids (TSS) water quality time series, Lake Fork OW-01 segment.

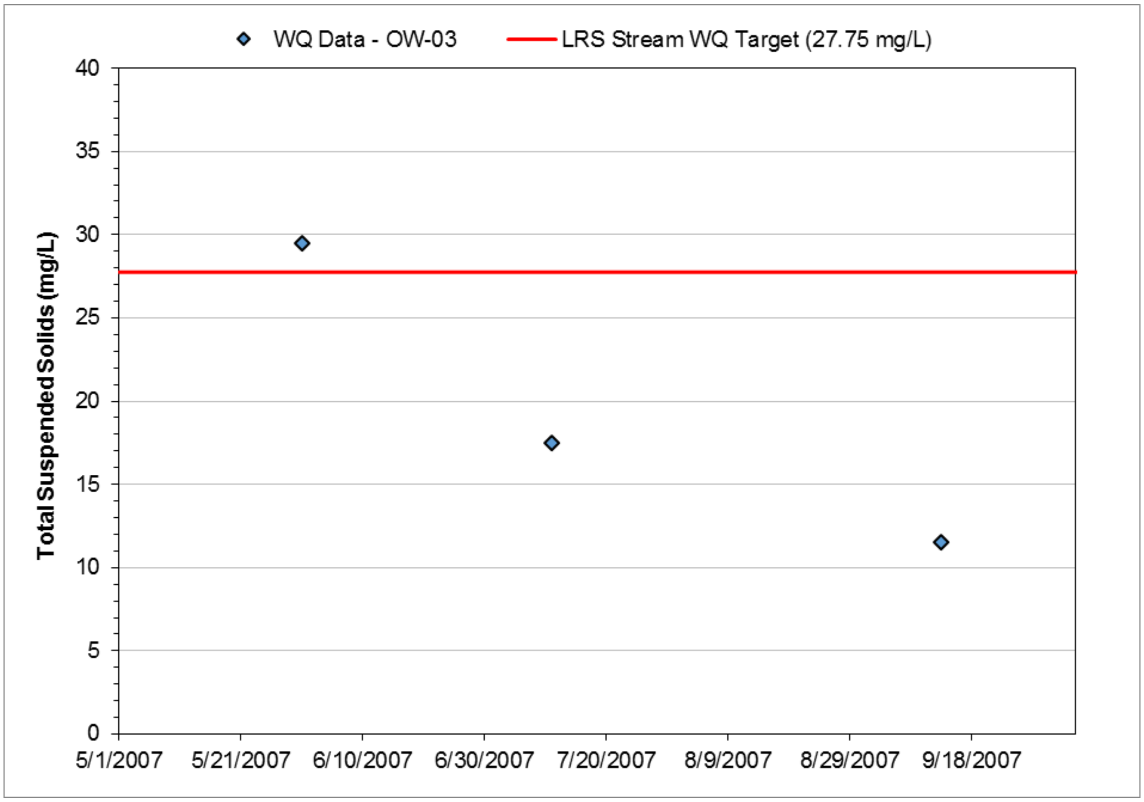


Figure 19. Total suspended solids (TSS) water quality time series, Lake Fork OW-02 segment.

Possible causes for high TSS concentrations include soil erosion from of agricultural and other nonpoint source land uses and stream bank erosion. Agricultural land use accounts for 93 percent of land use in the OW-01 watershed and 94 percent in the OW-02 watershed. Altered stream channels and streambank erosion also contribute to high TSS concentrations. The USACE identified historic channelization along both segments and noted stream restoration of channelized segments as a first step in reducing sediment concentrations (USACE 2010). Noteworthy is the concentration of TSS in the stream just upstream of the impaired segment at OW-03. This concentration is very close to the target, therefore land uses upstream of the impaired segments do not appear to be contributing to the impairment.

5.6 Asa Creek (OZZT-01)

Asa Creek is listed as being impaired for aquatic life use due to a pH range outside water quality criteria and for elevated sediment and siltation. One IEPA sampling site was identified on Asa Creek, OZZT-01. Both pH and TSS data have been collected at the site from 2006-2007 (Table 22, Figure 20 and Figure 21). Of the 12 pH samples collected, only one sample was outside the general use standard range for pH of 6.5-9.0, with a value of 9.2 s.u. The sample that exceeded the pH standard was measured in the field on the morning of February 2006. No samples at OZZT-01 from between 1999 and 2005 were recorded outside of the general use standard range. An evaluation of the data suggests that the stream is not violating the pH standard, although additional data could be collected to further evaluate the impairment.

Six of 11 TSS samples collected at OZZT-01 exceeded the LRS stream water quality target, with an average value above the target at 36 mg/L. Historical data collected at OZZT-01 from between 1990 and 2005 have an average TSS concentration of 39 mg/L, also above the target. No NVSS samples were available at OZZT-01. Available data verify the TSS concentrations in Asa Creek are above the target.

Table 22. Data summary, Asa Creek OZZT-01

Sample Site	No. of samples	Minimum	Average	Maximum	CV (standard deviation/ average)	Number of samples outside the range of the general use water quality standard (6.5 – 9 s.u.)
pH						
OZZT-01 (USGS 05591500)	12	7.0	7.8	9.2	0.06	1
OZZT-01 (USGS 05591500) [a]	62	6.9	7.6	8.9	0.06	0
Sample Site	**No. of samples**	**Minimum**	**Average**	**Maximum**	**CV (standard deviation/ average)**	**Number of exceedances of LRS stream water quality target (27.75 mg/L)**
Total Suspended Solids						
OZZT-01 (USGS 05591500)	11	5	36	79	0.65	6
OZZT-01 (USGS 05591500) [b]	73	1	39	213	1.10	33

a. Data from 1999-2005; greater than 10 years old, not used to assess impairment.
b. Data are from 1990-2005; greater than 10 years old, not used to assess impairment.

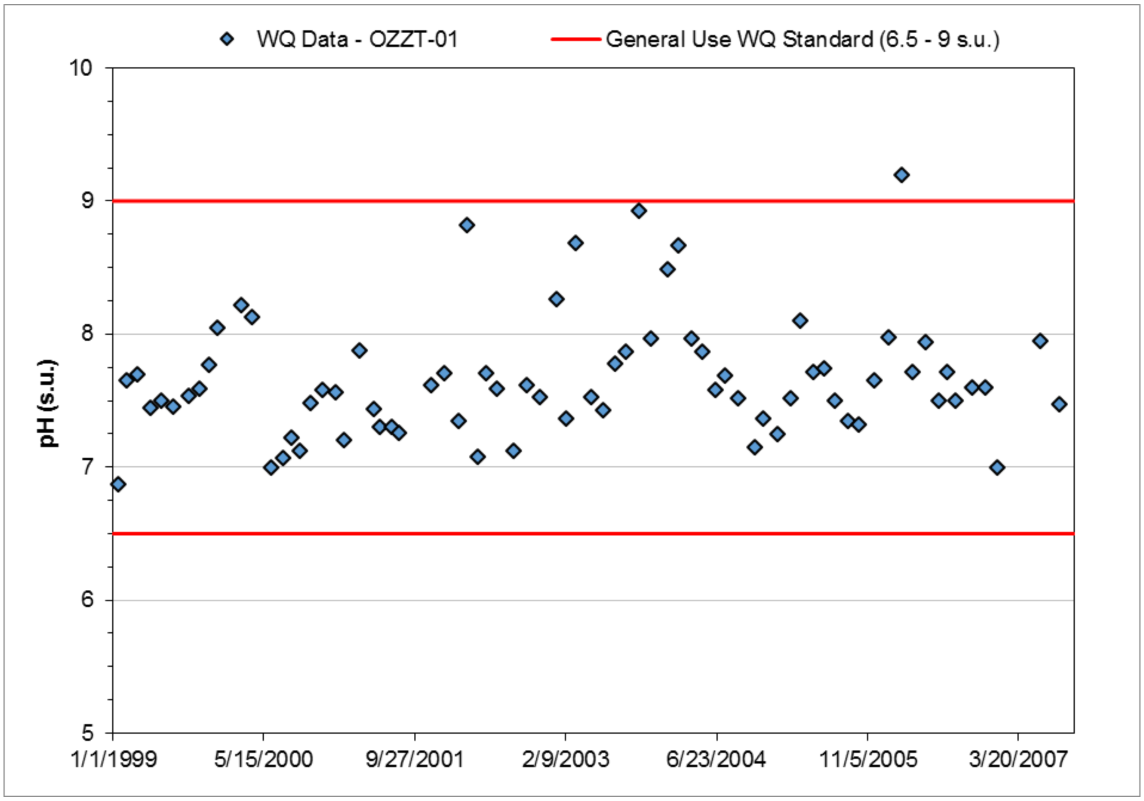


Figure 20. pH water quality time series, Asa Creek OZZT-01.

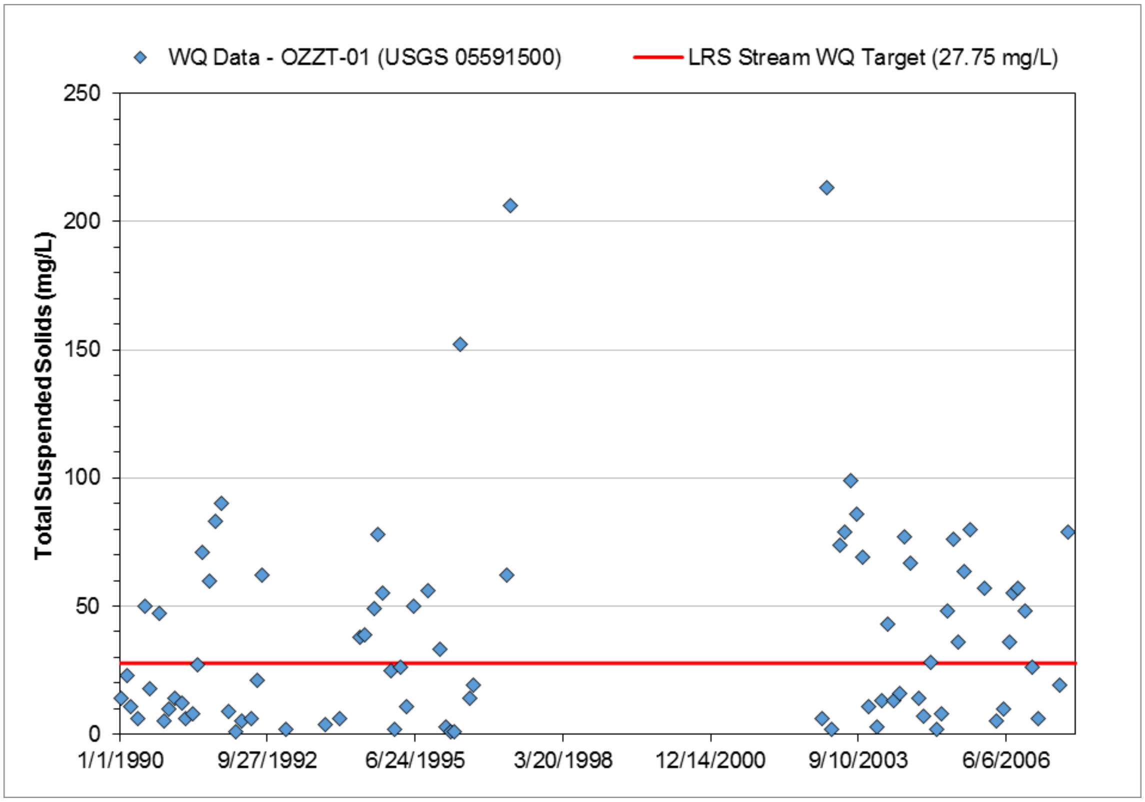


Figure 21. Total suspended solids (TSS) water quality time series, Asa Creek OZZT-01.

Possible causes for high pH can include high photosynthetic activity as a result of algae or macrophytes in the creek, and possibly discharges from industrial activity. Since the only sample that exceeded the water quality standard occurred in February, agricultural activities and photosynthesis would not be probable sources. The Sullivan STP (IL0021806) discharges directly to Asa Creek and may be contributing to higher pH levels in the creek. Discharge monitoring records from the Sullivan STP do not identify exceedances of the pH standard in February 2006, but have exceeded the standard three times between 2004 and 2015.

Concentrations of TSS that are exceeding the water quality target are likely the result of soil erosion from agricultural and nonpoint source land uses and stream bank erosion. Agricultural land use accounts for 78 percent of land use in the watershed. Altered stream channels and streambank erosion also contribute to high TSS concentrations.

6. Stage 2 Data Collection

Data satisfy two key objectives for IEPA, enabling the agency to make informed decisions about the resource. These objectives include developing information necessary to:

- Determine if the impaired areas are meeting applicable water quality standards for their respective designated use(s); and
- Support modeling and assessment activities required to allocate pollutant loadings for all impaired areas where water quality standards are not being met.

Additional data points can be needed to verify impairment, understand probable sources, calculate reductions, develop validated water quality models, and develop effective implementation plans. Table 23 summarizes each segment and the additional data that were collected by IEPA in 2016 to verify impairments and develop TMDLs/LRSs. A summary of these new data is provided below.

Table 23. Additional data needs

Name	Segment ID	Designated Uses	TMDL Parameters	LRS Parameters	Additional Data
Kaskaskia River	IL_O-02	Primary contact recreation	Fecal coliform	-	5 samples over a 30-day period
Kaskaskia River	IL_O-15	Primary contact recreation	Fecal Coliform	-	5 samples over a 30-day period
Becks Creek	IL_OQ-01	Primary contact recreation	Fecal Coliform	--	5 samples over a 30-day period
West Okaw River	IL_OT-02	Primary contact recreation	Fecal Coliform	--	5 samples over a 30-day period
West Okaw River	IL_OT-04	Aquatic life	*Dissolved Oxygen, pH*	*Total Phosphorus*	None, parameters being delisted
Jonathon Creek	IL_OU-01	Primary contact recreation	Fecal Coliform	--	5 samples over a 30-day period
Lake Fork	IL_OW-01	Aquatic life	--	Sedimentation/ Siltation	None
Lake Fork	IL_OW-02	Aquatic life	--	Sedimentation/ Siltation	None
Asa Creek	IL_OZZT-01	Aquatic life	*pH*	Sedimentation/ Siltation	3 samples to verify impairment

Italics – data indicate no impairment or no TMDL being developed, see Section 5.

IEPA collected data during June 2016 that included field data and laboratory assessment of fecal coliform within two mainstem Kaskaskia River segments O-02 and O-15, Becks Creek segment OQ-01, West Okaw River segment OT-02 and Johnathon Creek segment OU-01 (Figure 22 and Table 24). The fecal coliform single sample maximum was exceeded in each segment and the geometric mean (based on 5 samples collected during a 30-day period) also exceeded the standard in each segment. These data confirm impairment.

IEPA monitored pH within Asa Creek (OZZT-01) in June, July and October 2016 (Table 25). These data, along with existing monitoring data presented in the Section 5, do not confirm pH impairment in Asa Creek and a TMDL is not included in this report.

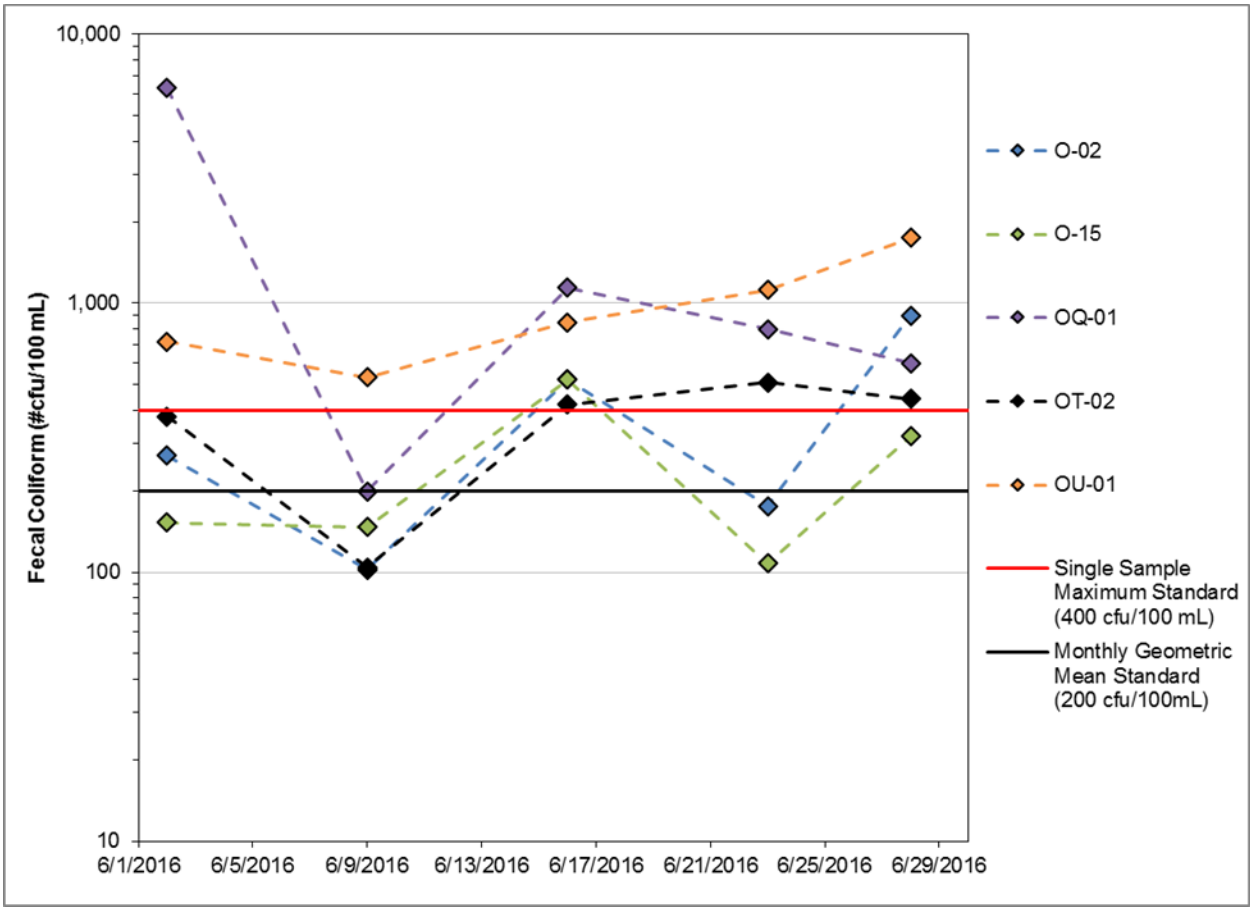


Figure 22. Fecal coliform water quality time series of sampling completed by IEPA in June 2016.

Comparison of water quality data to the geometric mean is provided in Table 24.

Table 24. Summary of fecal coliform sampling completed by IEPA in June 2016

Name	Sample Site	No. of Samples	Minimum (cfu/100 mL)	Maximum (cfu/100 mL)	Geometric Mean (cfu/100 mL)	Percent reduction needed to meet geometric mean standard (200 cfu/100 mL)
Kaskaskia River	O-02	5	102	900	296	32%
Kaskaskia River	O-15	5	108	520	210	5%
Becks Creek	OQ-01	5	200	6,300	928	78%
West Okaw River	OT-02	5	104	508	326	39%
Johnathon Creek	OU-01	5	530	1,750	913	78%

Table 25. pH sampling in Asa Creek (OZZT-01)

Sample Date	Sample Time	pH
28-Jun-16	12:00:00 PM	7.74
28-Jul-16	2:00:00 PM	7.91
20-Oct-16	10:10:00 AM	7.26
Exceedances of the standard (6.5-9.0)		**0**

7. TMDL and LRS Derivation

The first stage of this project included an assessment of available data, followed by evaluation of their credibility. The types of data available, their quantity and quality, and their spatial and temporal coverage relative to impaired segments or watersheds drive the approaches used for TMDL model selection and analysis. Credible data are those that meet specified levels of data quality, with acceptance criteria defined by measurement quality objectives, specifically their precision, accuracy, bias, representativeness, completeness, and reliability. The following sections describe the methods used to derive TMDLs and LRSs.

TMDLs and LRSs are developed for waterbodies that have been verified as impaired. TMDLs/LRSs are not developed for the following impairments:

- Based on expected changes to the impairment listing as described in Section 5, no TMDLs will be developed for West Okaw River (OT-04)
- pH in Asa Creek was found to be in compliance with water quality standards and not impaired (see Section 6)

Table 26 summarizes the final set of TMDLs and LRSs included in this report.

Table 26. TMDLs and LRSs included in Stage 3

Name	Segment ID	Designated Uses	TMDL Parameters	LRS Parameters
Kaskaskia River	O-02	Primary contact recreation	Fecal coliform	None
	O-15	Primary contact recreation	Fecal coliform	None
Becks Creek	OQ-01	Primary contact recreation	Fecal coliform	None
West Okaw River	OT-02	Primary contact recreation	Fecal coliform	None
Johnathon Creek	OU-01	Primary contact recreation	Fecal coliform	None
Lake Fork	OW-01	Aquatic life	None	Sedimentation/siltation
Lake Fork	OW-02	Aquatic life	None	Sedimentation/siltation
Asa Creek	OZZT-01	Aquatic life	None	Sedimentation/siltation

A waterbody's loading capacity represents the maximum rate of pollutant loading that can be assimilated without violating water quality standards (40 CFR 130.2(f)). Establishing the relationship between in-stream water quality and source loading is an important component of TMDL development. It allows the determination of the relative contribution of sources to total pollutant loading and the evaluation of potential changes to water quality resulting from implementation of various management options. The following section describes the methodology used in this analysis; results are then presented by waterbody in Section 8.

A TMDL is the total amount of a pollutant that can be assimilated by the receiving water while still achieving water quality standards. TMDLs are composed of the sum of individual wasteload allocations (WLAs) for regulated sources and load allocations (LAs) for unregulated sources and natural background levels. In addition, the TMDL must include a margin of safety (MOS), either implicitly or explicitly, that accounts for the uncertainty in the relationship between pollutant loads and the quality of the receiving waterbody and may contain a reserve capacity (RC) if needed. Conceptually, this is defined by the equation:

$$\mathbf{TMDL = \sum WLAs + \sum LAs + MOS + RC}$$

Section 8 presents the allowable loads and associated allocations for each of the impaired waterbodies in the watershed. LRSs were developed for total suspended solids. LRSs include the loading capacity of the receiving water and the reduction requirements to meet that loading capacity. An LRS does not include WLAs or MOS and is focused on nonpoint sources of pollution.

7.1 Loading Capacity and Reductions

A duration curve approach is used to evaluate the relationships between hydrology and water quality and calculate the TMDLs and LRSs for all stream impairments (Table 26). The primary benefit of duration curves in TMDL development is to provide insight regarding patterns associated with hydrology and water quality concerns. The duration curve approach is particularly applicable because water quality is often a function of stream flow. For instance, sediment concentrations typically increase with rising flows as a result of factors such as channel scour from higher velocities. Other parameters, such as chloride, may be more concentrated at low flows and more diluted by increased water volumes at higher flows. The use of duration curves in water quality assessment creates a framework that enables data to be characterized by flow conditions. The method provides a visual display of the relationship between stream flow and water quality.

Streamflow for all impairments was estimated from USGS gauges within or adjacent to the impairment watersheds. Streamflow data for all relevant USGS gauges were downloaded from the National Water Information System (NWIS; https://waterdata.usgs.gov/nwis) and area-weighted to relevant impairment watersheds depending on the gauges’ watershed area relative to the impairment watershed area. The streamflow estimation source for all impairments is presented in Table 27. The Lake Fork, Kaskaskia River and West Okaw River impaired segments have USGS gages in close proximity and within contributing drainage areas (Figure 7). The gages for Becks Creek, Johnathon Creek and Asa Creek are not within the contributing drainage areas to the impaired segments, but were selected based on similar land use and contributing drainage area size.

Table 27. USGS gauges used to estimate streamflow for impairments

Gage ID	Location	Impaired Segment(s)
03378635	Little Wabash River near Effingham, IL	OQ-01
05590800	Lake Fork at Atwood, IL	IL_OW-01, IL_OW-02
05591200	Kaskaskia River at Cooks Mill, IL	IL_O-02, IL_O-15
05591550	Whitley Creek near Allenville, IL	IL_OU-01, IL_OZZT-01
05591700	West Okaw River Near Lovington, IL	IL_OT-02

Allowable pollutant loads have been determined through the use of load duration curves. Discussions of load duration curves are presented in *An Approach for Using Load Duration Curves in the Development of TMDLs* (U.S. EPA 2007). This approach involves calculating the allowable loadings over the range of flow conditions expected to occur in the impaired stream by taking the following steps:

1. A flow duration curve for the stream is developed by generating a flow frequency table and plotting the data points to form a curve. The data reflect a range of natural occurrences from extremely high flows to extremely low flows.

2. The flow curve is translated into a load duration (or TMDL) curve by multiplying each flow value (in cubic feet per second) by the water quality standard/target for a contaminant (mg/L or count/100 mL), then multiplying by conversion factors to yield results in the proper unit (i.e., pounds per day or count/day). The resulting points are plotted to create a load duration curve.

3. Each water quality sample is converted to a load by multiplying the water quality sample concentration by the average daily flow on the day the sample was collected. Then, the individual loads are plotted as points on the TMDL graph and can be compared to the water quality standard/target, or load duration curve.

4. Points plotting above the curve represent deviations from the water quality standard/target and the daily allowable load. Those plotting below the curve represent compliance with standards and the daily allowable load. Further, it can be determined which locations contribute loads above or below the water quality standard/target.

5. The area beneath the TMDL curve is interpreted as the loading capacity of the stream. The difference between this area and the area representing the current loading conditions is the load that must be reduced to meet water quality standards/targets.

6. The final step is to determine where reductions need to occur. Those exceedances at the right side of the graph occur during low flow conditions, and may be derived from sources such as illicit sewer connections. Exceedances on the left side of the graph occur during higher flow events, and may be derived from sources such as runoff. Using the load duration curve approach allows IEPA to determine which implementation practices are most effective for reducing loads on the basis of flow regime. If loads are considerable during wet-weather events (including snowmelt), implementation efforts can target those best management practices that will most effectively reduce stormwater runoff.

The stream flows displayed on load duration curves may be grouped into various flow regimes to aid with interpretation of the load duration curves (example shown in Figure 23). The flow regimes are typically divided into 10 groups, which can be further categorized into the following five hydrologic zones (U.S. EPA 2007):

- High flow zone: stream flows that plot in the 0 to 10-percentile range, related to flood flows
- Moist zone: flows in the 10 to 40-percentile range, related to wet weather conditions
- Mid-range zone: flows in the 40 to 60-percentile range, median stream flow conditions
- Dry zone: flows in the 60 to 90-percentile range, related to dry weather flows
- Low flow zone: flows in the 90 to 100-percentile range, related to drought conditions

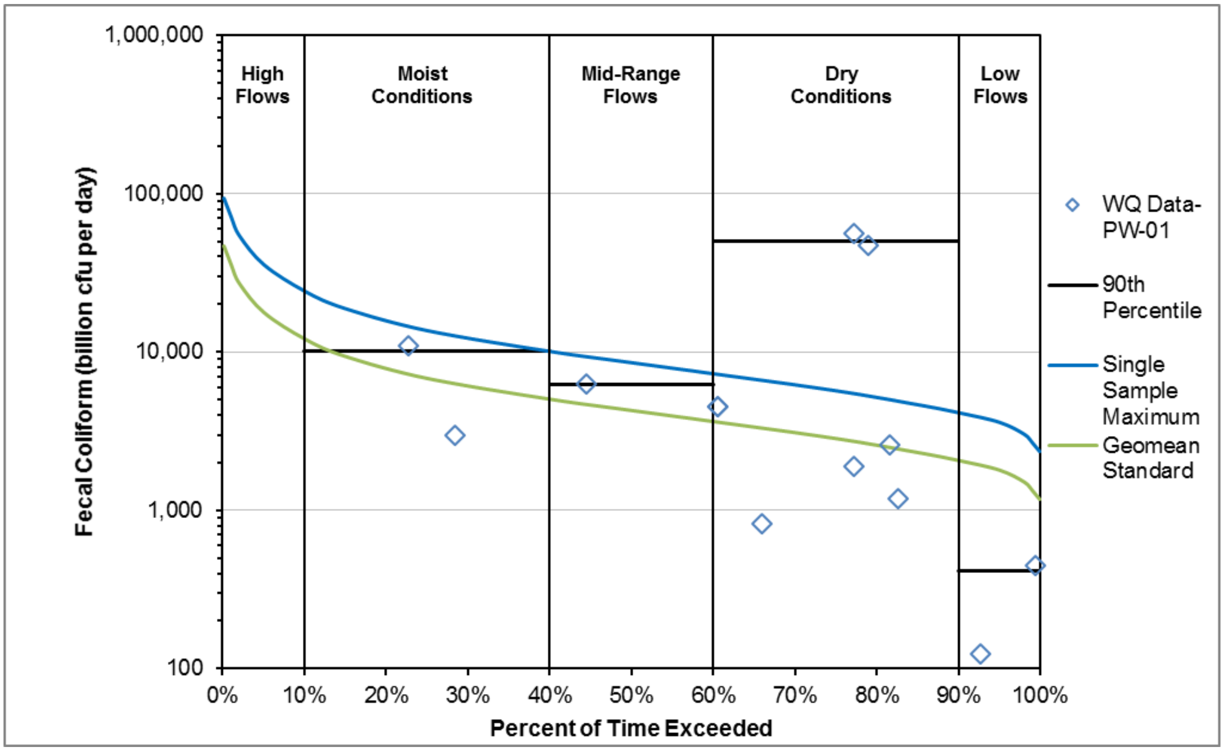


Figure 23. Example load duration curve for fecal coliform.

The fecal coliform TMDLs are based on compliance with both the single sample maximum standard (400 cfu/ 100 mL) and the geomean standard (200 cfu/100 mL). For the single sample maximum standard, reductions are based on the 90th percentile of the observed load and the median allowable load in each flow regime based on 2011-2016. 2016 is added to the dataset presented in Section 5 as a result of Stage 2 monitoring (see Section 6). Reductions relative to the geomean standard are concentration-based and were calculated using the geomean concentration of samples collected by IEPA in June 2016. The TSS LRS loading capacities are based on the median allowable load in each of the flow regimes, and the load reductions are based on the observed median load (from data collected between 2006 and 2015) in each flow regime and the LRS target.

The duration curve approach helps to identify the issues surrounding the impairment and to roughly differentiate between sources. Table 28 summarizes the general relationship between the five hydrologic zones and potentially contributing source areas (the table is not specific to any individual pollutant). For example, the table indicates that impacts from point sources are usually most pronounced during dry and low flow zones because there is less water in the stream to dilute their loads. In contrast, impacts from channel bank erosion is most pronounced during high flow zones because these are the periods during which stream velocities are high enough to cause erosion to occur.

Table 28. Relationship between duration curve zones and contributing sources

Contributing source area	Duration Curve Zone				
	High	Moist	Mid-range	Dry	Low
Point sources				M	H
Livestock direct access to streams				M	H
On-site wastewater systems	M	M-H	H	H	H
Riparian areas		H	H	M	
Stormwater: Impervious		H	H	H	
Stormwater: Upland	H	H	M		
Field drainage: Tile system	H	H	M-H	L-M	
Bank erosion	H	M			

Note: Potential relative importance of source area to contribute loads under given hydrologic condition (H: High; M: Medium; L: Low).

7.2 Load Allocations

Load allocations represent the portion of the allowable daily load that is reserved for nonpoint sources and natural background conditions. The load allocations are based on subtracting the WLAs and the MOS from allowable loads. The load allocations are summarized in Section 8 for each of the waterbody pollutant combinations along with the existing, baseline loads and WLAs.

7.3 Wasteload Allocations

National Pollutant Discharge Elimination System (NPDES) facilities within the watershed with the potential to discharge pollutants to impairments are presented in Table 11 in Section 3.2. As required by the Clean Water Act (CWA), individual WLAs were developed for these permittees as part of the TMDL development process. Each facility's maximum design flow is used to calculate the WLA for the high flow zone and the average design flow was used for all other flow zones. Illinois assumes that facilities will have to discharge at their maximum flow during both high and moist flows based on the following:

> *For municipal NPDES permits in Illinois, page 2 of the NPDES permit lists 2 design flows: a design average flow (DAF) and a design maximum flow (DMF). These are defined in 35 Ill. Adm. Code 370.211(a) and (b) (see http://www.ipcb.state.il.us/documents/dsweb/Get/Document-12042/). Since rain (and to a certain extent, high ground water) causes influent flows to wastewater treatment facilities to increase and precipitation also leads to higher river levels, a correlation between precipitation and treatment flows exists. The load limits in these permits gives a tiered load limit, one based on DAF for flows of DAF and below, and another load limit in the permit for flows above DAF through DMF.*

Fecal coliform WLAs are based on compliance with the geometric mean fecal coliform water quality standard of 200 cfu/100 mL; the instantaneous water quality standard requiring that no more than 10% of the samples shall exceed 400 cfu/100 mL is also required to be met at the closest point downstream where recreational use occurs in the receiving water or where the water flows into a fecal coliform impaired segment. WLAs are provided for both the instantaneous and geomean water quality standards for those facilities discharging fecal coliform.

Eleven of sixteen facilities in the watershed have disinfection exemptions discharging to fecal coliform impairments (Figure 24; note that one facility in Table 11 drains to Asa Creek, which is not impaired for fecal coliform). Disinfection exemptions are either seasonal (November-April) or year-round and allow a facility to discharge without disinfection. Facilities with disinfection exemptions are required to meet the in-stream water quality standard at the end of the exempted reach (i.e., geometric mean of 200 cfu/100 ml. WLAs for facilities with disinfection exemptions were based on the design flows for each facility multiplied by the water quality target. The resulting WLAs apply at the end of their respective disinfection exemption reaches (Figure 24). Facilities with year-round disinfection exemptions may be required to provide IEPA with updated information to demonstrate compliance with these requirements, and facilities directly discharging into a fecal impaired segment may have their year-round disinfection exemption reviewed through future NPDES permitting actions.

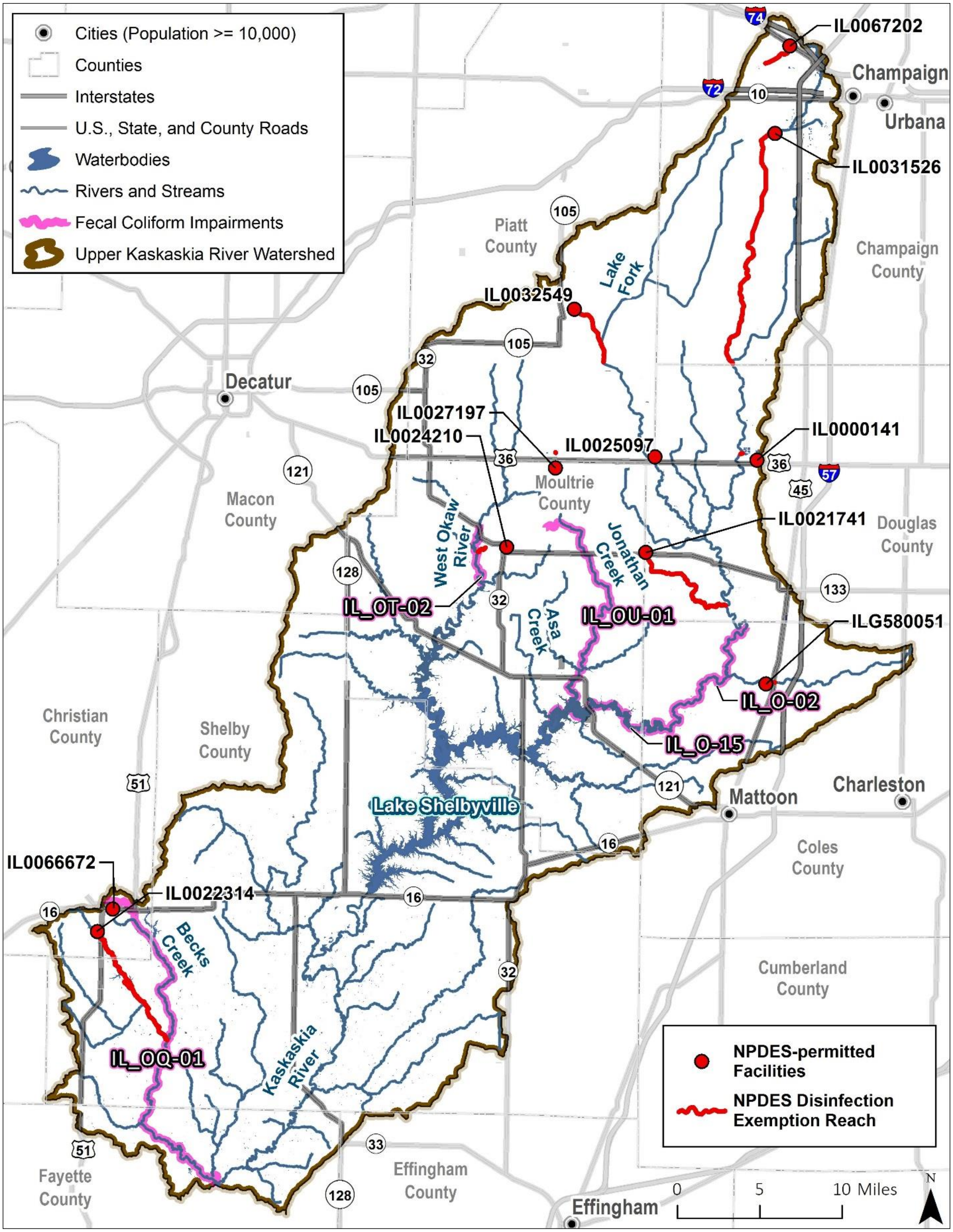


Figure 24. Facilities with disinfection exemption draining to fecal coliform impaired streams.

Five regulated Municipal Separate Storm Sewer Systems (MS4s) are in the watershed. Individual WLAs were established for each MS4 based on the area of the regulated community (Table 29). The jurisdictional areas of townships and municipalities were used as surrogates for the regulated area of each MS4. These areas were then used to calculate WLAs based on the proportion of the upstream drainage area located within the MS4 boundaries by multiplying that proportional area by the loading capacity of the assessment location. For the regulated road authorities, Champaign County and the Illinois Department of Transportation, the MS4 area was determined using the length of applicable roads and estimated right-of-way width. WLAs are not assigned to MS4s under low flow hydrologic conditions as these discharges are stormwater driven and it was assumed that stormwater was not contributing to stream flow under these conditions.

Table 29. Estimated MS4 areas

Permit ID	Regulated Entity	Receiving Waters	Estimated MS4 Area (acres)
ILR400313	City of Champaign	Kaskaskia River (IL_O-02 & IL_O-15)	5,472
ILR400256	Champaign County (road authority)	Kaskaskia River (IL_O-02 & IL_O-15)	58
ILR400026	Champaign Township	Kaskaskia River (IL_O-02 & IL_O-15)	3,507
ILR400621	Village of Bondville	Kaskaskia River (IL_O-02 & IL_O-15)	154
ILR400493	Illinois Department of Transportation (road authority)	Kaskaskia River (IL_O-02 & IL_O-15)	70

7.4 Margin of Safety

The CWA requires that a TMDL include a margin of safety (MOS) to account for uncertainties in the relationship between pollutants loads and receiving water quality. U.S. EPA guidance explains that the MOS may be implicit (i.e., incorporated into the TMDL through conservative assumptions in the analysis) or explicit (i.e., expressed in the TMDL as loadings set aside for the MOS). A 10 percent explicit MOS has been applied as part of this TMDL for fecal coliform. A moderate MOS was specified because the use of load duration curves is expected to provide accurate information on the loading capacity of the stream, but this estimate of the loading capacity may be subject to potential error associated with the method used to estimate flows. The MOS for fecal coliform is also implicit because the load duration analysis does not address die-off of pathogens.

7.5 Reserve Capacity

A reserve capacity (RC) is set aside to accommodate future growth in the watershed; this allocation can then be assigned to the appropriate permitted facility as needed. The city of Champaign is expected to continue growing in the future, and with this growth additional flow is expected from the WWTP. For fecal coliform, any new or expanded discharges will be required to comply with permit limits. As long as the facility is meeting the single sample maximum and geomean standards, any new flow and associated load will be in compliance with the TMDL. No additional reserve capacity is set aside at this time.

7.6 Critical Conditions and Seasonality

The CWA requires that TMDLs take into account critical conditions for streamflow, loading, and water quality parameters as part of the analysis of loading capacity. Through the load duration curve approach it was determined that load reductions are needed for specific flow conditions; however, the critical conditions (the periods when the greatest reductions are required) vary by location and are inherently addressed by specifying different levels of reduction according to flow.

The allocation of point source loads (i.e., the WLA) also takes into account critical conditions by assuming that the facilities will always discharge at their design flows. In reality, many facilities discharge below their design flows.

The CWA also requires that TMDLs be established with consideration of seasonal variations. Seasonal variations are addressed in the TMDLs and LRS by assessing conditions only during the season when the water quality standard applies (May through October) for fecal coliform and (April through September) for TSS. The load duration approach also accounts for seasonality by evaluating allowable loads on a daily basis over the entire range of observed flows and by presenting daily allowable loads that vary by flow.

8. Allocations

8.1 Kaskaskia River (O-02) Fecal Coliform TMDL

A fecal coliform bacteria TMDL has been developed for the Kaskaskia River segment O-02. Figure 25 presents the fecal coliform load duration curve and Table 30 and Table 31 summarize the TMDL and required reductions for both the single sample maximum standard and the geomean standard, respectively. Pollutant reductions are needed for all flow conditions, except low flows, to meet the single sample maximum standard. A 32 percent reduction is needed to meet the geomean standard. Table 32 summarizes the individual NPDES WLAs and Table 33 summarizes the individual MS4 WLAs. The exceedances are likely the result of runoff from impervious surfaces, feedlots, and fields or failing onsite wastewater systems. These could also be the result of untreated wastewater reaching the stream during periods of high flow.

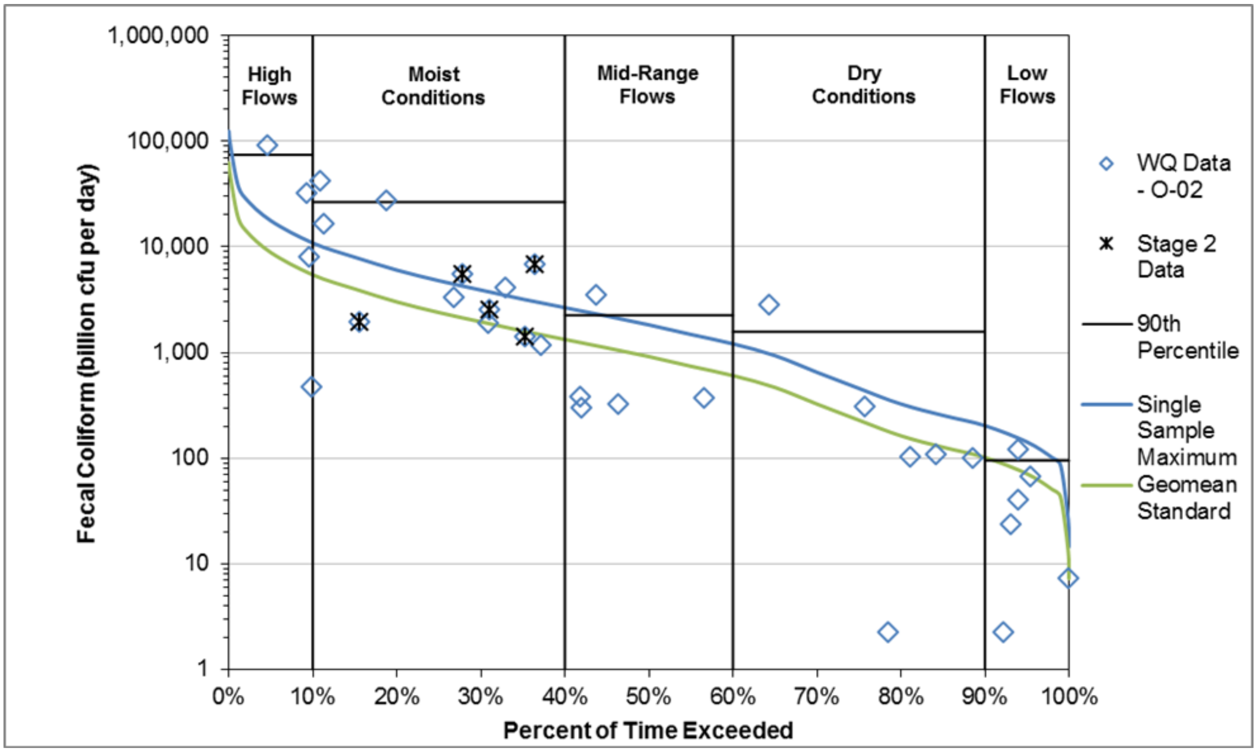


Figure 25. Fecal coliform load duration curve, Kaskaskia River at O-02.
Water quality data presented in the load duration curve were collected from 2011 to 2016.

Table 30. Fecal coliform TMDL summary (single sample maximum standard; Kaskaskia River at O-02)

TMDL Parameter		**Flow Zones**				
		High Flows	**Moist Conditions**	**Mid-Range Flows**	**Dry Conditions**	**Low Flows**
		Fecal Coliform Load (billion cfu/day)				
Wasteload Allocation	NPDES-permitted facilities	487	185	185	185	b
	MS4	454	121	43	7	0
Load Allocation		14,967	4,001	1,418	219	128
MOS		1,768	478	183	46	14
Loading Capacity		**17,676**	**4,785**	**1,829**	**457**	**142**
Existing Load		74,433	26,474	2,246	1,569	95
Load Reduction [a]		76%	82%	19%	71%	0%

a. TMDL reduction is based on the observed 90th percentile load in each flow regime.

b. The permitted wastewater treatment facility average design flows exceed the long-term monitored stream flow in the low flow zone. NPDES-permitted facilities can discharge under these flow conditions if meeting permit conditions. To account for these unique situations only, the WLAs are expressed as an equation rather than an absolute number: Wasteload Allocation = (flow contribution from a given source) x (400 counts per 100 mL).

Table 31. Fecal coliform TMDL summary (geomean standard; Kaskaskia River at O-02)

TMDL Parameter		**Flow Zones**				
		High Flows	**Moist Conditions**	**Mid-Range Flows**	**Dry Conditions**	**Low Flows**
		Fecal Coliform Load (billion cfu/day)				
Wasteload Allocation	NPDES-permitted facilities	244	93	93	93	c
	MS4	227	61	22	3	0
Load Allocation		7,483	1,999	708	110	64
MOS		884	239	91	23	7
Loading Capacity		**8,838**	**2,392**	**914**	**229**	**71**
Geomean Concentration (# cfu/100 mL) [a]		296				
Geomean Reduction [b]		32%				

a. Geomean concentration of five samples collected by IEPA in June 2016.

b. TMDL reduction is based on the 2016 observed geometric mean concentration and the geomean standard (200 cfu/100 mL).

c. The permitted wastewater treatment facility design flows exceed the long-term monitored stream flow in the low flow zone. NPDES-permitted facilities can discharge under these flow conditions if meeting permit conditions. To account for these unique situations only, the WLAs are expressed as an equation rather than an absolute number: Wasteload Allocation = (flow contribution from a given source) x (200 counts per 100 mL).

Table 32. Individual NPDES fecal coliform WLAs, Kaskaskia River at O-02

Permit ID	Facility Name	Fecal Coliform WLA (billion cfu per day)					
		High Flow Conditions			Moist to Low Flow Conditions		
		Design Maximum Flow (MGD)	Single Sample Maximum Standard	Geomean Standard	Design Average Flow (MGD)	Single Sample Maximum Standard	Geomean Standard
IL0000141	Equistar Chemicals, LP-Tuscola	12.2	184.7	92.4	3	45.4	22.7
IL0000221	Panhandle Eastern-Tuscola	0.01254[a]	0.2	0.1	0.01254	0.2	0.1
IL0004227	Kraft Foods Global-Champaign	0.289[a]	4.4	2.2	0.289	4.4	2.2
IL0021741	Arthur, Village of	1.25	18.9	9.5	0.5	7.6	3.8
IL0025097	Atwood, Village of	0.5	7.6	3.8	0.2	3	1.5
IL0031526	Urbana-Champaign SD SW STP	17.25	261.2	130.6	7.98	120.8	60.4
IL0032549	Bement, Village of	0.48	7.3	3.6	0.176	2.7	1.3
IL0062812	Marathon Petroleum-Champaign [a]	0.0073	0.1	0.1	0.0073	0.1	0.1
IL0067202	Commercial Flooring, Inc.	0.008[a]	0.1	0.1	0.008	0.1	0.1
ILG580051	Humboldt, Village of	0.175	2.6	1.3	0.07	1.1	0.5
	Total		**487**	**244**		**185**	**93**

a. Design maximum flow not reported for facility. Design average flow used to calculate WLA and is the sum of outfalls 001 and 002.

Table 33. Individual MS4 WLAs, Kaskaskia River at O-02

Permit ID	Regulated Entity	Fecal Coliform WLA (single sample maximum/geomean standard; billion cfu per day)				
		Flow Zones				
		High Flows	Moist Conditions	Mid-Range Flows	Dry Conditions	Low Flows
ILR400313	City of Champaign	268 / 134	71 / 36	25.4 / 13	4.14 / 1.77	-
ILR400256	Champaign County (road authority)	3 / 1	1 / 0.4	0.3 / 0.1	0.04 / 0.02	-
ILR400026	Champaign Township	172 / 86	46 / 23.1	16.3 / 8.3	2.65 / 1.14	-
ILR400621	Village of Bondville	8 / 4	2 / 1	0.7 / 0.4	0.12 / 0.05	-
ILR400493	Illinois Department of Transportation (road authority)	3 / 2	1 / 0.5	0.3 / 0.2	0.05 / 0.02	-
	Total	**454 / 227**	**121 / 61**	**43 / 22**	**7 / 3**	**0**

8.2 Kaskaskia River (O-15) Fecal Coliform TMDL

A fecal coliform bacteria TMDL has been developed for the Kaskaskia River segment O-15. Figure 26 presents the fecal coliform load duration curve and Table 34 and Table 35 summarize the TMDL and required reductions for both the single sample maximum standard and the geomean standard, respectively. Although one sample exceeded the single sample maximum standard, no pollutant reductions are calculated because the standard allows 10 percent of samples to exceed the single sample maximum standard during a 30-day period. A five percent reduction is needed to meet the geomean standard. Table 36 summarizes the individual NPDES WLAs and Table 37 summarizes the individual MS4 WLAs.

Limited data are available on this segment, but based on nearby O-02, it is likely that similar sources of fecal coliform are present including runoff from impervious surfaces, feedlots, and fields; failing onsite wastewater systems; and potentially untreated wastewater reaching the stream during periods of high flow.

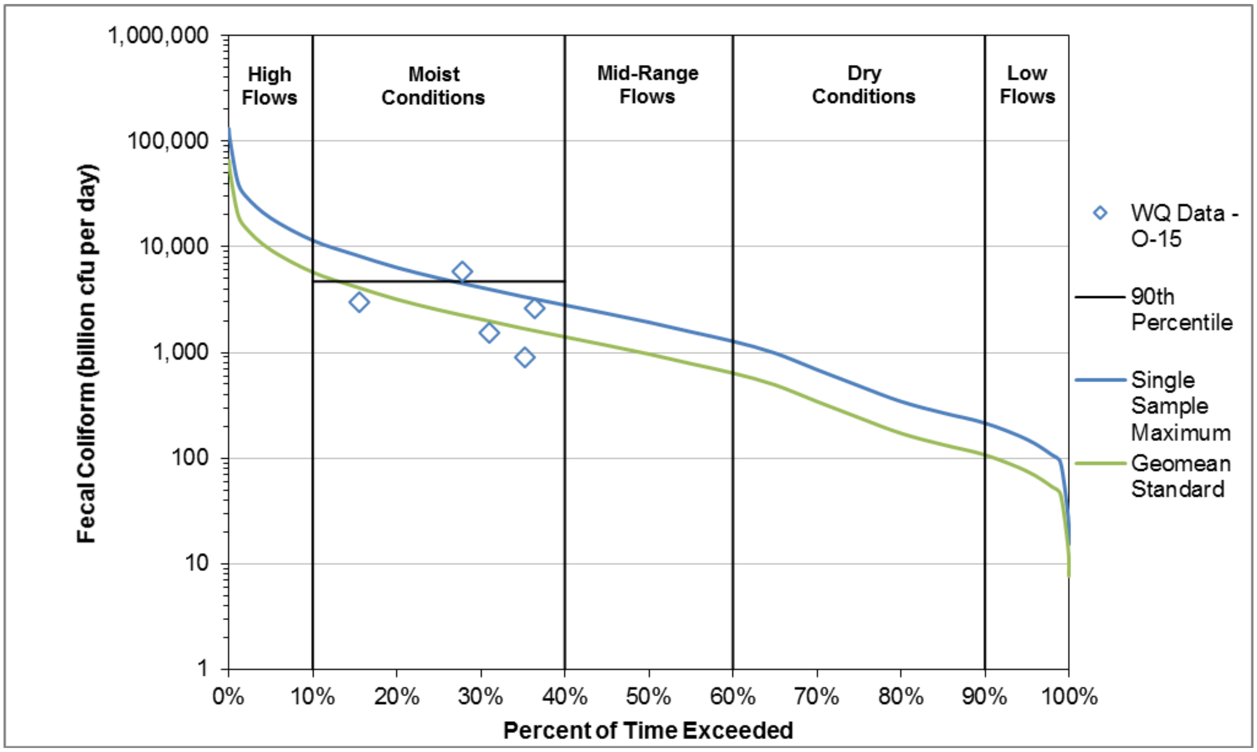


Figure 26. Fecal coliform load duration curve, Kaskaskia River at O-15.

All of the water quality data included in the load duration curve was collected as part of Stage 2 in 2016.

Table 34. Fecal coliform TMDL summary (single sample maximum standard; Kaskaskia River at O-15)

TMDL Parameter		Flow Zones				
		High Flows	Moist Conditions	Mid-Range Flows	Dry Conditions	Low Flows
		Fecal Coliform Load (billion cfu/day)				
Wasteload Allocation	NPDES-permitted facilities	487	185	185	185	b
	MS4	455	122	43	7	0
Load Allocation		15,874	4,245	1,512	243	135
MOS		1,868	506	193	48	15
Loading Capacity		**18,684**	**5,058**	**1,933**	**483**	**150**
Existing Load		-	4,705	-	-	-
Load Reduction [a]		-	0%	-	-	-

a. TMDL reduction is based on the observed 90th percentile load in each flow regime.

b. The permitted wastewater treatment facility average design flows exceed the long-term monitored stream flow in the low flow zone. NPDES-permitted facilities can discharge under these flow conditions if meeting permit conditions. To account for these unique situations only, the WLAs are expressed as an equation rather than an absolute number: Wasteload Allocation = (flow contribution from a given source) x (400 counts per 100 mL).

Table 35. Fecal coliform TMDL summary (geomean standard; Kaskaskia River at O-15)

TMDL Parameter		**Flow Zones**				
		High Flows	**Moist Conditions**	**Mid-Range Flows**	**Dry Conditions**	**Low Flows**
		Fecal Coliform Load (billion cfu/day)				
Wasteload Allocation	NPDES-permitted facilities	244	93	93	93	c
	MS4	228	61	22	3	0
Load Allocation		7,936	2,122	754	122	67
MOS		934	253	97	24	8
Loading Capacity		**9,342**	**2,529**	**966**	**242**	**75**
Geomean Concentration (# cfu/100 mL) [a]		210				
Geomean Reduction [b]		5%				

a. Geomean concentration of five samples collected by IEPA in June 2016.

b. TMDL reduction is based on the 2016 observed geometric mean concentration and the geomean standard (200 cfu/100 mL).

c. The permitted wastewater treatment facility design flows exceed the long-term monitored stream flow in the low flow zone. NPDES-permitted facilities can discharge under these flow conditions if meeting permit conditions. To account for these unique situations only, the WLAs are expressed as an equation rather than an absolute number: Wasteload Allocation = (flow contribution from a given source) x (200 counts per 100 mL).

Table 36. Individual NPDES fecal coliform WLAs, Kaskaskia River at O-15

Permit ID	**Facility Name**	**Fecal Coliform WLA (billion cfu per day)**					
		High Flow Conditions			**Moist to Low Flow Conditions**		
		Design Maximum Flow (MGD)	**Single Sample Maximum Standard**	**Geomean Standard**	**Design Average Flow (MGD)**	**Single Sample Maximum Standard**	**Geomean Standard**
IL0000141	Equistar Chemicals, LP-Tuscola	12.2	184.7	92.4	3	45.4	22.7
IL0000221	Panhandle Eastern-Tuscola	0.01254[a]	0.2	0.1	0.01254	0.2	0.1
IL0004227	Kraft Foods Global-Champaign	0.289[a]	4.4	2.2	0.289	4.4	2.2
IL0021741	Arthur, Village of	1.25	18.9	9.5	0.5	7.6	3.8
IL0025097	Atwood, Village of	0.5	7.6	3.8	0.2	3	1.5
IL0031526	Urbana-Champaign SD SW STP	17.25	261.2	130.6	7.98	120.8	60.4
IL0032549	Bement, Village of	0.48	7.3	3.6	0.176	2.7	1.3
IL0062812	Marathon Petroleum-Champaign [a]	0.0073	0.2	0.1	0.0073	0.2	0.1
IL0067202	Commercial Flooring, Inc.	0.008[a]	0.1	0.1	0.008	0.1	0.1
ILG580051	Humboldt, Village of	0.175	2.6	1.3	0.07	1.1	0.5
	Total		**487**	**244**		**186**	**93**

a. Design maximum flow not reported for facility. Design average flow used to calculate WLA and is the sum of outfalls 001 and 002.

Table 37. Individual MS4 WLAs, Kaskaskia River at O-15

Permit ID	Regulated Entity	Fecal Coliform WLA (single sample maximum/geomean standard; billion cfu per day)				
		Flow Zones				
		High Flows	Moist Conditions	Mid-Range Flows	Dry Conditions	Low Flows
ILR400313	City of Champaign	269 / 135	72 / 36	25.4 / 13	4.14 / 1.77	-
ILR400256	Champaign County (road authority)	3 / 1	1 / 0.4	0.3 / 0.1	0.04 / 0.02	-
ILR400026	Champaign Township	172 / 86	46 / 23.1	16.3 / 8.3	2.65 / 1.14	-
ILR400621	Village of Bondville	8 / 4	2 / 1	0.7 / 0.4	0.12 / 0.05	-
ILR400493	Illinois Department of Transportation (road authority)	3 / 2	1 / 0.5	0.3 / 0.2	0.05 / 0.02	-
	Total	**455 / 228**	**122 / 61**	**43 / 22**	**7 / 3**	**0 / 0**

8.3 Becks Creek (OQ-01) Fecal Coliform TMDL

A fecal coliform bacteria TMDL has been developed for the Becks Creek segment OQ-01. Figure 27 presents the fecal coliform load duration curve and Table 38 and Table 39 summarize the TMDL and required reductions for both the single sample maximum standard and the geomean standard, respectively. Pollutant reductions are needed for all flow conditions to meet the single sample maximum standard. A 78 percent reduction is needed to meet the geomean standard. Table 40 summarizes the individual WLAs. The exceedances during higher flow conditions may be the result of runoff from impervious surfaces, feedlots, and fields. The high loads found during drier conditions often correspond to point sources, livestock access, and failing onsite wastewater systems.

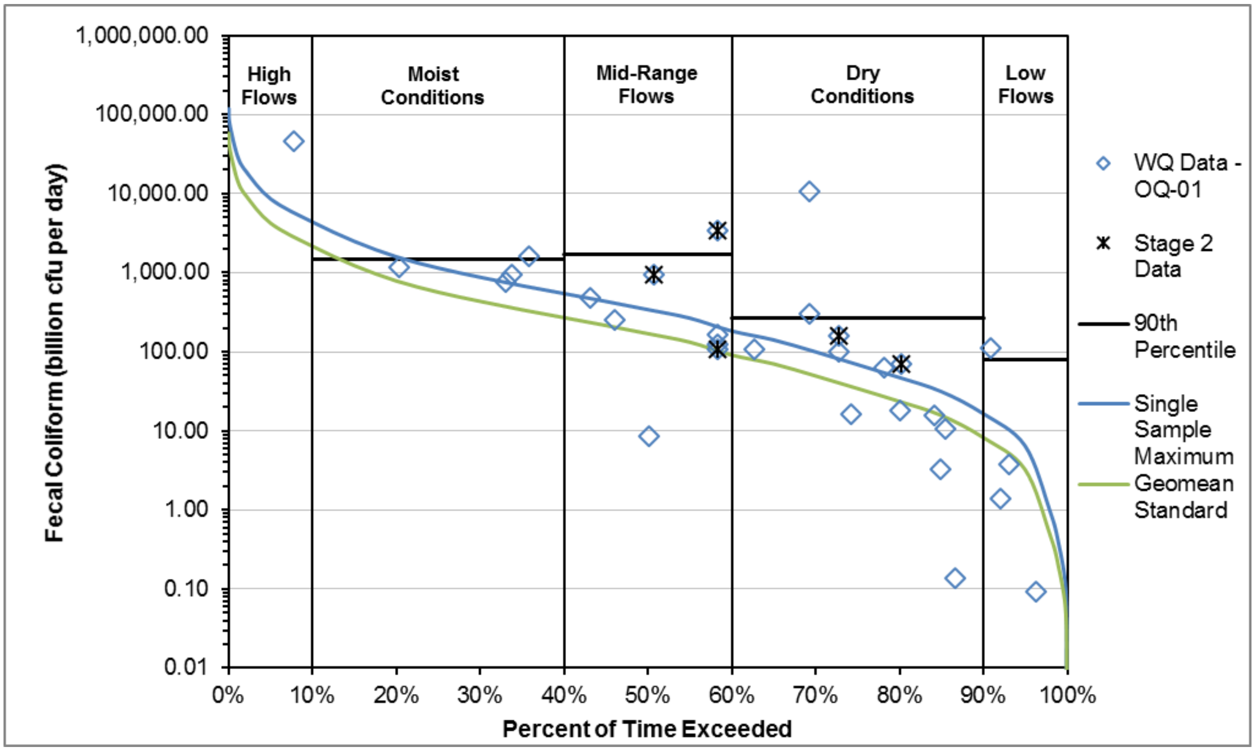


Figure 27. Fecal coliform load duration curve, Becks Creek at OQ-01.

Water quality data presented in the load duration curve were collected from 2011 to 2016.

Table 38. Fecal coliform TMDL summary (single sample maximum standard; Becks Creek at OQ-01)

TMDL Parameter	Flow Zones				
	High Flows	Moist Conditions	Mid-Range Flows	Dry Conditions	Low Flows
	Fecal Coliform Load (billion cfu/day)				
Wasteload Allocation: NPDES-permitted facilities	53	19	19	19	c
Load Allocation	7,584	1,007	288	43	6
MOS	848	114	34	7	0.7
Loading Capacity [a]	**8,485**	**1,140**	**341**	**69**	**7**
Existing Load	46,597	1,489	1,686	270	79
Load Reduction [b]	82%	23%	80%	74%	92%

a. Loading capacity rounded to a whole number.

b. TMDL reduction is based on the observed 90th percentile load in each flow regime.

c. The permitted wastewater treatment facility average design flows exceed the long-term monitored stream flow in the low flow zone. NPDES-permitted facilities can discharge under these flow conditions if meeting permit conditions. To account for these unique situations only, the WLAs are expressed as an equation rather than an absolute number: Wasteload Allocation = (flow contribution from a given source) x (400 counts per 100 mL).

Table 39. Fecal coliform TMDL summary (geomean standard; Becks Creek at OQ-01)

TMDL Parameter	**Flow Zones**				
	High Flows	**Moist Conditions**	**Mid-Range Flows**	**Dry Conditions**	**Low Flows**
	Fecal Coliform Load (billion cfu/day)				
Wasteload Allocation: NPDES-permitted facilities	26	10	10	10	d
Load Allocation	3,792	503	144	22	3
MOS	424	57	17	3	0.3
Loading Capacity [a]	**4,242**	**570**	**171**	**35**	**3**
Geomean Concentration (# cfu/100 mL) [b]	928				
Geomean Reduction [c]	78%				

a. Loading capacity rounded to a whole number.
b. Geomean concentration of five samples collected by IEPA in June 2016.
c. TMDL reduction is based on the 2016 observed geometric mean concentration and the geomean standard (200 cfu/100 mL).
d. The permitted wastewater treatment facility design flows exceed the long-term monitored stream flow in the low flow zone. NPDES-permitted facilities can discharge under these flow conditions if meeting permit conditions. To account for these unique situations only, the WLAs are expressed as an equation rather than an absolute number: Wasteload Allocation = (flow contribution from a given source) x (200 counts per 100 mL).

Table 40. Individual NPDES fecal coliform WLAs, Becks Creek at OQ-01

Permit ID	**Facility Name**	**Fecal Coliform WLA (billion cfu per day)**					
		High Flow Conditions			**Moist to Low Flow Conditions**		
		Design Maximum Flow (MGD)	**Single Sample Maximum Standard**	**Geomean Standard**	**Design Average Flow (MGD)**	**Single Sample Maximum Standard**	**Geomean Standard**
IL0022314	Pana, City of	3.13	47.4	23.7	1.17	17.7	8.9
IL0066672	Oak Terrace Sanitary System Inc.	0.36	5.5	2.7	0.09	1.4	0.7
	Total		**53**	**26**		**19**	**10**

8.4 West Okaw River (OT-02) Fecal Coliform TMDL

A fecal coliform bacteria TMDL has been developed for the West Okaw River segment OT-02. Figure 28 presents the fecal coliform load duration curve and Table 41 and Table 42 summarize the TMDL and required reductions for both the single sample maximum standard and the geomean standard, respectively. Pollutant reduction is needed under mid-range flows to meet the single sample maximum standard. A 39 percent reduction is needed to meet the geomean standard. Table 43 summarizes the individual WLAs. Potential sources of fecal coliform in this watershed are described in Section 5.

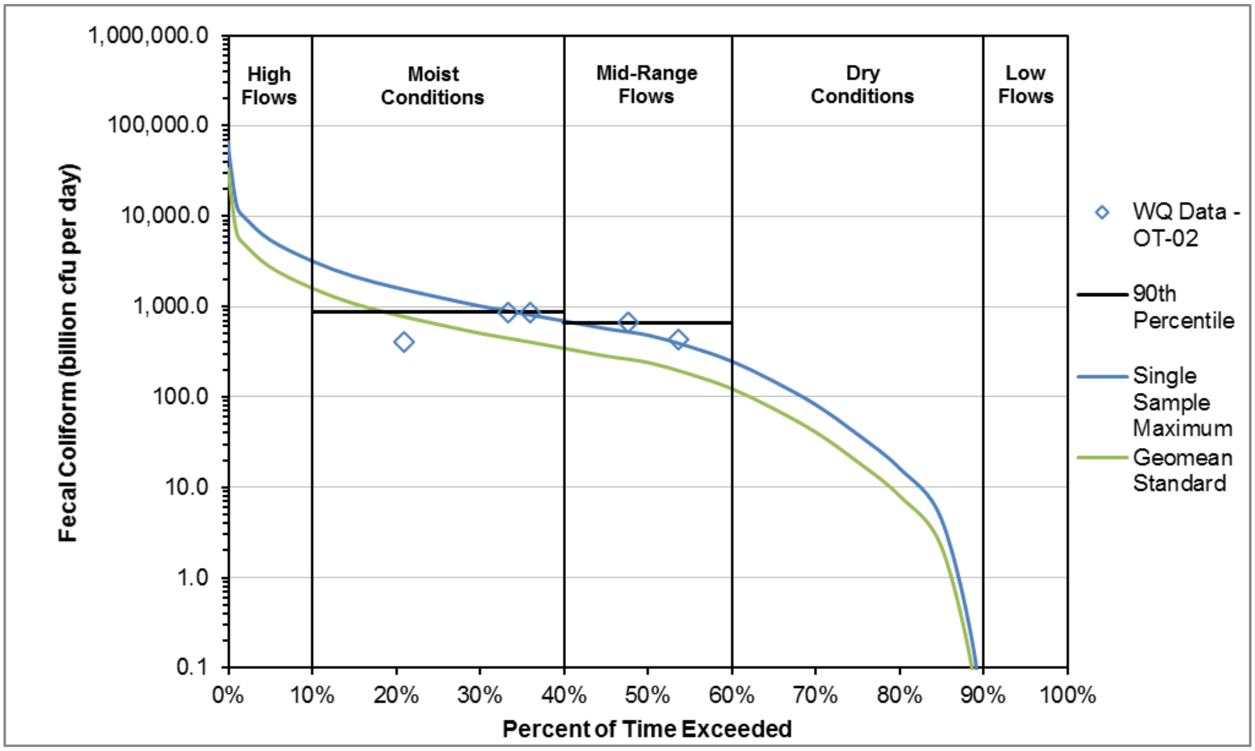


Figure 28. Fecal coliform load duration curve, West Okaw River at OT-02.

All of the data included in the load duration curve was collected as part of Stage 2 in 2016. USGS flow data indicates the river is dry 11% of the time.

Table 41. Fecal coliform TMDL summary (single sample maximum standard; West Okaw River at OT-02)

TMDL Parameter	Flow Zones				
	High Flows	Moist Conditions	Mid-Range Flows	Dry Conditions	Low Flows
	Fecal Coliform Load (billion cfu/day)				
Wasteload Allocation: NPDES-permitted facilities	10	4	4	4	-
Load Allocation	4,926	1,146	432	30	-
MOS	549	128	48	4	-
Loading Capacity	**5,485**	**1,278**	**484**	**38**	**-**
Existing Load	-	860	653	-	-
Load Reduction [a]	-	0%	26%	-	-

a. TMDL reduction is based on the observed 90th percentile load in each flow regime.

Table 42. Fecal coliform TMDL summary (geomean standard; West Okaw River at OT-02)

TMDL Parameter	Flow Zones				
	High Flows	Moist Conditions	Mid-Range Flows	Dry Conditions	Low Flows
	Fecal Coliform Load (billion cfu/day)				
Wasteload Allocation: NPDES-permitted facilities	5	2	2	2	-
Load Allocation	2,464	573	216	15	-
MOS	274	64	24	2	-
Loading Capacity	**2,743**	**639**	**242**	**19**	**-**
Geomean Concentration (# cfu/100 mL) [a]	326				
Geomean Reduction [b]	39%				

a. Geomean concentration of five samples collected by IEPA in June 2016.
b. TMDL reduction is based on the 2016 observed geometric mean concentration and the geomean standard (200 cfu/100 mL).

Table 43. Individual NPDES fecal coliform WLAs, West Okaw River at OT-02

Permit ID	Facility Name	Fecal Coliform WLA (billion cfu per day)					
		High Flow Conditions			Moist to Low Flow Conditions		
		Design Maximum Flow (MGD)	Single Sample Maximum Standard	Geomean Standard	Design Average Flow (MGD)	Single Sample Maximum Standard	Geomean Standard
IL0024210	Lovington STP	0.5	7.6	3.8	0.2	3.0	1.5
IL0027197	Village of Hammond	0.175	2.6	1.3	0.07	1.1	0.5
	Total		**10**	**5**		**4**	**2**

8.5 Johnathon Creek (OU-01) Fecal Coliform TMDL

A fecal coliform bacteria TMDL has been developed for the Johnathon Creek segment OU-01. Figure 29 presents the fecal coliform load duration curve and Table 44 and Table 45 summarize the TMDL and required reductions for both the single sample maximum standard and the geomean standard, respectively. Pollutant reductions are needed under mid-range flows and dry conditions to meet the single sample maximum standard. A 78 percent reduction is needed to meet the geomean standard. There are no point sources within this watershed, therefore no WLAs have been assigned. Potential sources of fecal coliform in this watershed are described in Section 5.

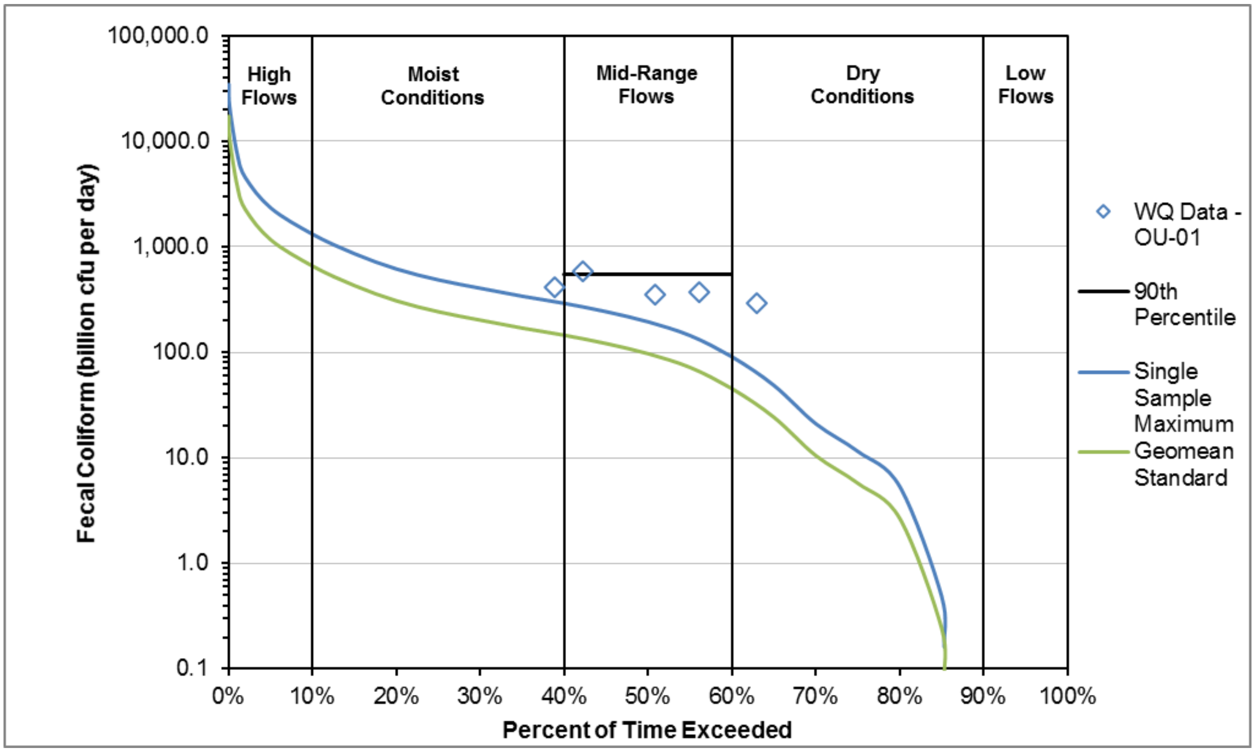


Figure 29. Fecal coliform load duration curve, Johnathon Creek at OU-01.
All of the data included in the load duration curve was collected as part of Stage 2 in 2016. USGS flow data indicate the creek is dry 15% of the time.

Table 44. Fecal coliform TMDL summary (single sample maximum standard; Johnathon Creek at OU-01)

TMDL Parameter	Flow Zones				
	High Flows	Moist Conditions	Mid-Range Flows	Dry Conditions	Low Flows
	Fecal Coliform Load (billion cfu/day)				
Wasteload Allocation: NPDES-permitted facilities [a]	0	0	0	0	0
Load Allocation	2,115	441	176	11	-
MOS	235	49	20	1	-
Loading Capacity	**2,350**	**490**	**196**	**12**	**-**
Existing Load	-	411	547	293	-
Load Reduction [b]	-	0%	64%	96%	-

a. There are no point sources in this watershed, therefore the WLA = 0.
b. TMDL reduction is based on the observed 90th percentile load in each flow regime.

Table 45. Fecal coliform TMDL summary (geomean standard; Johnathon Creek at OU-01)

TMDL Parameter	Flow Zones				
	High Flows	Moist Conditions	Mid-Range Flows	Dry Conditions	Low Flows
	Fecal Coliform Load (billion cfu/day)				
Wasteload Allocation: NPDES-permitted facilities [a]	0	0	0	0	0
Load Allocation	1,057	221	88	5	-
MOS	118	24	10	1	-
Loading Capacity	**1,175**	**245**	**98**	**6**	**-**
Geomean Concentration (# cfu/100 mL) [b]	913				
Geomean Reduction [c]	78%				

a. There are no point sources in this watershed, therefore the WLA = 0.
b. Geomean concentration of five samples collected by IEPA in June 2016.
c. TMDL reduction is based on the 2016 observed geometric mean concentration and the geomean standard (200 cfu/100 mL).

8.6 Lake Fork (OW-01) Total Suspended Solids LRS

A TSS LRS has been developed for the Lake Fork segment OW-01. There are no wasteload or MOS allocations provided for LRSs. Figure 30 presents the TSS load duration curve and Table 46 summarizes the LRS and required reductions. Pollutant reductions are needed under mid-range flows and dry conditions; data are not available for high flows and moist conditions. High TSS loads during lower flow conditions may be the result of livestock access in streams and other uncontrolled stream crossings.

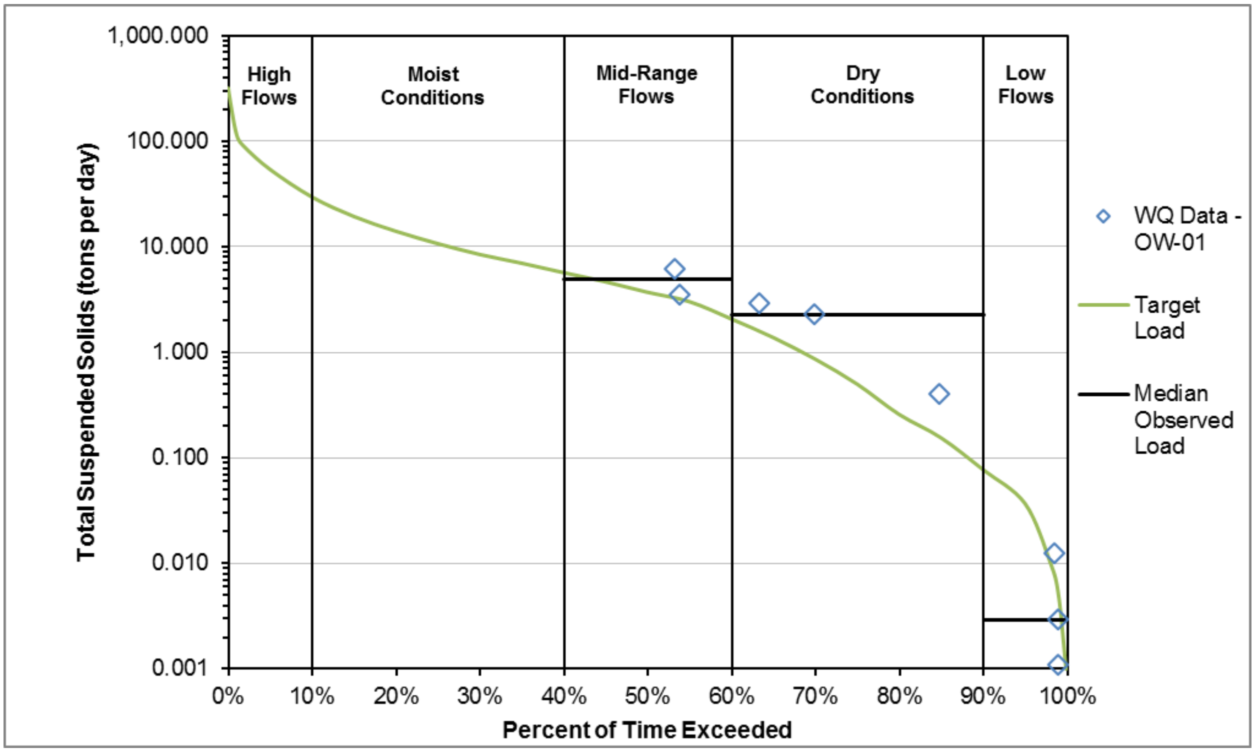


Figure 30. TSS load duration curve, Lake Fork at OW-01.

Water quality data presented in the load duration curve were collected in 2007 and 2012.

Table 46. TSS LRS, Lake Fork at OW-01

LRS Parameter	Flow Zones				
	High Flows	Moist Conditions	Mid-Range Flows	Dry Conditions	Low Flows
	TSS Load (tons/d)				
Loading Capacity	**53**	**10.7**	**3.7**	**0.50**	**0.037**
Existing Load	-	-	4.9	2.26	0.003
Load Reduction [a]	-	-	25%	78%	0%

a. LRS load reduction is based on the observed median load in each flow regime and the LRS target.

8.7 Lake Fork (OW-02) Total Suspended Solids LRS

A TSS LRS has been developed for the Lake Fork segment OW-02. There are no wasteload or MOS allocations provided for LRSs. Figure 31 presents the TSS load duration curve and Table 47 summarizes the LRS and required reductions. No pollutant reductions are needed based on data collected under mid-range flows and dry conditions.

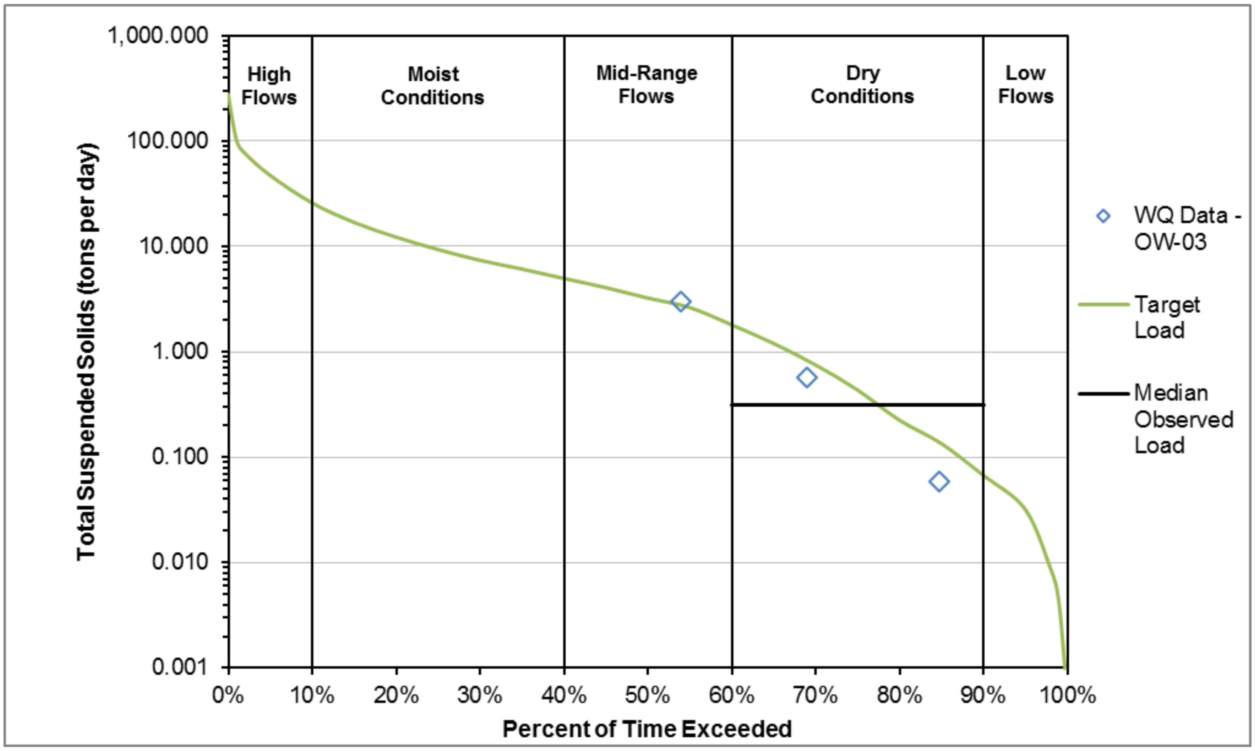


Figure 31. TSS load duration curve, Lake Fork at OW-02.

Water quality data presented in the load duration curve were collected in 2007.

Table 47. TSS LRS, Lake Fork at OW-02

LRS Parameter	Flow Zones				
	High Flows	Moist Conditions	Mid-Range Flows	Dry Conditions	Low Flows
	TSS Load (tons/d)				
Loading Capacity	**47**	**9.3**	**3.2**	**0.44**	**0.032**
Existing Load	-	-	3.0	0.32	-
Load Reduction [a]	-	-	0%	0%	-

a. LRS load reduction is based on the observed median load in each flow regime and the LRS target; additional reductions are needed to ensure compliance with the target.

8.8 Asa Creek (OZZT-01) Total Suspended Solids LRS

A TSS LRS has been developed for the Asa Creek segment OZZT-01. There are no wasteload or MOS allocations provided for LRSs. Figure 32 presents the TSS load duration curve and Table 48 summarizes the LRS and required reductions. No pollutant reductions are needed; however, exceedances are seen under mid-range flows and dry conditions. The exceedances suggest that there are a mix of sources in the watershed including watershed runoff during higher flow conditions along with erosion associated with channel access under low flow conditions.

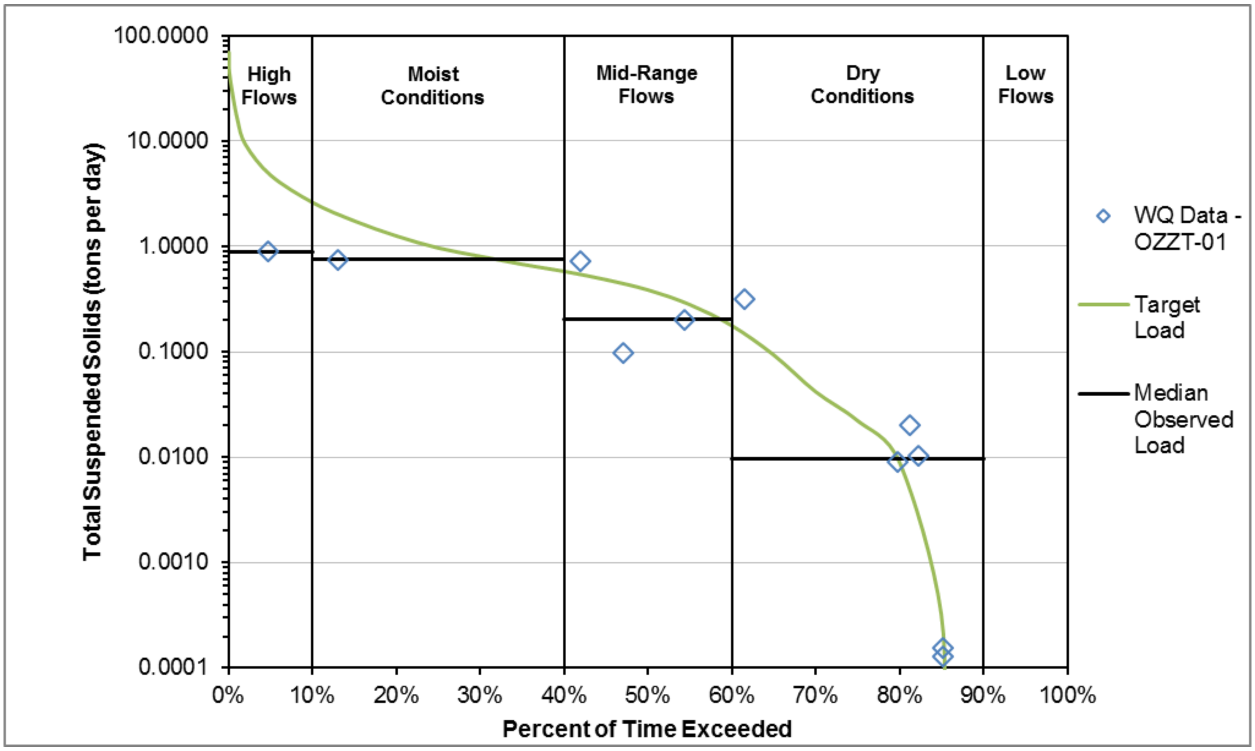


Figure 32. TSS load duration curve, Asa Creek at OZZT-01.

Water quality data presented in the load duration curve were collected during 2006 and 2007. USGS flow data indicates the creek is dry 15% of the time.

Table 48. TSS LRS, Asa Creek at OZZT-01

LRS Parameter	Flow Zones				
	High Flows	Moist Conditions	Mid-Range Flows	Dry Conditions	Low Flows
	TSS Load (tons/d)				
Loading Capacity	**4.8**	**1.0**	**0.39**	**0.022**	**-**
Existing Load	0.9	0.7	0.20	0.010	-
Load Reduction [a]	-	-	-	-	-

a. LRS load reduction is based on the observed median load in each flow regime and the LRS target; additional reductions are needed to ensure compliance with the target.

9. Public Participation

A public meeting was held on October 26, 2016 at the University of Illinois Extension building in Arthur, IL to present the Stage 1 report and findings. A public notice was placed in the Arthur Graphic-Clarion and on the IEPA website. There was one attendee. The public comment period closed on November 26, 2016. No written comments were provided on the draft Stage 1 report. Input was received from a local SWCD and the Upper Kaskaskia Watershed Ecosystem Partnership.

Based on low turnout for the first meeting, a second, informal public meeting was held on November 17, 2016 at the University of Illinois Extension building in Arthur, IL to present the Stage 1 report and findings. There were six attendees. Trevor Sample, IEPA project manager, also attended the Upper Kaskaskia Watershed Ecosystem Partnership meeting on January 23, 2017 to discuss the Stage 1 report and to address additional data needs for TMDL and implementation plan development.

A public meeting was held on June 25, 2018 at the University of Illinois Extension building in Arthur, IL to present the Stage 3 report and findings. A public notice was placed on the IEPA website and in the Arther Graphic Clarion. The meeting was held in conjunction with an Upper Kaskaskia Ecosystem Partnership meeting. The public comment period closed on July 25, 2018. There were two written comments received. A responsiveness summary is provided in Appendix D.

10. Implementation Plan and Reasonable Assurance

The implementation plan identifies planned future activities and recommends additional activities that stakeholders could consider to reduce pollutant loads and improve the conditions of the Upper Kaskaskia watershed. Not only will these implementation activities help to achieve reductions and attain water quality standards, these activities will also result in a cleaner, healthier watershed for the people who depend on the resources of the watershed for their livelihood now and in the future

10.1 Introduction

This implementation plan is a framework that watershed stakeholders may use to guide implementation of best management practices (BMPs) to address TMDLs and LRSs. This framework is flexible and incorporates adaptive management to allow watershed stakeholders to adjust the implementation plan to align with their priorities. This flexibility is necessary because the implementation of nonpoint source controls is voluntary. Adaptive management is also necessary because factors unique to specific localities may yield better or worse results for a certain BMP (or suite of BMPs) and the implementation plan will need to be modified to account for such results. This implementation plan addresses bacteria TMDLs and sedimentation/siltation LRSs in waters of the Upper Kaskaskia River in Illinois. As discussed in Section 7 and 8, TMDLs were developed for fecal coliform to address impairments of the primary contact recreation use in five segments (Table 49 and Figure 33). LRSs were developed for TSS to address impairments to aquatic life use for three segments. Figure 34 illustrates the HUC12 watersheds within the Upper Kaskaskia River watershed.

Table 49. Impaired waters with TMDLs and LRSs

Name	Segment ID	Contributing HUC12s (07140201****)[a]	Designated Uses	TMDL Parameters	LRS Parameters
Kaskaskia River	O-02	0101-0107, 0201-0206, 0401-0406	Primary contact recreation	Fecal coliform	None
	O-15	0101-0107, 0201-0206, 0301-0302, 0401-0406, 0701	Primary contact recreation	Fecal coliform	None
Becks Creek	OQ-01	1001-1006	Primary contact recreation	Fecal coliform	None
West Okaw River	OT-02	0601-0606	Primary contact recreation	Fecal coliform	None
Johnathon Creek	OU-01	0301-0302	Primary contact recreation	Fecal coliform	None
Lake Fork	OW-01	0101-0107	Aquatic life	None	Sedimentation/ siltation
Lake Fork	OW-02	0101-0106	Aquatic life	None	Sedimentation/ siltation
Asa Creek	OZZT-01	0701	Aquatic life	None	Sedimentation/ siltation

a. HUC12s are provided as a range; all HUC12s within the listed range are upstream of the impaired segment.

An important factor for implementation is access to technical and financial resources. This implementation plan identifies what type of technical and financial resources are needed to undertake the activities recommended for achieving the necessary pollutant load reductions in the watershed. One potential source of funding is the Clean Water Act Section 319 Nonpoint Source Management grants. Section 319 grant funding supports implementation activities including technical and financial assistance, education, training, demonstration projects, and monitoring to assess the success of nonpoint source implementation projects. To be eligible for these funds, watershed management plans must address nine elements identified by U.S. EPA (2008, 2013) as critical for achieving improvements in water quality. These nine elements are listed below:

1. Identification of causes of impairment and pollutant sources or groups of similar sources that need to be controlled to achieve load reductions estimated within the plan
2. Estimate of the load reductions expected from management measures
3. Description of the nonpoint source management measures that will need to be implemented to achieve load reductions estimated in element 2; and identification of critical areas
4. Estimate of the amounts of technical and financial assistance needed, associated costs, and the sources and authorities (e.g., ordinances) that will be relied upon to implement the plan
5. An information and public education component; early and continued encouragement of public involvement in the design and implementation of the plan
6. Implementation schedule
7. A description of interim, measurable milestones for determining whether nonpoint source management measures or other control actions are being implemented
8. Criteria to measure success and reevaluate the plan
9. Monitoring component to evaluate the effectiveness of the implementation efforts over time

The Upper Kaskaskia River watershed TMDLs and LRSs, including this implementation plan, is considered a watershed plan that meets U.S. EPA's nine elements. Applicable elements are listed in italics at the beginning of each corresponding section.

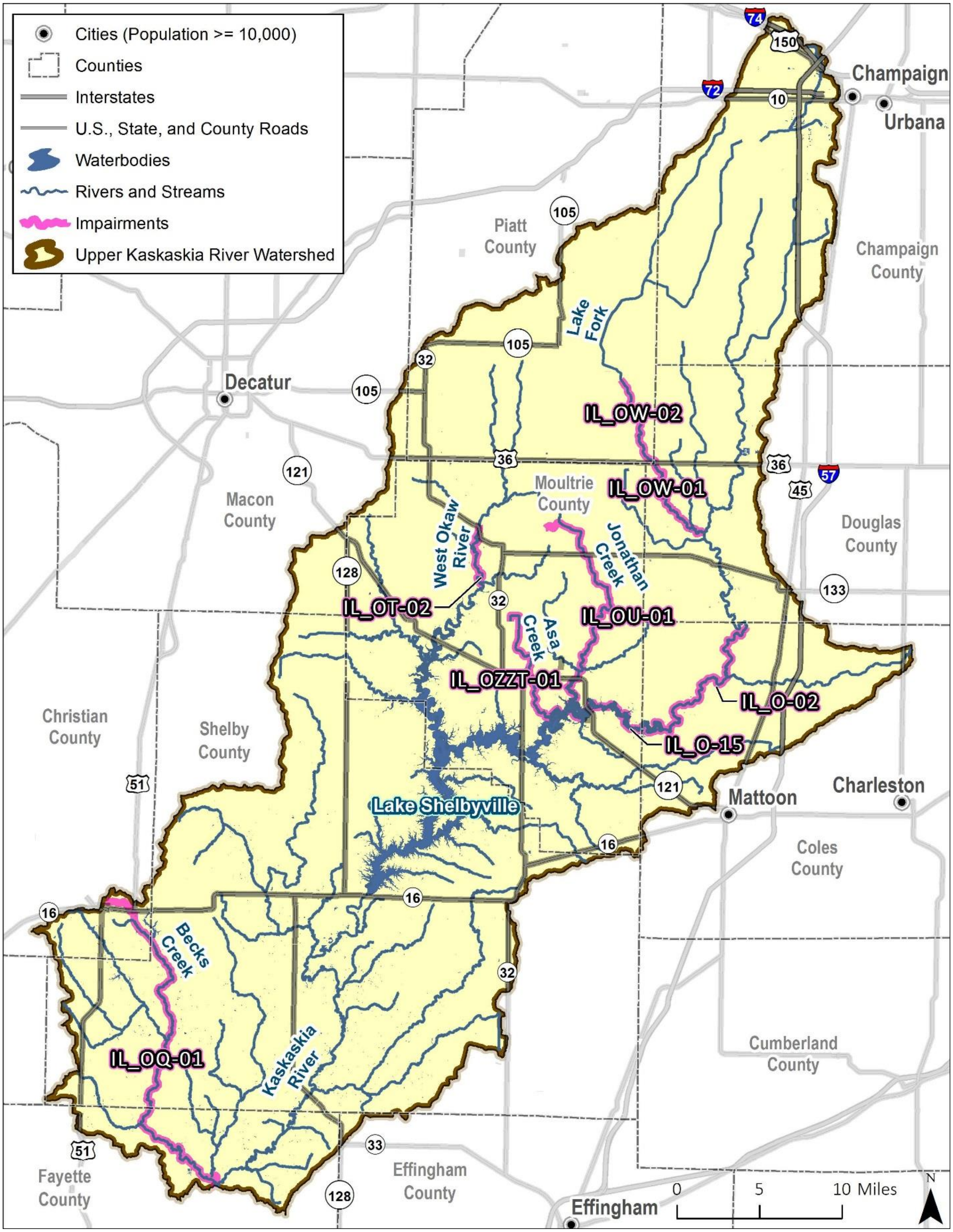


Figure 33. Upper Kaskaskia River watershed impaired segments.

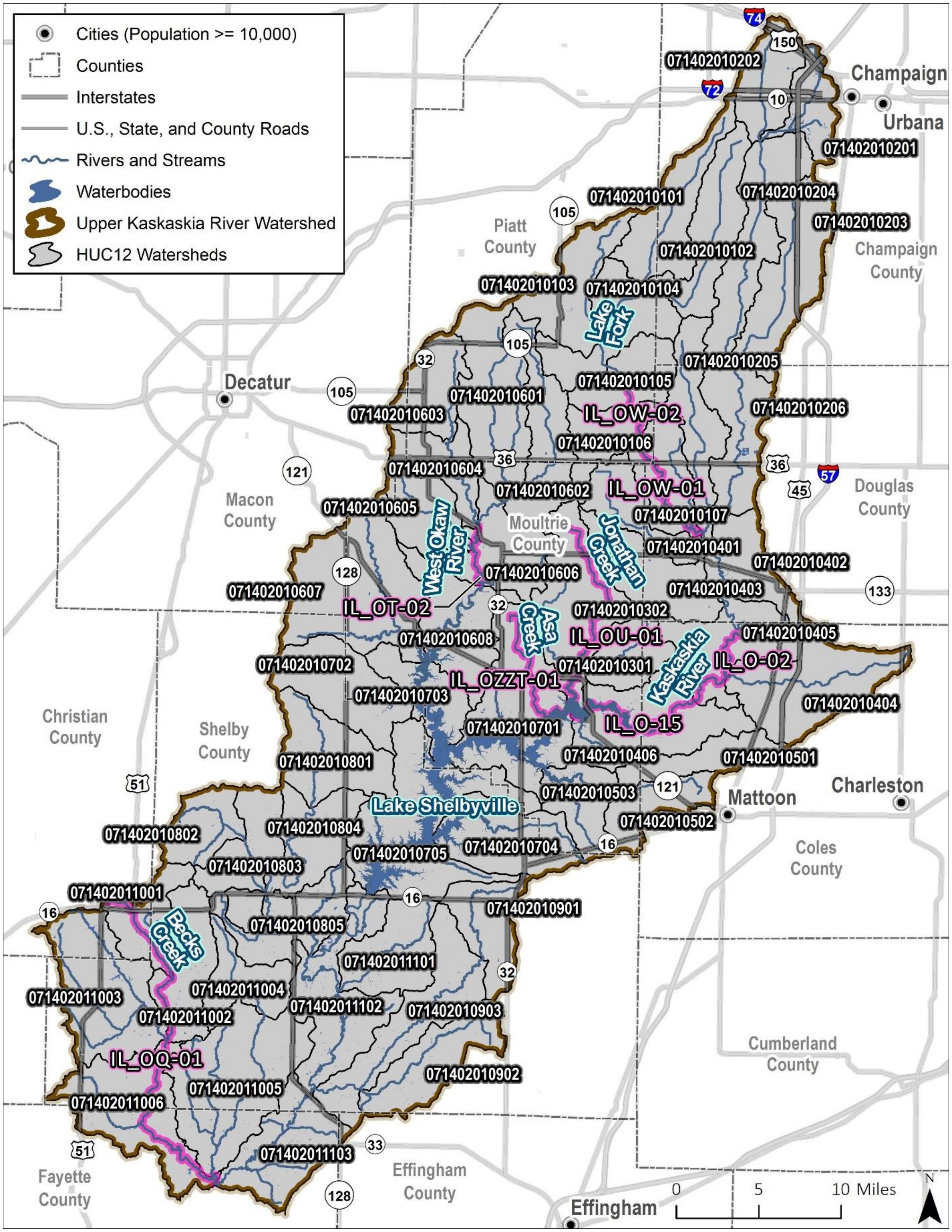


Figure 34. HUC12 watersheds.

10.2 Causes of Impairments and Pollutant Sources

This section, along with Section 3, contains the requirements for U.S. EPA's ***element one*** *of a watershed plan: identification of causes of impairments and pollutant sources.*

The implementation plan for the Upper Kaskaskia River watershed will focus on addressing the primary pollutants and sources presented in Table 50 and as described in detail in Section 3. These sources are contributing to impairments, and as such need to be managed in a way that will reduce pollutant loadings and address other negative effects.

Table 50. Primary sources (by pollutant) to be addressed

Sedimentation/siltation	Fecal coliform
• Crop production • Channelization • Livestock with access to riparian areas • Stream channel erosion • Urban stormwater	• Livestock with access to riparian areas • Livestock feeding operations • Municipal point source dischargers • On-site wastewater treatment systems • Urban stormwater • Agricultural runoff

10.2.1 Sediment Sources

Sediment is a primary pollutant causing impairment in Lake Fork and Asa Creek. A description of sediment sources is provided in Section 3. In addition, as part of implementation planning the *Spreadsheet Tool for the Estimation of Pollutant Load* (STEPL) model was used to quantify watershed loadings in this plan. STEPL provides a simplified simulation of precipitation-driven runoff and sediment and nutrient delivery. STEPL has been used extensively in U.S. EPA Region 5 for watershed plan development and in support of watershed studies. The model is based primarily on land cover and also incorporates livestock and septic systems when appropriate. Existing BMPs and point sources are not included in the model setup.

The STEPL model was used to estimate watershed source loads for the TSS impaired streams Lake Fork and Asa Creek. Watershed yields (watershed load divided by watershed area) are summarized in Figure 35 for total sediment in tons per acre per year by subwatershed (USGS HUC12s). Yields highlight those subwatersheds that are discharging a disproportionate amount of the pollutant load. Sediment yields in subwatersheds impacting TSS impaired streams range from 0.18 to 0.40 tons/acre/year. Sediment loading by source category is provided in Figure 36. Based upon STEPL modeling, the dominant nonpoint source of sediment is cropland. Urban land uses (e.g., the City of Sullivan, towns and villages, and roads) are the second largest source of TSS but is a far smaller load.

Streambank erosion is also contributing to sediment loads in the watershed. Douglas County conducted a streambank assessment in the Lake Fork watershed and identified several areas of potential sediment loading (Table 51 and Figure 37). Site photos are provided in Appendix A.

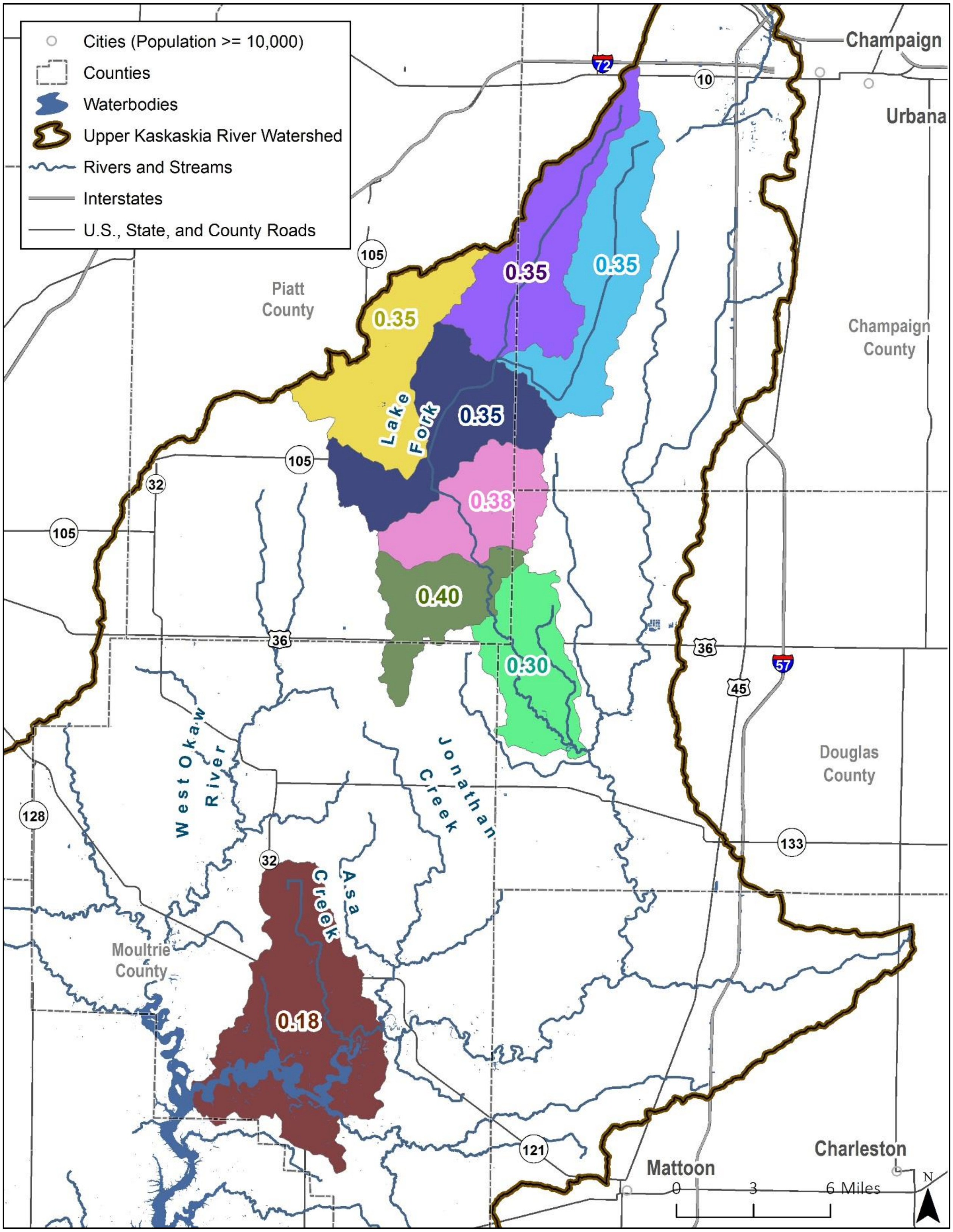
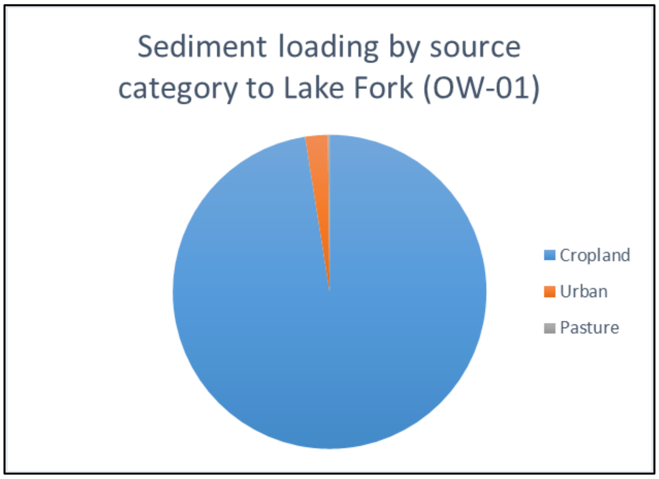
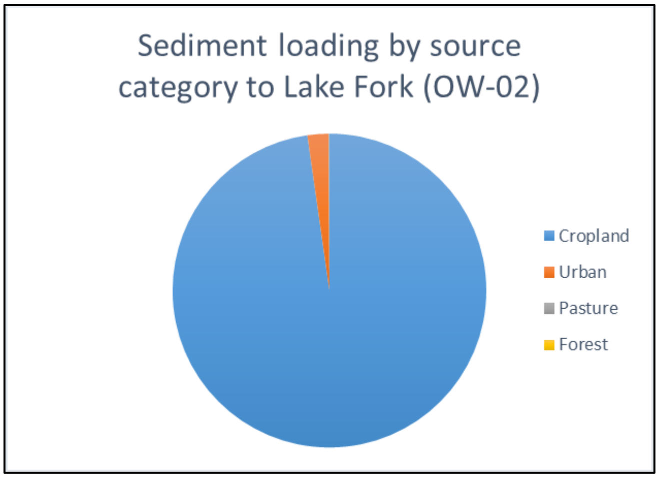


Figure 35. Sediment yields per HUC12 contributing to TSS impaired reaches (tons/acre/year).

Area loading rates based on EPA STEPL model results and represents the compilation of all land covers in the modeled catchment. Rates apply to upland areas only and do not represent edge of field soil loss.





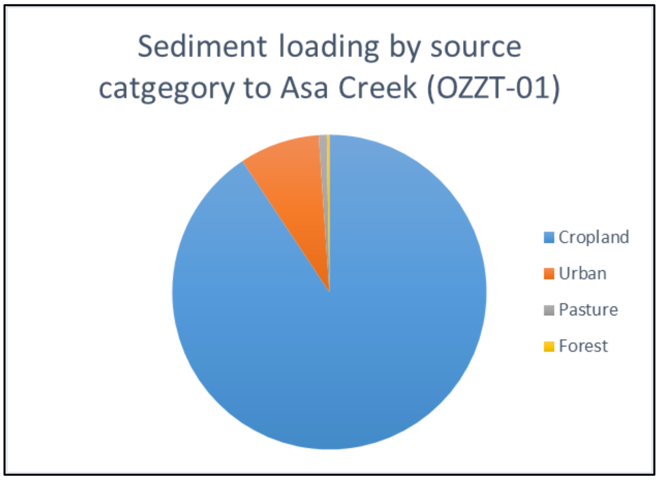


Figure 36. STEPL relative annual TSS loading by nonpoint source.

Table 51. Lake Fork streambank assessment results – critical areas for restoration

Assessment Location	Condition
1081	Old cement slab along north side of ditch needing attention
1082	Streambank sluffing approx. 150 ft along east side of channel
1083	90 degree turn in channel noting sluffing along 150 ft-200 ft
1084	Streambank sluffing along west side of channel
1085	Head cutting at road culvert west side of road with a silted in waterway
1086	Old, existing cement structure no longer functioning properly. Replace rusted out 48" pipe.
1087	Loads of existing broken concrete are padded along the east side of channel
1088	Scour erosion along west side of bank
1089	Scour erosion along north side of bank in the woods
1090	Streambank erosion along south side of channel
1091	Streambank erosion along north/east side of channel
1092	Gully erosion starting east side of road in pasture flowing to channel.

a. See Figure 37 for assessment locations.

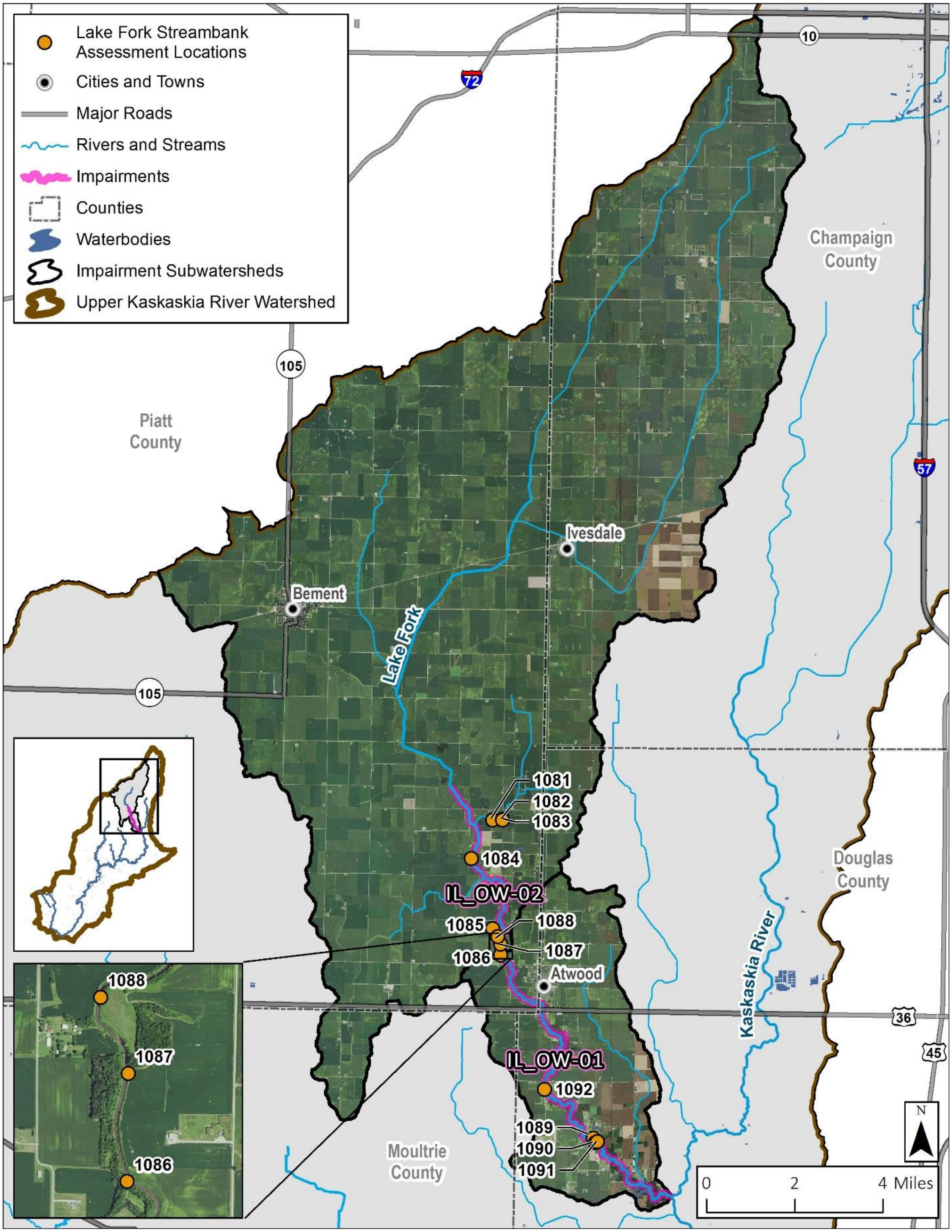


Figure 37. Lake Fork streambank assessment sites – critical areas for restoration.

10.2.2 Fecal Coliform Sources

Fecal coliform is causing impairment in five stream segments in the watershed (Table 49). A detailed description of fecal coliform sources is included in Section 3. Nonpoint sources of fecal coliform include on-site wastewater treatment systems, livestock (feedlots, access to streams, manure management), wildlife, pets (in urbanized areas), and stormwater. Point sources of fecal coliform include municipal point sources dischargers (e.g., WWTPs).

In addition to the information provided in Section 3.3.3, county health departments were contacted again to ensure all available information was included. No new information was available on septic system inventories or failure rates. The Illinois Department of Public Health regulates the installation of all septic tanks in the state. They review and approve plans for private sewage disposal systems and alternative private sewage disposal systems before construction and also licenses or certifies contractors and trainees for private sewage disposal installation and maintenance. The environmental divisions of county health departments in Illinois provide inspections of new and repaired on-site wastewater treatment systems.

Livestock are also a potential source of bacteria to streams, particularly when direct access is not restricted and where feeding structures are located near riparian areas. Table 52 summarizes the estimated number of animals and total animal units that are potentially contributing to fecal coliform impairments in the Upper Kaskaskia River watershed. This table only includes an estimate for the direct drainage area to the impaired segment because the streams are not impaired upstream (with the exception of Kaskaskia River O-15 – see footnote) and because livestock in the direct drainage area are more likely to have an effect on stream water quality and are the focus of implementation efforts. Total animal counts for each impaired watershed can be found in Table 15. Cattle, poultry and hogs are the primary types of livestock in the impaired watersheds.

Table 52. Estimated livestock and animal units contributing to impairments

Note – Estimates are provided for the direct drainage area only as this area is potentially contributing to the fecal coliform impairment.

Watershed	Segment	Number of Animals [a]					Total Animal Units [a]
		Cattle	Poultry	Sheep	Hogs	Horses	
Kaskaskia River	IL_O-02	308	323	15	62	62	**465**
Kaskaskia River [b]	IL_O-15	331	317	34	83	92	**558**
Becks Creek	IL_OQ-01	3,969	221	211	16,150	127	**10,709**
West Okaw River	IL_OT-02	290	394	32	118	103	**554**
Jonathon Creek	IL_OU-01	611	809	66	238	210	**1,149**

Source: 2012 Census of Agriculture (Illinois)

a. Animal units are converted from the number of animals.

b. Kaskaskia River segment O-15 is directly downstream of segment O-02. Livestock within the direct drainage area of O-02 are also potentially impacting fecal coliform levels in O-15 but were not included to prevent double counting.

As part of this implementation plan, additional analysis was conducted to determine the extent that point sources may be contributing to impairments, and under which flow conditions. Many NPDES permitted facilities discharge to fecal coliform impaired waters (Table 11). To determine the relative contribution of NPDES permitted facilities to fecal coliform impairments, discharge monitoring records for each facility for 2013 to 2015 were reviewed. Average monthly outflow from NPDES facilities make up a large proportion of in-stream flow under dry conditions and low flows (Table 53). Ensuring that facilities are meeting permit requirements for fecal coliform is critical to ensuring protection of beneficial uses under lower flow conditions.

Table 53. Flow contribution of NPDES-permitted facilities to fecal coliform impairments

Stream Name	Segment ID	Percentage of In-stream Flow that is Effluent				
		High Flows	Moist Conditions	Mid-Range Flows	Dry Conditions	Low Flows
Kaskaskia River	O-02	0.6	2.3	5.9	23.7	76.0
	O-15	0.6	2.1	5.6	22.4	71.9
Becks Creek	OQ-01	0.2	1.2	4.1	20.5	100
West Okaw River	OT-02	0.1	0.2	0.6	7.6	N/A

N/A - River is dry under low flow conditions

Eleven of the NPDES permitted facilities have year round disinfection exemptions which allow a facility to discharge wastewater without disinfection; exemptions are in place to allow for natural attenuation of fecal bacteria in the stream within the associated disinfection exemption reach (Figure 24). Facilities with disinfection exemptions are required to meet the in-stream water quality standard at the end of the exempted reach (i.e., geometric mean of 200 cfu/100 ml). Disinfection exemption reaches drain directly to Becks Creek (OQ-01) and West Okaw River (OT-02) impairments. Other disinfection reaches are present upstream of fecal-coliform stream impairments, however they drain to unimpaired waters. Facilities discharging into an impaired segment may have their year-round disinfection exemption reviewed through future NPDES permitting actions. Monitoring requirements may be included as a condition in the NPDES permit upon renewal. Following this monitoring, IEPA can evaluate the need for additional point source controls through the NPDES permitting program.

10.3 Load Reductions and Best Management Practices

This section contains the requirements for U.S. EPA's ***element two*** *of a watershed plan: Estimate of the load reductions expected from management measures.*

Fecal coliform load reductions are necessary in two reaches of the Kaskaskia River, Becks Creek, West Okaw River, and Johnathan Creek, while sediment load reductions are needed in Lake Fork and Asa Creek (Table 54, see Section 8 for additional details). Because the percent load reductions needed to achieve the TMDLs and LRSs are high (i.e., up to 96 percent for fecal coliform, and up to 78 percent for TSS), successful implementation will likely involve multiple BMPs targeting different sources in priority areas throughout the watersheds.

Within the watershed planning framework, candidate BMPs are identified and then evaluated to determine which BMPs will best address the causes and sources of pollutant loads. For watersheds with multiple causes and sources such as the Upper Kaskaskia River watershed, suites of BMPs must be identified and evaluated. BMPs are presented in this section to address each of the sources of pollutants described in Section 10.2. Several agricultural BMPs were identified as appropriate for the Upper Kaskaskia watershed by the local SWCDs with assistance from NRCS (Table 55). During the development of this implementation plan, several of these BMPs, in addition to others, were further evaluated and their potential effects quantified. Table 56 includes a suite of BMPs that could be used to achieve necessary load reductions in the watershed. This table summarizes the expected pollutant removal efficiency (percent reduction) for each BMP. Descriptions of each BMP follow. There are many different BMP scenarios that could be used to achieve pollutant load reductions, this plan provides one example.

Table 54. Load reductions needed in the Upper Kaskaskia River watershed

Waterbody ID	Waterbody Name	TMDL/LRS Pollutant	Needed Reductions by Flow Zone				
			High Flows	Moist Conditions	Mid-Range Flows	Dry Conditions	Low Flows
O-02	Kaskaskia River	Fecal coliform (SSM)	76%	82%	19%	71%	0%
		Fecal coliform (GM)	32%				
O-15	Kaskaskia River	Fecal coliform (SSM)	-	0%	-	-	-
		Fecal coliform (GM)	5%				
OQ-01	Becks Creek	Fecal coliform (SSM)	82%	23%	80%	74%	92%
		Fecal coliform (GM)	78%				
OT-01	West Okaw River	Fecal coliform (SSM)	-	0%	26%	-	-
		Fecal coliform (GM)	39%				
OU-01	Johnathon Creek	Fecal coliform (SSM)	-	0%	64%	96%	-
		Fecal coliform (GM)	78%				
OW-01	Lake Fork	Total suspended solids	-	-	25%	78%	0%
OW-02	Lake Fork	Total suspended solids	-	-	0%	0%	-
OZZT-01	Asa Creek	Total suspended solids	-	-	5%	-	-

SSM – based on the single sample maximum water quality standard
GM – based on the geometric mean water quality standard

Table 55. Selected NRCS conservation practices for the Upper Kaskaskia River Watershed

Practice	NRCS Code	Target Pollutant
Composting Facility	317	Fecal Coliform
Residue and Tillage Management, No Till	329	Sediment
Cover Crop	340	Sediment
Critical Area Planting	342	Sediment
Residue and Tillage Management, Reduce Till	345	Sediment
Sediment Basin	350	Sediment
Diversion	362	Fecal Coliform
Roofs and Covers	367	Fecal Coliform
Pond	378	Sediment, Potential for Fecal Coliform
Fence	382	Fecal Coliform, Sediment
Field Border	386	Sediment
Riparian Herbaceous Cover	390	Fecal Coliform, Sediment
Riparian Forest Buffer	391	Fecal Coliform, Sediment
Filter Strip	393	Fecal Coliform, Sediment
Grade Stabilization Structure	410	Sediment
Grassed Waterway	412	Sediment
Lined Waterway or Outlet	468	Sediment
Forage and Biomass Planting	512	Sediment
Livestock Pipeline	516	Fecal Coliform
Roof Runoff Structure	558	Fecal Coliform
Stream Crossing	578	Fecal Coliform, Sediment
Streambank and Shoreline Protection	580	Fecal Coliform, Sediment
Channel Bed Stabilization	584	Sediment
Amendments for Treatment of Agricultural Waste	591	Fecal Coliform
Terrace	600	Sediment
Waste Separation Facility	632	Fecal Coliform
Waste Transfer	634	Fecal Coliform
Segregated Treatment Area	635	Fecal Coliform
Water and Sediment Control Basin	638	Sediment

Table 56. Recommended BMPs for implementation

BMP	TSS Removal Efficiency [a]	Fecal Coliform Removal Efficiency
Cropland BMPs		
Conservation tillage (NRCS 329, 345)	50%	--
Cover crops (NRCS 340)	50%	--
Riparian buffers and filter strips (NRCS 386, 390, 391, 393)	25%	34-74% [b]
Stream Channel Erosion BMPs		
Streambank stabilization (NRCS 580, 584)	75%	--
Grade stabilization structure (NRCS 410)		
Stone toe protection		
Stream barbs		
Debris removal		
Livestock BMPs		
Exclusion fencing (NRCS 382, 578)	varies	29-46% [c]
Feedlot BMPs (NRCS 317, 362, 367, 558, 591, 632, 634, 635) (composting facilities, buffers, livestock access control, manure management plans, waste storage facilities and clean water diversions)	varies	90-97% [c, d]
Onsite Wastewater BMPs		
Upgrading or replacing failing septic systems	--	100% for failing septics
Septic maintenance	--	100% for failing septics
Education and inspection programs	--	100% for failing septics
Stormwater BMPs		
Detention pond	58-86%	e
Infiltration basin or bioretention	75%-90%	
Swale	65%-80%	
Pet waste management	--	varies

a. Source: STEPL outputs b. Source: Wenger 1999 c. Source: US EPA 2003
d. Source: Meals and Braun 2006
e. Stormwater BMPs may reduce fecal bacteria concentrations, however reductions depend on site specific conditions, design, maintenance, and source loads. BMPs that filter (e.g., sand filter) have been shown to provide the greatest reduction in fecal bacteria.

10.3.1 Cropland BMPs

Agricultural runoff is an important source of TSS and bacteria to impaired streams in the Upper Kaskaskia River watershed. Agricultural practices such as crop cultivation (74.5 percent) and pasture/hay (5.7 percent) cover an estimated 80 percent of the project area. Much of the cropland in the Upper Kaskaskia River watershed is tiled and most stream segments have little to no riparian buffers. Drain tiles transport agricultural runoff directly to ditches and streams, whereas runoff flowing over the land surface may infiltrate to the subsurface and may flow through vegetated riparian areas when present.

Cropland BMPs to address TSS and fecal coliform loading are presented in the following subsections and the estimated removal efficiencies (i.e., reductions) are summarized in Table 56. Other agricultural management practices can also be used to achieve the goals of the TMDL and this plan. The Illinois Council on Best Management Practices provides additional information on these and other BMPs (http://illinoiscbmp.org/).

Conservation Tillage

Conservation tillage is any tillage practice that results in at least 30 percent coverage of the soil surface by crop residuals after planting. Several types of tillage systems are commonly used to maintain the suggested 30 percent cover:

- **No-till** systems disturb only a small row of soil during planting, and typically use a drill or knife to plant seeds below the soil surface.
- **Mulch till** systems are any practice that results in at least 30 percent residual surface cover, excluding no-till and ridge till systems.
- **Reduced till** systems are any farming practice which involves fewer cultivations than used in conventional fallowing.

Corn residues are more durable and capable of sustaining the required 30 percent cover required for conservation tillage. Soybeans generate less residue, the residue degrades more quickly, and supplemental measures or special care may be necessary to meet the 30 percent cover requirement. The Illinois Department of Agriculture reports tillage practices by county in soil transect survey reports (https://www.agr.state.il.us/illinois-soil-conservation-transect-survey-reports). From the 2017 survey, percentage of surveyed sites under various tillage systems are provided in Table 57 for corn, soy and small grain for the counties that contain sediment impaired streams.

Table 57. Percent of surveyed cropland under conservation tillage systems (IDA 2015)

Crop	County	No-till systems	Mulch till systems	Reduced till systems
Corn	Champaign	0.3%	4.8%	11.4%
	Douglas	1.2%	0.8%	7.7%
	Moultrie	0.4%	0.0%	0.0%
	Piatt	0.0%	4.2%	10.3%
Soy	Champaign	21.9%	23.6%	13.5%
	Douglas	7.5%	13.2%	39.0%
	Moultrie	22.8%	26.5%	29.3%
	Piatt	10.8%	58.4%	19.0%
Small Grain	Champaign	100.0%	0.0%	0.0%
	Douglas	0.0%	100.0%	0.0%
	Moultrie [a]	--	--	--
	Piatt [a]	--	--	--

a. No small grains surveyed.

Cover Crops

Fall cover crops are an important management practice to reduce erosion and have many other benefits to a crop system. Selection of cover crops will depend on the objective of the producer. For example, in addition to reducing erosion, deep rooted species will help retain soil nutrients and reduce soil compaction. Grasses and legumes may be used as winter cover crops to improve soil quality and increase nitrogen levels for the following crop. Grasses tend to have low seed costs and establish relatively quickly and legumes are capable of fixing nitrogen from the atmosphere, thus reducing nitrogen fertilization required for the next cash crop. Soil loss from wind erosion can be prevented by inter seeding small grain crops in rows with row or vegetable crops. The right moment to kill the cover crop will depend on the specific rotation, weather, and grower objectives (NRCS 2011).

Riparian Buffers and Filter Strips

Riparian buffers are composed of vegetation that is tolerant of intermittent flooding and/or saturated soils located in the transitional zone between upland and aquatic habitats. Filter strips are a strip of permanent vegetation located between disturbed land (cropland or grazing) and environmentally sensitive areas (NRCS 2003 and 2013). Riparian buffers and filter strips provide many of the same benefits and can effectively address water quality degradation from sediment and fecal coliform while enhancing habitat. Riparian buffers and filter strips that include perennial vegetation and trees can filter runoff from adjacent cropland, provide shade and habitat for wildlife, and reinforce streambanks to minimize erosion. The root structure of the vegetation used enhances infiltration of runoff and subsequent trapping of pollutants. Both, however, are only effective in this manner when the runoff enters the BMP as a slow moving, shallow “sheet”; concentrated flow in a ditch or gully, will quickly pass through the vegetation offering minimal opportunity for retention and uptake of pollutants. Similarly, tile lines can often allow water to bypass a buffer or filter strip, thus reducing its effectiveness. The Illinois NRCS electronic Field Office Technical Guide (eFOTG) recommends the minimum width of a riparian buffer should be 2.5 times the width of the stream (at bank-full elevation) or 35 feet for water bodies to achieve additional water quality improvements (NRCS 2017a). Whereas, sufficient filter strip widths are dependent on the slope of the land. Table 58 summarizes the minimum and maximum flow lengths for filter strips according to Illinois NRCS standards.

Table 58. Minimum and maximum filter strip length for land slope (NRCS 2003)

Slope (%)	0.5	1.0	2.0	3.0	4.0	5.0 or greater
Minimum (feet)	36	54	72	90	108	117
Maximum (feet)	72	108	144	180	216	234

10.3.2 Stream Channel Erosion BMPs

In addition to sediment derived from crop production, erosion on the banks and beds of tributary streams has been identified as a potential source of sediment in the Lake Fork and Asa Creek watersheds. Several BMPs are appropriate to stabilize stream channels impacted by erosion. A site assessment and/or feasibility study are recommended prior to BMP selection. Stream channel erosion BMPs include engineering controls, vegetative stabilization, and restoration of riparian areas.

- **Engineering controls** include armoring with materials that straighten the banks, deflection of the water course with rock or log structures, and removal of debris to restore flows. Example practices include stone toes, stream barbs and removal of any problematic log jams that contribute to erosion.
- **Vegetative stabilization** and **restoration of riparian areas** can reduce peak flows from runoff areas and channel velocities directing runoff. Using vegetative controls also enhances infiltration, which reduces high flows that cause erosion. See Section 10.3.1 for more information.

Streambank stabilization can result in 75 percent reduction in sediment loading based on EPA STEPL. Selection of BMPs and costs will depend on location-specific factors. Specific to Lake Fork, several stream channel BMP recommendations were made in the Douglas County NRCS streambank assessment and are listed in Table 59 and locations are identified on Figure 37. BMPs were identified to improve stability and reduce erosion which is contributing to sediment in the stream. Watershed stakeholders should work with partnering organizations to identify other segments impacted by stream erosion, select appropriate streambank stabilization activities, and then finance and implement the selected activities.

Table 59. Lake Fork streambank assessment BMP recommendations – critical areas for restoration

Assessment Location [a]	BMP Recommendation
1081	New grade stabilization structure to handle surface flow off crop field into side channel.
1082	Stream barbs and stone toe approximately 150 ft.
1083	Stone toe protection approximately 150 ft-200 ft.
1084	3-5 stream barbs spaced approximately 50 ft -75 ft.
1085	Address grassed waterway and structure at road culvert.
1086	Address structure and address up stream surface flow.
1087	Site reference. No BMP recommendation
1088	Stone toe protection approx. 100 ft.
1089	Stone toe protection approx. 200 ft.
1090	Stone toe protection approximately 200 ft - 300 ft.
1091	Stone toe protection approximately 300 ft - 500 ft.
1092	Address grassed waterway and structure on west side of road. Reduce concentration of flow on east side of road and keep livestock out.

a. See Figure 37 for locations.

10.3.3 Livestock BMPs

Livestock and livestock manure are a potential source of bacteria to streams, particularly when direct access is not restricted and where feeding structures are located near riparian areas. Livestock BMPs to address fecal coliform loading are presented in the following subsections and the estimated removal efficiencies (i.e., reductions) are summarized in Table 56. Other feedlot management practices can also be used to achieve the goals of the TMDL and this plan.

Exclusion Fencing

To reduce bacteria from livestock with access to streams, the implementation plan goal is to promote the use of cost-share funding to voluntarily implement BMPs for alternative watering systems and exclusion fencing. These BMPs limit or eliminate livestock access to a stream or waterbody. Fencing can be used with controlled stream crossings to allow livestock to cross a stream while minimizing disturbance to the stream channel and streambanks. Providing alternative water supplies for livestock allow animals to access drinking water away from the stream, thereby minimizing the impacts to the stream and riparian corridor. Some researchers have studied the impacts of providing alternative watering sites without structural exclusions and found that cattle spend 90 percent less time in the stream when alternative drinking water is furnished (U.S. EPA 2003). U.S. EPA (2003) estimates that fecal coliform reductions from 29-46 percent can be expected; sediment load reductions are also achieved.

Feedlot BMPs

Feedlots on livestock feeding operations has been identified as a potential source of fecal coliform and sediment loads. Proper management of runoff and waste is important to improving water quality in the watershed. Animal operations are typically either pasture-based or confined, or sometimes a combination of the two. The operation type dictates the practices needed to manage manure and soil erosion from the facility. A pasture or open lot system with a relatively low density of animals (1 to 2 head of cattle per acre [U.S. EPA 2003]) may not produce manure in quantities that require management for the protection of water quality. If excess manure is produced, then the manure will typically be scraped with a tractor to a storage bin constructed on a concrete surface. Stored manure can then be land applied at agronomic rates when the ground is not frozen and precipitation forecasts are low. Rainfall runoff should be diverted around the storage facility with berms or grassed waterways. Runoff from the feedlot areas may contain pollutants and should be treated (see below).

Confined facilities (typically dairy cattle, swine, and poultry operations) often collect manure in storage pits. Wash water used to clean the floors and remove manure buildup combines with the solid manure to form a liquid or slurry in the pit. The mixture is usually land applied or transported offsite.

Final disposal of waste usually involves land application on the farm or transportation to another site. Manure is typically applied to the land once or twice per year. To maximize the amount of nutrients and organic material retained in the soil, application should not occur on frozen ground or when precipitation is forecast during the next several days.

Livestock operation BMPs generally seek to contain manure and manure wastewater; contain and treat runoff contaminated with manure or manure wastewater; divert clean water; and prevent contaminated runoff following manure land application. The following BMPs are recommended:

- **Composting manure structures and manure management**. Composting manure structures contain manure and other organic materials as they are broken down through aerobic microbial processes. Once decomposed, the organic materials are suitable for storage, on farm use, and application to land as a soil amendment. Composting facilities typically consist of a concrete floor separated by stalls, cover such as a roof or loose tarp is recommended to maintain an environment conducive to aerobic digestion (NRCS 2017b). Additional information on composting manure structures is provided in Appendix B. Other manure management practices include:
    - Grading, earthen berms, and such to collect, direct, and contain manure
    - Installation of concrete pads
- **Runoff management** (runoff from production areas)
    - Grading, earthen berms, and such to collect and direct manure-laden runoff
    - Filter strips
    - Storage ponds
- **Clean water diversion**
    - Roof runoff management
    - Grading, earthen berms, and such to collect and direct uncontaminated runoff
- **Manure land application**
    - Nutrient management strategy (e.g., the 4Rs: **R**ight Source, **R**ight Rate, **R**ight Time, **R**ight Place)
    - Filter strips and grassed waterways

10.3.4 Onsite Wastewater Treatment System BMPs

BMPs to reduce fecal coliform loads include system upgrades/replacement, maintenance, inspection programs, and public education. The most cost-effective BMP for managing loads from septic systems is regular maintenance. U.S. EPA recommends that septic tanks be pumped every 3 to 5 years depending on the tank size and number of residents in the household (U.S. EPA 2002b). When not maintained properly, septic systems can cause the release of pathogens, as well as excess nutrients, into surface water. Annual inspections, in addition to regular maintenance, ensure that systems are functioning properly. An inspection program would help identify those systems that are currently connected to tile drain systems or storm sewers and those that may be failing. Inspections would also help determine if systems discharge directly to a waterbody (“straight pipe”). Additional point of sale inspections, or inspections when a property is sold and purchased, can improve the baseline understanding of septic conditions and decrease occurrences of leaks potentially contributing to fecal loading in the watershed. These may include a soil boring to determine if the soil has adequate separation, and an examination of the inside of the tank after it has been pumped.

Education is a crucial component of reducing pollution from septic systems. Education can occur through public meetings, mass mailings, and radio and television advertisements. An inspection program can also help with public education because inspectors can educate owners about proper operation and maintenance during inspections.

The reductions in fecal coliform loading resulting from upgrading or replacing failing systems and improved operation and maintenance of all systems in the watershed depends on the wastewater characteristics and the level of failure present in the watershed. Upgrading or replacing failing systems will result in 100 percent reduction in fecal coliform loading from that system.

10.3.5 Stormwater Management

Stormwater in developed areas rapidly transports pollutants to streams and water bodies during and after precipitation events. Fecal coliform sources include pet and wildlife waste that are transported via runoff from a precipitation event to storm sewers and streams; leaky infrastructure is also a potential source of bacteria since untreated domestic wastewater can leak into stormsewers. Urban stormwater is also a source of sediment loading and contributes to increased bank erosion due to faster and more powerful stream flows caused by urban development and imperviousness. Runoff from construction or industrial sites that is not properly contained (e.g., silt fences) or treated (e.g., settling pond) also contributes to sediment loading. BMPs that address both fecal coliform and sediment sources are provided below.

Pet Waste Management

Pet waste management can reduce bacteria loadings in developed areas. Successful pet waste programs are often composed of (1) codified ordinance to penalize illicit deposition of pet feces, (2) public outreach, and (3) pet waste stations in public parks and recreation areas. Some pet waste programs also include municipal pet registries that are typically created for public health concerns.

Recommended implementation activities are intended to create a comprehensive, coordinated, and robust pet waste education and outreach program. Priority areas for domestic waste implementation practices are areas with lots of pets and with a high level of impervious cover in Champaign and other developed areas. Recommendations for developing a pet waste program include the following:

- **City code that penalizes pet feces deposition in public areas.** New city code should be developed to prohibit deposition of pet feces in public areas, if not already in place. Code should target public areas (e.g., municipal parks) and areas served by storm sewers. In the counties, which are rural, ordinance should focus on public recreation areas, especially those adjacent to waterways. City code or county ordinance, along with civil and monetary penalties, should be cited on signage at public recreation areas and at pet waste stations. Monetary penalties may serve as a disincentive from pet waste mismanagement.
- **Establish a network of pet waste stations in public recreation areas.** Pet waste stations should be established in parks and other recreation areas. The stations should include signs to identify the stations and how to use the stations; if code or ordinance is enacted to prohibit pet waste mismanagement, the code or ordinance should also be cited on signage.
- **Develop an education campaign.** A campaign refers to a coordinated, comprehensive outreach effort that integrates a variety of education and outreach techniques. Campaign development starts with a baseline survey to understand existing dog owner behaviors and perceptions, uses

survey information to craft effective messages delivered using formats tailored to target audiences, and follows up with a post-campaign survey to determine effectiveness. This campaign can support any regional or local stormwater management programs.

Because pet waste programs are a popular component of stormwater management programs, there is a great deal of material available for use by other communities. However, there are not a lot of data available about the effectiveness of these programs in changing behavior and improving water quality conditions. Assumptions related to the amount of dog waste diverted from the stream can be made based on bag usage from pet waste stations. Another evaluation mechanism used by these programs is changes in awareness, although a more aware target audience does not always translate into an audience that exhibits behavior changes.

Stormwater BMPs

Stormwater BMPs can be used to reduce pollutant loadings, especially in areas with higher levels of imperviousness. Stormwater management includes both retrofitting stormwater BMPs into existing untreated developed areas and enacting ordinances to require higher levels of stormwater management in new developments and re-development. The Illinois Urban Manual (http://www.aiswcd.org/illinois-urban-manual/) provides recommended design guidelines for many stormwater BMPs. Table 56 summarizes expected sediment load reductions from various stormwater BMPs. STEPL does not estimate fecal coliform loading or reductions, however, stormwater runoff from impervious areas can directly connect the location where fecal coliform is deposited on the landscape to surface waters. Reducing connected imperviousness surfaces may additionally reduce fecal coliform concentrations in nearby waters. In addition to stormwater BMPs, local water planning and ordinance adoption can also be used to enhance stormwater management activities.

10.4 Best Management Practice Implementation and Critical Areas

This section contains the requirements for U.S. EPA's ***element three:*** *description of non-point management measures needed to achieve load reductions and identification of critical areas.*

An important aspect of the implementation plan is to identify and encourage activities that can be implemented and produce measurable results. In many watersheds, implementation faces a variety of challenges. These challenges include how to assess the benefits of a variety of water quantity and quality control strategies, how to select the optimal combination of BMPs that minimize costs, how to be consistent with community goals and characteristics, and how to meet necessary reductions to achieve water quality standards. The following section will serve as a guide to overcome these challenges by outlining the level of implementation needed, and identifying critical areas for BMP implementation.

10.4.1 Level of Implementation

The majority of sediment loading in Asa Creek and Lake Fork is derived from cropland. Therefore, a simplified suite of implementation activities were simulated using EPA's STEPL model to estimate the needed level of implementation to meet the needed sediment load reductions in Table 54 (Table 60 and Table 61). STEPL calculated a load reduction from the acreage that the BMP is treating and an expected removal efficiency. It is important to note that the following implementation recommendations do not take into account existing BMPs on the landscape; these BMPs can be counted towards meeting load reduction requirements. The final set of BMPs will depend on numerous factors including cost, public support, and landowner interest.

Table 60. Asa Creek (OZZT-01) BMPs for TSS reduction

BMP	Units of BMP Needed	TSS load reduction (tons/year)
Conservation Tillage	1,319 acres	185
Riparian Buffer and Filter Strips	3,200 feet	93
Total	--	**278**

Table 61. Lake Fork (OW-01) BMPs for TSS reduction

BMP	Units of BMP Needed	TSS load reduction (tons/year)
Conservation Tillage	7,171 acres	1,268
Riparian Buffer and Filter Strips	7.3 miles	521
Cover Crops	7,171 acres	1,268
Streambank Stabilization and debris removal	12,000 feet	320
Total	--	**3,378**

Reduction in fecal coliform loading will require a combination of programmatic activities summarized in Section 10.3 that address septic systems, stormwater, feedlots, and pet waste. Fecal coliform source loads from BMPs in the Upper Kaskaskia are not quantified in STEPL, however, the following load reductions are estimated for select fecal coliform BMPs:

- **Livestock BMPs:** storage of manure for at least 30 days prior to land application may reduce fecal coliform concentrations in runoff by 97 percent (Meals and Braun 2006). Use of waste storage structures, ponds, and lagoons reduce fecal coliform loading by 90 percent (U.S. EPA 2003).
- **Riparian buffers and filter strips:** an estimated 34-74 percent reduction in fecal coliform has been estimated from the use of riparian buffers (Wenger 1999).
- **Exclusion fencing:** U.S. EPA (2003) estimates that fecal coliform reductions from 29-46 percent and be expected.

In addition, stormwater management practices can be used to disconnect impervious surfaces reduce fecal coliform loading, however load reductions are not quantifiable. Reductions associated with onsite wastewater BMPs and pet waste management are also not quantifiable.

Based on the above reductions, the following level of implementation is recommended to achieve necessary load reductions. It is important to note that the following implementation recommendations do not take into account existing BMPs on the landscape; these BMPs can be counted towards meeting load reduction requirements.

- **Livestock BMPs**[1] implemented for approximately 9,655 animal units, or 50 percent of all animal units in the direct drainage to Kaskaskia River (O-02 and O-15) and West Okaw River (OT-01), and 75 percent of animal units in Becks Creek (OQ-01) and Johnathon Creek (OU-01). Both Becks Creek and Johnathon Creek require higher reductions in fecal coliform loading.
- **Riparian buffers and filter strips** on approximately 696 acres, or approximately 35 foot buffers on 100 percent of fecal coliform impaired stream miles (82 miles).

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[1] Livestock BMPs refer to a suite of BMPs that include composting structures and other manure management practices, runoff management, clean water diversions, and proper manure land application.

- **Exclusion fencing** on 75 percent of streams that are accessible to livestock.
- **Stormwater management** to address 30 percent of the connected impervious area.

Since exact fecal coliform loading reductions depend on a multitude of site specific factors, it is also recommended that implementation of onsite wastewater BMPs and pet waste management occurs in the watershed to ensure needed reductions are met. Both ambient water quality and BMP effectiveness monitoring throughout implementation will further refine and direct the level of BMP implementation needed to achieve necessary load reductions in the watershed.

10.4.2 Critical Areas for BMP Implementation

Successful implementation begins with identifying and focusing resources in critical areas. Critical areas are the focus of outcome-based plans because they represent those locations where project funding will provide the greatest environmental benefit. This section contains critical area identification for a variety of implementation activities.

As part of implementation plan development, a stream corridor land cover assessment was conducted throughout the watershed’s 50-foot riparian zone (Figure 38; see Appendix C). The assessment categorized land cover on both sides of the stream and summarized the data by stream segment. Table 62 summarizes stream segments that can be designated as critical areas for buffer implementation and also identifies several stream reaches that have excellent existing riparian buffers and offer the opportunity for protection efforts. Critical areas for buffer implementation are identified as those with less than 15 percent natural cover. In addition, Asa Creek is identified as a critical area for buffer restoration due to its impairment and proximity to the cut off at 16 percent natural cover. The sites identified in the Lake Fork streambank assessment are also considered critical areas for stream channel erosion. Site locations are provided in Figure 37.

Areas with high density livestock, mostly cattle on pasture, were identified by NRCS and local SWCD staff. These HUC12s all drain to fecal coliform impaired streams and are identified as critical areas for livestock BMPs to address fecal coliform pollutant loading. Potential feedlot locations were identified within these subwatersheds using aerial photography to further prioritize implementation into critical areas (Table 63). Feedlot densities ranged from less than one to eight feedlots per square mile (Figure 39).

Table 62. Critical stream corridor areas

Implementation Action	Corridor Classification	Stream Segment (AUID)
Restoration (Critical areas for buffer implementation)	50-foot buffers with less than 15% natural cover	West Fork (OV-01) Kaskaskia River, Lake Fork (OW-02 and OW-03) Bear Creek (OW-OWA) East Lake Fork (OWB) West Branch Lake Fork (OWC) Hammond Mutual Ditch (OTF) West Okaw Ditch 3 (OTG) and Ditch 4 (OTH) Kaskaskia River (O-35 and O-37) Copper Slough (OZYA) Phinney Branch (ZYB) Asa Creek (OZZT-02)
Protection	50-foot buffers with 85% or more natural cover	Kaskaskia River (O-02 and O-17) Becks Creek (OQ-01) Coal Creek (OQCA-02) Cary Branch (ORAA) West Okaw River (OT-02) Bacon Branch (OZZFA)

Table 63. Critical areas for livestock BMP implementation

Order of Priority	HUC12 Watershed 071402010-	HUC12 Watershed Name
Highest	403	Town of Arthur
	402	Town of Chesterville-Kaskaskia River
	107	Bear Creek-Lake Fork
	401	West Fork
↓	302	Jonathan Creek
	405	Town of Cooks Mills-Kaskaskia River
	206	Town of Ficklin-Kaskaskia River
	301	Bolin Branch
	406	Coon Creek-Kaskaskia River
Lowest	205	Dry Fork

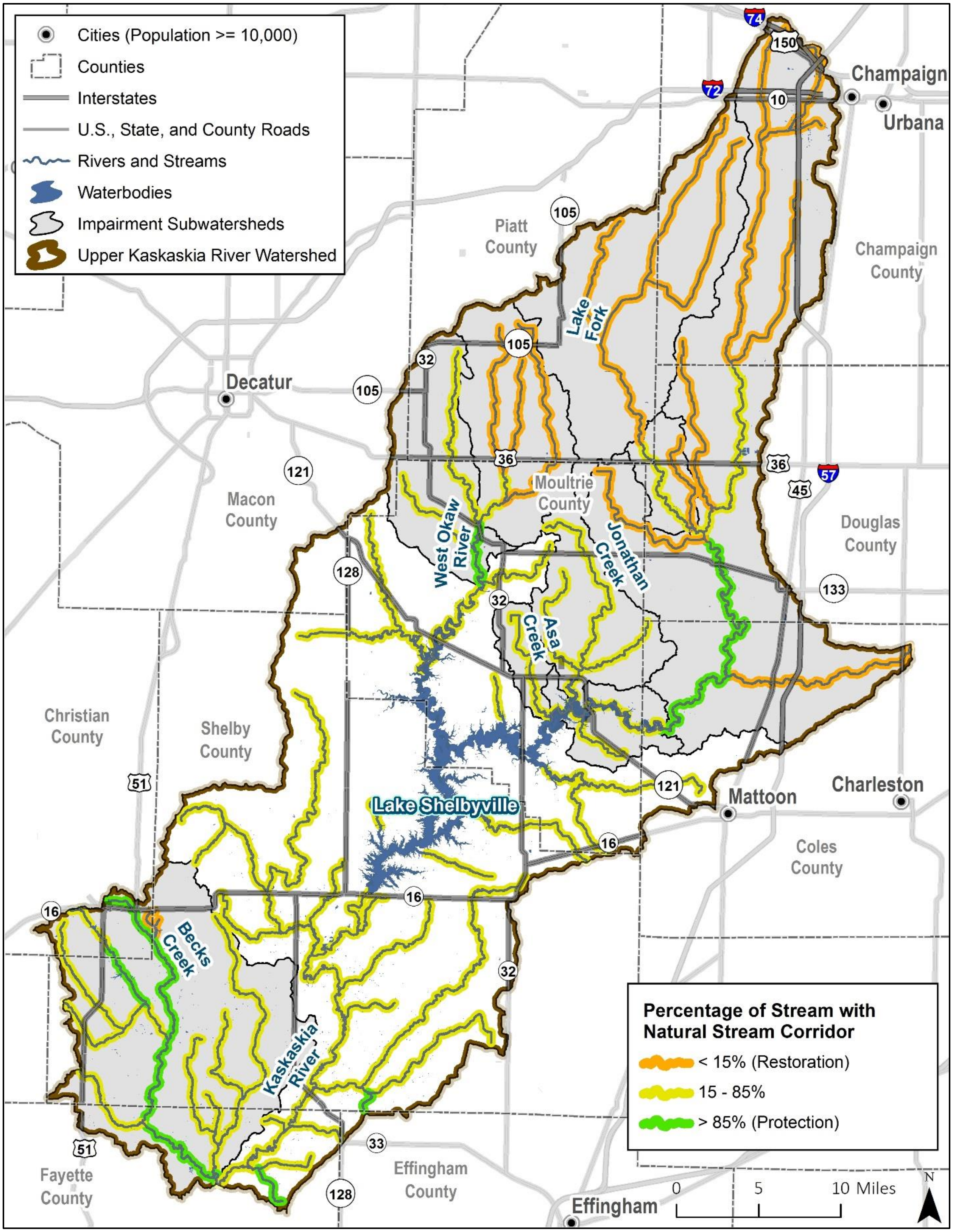

Figure 38. Results of stream corridor assessment – critical stream corridor areas.
Stream critical areas include those stream segments with <15% natural (critical area for restoration) and >85% natural (critical area for protection).

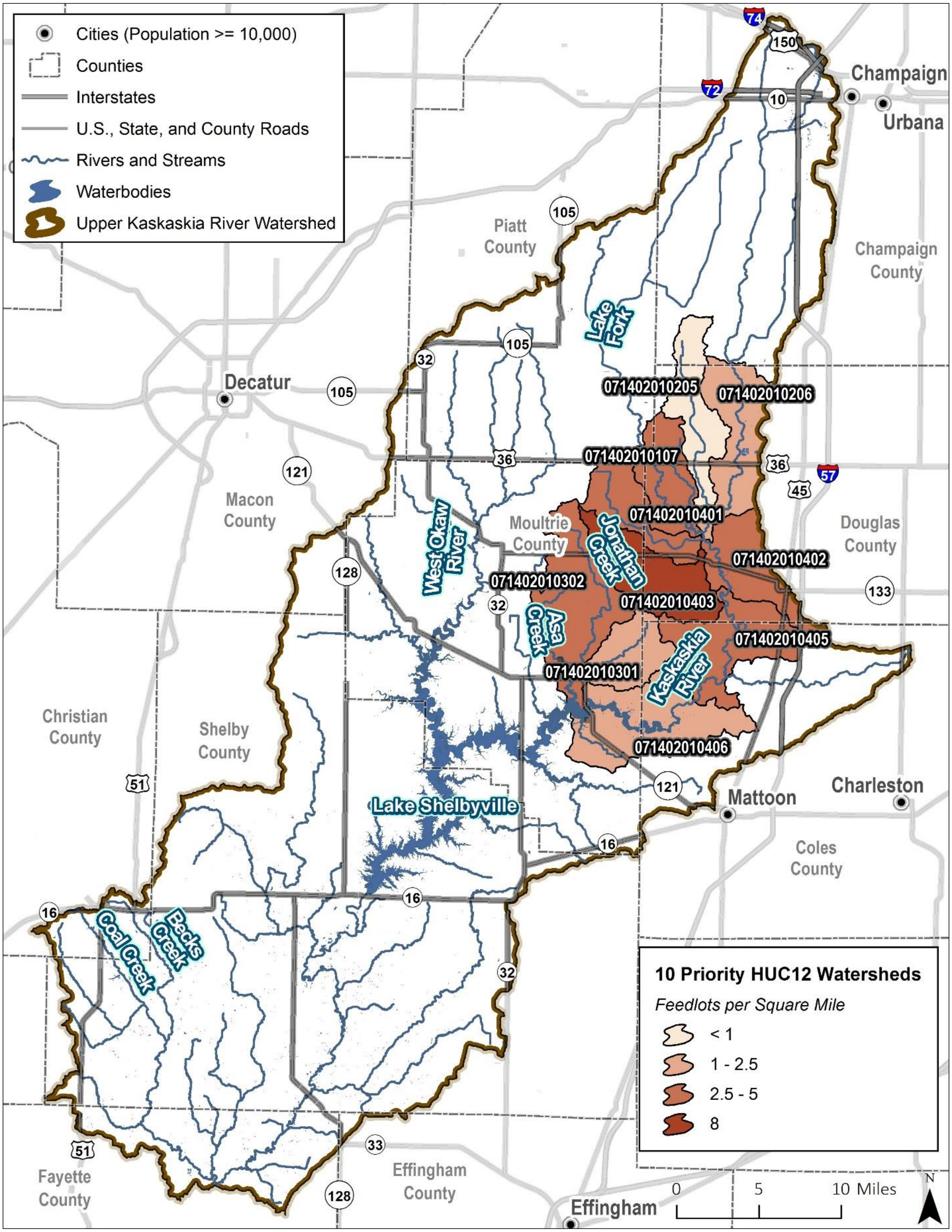

Figure 39. Critical watersheds identified by stakeholders for livestock BMPs.

See Table 63 above for watershed ranks (high to low priority).

10.5 Technical and Financial Assistance

This section contains the requirements for U.S. EPA's ***element four:*** *technical and financial assistance needed, associated costs, and the sources and authorities that will be relied upon for implementation.*

A significant portion of this TMDL implementation plan focuses on voluntary efforts as opposed to permit requirements. As a result, technical and financial assistance are essential to successful implementation over time. This section identifies total cost of implementation and cost per BMP and sources of funding and technical assistance for the recommended implementation practices in the watershed. This section also identifies the watershed partners who will likely play a role in implementation.

10.5.1 Implementation Costs

Total cost to implement the Upper Kaskaskia River watershed TMDL is estimated between $4-7 million. Table 64 summarizes the estimated cost per recommended BMP. These costs are derived from a variety of sources including the Illinois Nutrient Loss Reduction Strategy, the 2017 EQIP schedule, and other regional cost data. Total costs were calculated from these and the estimated level of implementation needed to achieve required pollutant load reductions.

Table 64. Cost per BMP

BMP	Cost/Unit
Cropland BMPs	
Conservation tillage (NRCS 329, 345)	(-$16.60) per pound of phosphorus removed [a]
Cover crops (NRCS 340)	$24.50 per pound of phosphorus removed [a]
Riparian buffers and filter strips (NRCS 386, 390, 391, 393)	$11.97 per pound of phosphorus removed [a]
Stream Channel Erosion BMPs	
Streambank stabilization (NRCS 580, 584)	$130,000 to 350,000 /stream mile [b]
Grade stabilization structure (NRCS 410)	$10,000 /structure [c]
Stone toe protection	$100 /ft of stone toe [c]
Stream barbs	$5,000 /barb [c]
Livestock BMPs	
Exclusion fencing (NRCS 382, 578)	$0.9-12/ft [d]
Feedlot BMPs (NRCS 362, 367, 558, 591, 632, 634, 635) (buffers, livestock access control, manure management plans, waste storage facilities and clean water diversions)	$350/animal unit [d]
Onsite Wastewater BMPs	
Upgrading or replacing failing septic systems	$6,000 – 12,000 per system [e]
Septic maintenance	$100-300 per system [e]
Education and inspection programs	Varies depending on level of effort required to communicate the importance of proper maintenance and the number of systems in the area
Stormwater BMPs	

BMP	Cost/Unit
Detention pond	$0.30 – 5.00 per cubic foot of treated water [f]
Infiltration basin or bioretention	$10.10-11.30 per cubic foot of treated water [f]
Swale	$1.57-2.66/foot [d]
Pet waste management	Varies depending on the level of effort required to communicate the importance of proper pet waste disposal

a. Illinois Nutrient Loss Reduction Strategy, Table 3.14; negative values indicate cost savings.
b. Source: Bair 2004
c. Cost estimates from Douglas County NRCS
d. Source: EQIP 2017
e. Based on a similar project costs
f. Source: Weiss et al. 2005

10.5.2 Financial Assistance Programs

There are many existing financial assistance programs which may assist with funding implementation activities. Many involve cost sharing, and some may allow the local contribution of materials, land, and in-kind services (such as construction and staff assistance) to cover a portion or the entire local share of the project. Several of these programs are presented below. In addition to these programs, partnerships between local governments can help to leverage funds. State and federal grant programs may also be available, depending on the nature of the implementation activity.

Federal Programs Administered through USDA

Environmental Quality Incentives Program (EQIP)
Several cost-share programs are available to landowners who voluntarily implement resource conservation practices. The most comprehensive is the NRCS EQIP which offers cost-sharing and incentives to farmers (in livestock, agricultural, or forest production) who utilize approved conservation practices to reduce pollutant loading from agricultural lands. In recent years, EQIP has provided cost-share for:

- Acreage of farmland that is managed under a nutrient management plan
- Use of vegetated filter strips
- Portions of the cost to construct grassed waterways, riparian buffers, and windbreaks
- Use of residue management
- Installation of drainage control structures on tile outlets, as well as portions of the cost of each structure
- Portions of the construction cost for a composting facility
- Portions of the fencing, controlled access points, spring and well development, pipeline, and watering facility costs
- Cost-share for waste storage facilities
- Prescribed grazing practices

To participate in the EQIP cost-share program, all BMPs must be constructed according to the specifications listed for each conservation practice. Payments are made after practices have been installed, and are capped per practice, but may cover up to 75 percent of project costs. Most contracts are for one to three years. More information about this program in Illinois is available at https://www.nrcs.usda.gov/wps/portal/nrcs/main/il/programs/financial/eqip/

Conservation Stewardship Program (CSP)

The NRCS CSP is for agricultural producers who want to enhance existing conservation practices on their land. NRCS consults one-on-one with the producer to develop enhancements that will improve conservation. CSP contracts are for five years and are renewable. Program participants are required to maintain the stewardship level that the resource concerns are already meeting in addition to meeting or exceeding at least one additional resource concern in each land use by the end of the contract. If a participant wishes to renew, the original contract must be fulfilled and the participant must agree to achieve additional conservation objectives. Two types of contract payments are available: payments to maintain existing conservation (based on the operation type and number of resource concerns meeting the applicable stewardship level at the time of application), and payments to implement additional conservation activities. There is a minimum annual payment of $1,500. Recent CSP conservation practices include:

- Riparian buffers
- Cover crops
- Livestock access management to streams

More information about the CSP can be found at https://www.nrcs.usda.gov/wps/portal/nrcs/main/national/programs/financial/csp/.

Agricultural Conservation Easement Program

NRCS's Agricultural Conservation Easement Program (ACEP) offers landowners the opportunity to protect, restore, and enhance agricultural lands and wetlands on their property. Land can be placed into an agricultural land easement or wetland reserve easement. Under the Agricultural Land component, NRCS may contribute up to 50 percent of the fair market value of the agricultural land easement. Under the Wetlands component, NRCS may contribute up to 100 percent of easement value for the purchase of the easement and up to 100 percent for the cost of restoration, and NRCS offers technical support for restoration. Easements can be 30 years in length or permanent. This program offers landowners an opportunity to establish long-term conservation and wildlife practices and protection. More information is available at http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/programs/easements/acep/.

Tax Incentive Filter Strip Program

The is an NRCS program that protects water quality by providing a property tax reduction incentive to landowners who install vegetative filter strips between farm fields and a water body to be protected. As an incentive for installing protective vegetative filter strips on land adjacent to surface or ground water sources, landowners may receive a reduced property tax assessment of 1/6th of its value as cropland. Landowners can expect to save about $1 to $25 per acres in taxes depending on soils and local tax rates. Vegetative filter strip design and certification assistance is available from local Soil and Water Conservation District offices. For more information, see local SWCD websites.

Conservation Reserve Program (CRP)

The Farm Service Agency of the USDA supports the CRP which provides a yearly rental payment in exchange for farmers removing environmentally sensitive land from agricultural production. Payments are based on the number of acres removed, and are capped at $50,000 per year. The land is converted to grass or forestland for the purposes of reducing erosion and protecting sensitive waters. This program is available to farmers who establish wetland or riparian buffers, vegetated filter strips, grassed waterways, or similar practices. The program also provides up to 50 percent of the upfront cost to establish vegetative cover, and contracts in the program are for 10 to 15 years. More information about this program can be found at https://www.dnr.illinois.gov/conservation/CREP/Pages/default.aspx.

Conservation Reserve Enhancement Program (CREP)

CREP is an enhancement of the Conservation Reserve Program. It is a Federal, State and Local partnership. Under the CREP, producers and private landowners are paid an annual rental rate in exchange for removing their frequently flooded and environmentally sensitive land from production and placing them under conservation practices. These practices reduce sediment and nutrients, improve water quality, and create/enhance critical habitat for fish and wildlife in Illinois. Eligible land meets one or more of the following criteria

- Located in the 100-year floodplain
- Qualifies as wetlands, wetlands farmed under natural conditions, or prior converted wetlands
- Highly erodible land (HEL) with an erodibility index of 8 or greater adjacent to the 100-year floodplain

Participation in the program is voluntary, and the contract periods for easements in Illinois are 15, 35 and perpetuity. More information on CREP in Illinois can be found at https://www.dnr.illinois.gov/conservation/CREP/Pages/default.aspx.

Sustainable Agricultural Grand Program (SARE)

SARE is a USDA program that funds research, education, and outreach efforts for sustainable agricultural practices. Farmer Rancher Grants are for farmers and ranchers who want to explore sustainable solutions to problems through on-farm research, demonstration, and education projects. These grants have funded a variety of topics including pest/disease management, crop and livestock production, education/outreach, networking, quality of life issues, marketing, soil quality, energy, and more. Awards are for a maximum of $7,500 for an individual project to a maximum of $22,500 for a group project, and may last up to 24 months. No matching funds are required for this program. About 40 Farmer Rancher grant projects are funded nationwide each year. More information is at http://www.sare.org/Grants.

State Programs Administered by the Illinois Department of Natural Resources, Department and Agriculture, and IEPA

Partners for Conservation (formerly Conservation 2000)

In 1995 the Illinois General Assembly passed the Conservation 2000 bill providing $100 million in funding over a 6-year period for the promotion of conservation efforts. In 1999, legislation was passed to extend the program through 2009. In 2008, House Bill 1780 was signed into law as Public Act 95-0139, extending the program to 2021 as Partners for Conservation. The Partners for Conservation Program funds programs at Illinois Department of Natural Resources, Illinois Department of Agriculture, and IEPA. Its programs include:

- **Conservation Practices Program:** This program provides monetary incentives for conservation practices implemented on land eroding at a rate of one and one-half times or more the tolerable soil loss rate. Payments of up to 60 percent of initial costs are paid through the local conservation districts, which also prioritize and select the projects to be funded in their district. The program provides cost share assistance for BMPs such as cover crops, filter strips, grassed waterways, no-till systems, pasture planting, contour farming, and installation of stormwater ponds. Practices funded through this program must be maintained for at least 10 years. More information can be found at https://www.agr.state.il.us/conservation/.
- **Streambank Stabilization Restoration Program**: Partners for Conservation also funds a streambank stabilization and restoration program aimed at restoring highly eroding streambanks. Research efforts are also funded to assess the effectiveness of vegetative and bioengineering techniques for bank stabilization. Streambank stabilization projects funded through this program must be maintained for at least 10 years. Further information is available at https://www.agr.state.il.us/conservation/.

- **Sustainable Agriculture Grant Program:** This program funds on-farm and university research, education, and outreach efforts for sustainable agricultural practices. Private landowners, organizations, and educational and governmental institutions are all eligible for participation in this program. Maximum per-project, per-year grant amounts are $10,000 for individuals and $20,000 for units of government, non-profits, institutions or organizations, and a source of matching funds is required. More information can be found at https://www.agr.state.il.us/conservation-2000.

State Programs Administered by IEPA

Nonpoint Source Management Program

IEPA receives federal funds through section 319(h) of the Clean Water Act to help implement Illinois' Nonpoint Source Pollution Management Program. The purpose of the program is to work cooperatively with local units of government and other organizations toward the mutual goal of protecting the quality of water in Illinois by controlling nonpoint source pollution. The program emphasizes funding for implementing cost-effective corrective and preventative BMPs on a watershed scale; funding is also available for BMPs on a non-watershed scale and the development of information/education nonpoint source pollution control programs.

The maximum federal funding available is 60 percent, with the remaining 40 percent coming from local match. The program period is two years unless otherwise approved. This is a reimbursement program. Funding is directed toward activities that result in the implementation of appropriate BMPs for the control of nonpoint source pollution or to enhance the public's awareness of nonpoint source pollution. Priorities include the development of watershed-based plans and implementation of those plans. Approximately $3,000,000 is available in this program per year Applications are accepted June 1 through August 1 of each year.

Projects or activities carried out to comply with the MS4 six minimum control measures are not eligible for section 319 funding. However, there may be some activities that promote opportunities to implement the watershed approach that are eligible for section 319 funding that could indirectly address the six minimum measures as well as nonpoint source projects. For more information: http://www.epa.state.il.us/water/watershed/nonpoint-source.html.

State Revolving Fund

The State Revolving Fund programs, including the Water Pollution Control Loan Program for wastewater and stormwater projects and the Public Water Supply Loan Program for drinking water projects, are annually the recipients of federal capitalization funding, which is combined with state matching funds and program repayments to form a perpetual source of low interest financing for environmental infrastructure projects. Eligible projects include traditional pipe, storage, and treatment systems, green infrastructure projects, erosion and sediment control projects, and right-of-way acquisition needed for such projects. The loans are for a maximum of 20 years, and can be used to cover the entire project cost. More information about this fund can be found at http://www.epa.illinois.gov/topics/grants-loans/state-revolving-fund/index.

State Program Administered by Illinois State Treasury Office

Ag Invest Agricultural Loan Program – Annual or Long Term

The Ag Invest Agricultural Loan Program offered through the Illinois State Treasury office provides low-interest loans to assist farmers. Loan funds can be used to implement soil and water conservation practices, for construction related expenses, to purchase farm equipment, or to pay for costs related to traditional crop production and alternative activities. Loan limits are between $300,000 and $400,000 per year. More information is available at http://illinoistreasurer.gov/Individuals/Ag_Invest.

Other Programs

Illinois Buffer Partnership

The Illinois Buffer Partnership is administered by Trees Forever, an Iowa non-profit organization. It offers cost sharing for installation of streamside buffer plantings at selected sites. Ten to twenty participants in Illinois are selected for the program annually. They receive cost-share assistance, on-site assistance from Trees Forever field staff, project signs and the opportunity to host a field day to highlight their project. Participants are reimbursed up to $2,000 for 50 percent of the expenses remaining after other grant programs are applied. Types of conservation projects eligible for the Illinois Buffer Partnership program include: riparian buffers, livestock buffers, streambank stabilization projects, wetland development, pollinator habitat, rain gardens and agroforestry projects. More information can be found at http://www.treesforever.org/Illinois_Buffer_Partnership.

10.5.3 Partners

There are several key implementation partners that can provide technical and financial assistance to promote successful TMDL implementation and watershed management. In addition, watershed groups within the Upper Kaskaskia River watershed have local knowledge of the resources and the residents. These federal, state, and local partners will have a more specific understanding of what technical and financial needs exist in the Upper Kaskaskia River watershed to undertake the recommended implementation activities:

- Kaskaskia Watershed Association
- Upper Kaskaskia Watershed Ecosystem Partnership
- Heartlands Conservatory
- Lake Shelbyville Development Association
- Soil and Water Conservation Districts
- Illinois Farm Bureau
- University of Illinois Extension
- County Health Departments
- County Commissioners, City Councils, and Township Boards
- Illinois Environmental Protection Agency
- Illinois Department of Agriculture
- Illinois Department of Natural Resources
- Illinois State Water Survey
- National Resources Conservation Service
- Farm Service Agency
- U.S. EPA Region 5
- U.S. Army Corps of Engineers

Staff at local NRCS offices and county SWCDs can meet with farmers and landowners and help them identify, finance, and install or implement agricultural BMPs. Similarly, staff at county health departments can meet with septic system owners and help determine if and when upgrades are needed.

10.6 Public Education and Participation

This section contains the requirements for U.S. EPA's ***element five*** *of a watershed plan: information and education component.*

Successful implementation will rely heavily on effective public education and outreach activities that will encourage participation and produce changes in behavior. Although Section 319 grant funds and cost-share dollars are available, if watershed stakeholders eligible to participate in activities such as feedlot improvements are not aware of these programs or willing to get involved, water quality improvements will not occur in the watershed. This section presents recommendations related to developing and implementing a coordinated watershed-wide information and education strategy. An information and education strategy will typically include the following elements:

- Goals and objectives
- Target audiences
- Programs, tools, materials, actions and campaigns
- Delivery mechanisms
- Priorities and schedule
- Lead and supporting organizations
- Expected outcomes and/or changes
- Estimated costs

Many of these elements are included in this section. Certain elements such as priorities and costs will need to be refined by the local stakeholders and partners and are called out in Section 10.7 as part of the schedule. The information and education strategy should be spearheaded by a single entity serving as an outreach campaign organizer. Existing organizations such as the Upper Kaskaskia River Watershed Partnership could potentially lead this effort. The lead organization would be responsible for coordinating all outreach efforts conducted to ensure an efficient use of resources, avoid duplicative activities, and promote targeted messaging to specific audiences. In addition, stakeholder input should be considered and inform future management decisions, keeping in line with the adaptive management framework.

The overall goal of the information and education strategy is to support and encourage implementation of this TMDL. In addition, the strategy can be used to enhance coordination and collaboration between the various agencies and entities actively working in the watershed.

It is imperative to raise stakeholders' awareness about issues in the watershed and develop strategies to change stakeholders' behavior in a manner that will promote voluntary participation. Changes in awareness and behavior are surrogate indicators for longer-term changes in water quality. The first step to a successful information and education strategy is to identify target audiences and determine how to best reach these audiences. Potential audiences in the Upper Kaskaskia River watershed include producers, riparian landowners, Amish farmers and communities, residents on septic systems, pet owners, municipal public works and sanitary staff, and others. Detailed information about audience characteristics will influence message development, outreach format selection, involvement opportunities, and other aspects of information and education. For example, Amish communities in the area have limited or no access to phones or internet, and some do not participate in cost-share programs.

In addition, several BMPs may need to be modified to fit their belief system and rely on non-mechanical power.

The information and education strategy can include a variety of activities including newspaper articles, social media campaigns, newsletters, radio spots, website content, workshops, demonstration projects and tours as described in Table 65. Key topics for education and outreach materials could include:

- General watershed management principles
- Watershed friendly riparian uses and activities
- Agricultural BMP demonstration field days (e.g., cover crops, conservation tillage)
- Municipal operations
- Septic system maintenance and compliance
- Feedlot and livestock management
- Pet waste management in developed areas
- Funding and technical assistance opportunities

Additional targeted audiences, concerns, and potential communication channels are outlined in Table 65.

Table 65. Potential audience concerns and communication channels

Key Target Audiences	Potential Audience Concerns	Potential Communication Channels
Livestock producers	• Potential future regulation	• Commodity groups • Agricultural associations • 4-H groups • Soil and water conservation districts • Watershed groups • Demonstration farms • Field days • Radio and newspapers • Word of mouth • On-site visits • Informational meetings
Corn, soybean, and other crop producers	• Erosion and losing valuable topsoil • Loss of cropland acreage • Potential future regulation • Flooding	
Amish producers	• Outside influence on their community • Cultural traditions • Maintaining current way of life	• Community events and gatherings • On-site visits • Handouts and factsheets • Word of mouth
Riparian landowners	• Streambank erosion • Water quality issues (safety, aesthetics, quality) • Property values • Flooding • Drinking water quality • Quality of fisheries	• Newspapers • Social media • Local media • Local governments • Soil and water conservation districts • Watershed groups • Informational meetings • Brochures and other handouts • County and state health departments
Residents on septic systems	• Septic system operation, maintenance and cost • Water quality issues (safety, aesthetics, quality) • Drinking water quality • Property values	

Key Target Audiences	Potential Audience Concerns	Potential Communication Channels
Pet owners	• Availability of waste disposal • Pet access to public parks and recreational areas	• Watershed groups • Brochures and other handouts • Newspapers • Social media • Local media • Signage • Local events
Municipal and public works staff	• Additional programmatic and regulatory requirements • Technical and financial support from state and federal partners to implement recommended BMPs • Compliance with existing permits • Property value and tax revenue • Zonation and planning	• Other local governments (e.g., SWCD, counties, cities) • State agencies • Watershed groups • Presentations and stakeholder meetings

The expected outcome of this plan is to increase awareness of water quality issues and increase participation in voluntary actions to improve water quality. A pre-campaign and post-campaign survey can be used to measure changes in stakeholder awareness and behaviors. In addition, a pre-campaign survey can be used to further refine audience characterization and establish a baseline that will help watershed outreach campaign organizers to further develop tailored outreach messages. These types of surveys can be used to measure changes in the level of stakeholder knowledge and involvement in water quality issues as well as changes in behavior. Other measures of change can include the number of producers who are signing up for cost-share programs or participating in field days or demonstration projects.

Keeping in line with the adaptive nature of a nine element plan, results from stakeholder input should also inform changes or adaptations to the implementation plan. For example, if after engaging with local producers, watershed organizers determine that one of the recommended BMPs is unfeasible, implementers of the plan should revisit and re-evaluate potential BMPs for the area.

A variety of activities can be undertaken in order to reach the various stakeholders and should address each audience appropriately. The costs associated with these activities will depend on the lead organization and the ability to collaborate with other existing agencies and entities. Resources for information and education in the watershed are available to assist with promoting implementation activities and increasing awareness of water quality issues in the area. Examples of these resources are described below.

Illinois Manure Share

Created by the University of Illinois Extension, Illinois Manure Share is a free manure exchange program between livestock owners who have excess manure and those looking for organic material to use for gardening or landscaping. Its goal is to remove the manure from farms that do not have the acreage to adequately utilize its nutrients on their fields or pastures, benefiting water quality by both reducing nutrient runoff and lowering the amount of commercial fertilizer used by gardeners. For more information visit: http://web.extension.illinois.edu/manureshare/

Animal Agricultural Discussion Group (AADG)

The AADG is an informal and iterative group of individuals from the USDA, all sectors of the animal feeding industry and their association, academia, and states, formed by the USEPA. The goal of the AADG is to develop a shared understanding of how to implement the Clean Water Act through open communication and improved two-way understanding of viewpoints. The group convenes via conference calls and face-to-face meetings twice per year.For more information, visit https://www.epa.gov/npdes/animal-feeding-operations-afos-animal-agriculture-industry-partnerships

University of Illinois Extension Units

The University of Illinois Extension has several units within the Upper Kaskaskia watershed. Each unit has extensive education and outreach programs in place that range in topic from commercial agriculture, horticulture, energy, and health that can provide meaningful resources to the information and education effort in the watershed. The main units include

- Coles-Cumberland-Douglas-Moultrie-Shelby Extension Unit (http://web.extension.illinois.edu/ccdms/)
- DeWitt-Macon-Piatt Country Extension Unit (http://web.extension.illinois.edu/dmp/)
- Clay-Effingham-Fayette-Jasper Extension Unit (http://web.extension.illinois.edu/cefj/).

10.7 Schedule and Milestones

This section contains the requirements for U.S. EPA's element ***six and seven*** *of a watershed plan: implementation schedule and a description of interim measurable milestones.*

A key part of U.S. EPA's nine-elements is interim milestones that provide meaningful evaluation points and a focus for program activities. Interim milestones are steps that demonstrate that implementation measures are being executed in a manner that will ensure progress over time. Milestones are not changes in water quality. Measurable milestones are an important tool for directing limited resources towards the array and number of sources and nonpoint source pollution problems across the watershed. Interim measurable milestones are presented in Table 66 and Table 67.

A 25-year implementation schedule is assumed and divided into three phases: 2017-2021, 2022-2031, and 2032-2041. Each phase will rely on an adaptive management approach, and will build upon previous phases. Short-term efforts (Year 1-5) include implementing practices in critical areas. Mid-term efforts (Year 6-15) are intended to build on the results of short-term implementation activities. This includes evaluating the success of Phase 1 projects installed (success rate, BMP performance, pollutant reductions realized, actual costs, etc.). Long-term efforts (Year 16-25) are those implementation activities that result in the watershed reaching full pollutant load reductions.

Table 66. Schedule and milestones for TSS implementation in Asa Creek and Lake Fork

Note: Asa Creek and Lake Fork are identified as critical areas in section 10.4.2.

Watershed	BMP	Milestones [a]		
		2018-2022	2023-2032	2033-2042
TMDL project area	Information and Education	Assign lead organization and develop information and education strategy Stakeholder survey (“pre-campaign survey”) Identify priorities Begin implementation in critical areas identified in Figure 38 and Table 59	Continued implementation of information and education strategy with targeted audiences Interim stakeholder survey to evaluate effectiveness of strategy Adapt strategy, as needed	Implement changes, if needed Post campaign survey
Asa Creek	Conservation Tillage	260 acres	1,000 acres	1,319 acres
	Riparian Buffers and Filter Strips [b]	0.5 acres	1.5 acres	2.5 acres
Lake Fork	Conservation Tillage	2,000 acres	5,000 acres	7,171 acres
	Cover Crops	2,000 acres	5,000 acres	7,171 acres
	Riparian Buffers and Filter Strips [b]	2 acres	5 acres	8 acres
	Stream channel stabilization BMPs	Complete 2 streambank stabilization projects identified by Douglas County/NRCS assessment (Figure 37)	Complete remaining streambank stabilization projects from Douglas County/NRCS assessment	Address any remaining eroding banks as needed to meet water quality goals

a. Milestones are cumulative.

b. Assumes a 35-foot buffer width on both sides of the stream. Buffer widths can change depending on vegetation and slope.

Table 67. Schedule and milestones for fecal coliform implementation

Watershed	BMP	Milestones [a]		
		2018-2022	2023-2032	2033-2042
All fecal coliform impaired watersheds	Exclusion fencing (with alternative watering systems)	Inventory of livestock access to streams beginning in critical areas for livestock BMPs (Figure 38), then in remaining watersheds draining to fecal coliform impaired streams, complete 4 fencing projects	Complete fencing projects on 30% of streams identified in inventory	Complete fencing projects on 75% of streams identified in inventory
	Livestock BMPs	Livestock inventory and feedlot inspections in critical areas for livestock BMPs (Figure 39)	Complete livestock BMPs on 30% of feedlots identified in inventory	Complete livestock BMPs on 75% of feedlots identified in inventory
	Onsite wastewater BMPs	Landowner survey and inventory of failing systems watersheds of fecal coliform impaired streams Evaluation of inspection program effectiveness Develop and distribute watershed-specific promotional material	Evaluate effectiveness of promotional material Revise and continue distribution of promotional material Upgrade/replace 25% of failing septic systems in watersheds of fecal coliform impaired streams	Evaluate effectiveness of promotional material Revise and continue distribution of promotional material Upgrade/replace 100% of failing septic systems in watersheds of fecal coliform impaired streams
	Pet waste management	Evaluate potential city code or county ordinance Establish pet waste stations Pet owner survey (awareness and behavior) Develop and distribute watershed-specific promotional material	Enact city code or county ordinance Evaluate effectiveness of promotional material Revise and continue distribution of promotional material	Evaluate effectiveness of city code or county ordinance Amend city code or county ordinance, as necessary Evaluate effectiveness of promotional material Revise and continue distribution of promotional material
	Information and Education	Assign lead organization and develop information and education strategy Stakeholder survey (“pre-campaign survey”) Identify priorities Begin implementation	Continued implementation of information and education strategy with targeted audiences Interim stakeholder survey to evaluate effectiveness of strategy Adapt strategy, as needed	Implement changes, if needed Post campaign survey
Kaskaskia River O-02	Riparian Buffers and Filter Strips [b]	20 acres, beginning in critical areas identified in Figure 38 and Table 59	80 acres	115 acres
	Livestock BMPs	Livestock inventory and feedlot inspections 50 animal units under feedlot management	140 animal units under feedlot management	235 animal units under feedlot management
	Stormwater BMPs [c]	Identify areas of connected imperviousness (e.g., storm sewers)	20 acres	40 acres

Watershed	BMP	Milestones [a]		
		2018-2022	2023-2032	2033-2042
Kaskaskia River O-15	Riparian Buffers and Filter Strips [b]	20 acres, beginning in critical areas identified in Figure 38 and Table 59	80 acres	119 acres
	Livestock BMPs	Livestock inventory and feedlot inspections 56 animal units under feedlot management	170 animal units under feedlot management	280 animal units under feedlot management
	Stormwater BMPs [c]	Identify areas of connected imperviousness (e.g. storm sewers)	24 acres	48 acres
Becks Creek OG-01	Riparian Buffers and Filter Strips [b]	50 acres, beginning in critical areas identified in Figure 38 and Table 59	175 acres	253 acres
	Livestock BMPs	--	Livestock inventory and feedlot inspections 4,200 animal units under feedlot management	8,000 animal units under feedlot management
	Stormwater BMPs [c]	Identify areas of connected impervious (e.g. storm sewers)	150 acres	300 acres
West Okaw River OT-02	Riparian Buffers and Filter Strips [b]	9 acres, beginning in critical areas identified in Figure 38 and Table 59	32 acres	46 acres
	Livestock BMPs	--	Livestock inventory and feedlot inspections 170 animal units under feedlot management	280 animal units under feedlot management
	Stormwater BMPs [c]	Identify areas of connected impervious (e.g. storm sewers)	18 acres	36 acres
Johnathan Creek OU-01	Riparian Buffers and Filter Strips [b]	33 acres	115 acres	163 acres
	Livestock BMPs	Livestock inventory and feedlot inspections 230 animal units under feedlot management	575 animal units under feedlot management	860 animal units under feedlot management
	Stormwater BMPs [c]	Identify areas of connected impervious (e.g. storm sewers)	30 acres	60 acres

a. Milestones are cumulative.
b. Assumes a 35-foot buffer width on both sides of the stream. Required buffer widths can change depending on vegetation and slope.
c. Assumes a 1:10 ratio of BMP footprint to area treated.

10.8 Progress Benchmarks and Adaptive Management

*This section contains the requirements for U.S. EPA's **element eight** of a watershed plan: a set of criteria that can be used to determine whether loading reductions are being achieved over time.*

Implementation activities for the Upper Kaskaskia River watershed occur in three phases using outcome-based strategic planning and an adaptive management approach. Phase 2 (mid-term) and Phase 3 (long-term) are designed to build on results from the preceding phase. To guide plan implementation through each phase using adaptive management, water quality benchmarks are identified to track progress towards attaining water quality standards. Progress benchmarks (Table 68) are intended to reflect the time it takes to implement management practices, as well as the time needed for water quality indicators to respond.

Table 68. Progress benchmarks

Indicator	In-stream Target	Segments	Timeframe	Progress Benchmark
Fecal coliform	400 cfu/100 mL in <10% of samples and geometric mean <200 cfu/100 mL [a]	Kaskaskia River (O-02) Kaskaskia River (O-15) Becks Creek (OQ-01) West Okaw River (OT-02) Johnathan Creek (OU-01)	2017-2021	20% of load reductions specified in Section 8.
			2022-2031	40% of load reductions specified in Section 8.
			2032-2041	Load reductions specified in Section 8. Full attainment of water quality standards.
TSS	27.75 mg/L	Lake Fork (OW-01) Lake Fork (OW-02) Asa Creek (OZZT-01)	2017-2021	20% of load reductions specified in Section 8.
			2022-2031	40% of load reductions specified in Section 8.
			2032-2041	Load reductions specified in Section 8. Compliance with LRS target.

Notes

cfu/100 mL = colony forming units per 100 milliliters; mg/L = milligrams per liter.

a. Fecal coliform targets are only applicable during the Illinois recreation season (May through October). Ten percent or less of samples collected in a 30-day period must be less than or equal to 400 cfu/100 mL. Geometric mean based on minimum of 5 samples taken over not more than a 30-day period.

To ensure management decisions are based on the most recent knowledge, the implementation plan follows the form of an adaptive and integrated management strategy and establishes milestones and benchmarks for evaluation of the implementation program. U.S. EPA (2008) recognizes that the processes involved in watershed assessment, planning, and management are iterative and that actions might not result in complete success during the first or second cycle. For this reason, it is important to remember that implementation will be an iterative process, relying upon adaptive management.

Adaptive management is a commonly used strategy to address natural resource management that involves a temporal sequence of decisions (or implementation actions), in which the best action at each decision point depends on the state of the managed system. As a structured iterative implementation process, adaptive management offers the flexibility for responsible parties to monitor implementation actions, determine the success of such actions and ultimately, base management decisions upon the measured results of completed implementation actions and the current state of the system. This process, depicted in Figure 40, enhances the understanding and estimation of predicted outcomes and ensures refinement of necessary activities to better guarantee desirable results. In this way, understanding of the resource can be enhanced over time, and management can be improved.

In addition to focusing future management decisions, with established assessment milestones and benchmarks, adaptive management can include a re-assessment of the TMDL/LRS. Re-assessment of the TMDL is particularly relevant when completion of key studies, projects or programs result in data showing load reductions or the identification/quantification of alternative sources. Reopening/ reconsidering the TMDL/LRS may include refinement or recalculation of load reductions and allocations. For instance, if special studies can quantify wildlife loading, the load allocations can be refined and wasteload adjusted accordingly.

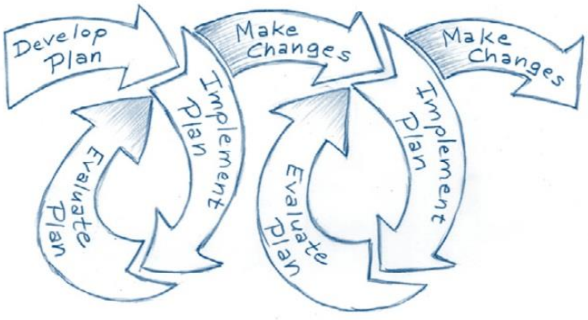

Figure 40. Adaptive management iterative process (U.S. EPA 2008).

The implementation phases, milestones, and benchmarks will guide the adaptive management process, helping to determine the type of monitoring and implementation tracking that will be necessary to gauge progress over time. Evaluation for adaptive management can include a variety of evaluation components to gain a comprehensive understanding of implementation progress. An implementation evaluation determines if non-structural and structural activities are put in place and maintained by implementation partners according to schedule; this is often referred to as an output evaluation. An outcome evaluation focuses on changes to behaviors and water quality as a result of implementation actions. This type of evaluation looks at changes in stakeholder behavior and awareness, BMP performance, and changes to ambient water quality.

10.9 Follow-Up Monitoring

This section contains the requirements for U.S. EPA's ***element nine*** *of a watershed plan: a monitoring component to evaluate the effectiveness of the implementation efforts over time.*

The ultimate measure of success will be documented changes in water quality, showing improvement over time (see Table 68 for progress benchmarks). In addition, long-term monitoring of the overall health and quality of the watershed is important. Monitoring will help determine whether the implementation actions have improved water quality and support future resource management decisions. In addition, monitoring will help determine the effectiveness of various BMPs and indicate when adaptive management should be initiated. The primary goal of the monitoring plan is to assess the effectiveness of source reduction strategies for attaining water quality standards and designated uses.

Water Quality Monitoring

Progress towards achieving water quality standards will be determined through ambient monitoring by IEPA (i.e., AWQMN). The state conducts routine water quality monitoring (see Section 2.6.2) by evaluating watersheds on a rotating basis, collecting measurements of physical, chemical, and biological parameters (see Figure 10 for Upper Kaskaskia River watershed monitoring network). This ambient monitoring program will continue as the Upper Kaskaskia River watershed plan is implemented. In addition to the ambient monitoring program conducted by IEPA, the following organizations conduct water quality monitoring in the Upper Kaskaskia River watershed:

- US Army Corps of Engineers
- US Geological Survey
- Wastewater treatment facilities

Water quality monitoring efforts may also be supported through volunteer citizen monitoring efforts that typically allow for more frequent monitoring at a lower cost. Formation of a monitoring committee may help streamline efforts.

Recommended monitoring in the watershed includes collection of chemical and flow data. At a minimum, in order to track changes in water quality in impaired streams, fecal coliform and TSS should continue to be monitored along each impaired stream segment (see Table 69). Increased frequency of monitoring will further allow additional evaluation of sources. Synoptic stream sampling can be used to identify hot spots, or additional critical areas in the impaired streams.

Table 69. Monitoring parameters for impaired streams

Parameter	Stream Segment
Fecal coliform	Kaskaskia River (O-02 and O-15) Becks Creek (OQ-01) West Okaw River (OT-02) Johnathan Creek (OU-01)
Total suspended solids (TSS)	Lake Fork (OW-01 and OW-02) Asa Creek (OZZT-01)

Sampling during different flow regimes is also critical to understanding sources. Monitoring flow is also recommended for each site when water quality samples are taken. Very low flow conditions can be found throughout the watershed, documenting when streams have zero or close to zero flow is also relevant to understanding sources and impairment status.

In addition, continued and supporting monitoring can be conducted throughout the watershed and on impaired streams to support the assessment of other designated uses. These parameters may include but are not limited to

- Fecal coliform
- Total suspended solids
- Total phosphorus
- Dissolved oxygen (continuous)
- Temperature (continuous)
- Fish and macroinvertebrates

Microbial Source Tracking

Sources of bacteria are typically widespread and often intermittent. Some sources pose a greater risk to human health than others. Understanding the different source contributions and their potential risk to human health is important to overall TMDL implementation and prioritizing implementation activities that address the recreational use impairments due to fecal coliform.

Microbial source tracking (MST) is a useful tool to help differentiate sources of fecal indicator bacteria. Human markers along with a variety of other bird and animal markers can be identified. While human sources of fecal pollution are critical to eliminate, it is also important to minimize other sources that can cause illness in humans, although the actual risk associated with these other sources may fall within "acceptable" levels of risk. MST can help inform selection of BMPs discussed in Section 10.3 for fecal coliform to best align with the pollution source.

Fecal bacteroidetes, or fecal indicator bacteria, are used in MST. Two common types of testing are available for bacterial source tracking, quantification tests and presence/absence tests. While presence/absence tests are typically less expensive than a quantification test, they do not measure the relative amount of DNA from various fecal sources, which might be used to estimate the relative abundance of those sources. Neither test, however is able to determine exact source location (i.e., a certain farm is contributing the most fecal coliform loads). Best professional judgement from site surveys and local knowledge can help determine source locations.

MST monitoring and sample collection methods are similar to fecal coliform sampling procedures. They should include both dry and wet (samples taken within at least 24 hours of a rainfall of ½ inches or more) samples, and target areas with high levels of fecal coliform. Topography, watershed delineations, and other factors may also influence sample design.

BMP Effectiveness Monitoring

Multiple BMPs will be needed to address the water quality impairments in the Upper Kaskaskia River watershed. There are limited local data on the effectiveness of many BMPs; therefore, monitoring the results of programs and representative practices are critical. BMP monitoring can include quantitative monitoring of physical components (e.g., water quality and flow) qualitative (i.e., visual) monitoring of physical components (e.g., vegetation), and monitoring of behaviors. A monitoring program should be put in place as BMPs are implemented to 1) measure success and 2) identify changes that could be made to increase effectiveness.

10.10 Reasonable Assurance

U.S. EPA requires that a TMDL provide reasonable assurance that the required load reductions will be achieved and water quality will be restored. For municipal point source dischargers (including MS4s) in the Upper Kaskaskia River watershed, IEPA will assure implementation of TMDLs through its NPDES and stormwater programs. Participation of farmers and landowners is essential to implementing nonpoint source BMPs and improving water quality, but resistance to change and upfront cost may deter participation. Educational efforts and cost-share programs will likely increase participation to levels needed to protect water quality. Technical and financial assistance, as summarized in Section 10.4, provides the resources needed to improve water quality and meet watershed goals. Additional assurance can be achieved in implementation of the TMDLs through contracts, memorandums of understanding, and other similar agreements, especially for BMPs that receive outside funds and cost share.

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12. Appendices

Appendix A. Lake Fork Streambank Site Assessment Photos

1. Site 1086

   Old existing cement structure that no longer functions properly

2. Site 1088

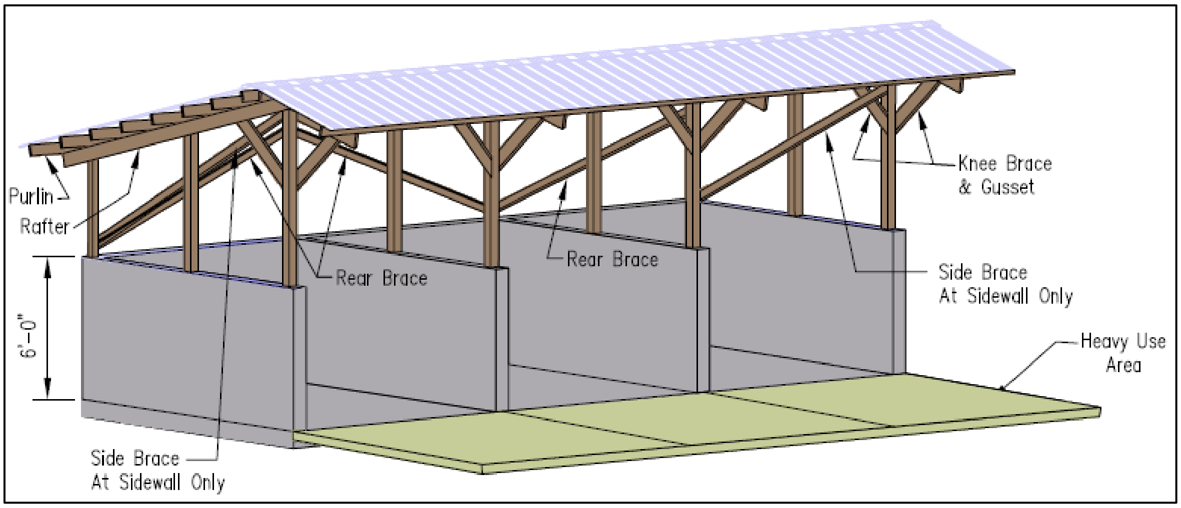
   Scour erosion along west side of bank

3. Site 1090

   Streambank erosion along south side of bank

Appendix B. Composting Manure Structures

1. Composting manure structure diagram (Illinois NRCS)



2. Image of composting manure structure, no roof (Illinois NRCS)

3. Composting manure structure, roof (Illinois NRCS)

Appendix C. Land Use Buffer Assessment

AUID	NAME	Barren Land	Cultivated Crops	Deciduous Forest	Developed, High Intensity	Developed, Low Intensity	Developed, Medium Intensity	Developed, Open Space	Emergent Herbaceous Wetlands	Hay/Pasture	Herbaceous	Open Water	Woody Wetlands	Grand Total
IL_O-02	KASKASKIA R		7.3	181.7		2.2	0.5	1.1	1.7	4.7		2.2	126.5	327.8
IL_O-10	KASKASKIA R		54.1	229.3		0.8		6.7	1.3	1.5		127.0	154.5	575.2
IL_O-11	KASKASKIA R		5.8	120.8	0.4	1.6	2.4	6.2		1.9	1.0	49.0	25.6	214.8
IL_O-13	KASKASKIA R		23.4	78.1		6.2	0.1	3.0		48.9	1.9		62.3	223.7
IL_O-15	KASKASKIA R		25.7	169.8		1.1	1.8	2.7	1.0	2.2	1.0	63.2	66.5	335.1
IL_O-17	KASKASKIA R		6.0	66.2	0.5	3.8	0.7	1.1		5.6	0.9	10.2	165.8	261.0
IL_O-31	KASKASKIA R		26.5	28.6		2.8		0.1		48.3			21.7	128.0
IL_O-32	KASKASKIA R		16.4	102.8				0.5				30.1	18.0	167.7
IL_O-33	KASKASKIA R			0.5								0.5	0.3	1.3
IL_O-35	KASKASKIA R		281.7	17.6		12.0		1.8		45.4	1.3	0.4	9.2	369.3
IL_O-37	KASKASKIA R		178.5			6.7	1.2	3.6		2.0				192.0
IL_OQ-01	BECKS CR		14.6	282.5		2.2	0.5	12.3		8.2			40.0	360.2
IL_OQA-01	MITCHELL CR		57.1	170.4		0.2		7.2		13.5	0.0		21.3	269.6
IL_OQAA	Section Creek		15.0	79.0		2.3		4.2		12.5			2.9	116.0
IL_OQAAA	Pint Creek		3.2	26.7				1.0		7.2				38.1
IL_OQAB	Polecat Creek		32.1	56.7				2.5		4.4			0.9	96.6
IL_OQB	Little Creek		5.9	65.3		0.4		3.2		11.0			0.6	86.3
IL_OQC-01	OPOSSUM CR		20.8	122.0		0.4		3.3		20.0			7.5	173.9
IL_OQCA	COAL CR		1.3	6.8				2.2		11.7		0.0		22.0
IL_OQCA-01	COAL CR			11.7		0.2	0.0	4.0		0.1		0.1		16.1
IL_OQCA-02	COAL CR		1.2	57.8				1.3		1.5				61.9

AUID	**NAME**	**Barren Land**	**Cultivated Crops**	**Deciduous Forest**	**Developed, High Intensity**	**Developed, Low Intensity**	**Developed, Medium Intensity**	**Developed, Open Space**	**Emergent Herbaceous Wetlands**	**Hay/Pasture**	**Herbaceous**	**Open Water**	**Woody Wetlands**	**Grand Total**
IL_OQCB	Matney Branch		19.8	30.2		1.0		6.9		14.2	3.0			75.1
IL_OR-01	Richland Creek		41.4	228.5		10.2	0.0	11.8		21.8	0.1		20.2	334.0
IL_ORA-01	Brush Creek	0.8	32.2	88.6		0.8		9.3		16.1	1.6	0.2	10.0	159.6
IL_ORAA	Cary Branch		0.4	16.3				0.4		1.3	0.6		1.0	19.9
IL_OS-03	ROBINSON CR		63.1	238.0		3.5		9.3		22.2	0.0		39.5	375.7
IL_OSA	Swafford Branch	0.4	20.7	41.2	0.1	1.3	0.1	3.3		3.8		0.9	0.7	72.4
IL_OSB	Rocky Branch		42.4	34.4		1.2		4.1		2.3			3.4	87.7
IL_OSC	Mud Creek		33.6	80.3		0.6		4.5		6.1			0.1	125.2
IL_OSCA	Angel Branch		5.1	27.0				2.6		10.6				45.2
IL_OT-02	W OKAW R		2.6	50.9		1.2	0.3	1.5		0.0	0.0		8.4	64.9
IL_OT-03	W OKAW R		16.2	111.0		0.4	0.4	0.5	2.0	14.4	0.9	6.0	15.2	166.9
IL_OT-04	W OKAW R		15.3	24.1		4.6		0.6		13.1			3.8	61.4
IL_OTB-01	Marrowbone Creek		61.3	91.9		2.7	0.7	5.1		19.3	0.2		5.0	186.1
IL_OTBA	Brush Creek		57.0	29.3		0.6		2.6		16.7			0.4	106.6
IL_OTD	Jonathan Branch		48.7	22.9		1.7		2.3		9.3			2.9	87.8
IL_OTE	Stringtown Branch		61.9	22.4		2.3		4.8		8.0			2.5	101.9
IL_OTF	HAMMOND MUTUAL DITCH		141.5	4.6		6.5	0.2	3.2		28.4			1.5	185.9
IL_OTG	W OKAW DITCH 3		116.0	0.8		5.9		4.3						127.0
IL_OTH	W OKAW DITCH 4		83.0			2.2		4.8						89.9
IL_OTI	W OKAW R TRIB		88.2	49.7		3.3		2.7		16.0			13.4	173.4
IL_OU-01	JONATHON CR		100.6	63.8		12.9		4.2		43.1	0.6		7.7	232.8
IL_OUA	Twomile Branch		59.2	18.5		1.2		0.9		29.4			1.4	110.6
IL_OUB	Bolin Branch		42.2	17.5		0.2		3.2		9.5	0.0		5.9	78.5
IL_OV-01	WEST FORK		120.8	1.1	0.3	4.8	0.1	0.4		9.5			3.4	140.3

AUID	NAME	Barren Land	Cultivated Crops	Deciduous Forest	Developed, High Intensity	Developed, Low Intensity	Developed, Medium Intensity	Developed, Open Space	Emergent Herbaceous Wetlands	Hay/Pasture	Herbaceous	Open Water	Woody Wetlands	Grand Total
IL_OW-01	KASKASKIA R, LAKE FK		14.4	37.4		3.0		1.9	1.0	17.1	0.2	0.1	42.4	117.67
IL_OW-02	KASKASKIA R, LAKE FK	0.7	29.2	6.6		0.6				20.7			1.6	59.3
IL_OW-03	KASKASKIA R, LAKE FK		218.1			5.1		6.2		9.3				238.7
IL_OWA	Bear Creek		64.7	0.6		1.7		2.4		14.4		0.2		84.0
IL_OWB	East Lake Fork		152.9			9.5		9.4		4.0				175.8
IL_OWC	West Branch Lake For		104.5			5.4		0.5						110.4
IL_OZYA	Copper Slough		41.6	0.5	0.1	32.3	3.7	25.2		0.2		1.7		105.4
IL_OZYB	Phinney Branch					15.5	0.5	11.6						27.6
IL_OZZF	Hog Creek		0.0	47.6				1.7		8.3			1.9	59.4
IL_OZZFA	Bacon Branch			35.6				1.3		0.8			0.8	38.6
IL_OZZG	Petty Branch		2.9	17.6		0.5		2.7		0.2			0.2	24.1
IL_OZZH	Fanny Branch		5.6	39.3				1.4		0.1		0.4	1.2	47.9
IL_OZZI	Howe Creek		13.2	29.8				3.3		3.7			2.1	52.0
IL_OZZJ-01	Jordan Creek		22.2	88.0				3.6		7.5			4.3	125.6
IL_OZZK	Opossum Creek		6.3	28.9		0.3		0.9		10.1		0.1		46.4
IL_OZZM	Coon Creek South		5.6	21.3		0.3		0.5						27.6
IL_OZZN	Skull Creek		18.1	35.9				1.2		7.7		1.6		64.4
IL_OZZO	Sand Creek		50.4	63.2		1.4		5.4		10.9				131.2
IL_OZZS-01	WHITLEY CR		60.4	73.4		2.8	0.2	2.0		17.1	0.9	8.6	8.5	173.9
IL_OZZSA	Lynn Creek		31.6	48.7		2.0		3.5			0.0		1.0	86.7
IL_OZZT-01	Asa Creek		51.9	16.0		9.1	0.1	25.6		7.1	2.1			111.8
IL_OZZU	Coon Creek North		24.5	19.6		3.2		1.8		7.0			3.5	59.5
IL_OZZV-01	Flat Branch		115.6	16.7		7.0	0.1	7.0		19.0	0.6		5.5	171.4
IL_OZZW	Dry Fork		127.9	0.5		4.2		1.5		11.4			0.1	145.6

AUID	NAME	Barren Land	Cultivated Crops	Deciduous Forest	Developed, High Intensity	Developed, Low Intensity	Developed, Medium Intensity	Developed, Open Space	Emergent Herbaceous Wetlands	Hay/Pasture	Herbaceous	Open Water	Woody Wetlands	Grand Total
IL_OZZX-01	Twomile Slough		134.6	9.3		13.5		3.5			0.0	0.3	2.7	163.9
IL_OZZZC	Camfield Branch		12.2	18.9		0.7		0.6		3.2				35.6
IL_ROF	Pana Lake			1.1		0.2		0.6				33.5		35.4
	TOTALS	1.9	3358.2	3822.8	1.4	229.8	13.4	286.4	7.0	745.3	17.1	336.3	945.7	9765.3

Appendix D. Responsiveness Summary

Responsiveness Summary

Upper Kaskaskia River Watershed Total Maximum Daily Load

The responsiveness summary responds to any questions and comments received during the public comment period from May 21, 2018 through July 25, 2018.

What is a TMDL?

A Total Maximum Daily Load (TMDL) is the sum of the allowable amount of a pollutant that a water body can receive from all contributing sources and still meet water quality standards or designated uses. The Upper Kaskaskia River watershed TMDL report contains a plan detailing the actions necessary to reduce pollutant loads to the impaired water bodies and ensure compliance with applicable water quality standards. The Illinois EPA implements the TMDL program in accordance with Section 303(d) of the federal Clean Water Act and regulations thereunder.

Background

The watershed targeted for TMDL development is the Upper Kaskaskia River, located mostly in Champaign, Coles, Douglas, Moultrie, Piatt, and Shelby counties. The Upper Kaskaskia River watershed encompasses an area of approximately 1,003,631 acres (1,568 square miles). Land use in the watershed is predominately agriculture.

The Clean Water Act and USEPA regulations require that states develop TMDLs for waters on the Section 303(d) List. Illinois EPA is currently developing TMDLs for pollutants that have numeric water quality standards. Therefore, TMDLs were developed for five stream segments listed as impaired according to the *Illinois Integrated Water Quality Report and Section 303(d) List-2016*. Stream segments include Kaskaskia River (O-02, O-15): fecal coliform; Beck Creek (OQ-01): fecal coliform; West Okaw River (OT-02): fecal coliform; Jonathon Creek (OU-01): fecal coliform.

In addition, Load Reduction Strategies (LRS) were developed for pollutants that do not have numeric water quality standards. These include Lake Fork (OW-01, OW-02): sedimentation/siltation, and Asa Creek (OZZT-01): sedimentation/siltation.

Illinois EPA contracted with Tetra Tech (TMDL Consultant) to prepare the TMDL report for the Upper Kaskaskia River Watershed.

Public Meetings

The Stage 1 public meeting was held on October 26, 2016 at the University of Illinois Extension Moultrie/Douglas Counties building in Arthur, Illinois, with an additional public meeting being held on November 17, 2018 at the same location. The Stage 3 public meeting was held on June 25, 2018 at the University of Illinois Extension Moultrie/Douglas Counties building in Arthur, Illinois. Illinois EPA provided public notice for both meetings by placing display ads in the Arthur Graphic-Clarion. In addition, a direct mailing was sent to approximately 52 stakeholders/permittees in the watershed. These notices gave the date, time, location, and purpose of the meeting. The notice also provided references on how to obtain additional information about this specific site, the TMDL program, and other related information. The draft TMDL report was available for review at the University of Illinois Extension Moultrie/Douglas Counties building, Champaign County Soil and Water Conservation District (SWCD), Coles County SWCD, Douglas County SWCD, Moultrie County SWCD, Piatt County SWCD, Shelby County SWCD, and also on the Agency's webpage at http://www.epa.illinois.gov/public-notices/general-notices/index

The Stage 3 public meeting started at 6:00 p.m. on Monday, June 25, 2018. It was attended by approximately 25 people and concluded at approximately 8:00 p.m., with the meeting record remaining open until midnight, July 25, 2018.

Questions & Comments

1. The one channel erosion BMP recommendation that I see missing is selective log jam maintenance. NRCS indicated that there is not a practice number as listed on page 86. So I assume a separate paragraph under Stream Channel Erosions BMPs?

   Response: Debris removal has been added as a conservation practice to reduce sedimentation/siltation from streambank/streambed erosion in the final report.

2. Conservation Cropping Systems (simultaneously implementing the Best Management Practices No-Till/Strip Till, Cover Crops, and Nutrient Management on the same row crop acres) are a necessary component of the Upper Kaskaskia River Watershed's implementation plan to combat sedimentation. Recognition that to be successful, farmers will need to implement these practices through a comprehensive, systems approach is key.

   Response: The Implementation plan does include discussion and descriptions of conservation tillage including no-till, mulch till, and reduced tillage systems, as well as cover crops. Nutrient management plans are also a suggested practice related to proper manure application in order to reduce fecal coliform loads to impaired streams.

3. Where tile drainage is present, the use of edge-of-field treatment practices should be included in an implementation plan. Edge-of-field practices like saturated buffers, bioreactors, constructed wetlands, and two-stage ditches effectively reduce nutrient losses from row crop acres to downstream waters, while at times providing the additional benefit of increased wildlife habitat.

   Response: Since this TMDL and LRS primarily focuses on fecal coliform and sedimentation/siltation, respectively, the edge of field practices you mention are not recommended in the implementation plan because they do not adequately treat the pollutants for which TMDL and LRS were developed.

4. The Upper Kaskaskia Ecosystem Partnership (UKEP) Planning Council membership (attachment 1) welcomes this recent Total Maximum Daily Load and Load Reduction strategies. Some of UKEP members have submitted (and resubmitted) comments on the final Public Draft Report. Our level of acceptance may well depend on the their incorporation into the final submission to USEPA . The focus on sedimentation and fecal coliform matches several of our priorities listed in our Plan of Work.

   Response: Thank you for your comment. Illinois EPA believes that strong leadership at the local level leads to a better chance of successful implementation.

5. In 2001 UKEP adopted an Interim Watershed Management Plan, which includes both water quality and sedimentation concerns. We have funded projects and collected data for the past 20+ years to better understand exactly where our focus should be. This recent TMDL study reinforces our earlier findings and hopefully will lead to project monies to address the identified areas of concern.
   Response: Once this plan is approved for meeting USEPA's nine-minimum elements of a watershed plan, the watershed areas covered by this TMDL will be eligible to receive Section 319(h) grant funds to implement conservation practices that support the implementation of this TMDL.

6. After the Public Draft Report meeting on June 25, UKEP leadership and some of our Technical Advisory Committee met. Since the Kaskaskia Basin is a priority watershed this year, we wanted to proceed with a sedimentation application based on proposal #9 in our plan of work. We cautiously decided to wait another year since uncertainties in the current Farm Bill legislation / negotiations could remove or redefine some of the voluntary programs that we would be promoting! Meanwhile each SWCD district would continue to promote Best Management Practices for grass waterways and grass buffers, etc.

Response: County Soil and Water Conservation District support, along with other federal cost share programs administered by agencies such as the Natural Resource Conservation Service, are critical in providing technical and financial support in the watershed in order to address water quality resource concerns.

7. We turned our focus on fecal coliform deciding on a two pronged approach:
   1. Work with the 5 County Health Departments on septic system management and promote public awareness of webinars such as Septic Systems 101.
   2. Pursue development of a voluntary composting guide (attachment 3) and structure cost share opportunities for our small livestock, dairy, and horse farms. We identified and are pursuing funding from Footprint and Prairie Farms Dairy. These sources of funding would stretch a lot further if they could be used as potential cost share for a 319 implementation grant as opposed to having to use all the monies on a select few sites.

   Response: We believe this is a practical approach to begin reducing fecal coliform loads in the watershed. Partnering with local organizations to provide outreach and cost-share match provides for a more robust course of action. Note that any funds used to match 319 grants must be part of the grant application, the grant contract and spent during the timeframe of the grant being matched.