Regional Fecal Coliform TMDL
on
Salt Creek of Sangamon River and Lower Sangamon River Watersheds

Flat Branch Tributary

Stage 3 Final Report

Illinois Environmental Protection Agency
Watershed Management Section
Planning Unit

September 2005

http://www.epa.state.il.us/water/tmdl/

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1. Introduction

This report is a Total Maximum Daily Load (TMDL) for the Salt Creek of Sangamon River and the Lower Sangamon River Watersheds. The purpose is to describe the watersheds, confirm impairments and identify the procedure for developing the TMDL.

These watersheds are located in central Illinois and drain approximately 1,477 miles of streams into the Sangamon River. There are eleven stream segments comprising 226 miles of stream in these watersheds that are impaired for primary contact (swimming) use and pathogens are the potential cause. Assessment of primary use is based on fecal coliform bacteria, which is an indicator organism for pathogens.

The Clean Water Act requires states to develop TMDLs for waters on the 303(d) List. A TMDL is the sum of wasteload allocations (point sources) and load allocations (nonpoint sources) and natural background such that the capacity of the waterbodies to assimilate pollutant loading is not exceeded. A TMDL must also be developed with seasonal variations and a margin of safety that addressed uncertainty in the analysis.

This TMDL will determine the maximum fecal coliform load the waterbodies can receive to fully support the designated use of primary contact (swimming). Current loads are determined and if they exceed the maximum a load reduction will be given.

2. Physical Settings

2.1. Listed Water Bodies

This project area is 2,487,649 acres (3,887 square miles) and includes all or part of 15 counties. It consists of Salt Creek Watershed (8-Digit hydrologic Unit Code 07130009), South Fork Sangamon River Watershed (HUC 07130007) and Lower Sangamon River Watershed (HUC 07130008). Waters in Salt Creek and South Fork Sangamon River Watersheds flow into the Lower Sangamon River Watershed that then flows into the Illinois River (see Figure 1). Salt Creek of Sangamon River Watershed is 1,182,633 acres. It contains the impaired stream segments of Sugar Creek (EID 04), Kickapoo Creek (EIE 04 and EIE 05), Lake Fork (EIG 01) and Salt Creek (EI 02 and EI 06). Lower Sangamon Creek Watershed consists of two HUCs. The southernmost HUC (07130007) is 740,225 acres and contains Flat Branch (EOH 01), South Fork Sangamon River (EO 01 and EO 02), and Sugar Creek (EOH 01). HUC 07130008 is 564,792 acres and contains Spring Creek (EL 01). There are approximately 119 streams miles impaired for pathogens in Salt Fork Watershed and 107 miles in the Lower Sangamon River Watershed. All of these streams are either partial or nonsupport for primary contact use and the cause is pathogens. For specific designated use supports for each segment, refer to Table 1.

Figure 1. Segment Map

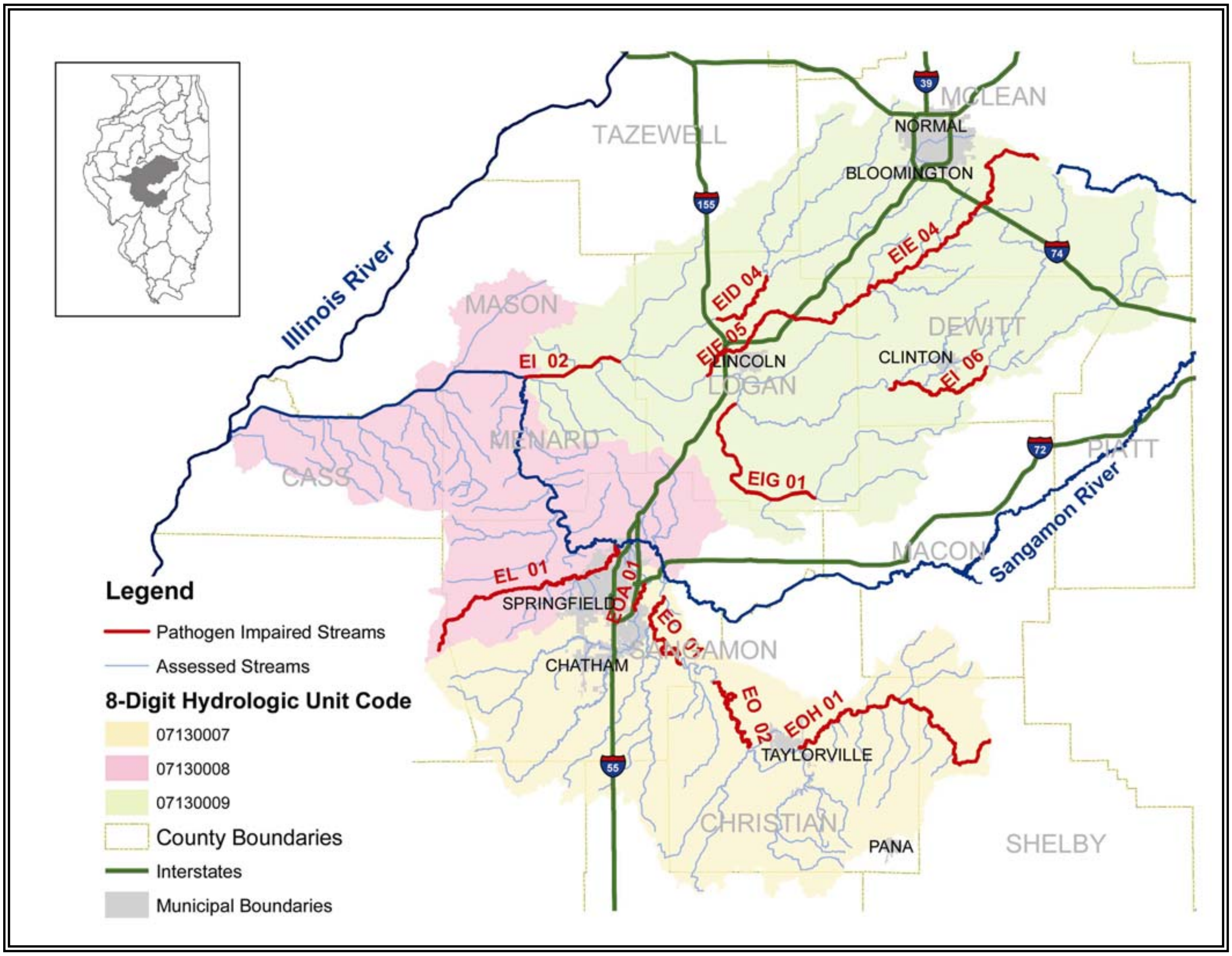


Table 1. Impaired Segments

Watershed HUC 8	Segment ID	Segment Name	Miles	Year Listed	Designated Use	Use Support	Potential Cause
Salt Fork 07130009	EI 02	Salt Cr.	11	1998	Primary Contact	Partial	Pathogens
	EI 06	Salt Cr.	15.63	2002	Primary Contact	Nonsupport	Pathogens
	EID 04	Sugar Cr.	9.79	1998	Primary Contact	Nonsupport	Pathogens
	EIE 04	Kickapoo Cr.	41.46	2002	Primary Contact	Nonsupport	Pathogens
	EIE 05	Kickapoo Cr.	19.89	2002	Primary Contact	Nonsupport	Pathogens
	EIG 01	Lake Fk.	21.04	1998	Primary Contact	Nonsupport	Pathogens
Lower Sangamon 07130008	EL 01	Spring Cr.	34.51	1998	Primary Contact	Nonsupport	Pathogens
S. Fk. Sangamon 07130007	EO 01	S. Fk. Sangamon R.	15.55	1998	Primary Contact	Nonsupport	Pathogens
	EO 02	S. Fk. Sangamon R.	16.09	1998	Primary Contact	Partial	Pathogens
	EOA 01	Sugar Cr.	3.9	1998	Primary Contact	Nonsupport	Pathogens
	EOH 01	Flat Br.	36.13	1998	Primary Contact	Nonsupport	Pathogens

2.2. Watershed Characteristics

This section goes over the general watershed characteristics for Salt Creek of Sangamon River and Lower Sangamon River Watersheds.

Land Use and Land Cover

Approximately 89 percent of the watershed is agricultural and of that 80 percent is cultivated crops and nine percent is rural grassland. Four percent is forest, four percent is urban, two percent is wetland and one percent is surface water (refer to Figure 2). See Table 2 for a breakdown of land use by watersheds.

Table 2. Land Use in Watersheds

Land Use	So. Fork (07130007)	%	Lower Sang. (07130008)	%	Salt (07130009)	%	Total	%
Ag: Cultivated	618,996	84	381,563	68	978,895	83	1,979,454	80
Ag: Grassland	39,086	5	81,575	14	105,630	9	226,291	9
Forest	22,087	3	50,025	9	22,063	2	94,174	4
Urban	31,433	4	28,818	5	49,489	4	109,741	4
Wetland	20,798	3	19,043	3	18,997	2	58,838	2
Surface Water	7,494	1	3,356	1	7,277	1	18,127	1
Barren Land	331	0	298	0	281	0	910	0
Other			115	0		0	115	0
Totals	**740,225**		**564,792**		**1,182,633**		**2,487,649**	

Soil erosion and runoff are greatly affected by land use and land cover. Both affect the infiltration rate. The close proximity of cultivate land to streams creates a high potential for erosion runoff with sediment and pollutants attached to sediment. Since most of the land in the watershed is cultivated row crops, tillage practices were looked at. Tillage practices are available county wide in the Illinois Department of Agriculture's *2004 Illinois Soil Conservation Transect Survey Summary.* This survey measures the progress in reducing soil erosion to T or tolerable soil loss levels statewide. The tolerable soil loss for most soils is between 3 and 5 tons per acre per year. This is the amount of soil loss that occur and be replaced by natural soil-building processes. Reducing soil loss to T is essential to maintaining the long-term agricultural productivity of the soil and to protecting water resources from sedimentation due to soil erosion (IDOA 2004). The survey also includes tillage systems used in planting corn and soybean crops in spring, and small grain crops in fall. Residue left on the fields as a result of reduced tilling is important because it shields the ground from the eroding effects of rain and helps retain moisture for crops. No-till farming leaves the soil virtually undisturbed from harvest through planting. Mulch-till requires at least 30% of the residue from the previous crop to remain on the soil surface after being tilled and planted. Mulch-till and no-till are conservation tillage systems. A Reduced-till system does provide some level of soil conservation; crop residues are not present in the amounts necessary to be categorized as conservation tillage. Conventional tillage does not have any reductions in tilling. Results of the survey are presented in Table 3.

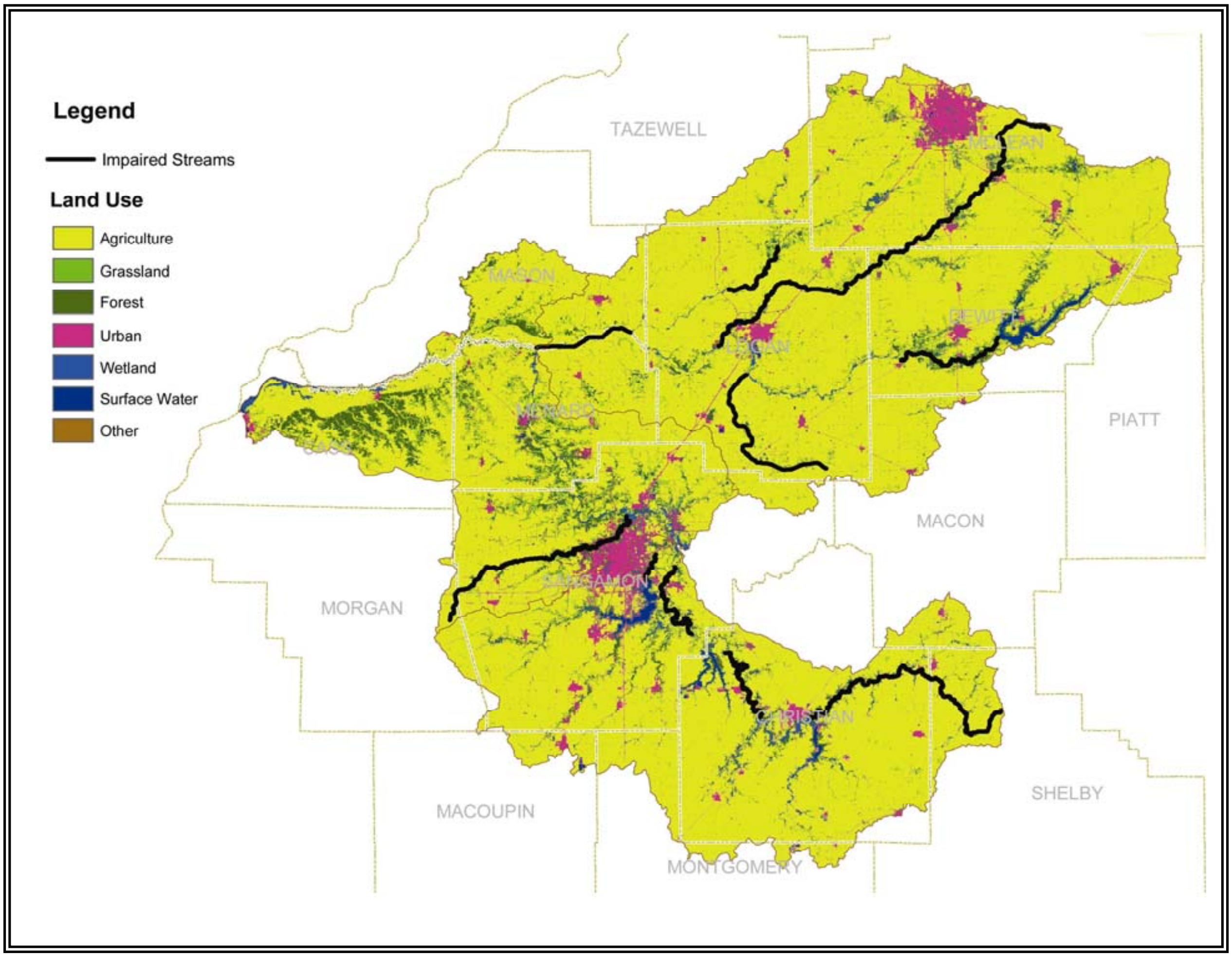
From the survey, an average of 89% of the points were at or below T or tolerable soil loss levels, which means 11% were exceeding T levels. Tillage practices varied throughout the watershed.

Table 3. Land Cover in Counties

			Corn (%)				Soybean (%)				Small Grains (%)			
County	**%<=1 T**	**% > T**	**C**	**R**	**M**	**N**	**C**	**R**	**M**	**N**	**C**	**R**	**M**	**N**
Cass	96	4	6	22	37	35	0	12	12	76	0	4	4	91
Christian	87	13	87	11	0	2	27	43	6	24	80	0	0	20
Dewitt	89	11	82	2	6	11	10	28	28	34	0	0	0	0
Logan	96	4	21	36	10	33	3	19	24	55	0	33	67	0
Macon	84	16	93	6	0	0	34	47	5	14	0	0	0	0
Macoupin	86	14	72	19	8	2	8	18	26	47	100	0	0	0
Mason	99	1	0	32	31	36	0	11	30	59	0	11	75	14
McLean	87	13	64	10	14	12	4	8	54	35	0	0	33	67
Montgomery	85	15	76	9	8	7	6	23	38	33	0	0	0	100
Morgan	84	16	68	15	6	11	8	18	31	43	0	0	45	55
Piatt	95	5	77	20	3	0	0	22	54	24	67	0	33	0
Sangamon	88	12	57	18	8	17	19	25	15	42	0	0	0	100
Shelby	78	22	82	17	1	0	23	48	11	18	63	37	0	0
Tazewell	94	6	33	34	14	19	2	20	30	49	10	20	20	50
Average	89	11												

C = Conventional
R = Reduced-till
M = Mulched-till
N = No-till

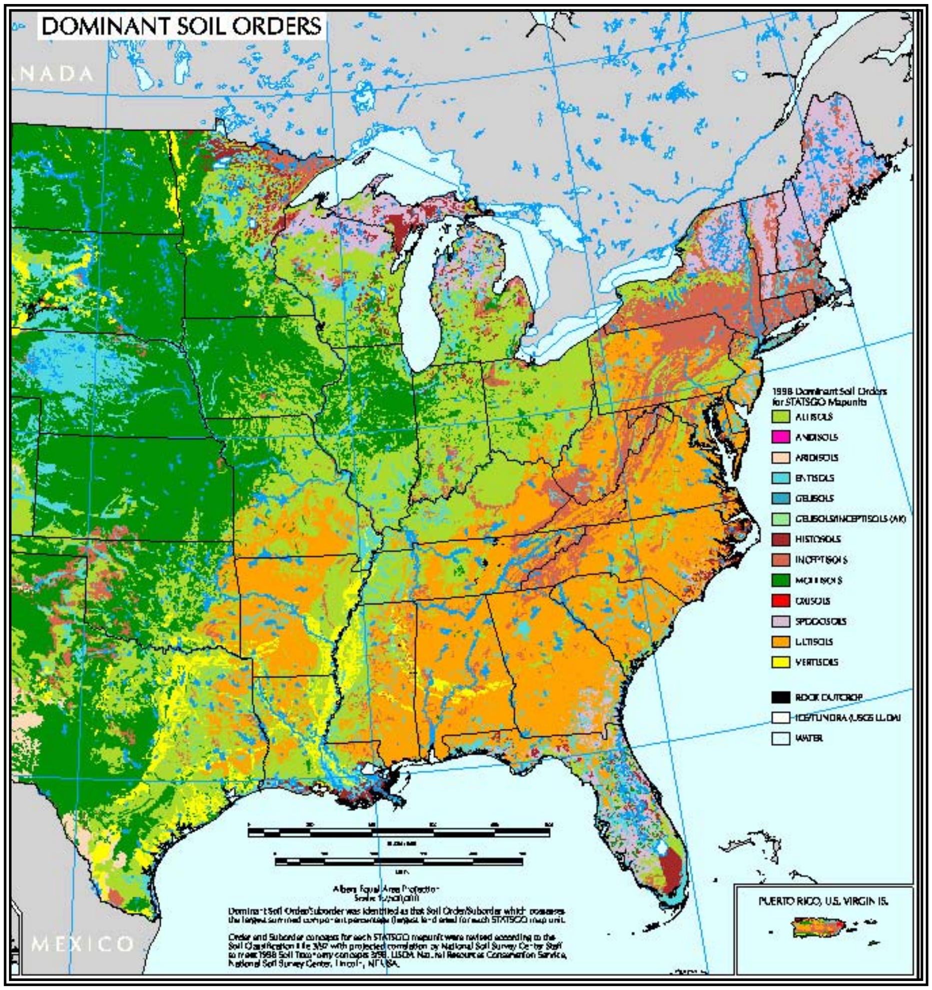
Figure 2. Land Use in Watershed



Soils

Soils in Illinois were developed when windblown silt called loess was deposited during times of glacial retreat. Melting waters from the retreat carried large amounts of silt, which were deposited along outlets such as the Illinois River. When water subsided, the silt deposits were carried by the wind to the uplands. Winds created the prairies and woodlands developed in the sloped drainage ways. Prairies acted like a sponge that caught and held rainwater. Illinois is made up of mollisols in the north and alfisols in the south (refer to Figure 3). Mollisols (dark green in the figure) are dark colored soils developed by decomposition of prairie grasses and wildflowers. Alfisols (light green) are light covered and developed under forest vegetation. This area in central Illinois is mostly made up of mollisols. Mollisols are very productive agricultural soils and are used extensively for this use.

Figure 3. Soil Orders of the United States



http://www.nrcs.usda.gov/technical/land/lgif/m4025l.gif

Hydromodification

Waters in these watersheds drain into the Sangamon River, to the Illinois River, to the Mississippi River. This area of the state is extensively tiled for agricultural purposes to facilitate drainage. When a field is tile-drained, rainwater will move much more rapidly to a watershed outlet when compared to water in the natural soil matrix. Figure 4 shows tile drains in the Lake Fork watershed. Some streams in this watershed are channelized. Channelization straightens, deepens and can widen a stream. Water flows much faster through the altered channel, resulting in increased erosion and flooding downstream. The straightened channel also moves more gravel and sediment downstream. In addition, channelizing can strip streambanks of vegetation, making them more prone to erosion. Natural streams have pools and riffles. Pools help protect streambanks from erosion by absorbing some of the energy of the flowing water. By removing pools, riffles and deep holes, channelizing can harm fish and other aquatic life in the stream. Although channelization may appear to solve a problem in the short term, the stream will constantly work to return to its natural shape. This short-term solution can result in long-term problems and high, recurring costs (http://www.tennessee.gov/environment/wpc/publications/Streambank/strmbank.php).

Figure 4. Tile Outlets in Lake Fork Watershed

Climate

Climate data is from the Illinois State Climatologist Office. Station 118179 is located in Springfield and was used for climate summaries for the watershed. Figure 1 contains a map showing the city of Springfield and its central location in the watershed. Table 4 contains the historical precipitation and temperature averages from 1971-2000. Table 5 contains the monthly precipitation data from the last ten years.

Table 4. Climate Summary for Springfield Station 118179 (1971-2000)

Element	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann
Prec. (in)	1.6	1.8	3.2	3.4	4.06	3.8	3.5	3.4	2.8	2.6	2.9	2.5	35.6
Temp High °F	33	39	51	63	74.4	83	87	85	79	67	51	38	62.4
Temp Low °F	17	22	32	42	52.7	62	66	64	55	44	34	23	42.9
Mean °F	25	31	42	53	63.6	73	76	74	67	56	42	30	52.7

http://www.sws.uiuc.edu/atmos/statecli/Summary/118179.htm

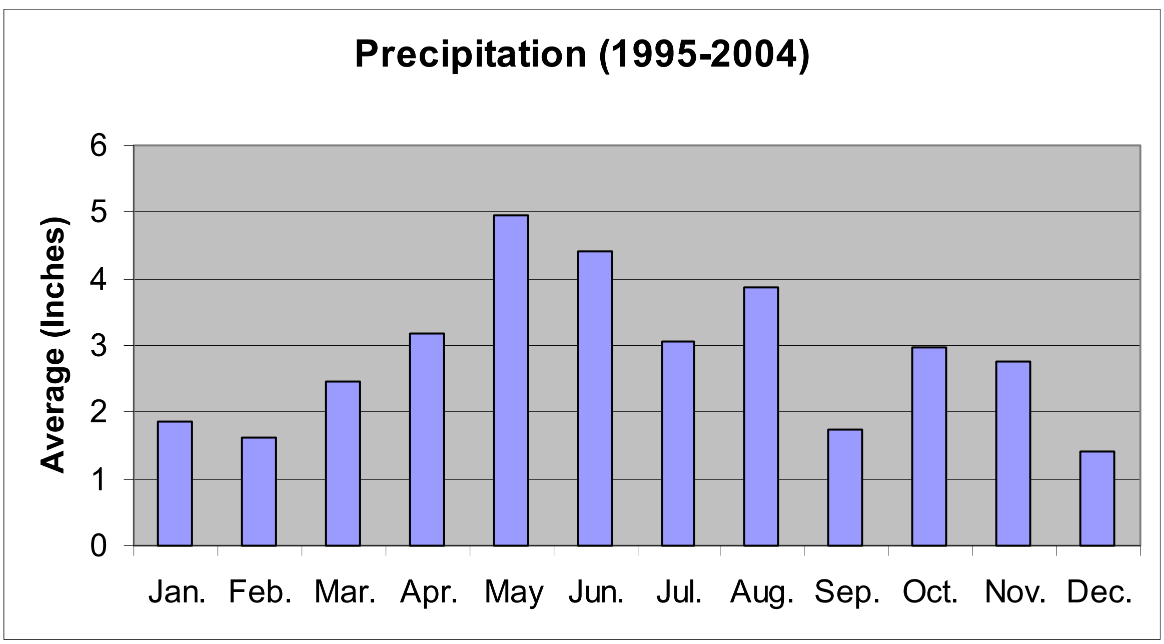
Table 5. Precipitation for Springfield Station (1995-2004)

	1995	1196	1997	1998	1999	2000	2001	2002	2003	2004	Mean
Jan.	4.01	1.48	1.58	2.43	1.94	0.54	2.06	2.45	0.76	1.4	1.87
Feb.	0.51	1.04	2.65	2.71	2.15	1.27	3.01	1.38	1.15	0.47	1.63
Mar.	3.41	1.93	2.5	4.63	0.97	2.8	1.11	2.08	1.79	3.31	2.45
Apr.	2.71	3.29	1.48	4.05	4.61	1.94	1.99	6.48	2.83	2.48	3.19
May	7.54	10.72	3.1	5.65	2.9	1.35	3.5	7.86	3.17	3.6	4.94
Jun.	1.29	1.95	1.54	8.81	2.95	7.46	4.42	5.29	6.77	3.61	4.41
Jul.	2.7	3.32	0.89	3.32	2.08	3.16	3.41	2.62	3.91	5.16	3.06
Aug.	3.67	1.81	4.64	5.3	4.64	3.33	3.34	5.41	3.82	2.66	3.86
Sep.	0.65	1.12	3.53	1.27	2.42	2.92	2.5	1.22	1.58	0.24	1.75
Oct.	2.24	1.59	1.79	3.3	1.78	2.55	4.96	3.12	2.99	5.25	2.96
Nov.	1.38	2.96	4.5	2.81	0.25	2.99	2.61	0.51	4.58	4.91	2.75
Dec.	1.34	0.72	1.75	0.64	2.2	0.91	2.09	1.7	1.42	1.23	1.40
Tot.	31.45	31.93	29.95	44.92	28.89	31.22	35	40.12	34.77	34.32	

http://www.sws.uiuc.edu/data/climatedb/data.asp

Table 5 does not show a drastic change for precipitation year-to-year, but the monthly precipitation shows variance (Figure 5 shows the variations from the last ten years).

Figure 5. Monthly Precipitation for Springfield 1995-2004



Precipitation results in surface runoff, which can convey what is on the ground to the streams in both rural and urban areas. Fecal coliform from nonpoint sources such as livestock, pets or humans can enter the streams when precipitation occurs.

Populations

Humans

Population calculations were calculated based on the U.S. Census tract data. The approximate total population for these watersheds is 519,140. Populations for the larger cities (cities over 7,000) are given in Table 6. Note that not all the Bloomington and Normal City populations are in the overall population of the watersheds because the entire city is not in the watershed.

Table 6. Populations for larger cities

City	1990 Census	2000 Census	2003 Estimate	% Change
Bloomington	51,972	64,808	68,507	+ 24%
Chatham	6,074	8,583	9,330	+ 35%
Clinton	7,437	7,485	7,336	- 1%
Lincoln	15,418	15,369	15,039	- 3%
Normal	40,023	45,386	48,649	+ 18%
Springfield	105,227	111,454	113,586	+ 7%
Taylorville	11,133	11,427	11,296	+ 1%

Wildlife

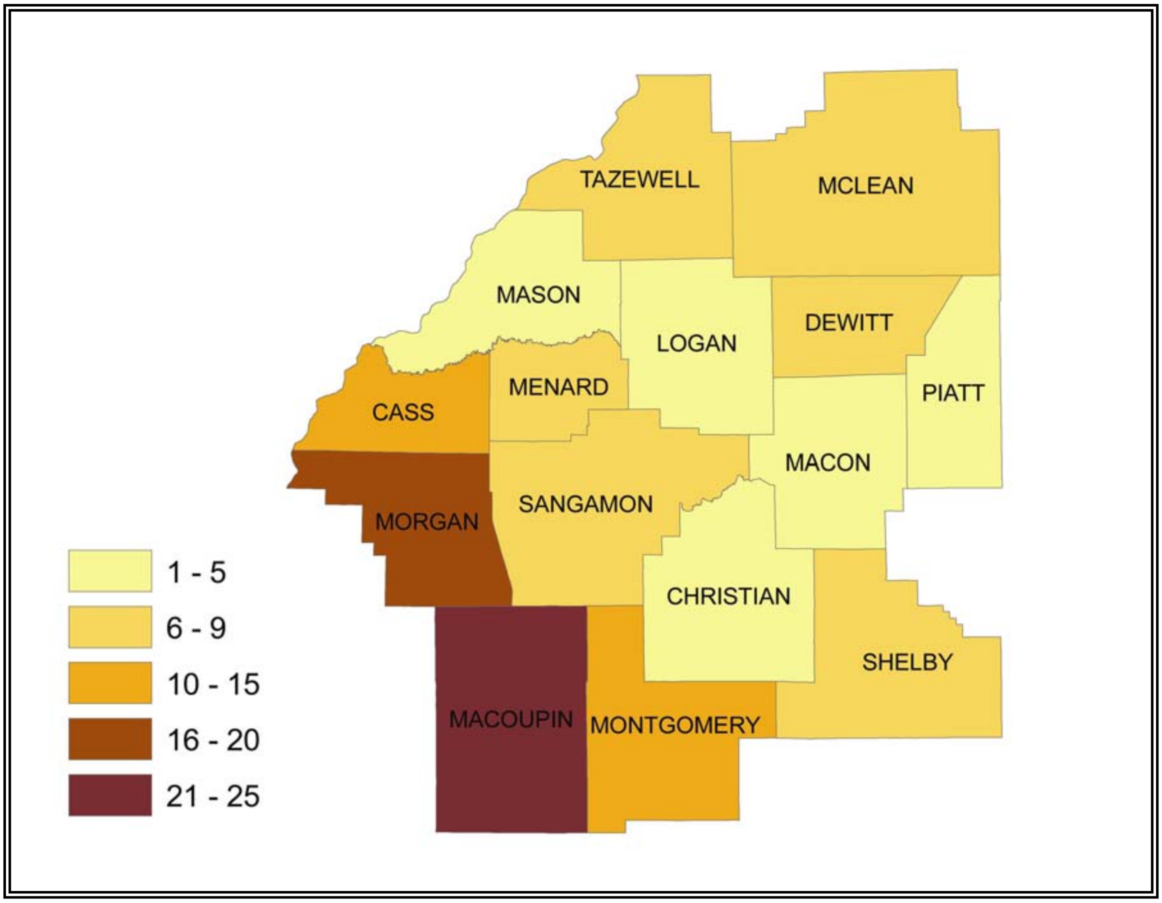
Deer estimates from Illinois Department of Natural are used to represent wildlife populations. Deer populations were divided by the square miles in the watershed to show the densities. Table 7 has the deer densities for all the counties in this watershed and Figure 6 is a graphic representation of these densities.

Table 7. Deer Populations

County	Deer Populations	Square Miles	Deer Density (per sq. mile)
Cass	5022	380	13
Christian	3341	708	5
Dewitt	2580	401	6
Logan	2740	610	4
Macon	992	1174	1
Macoupin	13857	580	24
Mason	2805	858	3
McLean	4744	557	9
Menard	2859	313	9
Montgomery	9164	702	13
Morgan	9853	567	17
Piatt	1075	435	2
Sangamon	6753	868	8
Shelby	4527	760	6
Tazewell	5262	651	8

IDNR 1998

Figure 6. Deer Densities per county (per square mile)



Macoupin and Morgan counties have the highest densities while Macon, Piatt, Mason, and Logan have the lowest. It is assumed that deer populations are a reliable indicator of wildlife populations.

Livestock

Livestock estimates are based on the National Agriculture Statistics Service from the United States Department of Agriculture. Table 8 has countywide livestock statistics and Figure 7 is a graph displaying these statistics. Figure 8 is the livestock densities for all counties. It is based on total animal units and total acres in the county.

Table 8. Livestock Populations by County

County	Hogs and Pigs	Cattle and calves	Sheep and Lambs	Horses and ponies	Chickens- >20 weeks	Other
Cass	82080	9409	214	176		271
Christian	27742	6884	665	484		470
Dewitt	22107	3591				
Logan	81755	6037	458		237	
Macon	6397	3295	189	346	214	
Macoupin	68030	26961	1461			2200
Mason	13521	6225	357	216	106	
McLean	92321	13122	2179	759		
Menard	30859	5509		206	285	
Montgomery	58861	11053		625	485	571
Morgan	46092	15755	466		542	
Piatt	8072	2294	230	286		
Sangamon	50810	10957	401	1536	1463	
Shelby	56285	20247	768	925	461	
Tazewell	74762	9417	578	656		

http://www.nass.usda.gov/census/census02/profiles/il/index.htm

Figure 7. Livestock per County

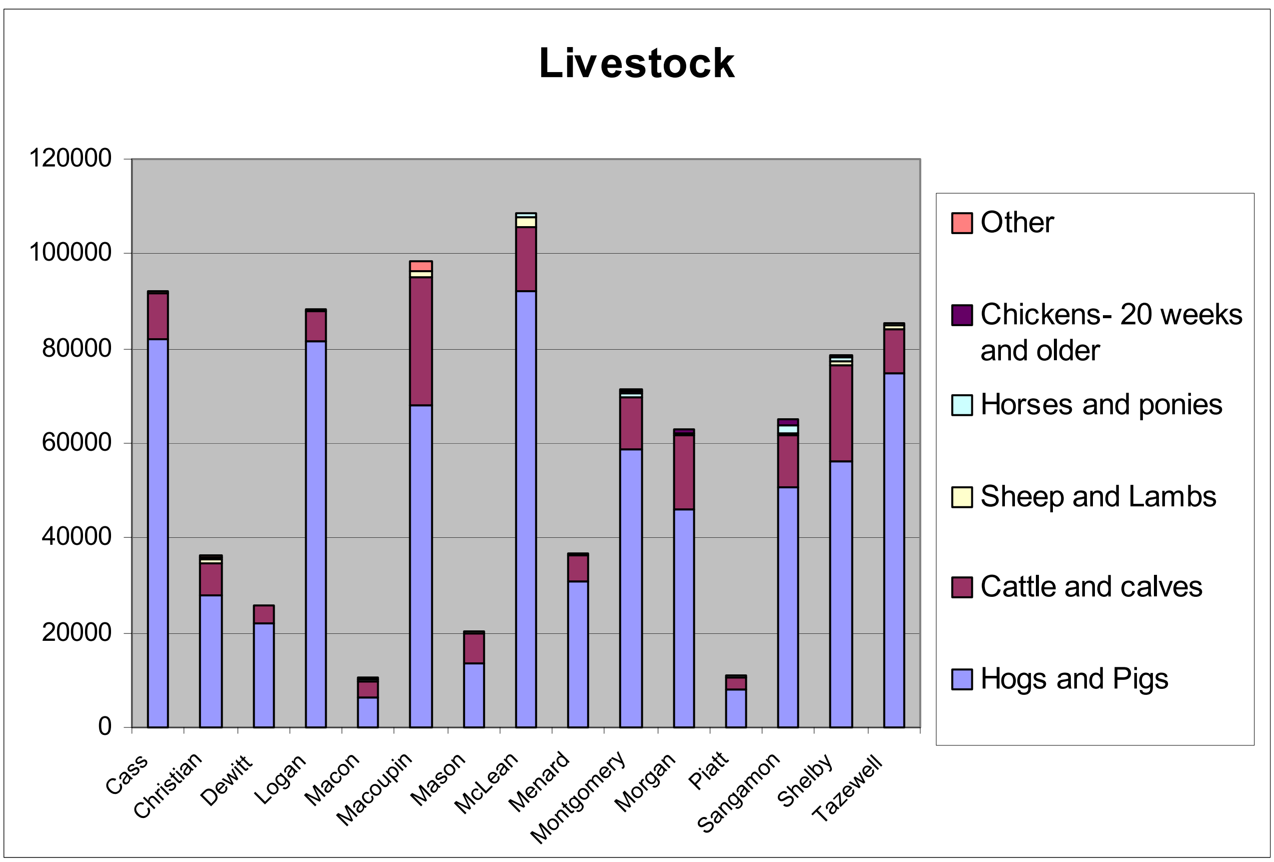
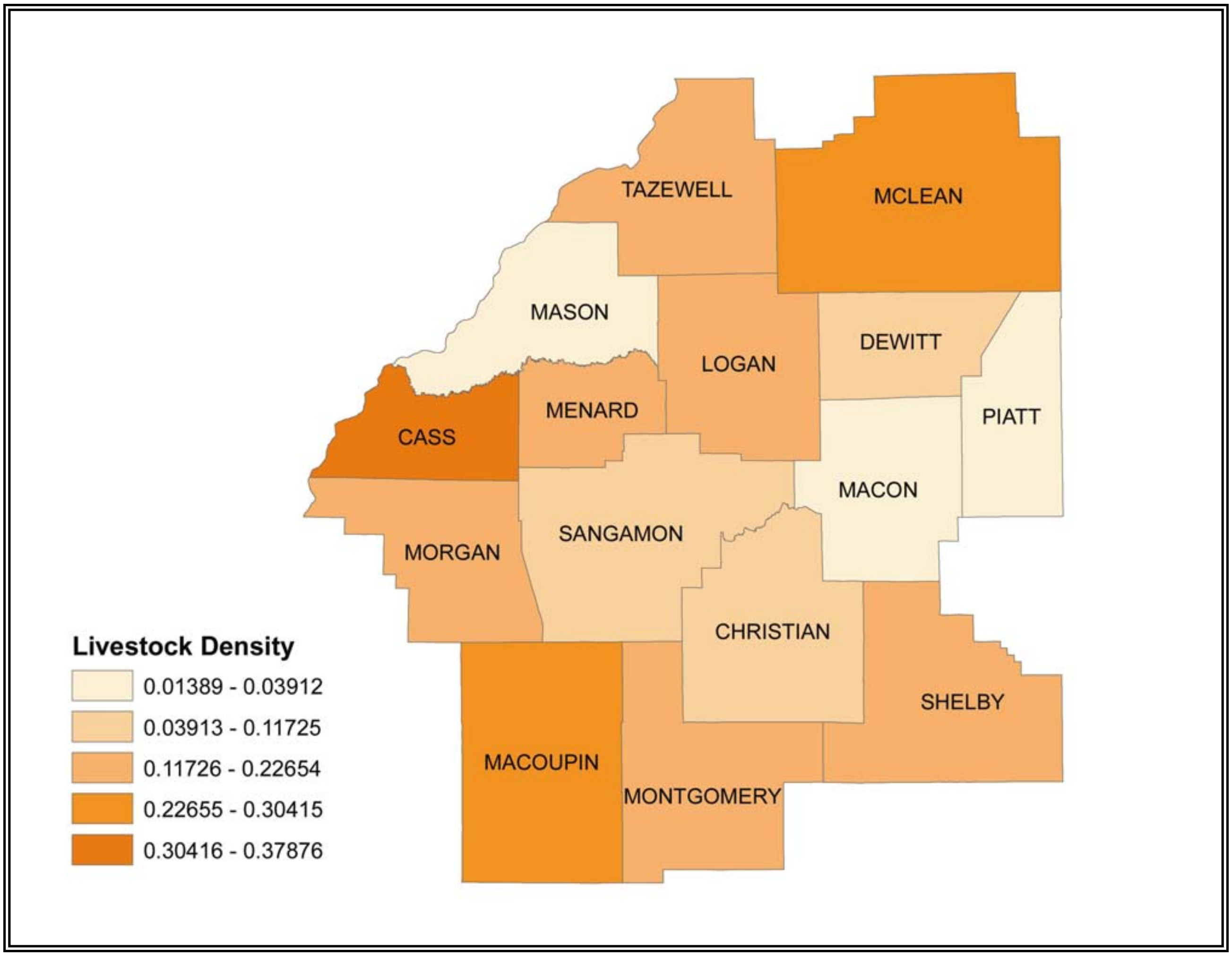


Figure 8. Livestock Density per County (animals per acre)



Macoupin county has the highest animal count of all the counties, but Cass county has the highest density which means it has more animals per acre.

3. Water Quality Standard and Guideline

Water quality standards are developed and enforced by the state to protect the "designated uses" of the state's waterways. Illinois' designated use categories include: Aquatic Life, Primary Contact (Swimming), Secondary Contact, Drinking Water, and Fish Consumption. In the state of Illinois, setting the water quality standards is the responsibility of the Illinois Pollution Control Board (IPCB). This TMDL will deal with the impaired use of primary contact.

The assessment of *primary contact (swimming)* use is based on fecal coliform bacteria and water-chemistry data from the Ambient Water Quality Monitoring Network. 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 200cfu (colony forming units)/100 ml, nor shall more than 10 percent of the samples during any 30 day period exceed 400cfu/100 ml (35 Ill. Adm. Code 302.209 [2003]). This standard protects for primary contact, i.e., *primary contact (swimming)* use of Illinois waters by humans. Due to limits in agency resources allotted to surface-water monitoring and assessment, fecal coliform bacteria cannot be sampled at a frequency necessary to apply the "General Use" standard, i.e., at least five times per month during May through October. Therefore, surrogate assessment guidelines are used to assess attainment of *primary contact (swimming)* use.

To assess this use, Illinois EPA uses measures of fecal coliform bacteria and of total suspended solids from water samples collected approximately once every six weeks in May through October, over the most recent five-year period (i.e., 1998 through 2002 for this report). Based on these water samples, geometric means and individual measurements of fecal coliform bacteria are compared to the concentration thresholds in Table 3-11. To apply part of 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. However, another part of the guidelines, the percent exceedances, is based on only a subset of these fecal coliform bacteria measurements. This subset comprises water samples in which the total suspended solids concentration is not greater than the fiftieth-percentile value of the entire distribution (i.e., all May-through-October samples, across the five years) of total suspended solids measurements for that sampling location (station). See Table 9 for guideline specifics.

Table 9. Guidelines for Assessing Primary Contact (Swimming) Use in Illinois Streams

Degree of Use Support	Guidelines
Full	Geometric mean of all fecal coliform bacteria observations ≤200/100 ml, and ≤10% of observations exceed 400/100 ml when total suspended solids concentration for that station is ≤50th percentile.
Partial	Geometric mean of all fecal coliform bacteria observations ≤200/100 ml, and >10% of observations exceed 400/100 ml when total suspended solids concentration for that station is ≤ 50th percentile; or Geometric mean of all fecal coliform bacteria observations >200/100 ml, and ≤25% of observations exceed 400/100 ml when total suspended solids concentration for that station is ≤ 50th percentile.
Nonsupport	Geometric mean of all fecal coliform bacteria observations >200/100 ml, and >25% of observations exceed 400/100 ml when total suspended solids concentration for that station is ≤50th percentile.

All the data was used in this TMDL regardless of TSS values that were used in the assessment. TSS values did not deter any water segment in this watershed from being impaired for primary contact use.

Stream miles assessed for *primary contact (swimming)* use include only those reaches represented by Ambient Water Quality Monitoring Network stations and for which exemptions do not apply. Some portions of stream segments assessed as Full, Partial, or Nonsupport are exempt from the fecal coliform bacteria water quality standard and thus *primary contact (swimming)* use does not apply in these portions (35 Ill. Adm. Code 302.209 [2003]). The standards established by the Pollution Control Board allow that waters unsuitable for primary contact activities, unlikely to allow incidental contact due to remoteness from any parks or residential areas, and unutilized for public and food processing water supply are exempt from fecal quality standards. NPDES permit dischargers that affect these waters may be eligible for an exemption (35 Ill. Adm. Code 378.101). Before a disinfection exemption is granted, the point source must prove it will not cause downstream waters to exceed applicable fecal coliform standards. The point source must model the die-off of fecal coliform from its discharge using a first-order die-off equation that predicts levels of fecal coliform at points downstream from the fecal coliform source. Preferable fecal coliform concentrations used in the equation are an average over at least three months, but a minimum of four samples in 30 days is acceptable.

4. Description of Water Quality Problem/Impairment

Impaired segments were initially on the 303(d) List in either 1998 or 2002 as impaired for primary contact (swimming) use. See Table 10 for specific 303(d) Listings. Five segments were listed initially in 1998, five in 2002 and one was added in 2004.

Table 10. Segments on current and previous 303(d) Lists

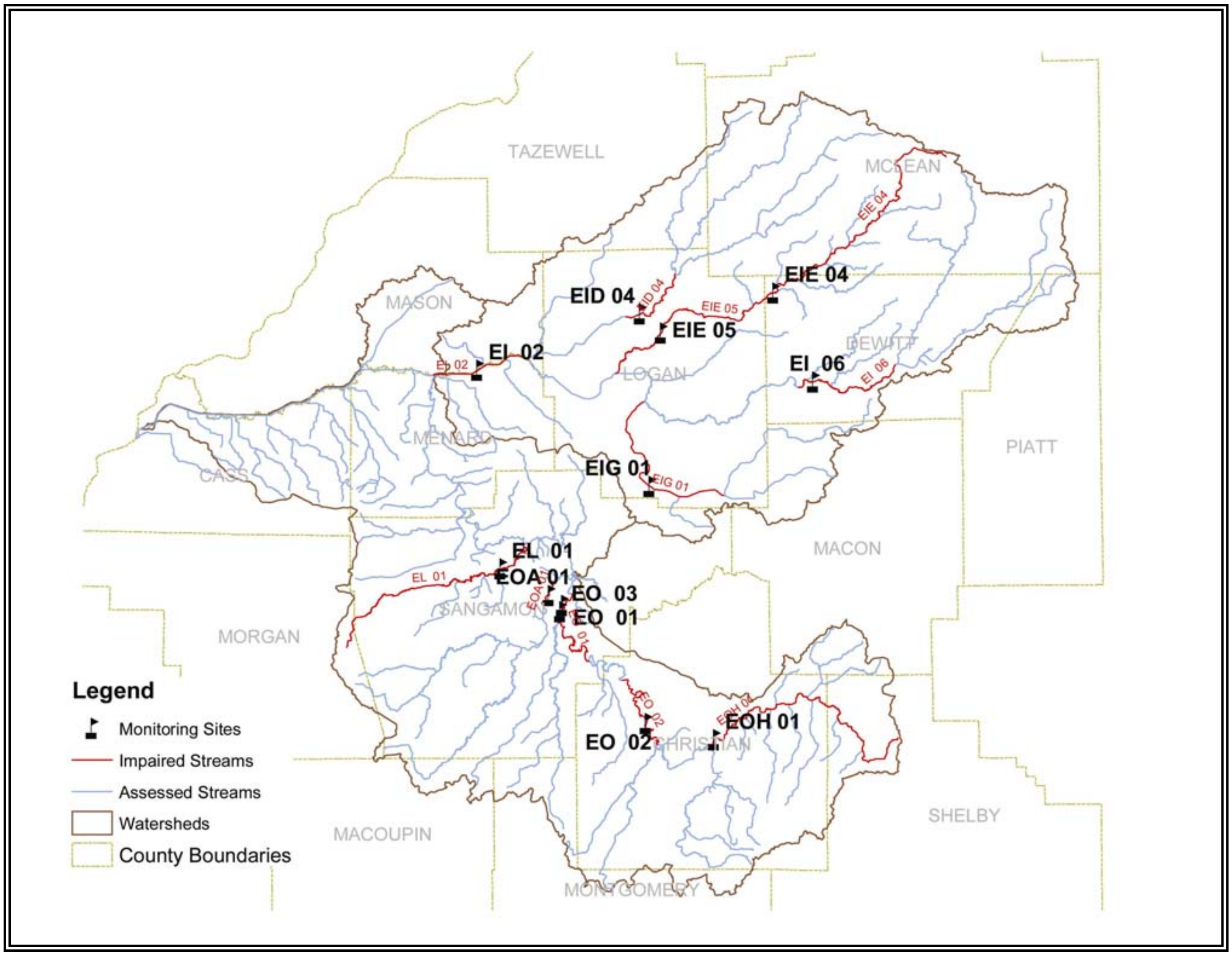
Segment ID	Segment Name	303(d) Lists		
		1998	2002	2004
EI 02	Salt Cr.	x	x	x
EI 06	Salt Cr.		x	x
EID 04	Sugar Cr.	x	x	x
EIE 04	Kickapoo Cr.		x	x
EIE 05	Kickapoo Cr.		x	x
EIG 01	Lake Fk.		x	x
EL 01	Spring Cr.	x	x	x
EO 01	S. Fk. Sangamon R.		x	x
EO 02	S. Fk. Sangamon R.			x
EOA 01	Sugar Cr.	x		x
EOH 01	Flat Br.	x	x	x

Pathogen is the cause of primary contact use impairment for these segments. Pathogens are easily transported by surface water runoff or other discharges into waterbodies. They can infect humans through contaminated fish, skin contact or ingestion of water. Infection due to pathogen-contaminated recreational waters include gastrointestinal, respiratory, eye, ear, nose, throat, and skin diseases (USEPA 1986).

Primary contact use is assessed using fecal coliform bacteria, which is an indicator organism for pathogens. Pathogenic organisms are difficult to identify, but indicator organisms are more easily sampled and measured. Indicator organisms are nonpathogenic bacteria associated with pathogens transmitted by fecal contamination. Fecal coliform bacteria are found in the intestines and feces of warm-blooded animals.

Figure 9 has Ambient Water Quality Monitoring Network stations where the fecal coliform data was sampled. These stations provide water chemistry data from water samples collected once every six weeks (approximately nine per year). Most of the segments have stations names that are the same as the stream IDs. For S. Fk. Sangamon EO 01, there are two stations used for fecal coliform data. EO 01 was used for data up to 2001 and EO 03 is now being used as of 2003. Both stations are on the EO 01 segment.

Figure 9. Monitoring Stations



The 2004 3003(d) List used the data from the 305(b) Report Assessments, which are based on data through 2002. Most of the sites in Illinois do not have enough data (five samples in a thirty-day period) to use the standard for fecal Coliform. For primary use assessment, IEPA uses the guideline and data from the last five years is used. All of the stations sampled had a geometric mean over 200 cfu/100ml, which meets the first qualifier of the guideline that makes it less than full support. Depending on how many samples are over 400 cfu/100ml and also the percentage of TSS is what determines if a segment meets the second qualifier and whether it is less than full support. For partial support the segment must have less than or equal to 25% of the samples over 400 cfu/100ml when TSS is less than the median (50^{th} percentile). For nonsupport, over 25% of the samples exceed 400 cfu/100ml when TSS is less than the median. See Table 11 for each stream assessment parameters and use support.

Table 11. Assessment of Primary Contact Use for 305(b) Listing

	Geo Mean	No. of Samples	Mean TSS	Median TSS	# >400	# > 400, TSS < Median	% >400, TSS < Median	Use Support
EI 02	224	22	86	38	8	1	13	PARTIAL
EI 06	388	20	63	59	11	4	36	NONSUPPORT
EID 04	546	22	69	50	9	3	33	NONSUPPORT
EIE 04	392	20	55	34	15	10	67	NONSUPPORT
EIE 05	827	37	61	42	31	17	55	NONSUPPORT
EIG 01	420	34	53	53	16	6	38	NONSUPPORT
EL 01	1203	37	54	44	27	15	56	NONSUPPORT
EO 01	328	34	63	49	11	4	36	NONSUPPORT
EO 02	237	18	72	60	5	1	20	PARTIAL
EOA 01	483	23	35	31	12	6	50	NONSUPPORT
EOH 01	309	21	63	59	7	4	57	NONSUPPORT

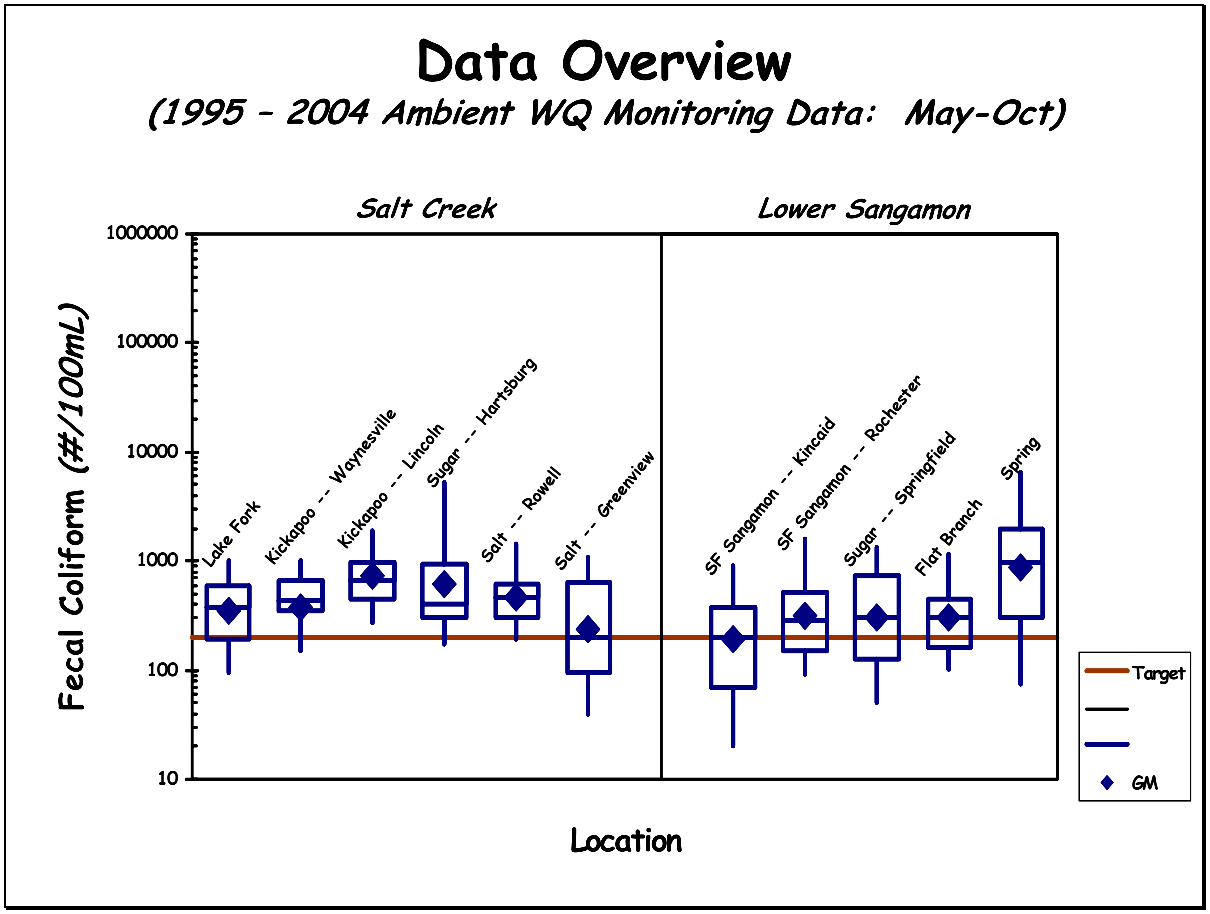
In 2000, IEPA chose a few specific sites in Illinois to monitor fecal Coliform enough for the standard (at least five samples in 30 days). In this watershed, there are four sites that have done this monitoring- EIE 05, EIG 01, EO 01, and EL 01. Table 12 has the geometric means for three-30 day sampling periods for each segment. Every geometric mean is over the standard of 200 cfu/100ml.

Table 12. Fecal Coliform Geometric Means

	EIE 05	EIG 01	EL 01	EO 01
6/5/2000	850	1280	26700	290
6/8/2000	1300	407	340	200
6/13/2000	2067	1533	1933	513
6/20/2000	1253	627	900	153
6/27/2000	780	600	2933	750
Geo. Mean	**1174**	**786**	**2154**	**321**
7/5/2000	56667	14867	33333	3167
7/10/2000	590	2200	2270	250
7/12/2000	850	2200	5400	300
7/13/2000	680			
7/18/2000	670	400	1970	83
7/24/2000	513	380	700	213
7/26/2000		190		
Geo Mean	**1371**	**1130**	**3550**	**335**
9/5/2000	833	193	27	317
9/11/2000			700	
9/12/2000	5050	840	1010000	1627
9/18/2000	543	197	673	193
9/21/2000	867	193	1153	250
9/26/2000	867	180	6733	633
9/27/2000	300			
Geo Mean	**895**	**256**	**2153**	**436**

Figure 10 contains box and whisker plots that show the extreme values and the range of middle values of fecal coliform data from 1995-2004 for each segment. The box shows us the middle variables. The line in the box is the median (or middle) of the data, the upper line is the upper quartile or 75th percentage and the lower line is the lower quartile or the 25th percentage. The upper whisker stretches to the maximum value and the lower stretches to the minimum.

Figure 10. Fecal Coliform Data from All Segments



Time series graphs of the data collected from each station for 1995 to 2004 is presented in Appendix A. Instead of using all the data, Illinois EPA chose to use the most recent ten years of data for load allocations.

5. Assessment of Bacteria Sources

5.1. Point and Nonpoint Sources

There are point and nonpoint sources of fecal coliform bacteria in the Salt Creek of Sangamon and Lower Sangamon watersheds. Point sources directly discharge bacteria into the water body itself. Nonpoint sources are not as easy to quantify because they do not directly discharge and are dependent on facilitators such as precipitation that results in runoff and tile drainage.

Point Sources

NPDES Permitted Facilities

Point sources in the watershed include permitted NPDES facilities. These include wastewater treatment plants, industrial businesses, schools, and subdivisions. NPDES facilities in the Salt Creek of Sangamon River Watershed are in Figure 11 and facilities in the Lower Sangamon River Watershed are in Figure 12. Table 13 and Table 14 contain each facility, the designed average flow for their effluent and the exemption status. Facilities with a designed average flow over one MGD (million gallons per day) are considered major facilities and are labeled major on the map and are bold in the tables.

Figure 11. NPDES Permitted Facilities in the Salt Creek of Sangamon River Watershed

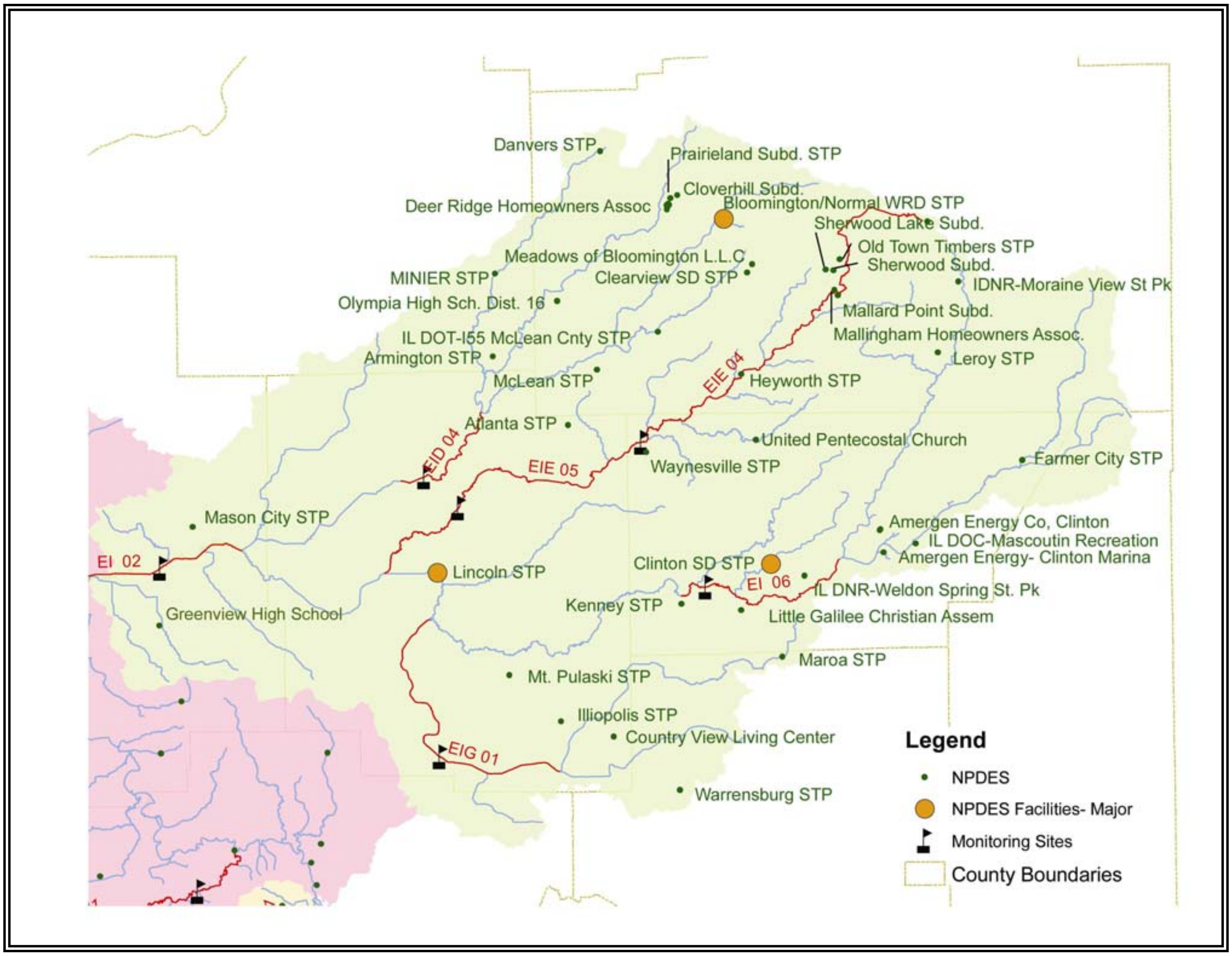


Table 13. NPDES Permitted Facilities in the Salt Creek of Sangamon River Watershed

NPDES ID	Facility Name	Design Average Flow (MGD)	Exempt
IL0036919	AMERGEN ENERGY CO,LLC-CLINTON	0.0930	
IL0044806	ARMINGTON STP	0.0400	YR
ILG580181	ATLANTA STP	0.1915	YR
IL0027731	**BLOOMINGTON/NORMAL WRD STP**	**22.5000**	YR
IL0073504	**BLOOMINGTON/NORMAL SE WRD**	**7.5000**	
IL0059412	CLEARVIEW SD STP	0.0191	
IL0023612	**CLINTON SD STP**	**1.6800**	YR
IL0072168	CLOVERHILL SUBDIVISION	0.0084	
ILG551010	COUNTRY VIEW LIVING CENTER	0.0144	YR
ILG580059	DANVERS STP	0.1400	YR
IL0070823	DEER RIDGE HOMEOWNERS ASSN	0.0039	
IL0070823	DEER RIDGE HOMEOWNERS ASSN	0.0018	
IL0070823	DEER RIDGE HOMEOWNERS ASSN	0.0028	
IL0070823	DEER RIDGE HOMEOWNERS ASSN	0.0028	
IL0070823	DEER RIDGE HOMEOWNERS ASSN	0.0021	
IL0070823	DEER RIDGE HOMEOWNERS ASSN	0.0081	
IL0022462	FARMER CITY STP	0.3600	YR
IL0044776	GREENVIEW HIGH SCHOOL	0.0074	YR
IL0022993	HEYWORTH STP	0.4000	YR
IL0072877	IDNR-MORAINE VIEW STATE PARK	0.0210	YR
IL0070386	IL DNR-WELDON SPRINGS STATE PK	0.0113	
IL0062961	IL DOC-MASCOUTIN RECREATION	0.0272	S
IL0062278	IL DOT-I55 MCLEAN COUNTY STP	0.0050	
IL0024856	KENNEY STP	0.0200	YR
IL0021563	LEROY STP	0.6570	YR
IL0029564	**LINCOLN STP**	**4.1900**	S
IL0071200	LITTLE GALILEE CHRISTIAN ASSEM	0.0130	YR
IL0071404	MALLARD POINT SUBDIVISION	0.0160	
IL0073563	MALLINGHAM HOMEOWNERS ASSN	0.0133	
IL0025208	MAROA STP	0.3600	YR
IL0029815	MASON CITY STP	0.4700	YR
ILG580162	MCLEAN STP	0.2050	YR
IL0050121	MEADOWS OF BLOOMINGTON L.L.C	0.0650	
ILG580098	MINIER STP	0.1800	YR
IL0023400	MT. PULASKI STP	0.4400	YR
IL0071323	OLD TOWN TIMBERS STP	0.0080	
ILG551022	OLYMPIA HIGH SCHOOL DIST 16	0.0318	YR
IL0074756	PRAIRIELAND SUBDIVISION STP	0.0180	S
IL0075892	SHERWOOD LAKE SUBDIVISION	0.0200	S
IL0074551	SHERWOOD SUBDIVISION	0.0130	
IL0059331	UNITED PENTECOSTAL CHURCH	0.0300	YR
IL0034215	WARRENSBURG STP	0.2500	YR
IL0065447	WAYNESVILLE STP	0.0110	YR

S= Seasonal Exemption
YR= Year Round Exemption

Figure 12. NPDES Permitted Facilities in the Lower Sangamon River Watershed

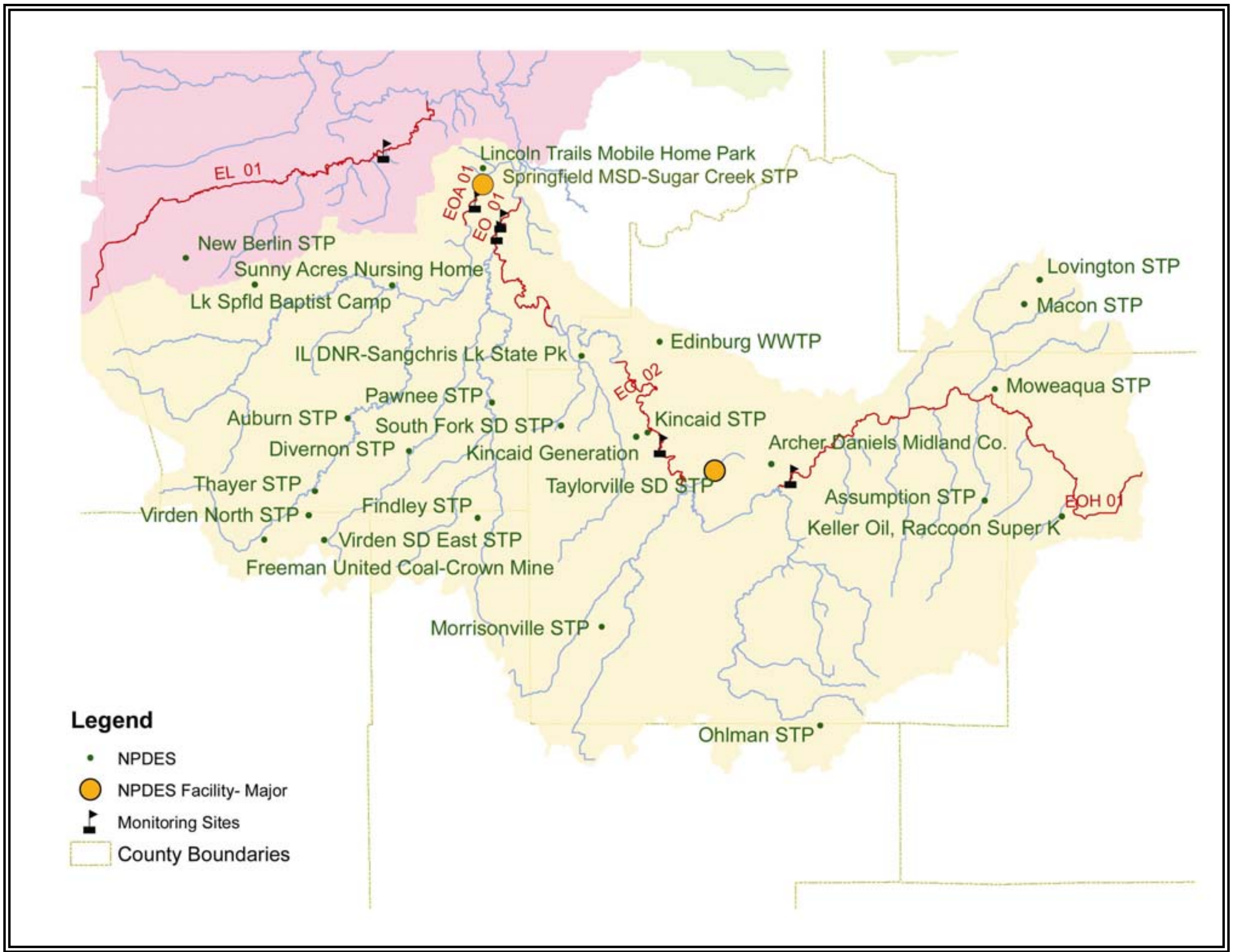


Table 14. NPDES Facililities in the Lower Sangamon River Watershed

NPDES ID	Facility Name	Design Average Flow (MGD)	Exempt
IL0020907	ASSUMPTION STP	0.3900	YR
IL0022403	AUBURN STP	0.6200	YR
ILG580175	DIVERNON STP	0.1400	YR
IL0025372	EDINBURG WWTP	0.3000	YR
IL0020524	FINDLAY STP	0.1000	S
IL0051811	IL DNR-SANGCHRIS LAKE STATE PK	0.0020	
IL0002241	KINCAID GENERATION, L.L.C.	0.0015	
IL0048607	KINCAID STP	0.2500	YR
IL0050253	LAKE SPRINGFILED BAPTIST CAMP	0.0150	S
IL0048241	LINCOLN TRAILS MOBILE HOME PARK*	0.0080	S
IL0024210	LOVINGTON STP	0.2000	YR
ILG580141	MACON STP	0.2140	
IL0025101	MORRISONVILLE STP	0.3300	YR

ILG580134	MOWEAQUA STP	0.2200	YR
IL0032671	OHLMAN STP	0.0250	YR
IL0033324	PAWNEE STP	0.3000	YR
IL0053252	RACCOON SUPER K	0.0015	
IL0050148	SOUTH FORK SD STP	0.1020	YR
IL0021971	**SPRINGFIELD MSD SUGAR CRK STP**	**10.0000**	**YR**
IL0068683	SUNNY ACRES NURSING HOME	0.0110	YR
IL0031356	**TAYLORVILLE SD STP**	**3.0200**	**YR**
IL0023426	VIRDEN NORTH STP	0.2000	YR
IL0066087	VIRDEN SD EAST STP	0.4000	YR
ILG580171	NEW BERLIN STP	0.1500	YR

S= Seasonal Exemption
YR= Year Round Exemption

35 Ill. Adm. Code 304.121 states that effluents discharged to all general use waters shall not exceed 400 fecal coliforms per 100 mL unless the Illinois EPA determines that an alternative effluent standard is applicable. For those facilities that monitor, the seasonal data will be averaged. For those facilities that are exempt, 200 cfu/100ml is used for the discharge. Die off calculations used for exemptions must prove this 200cfu/100ml is met downstream of the exempted segment. For discharge loads used in the die-off equations, refer to Appendix C, Table 2.

Another program under the NPDES systems requires permits storm sewers. Phase I of the NPDES Storm Water program began in 1990 and required medium and large municipal separate storm sewer systems (MS4s) to obtain NPDES coverage. The expanded Phase II program begins March 2003 and requires small MS4s in urbanized areas to obtain NPDES permits and implement six (6) minimum control measures. Bloomington, Normal, Springfield and Chatham have MS4 permits.

There are three MS4 requirements. The first is to develop a storm water management program comprised of best management practices (BMPs) and measurable goals for each of the six minimum control measures. The second requirement is to submit a completed Notice of Intent. The third requirement is to submit an annual status report to IEPA in June of each year starting. For more information on MS4s, see IEPA website at http://www.epa.state.il.us/water/permits/storm-water/ms4.html.

For communities having MS4 stormwater permits, the ratio of municipal acres and total acres in the watershed is multiplied by the total load to get a MS4 load for the watershed.

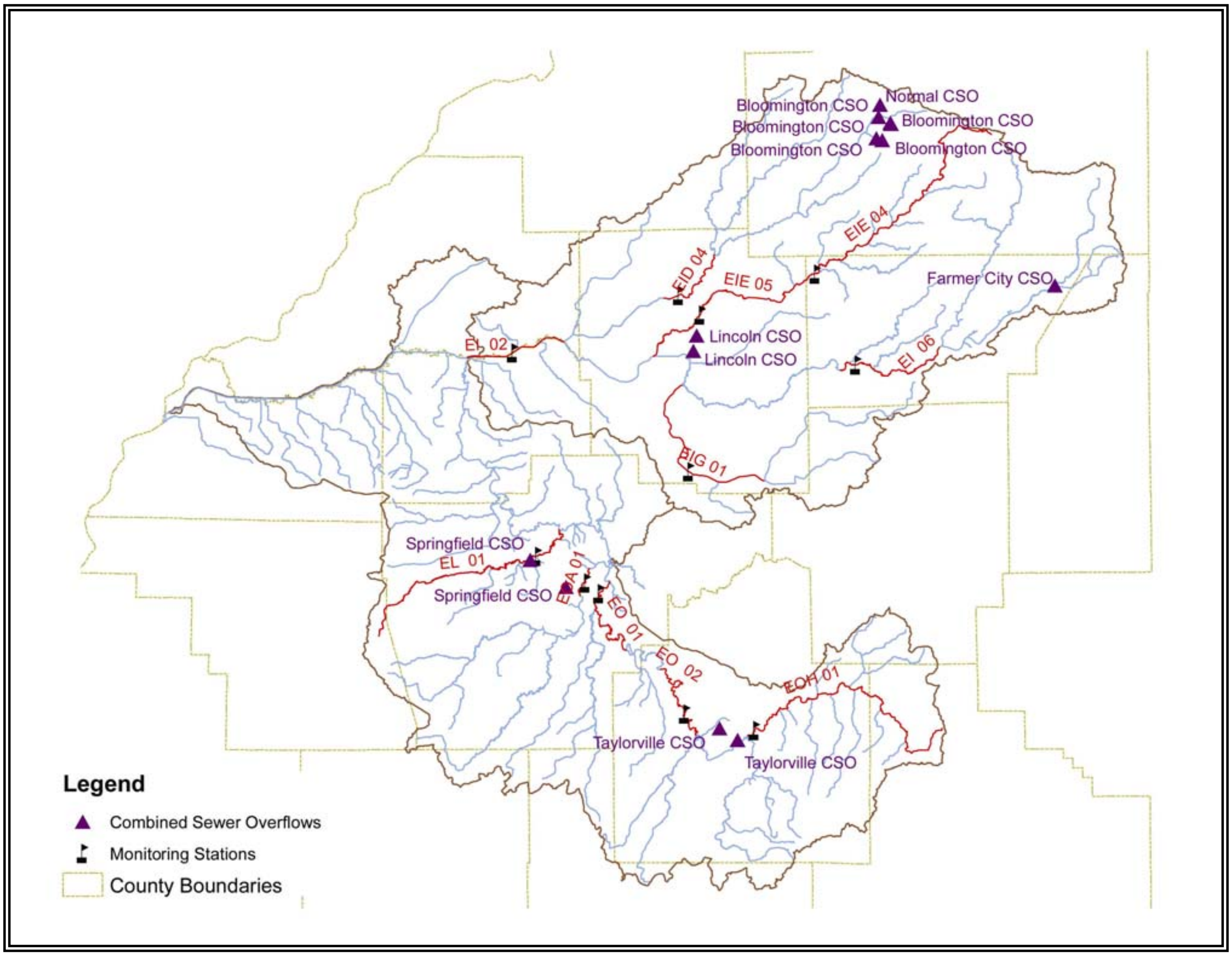
Failing Septic Systems

Another point source in the watershed is failing septic systems that directly discharges into surface water. There is the potential for septic systems to contribute significant pathogen loads by failure and malfunction. Illinois EPA is not aware of any county specific health information on septic systems. Estimates of failing septic systems were obtained from the National Small Flow Clearinghouse (NSFC 2001). According to this report an average of 42 septic systems fail per county. Salt Creek of Sangamon and Lower Sangamon Watersheds are approximately 41 percent of 15 counties; so 269 systems are estimated to have failed in the watershed. According to the NSFC, 19 percent of failures were defined as documented groundwater or surface water contamination. 51 households in the watershed are estimated to have failing septic systems directly discharging into the stream.

Combined Sewer Overflows

Combined Sewer Overflows (CSOs) are a point source in these watersheds. CSOs occur when wet weather flows exceed the conveyance and storage capacity of the combined stormwater and sanitary sewage system. Bloomington, Farmer City, Lincoln, Leroy, Normal, Springfield and Taylorville have CSOs (see Figure 13).

Figure 13. Combined Sewer Overflows



* Please note that the town of Leroy is not on this map, but does have a CSO.

Confined Animal Feeding Operations

Confined animal feeding operations may be a point source in the watersheds. U.S. EPA adopted several changes to the federal CAFO program that must now be undertaken by many livestock producers. In Illinois, the CAFO program will be administered under the NPDES permit system. By April of 2006, medium and large operators are required to apply for a permit. This permit contains information such as the number of animals, type of waste containment and storage, and outfall flow. For more information on CAFOs, go to http://www.epa.state.il.us/water/cafo/ . As of now, the Illinois EPA does not have information on CAFOs in this watershed.

Nonpoint Sources

Non-point sources of bacteria include septic systems, land application of biosolids, pets, livestock and wildlife. These sources deposit waste on the land where some may be transported into the stream by either surface runoff or tile drainage..

Failing Septic Systems

As discussed above under Point Sources, part of the septic system failure is point source related and the other is nonpoint source related. Using the same parameters above, there are 218 systems that are estimated to have failed throughout the watersheds and are nonpoint sources.

Land Application of Municipal Waste Biosolids

Municipal waste biosolids can be applied on the land surface where it may be transported to streams through storm water runoff. Bloomington/Normal Water Reclamation District and Lincoln Sewage Treatment Plant apply aerobically and/or anaerobically digested sewage sludge to agricultural lands at rates not to exceed the agronomic nitrogen demand of the crop grown. Both facilities land apply sludge in the Salt Creek of Sangamon River Watershed. Lincoln STP has been granted a permit to apply approximately 900 dry tons per year to agricultural lands. Bloomingon-Normal Water Reclamation District has been granted a permit to apply approximately 2,150 dry tons per year to agricultural land. Treatment at the facilities by a method that meets Class A standards will reduce fecal coliform numbers by a factor of 100,000 to less than 1000 fecal coliforms per gram total dry solids (Krogmann & Boyles 2003).

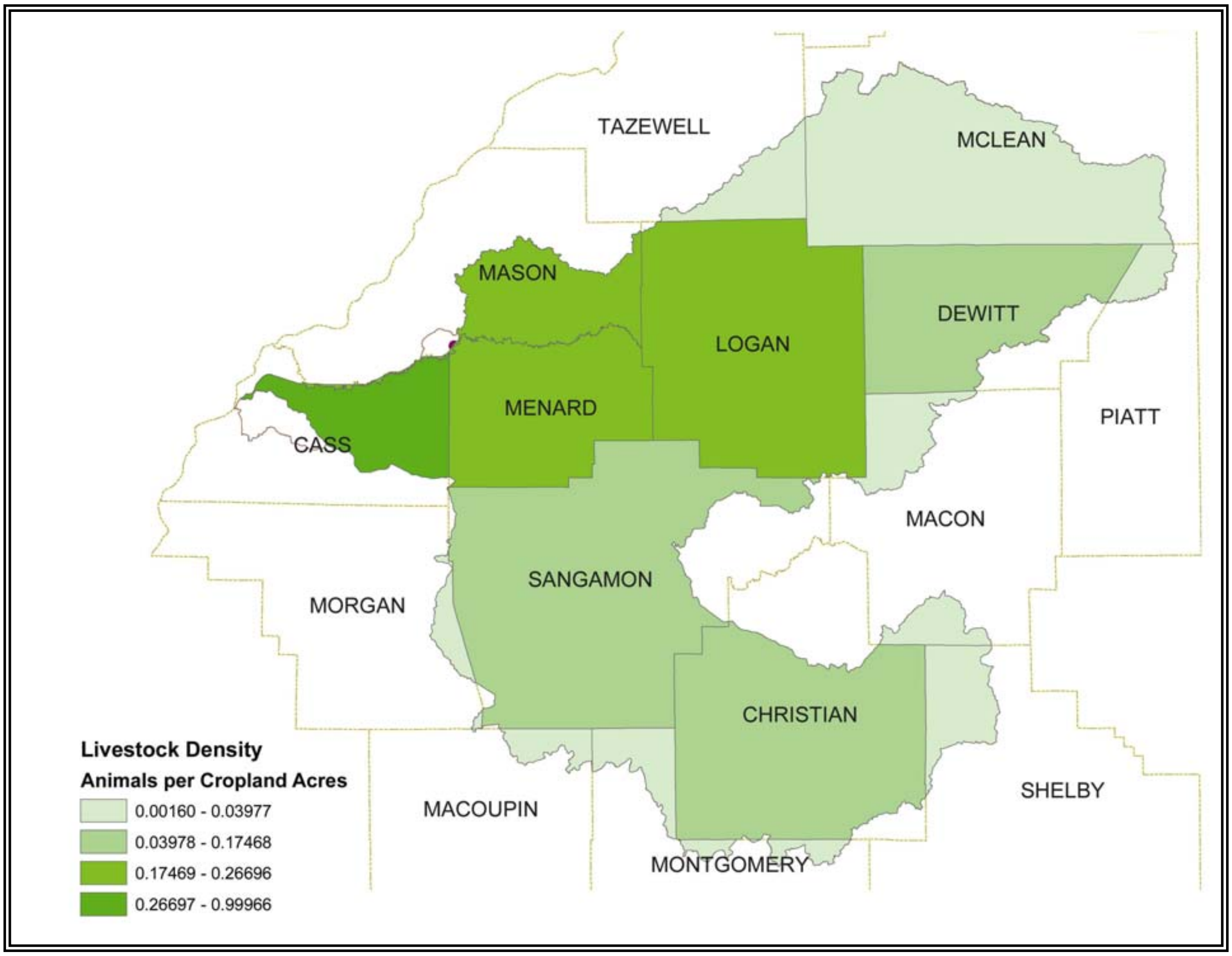
Pets

Pets generate wastes throughout the watershed. The number of pets was estimated based on the number of households in the watershed. According to the American Veterinary Medical Association, there are 1.6 dogs and 2.1 cats per household. Since not all cats are outdoors, 1 cat per household will be used. Based on population information, there are 197,392 households in the watershed, so there are approximately 315,827 dogs and 197,392 cats.

Livestock

Livestock may be confined, grazing in pastures or watering in streams. Confined feedlots generally capture the waste and can then land apply on agricultural fields. In open feedlots and pastures, livestock waste is deposited on the land surface where storm water can cause polluted runoff. No specific information is available to the Illinois EPA on manure application quantity and location. The availability of cropland can be a factor in the rate and placement of manure applications. The average number of animal units per acre of cropland is used to indicate where this is limiting (refer to Figure 14). Cass county, for example, has the highest density of livestock per county, but it has less cropland acres per animal than other counties. The higher the density, the less cropland per animal.

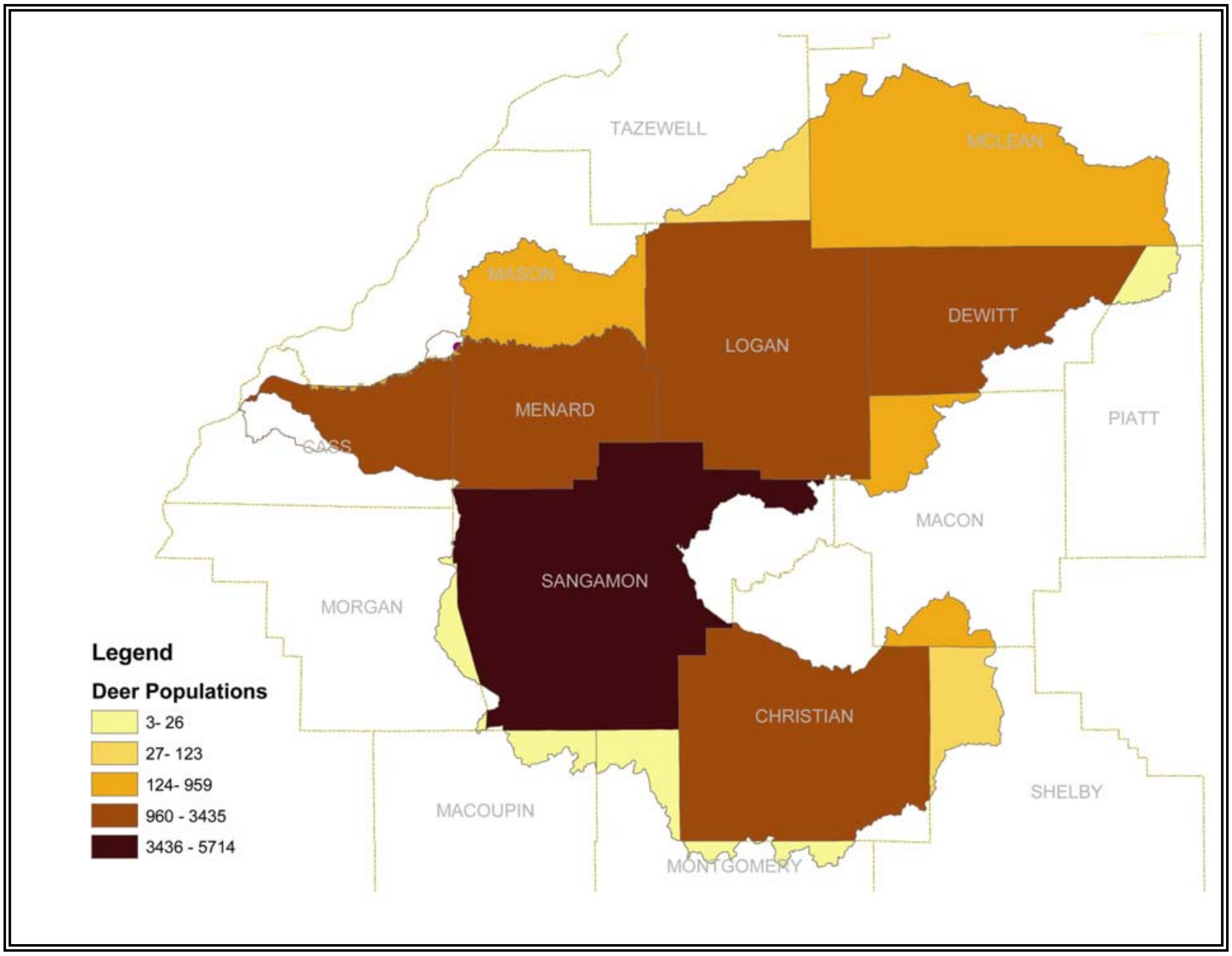
Figure 14. Livestock per Cropland Acre



Wildlife

The number of wildlife in the watershed is based on deer populations from Illinois Department of Natural Resources. Deer populations are countywide. For deer populations by watershed, it is assumed that most populations will reside near forested areas. The ratio of forested land in the watershed and in the county is multiplied by the estimates for that county to give the deer populations in the watershed (see Figure 15).

Figure 15. Deer Populations in Watershed Counties

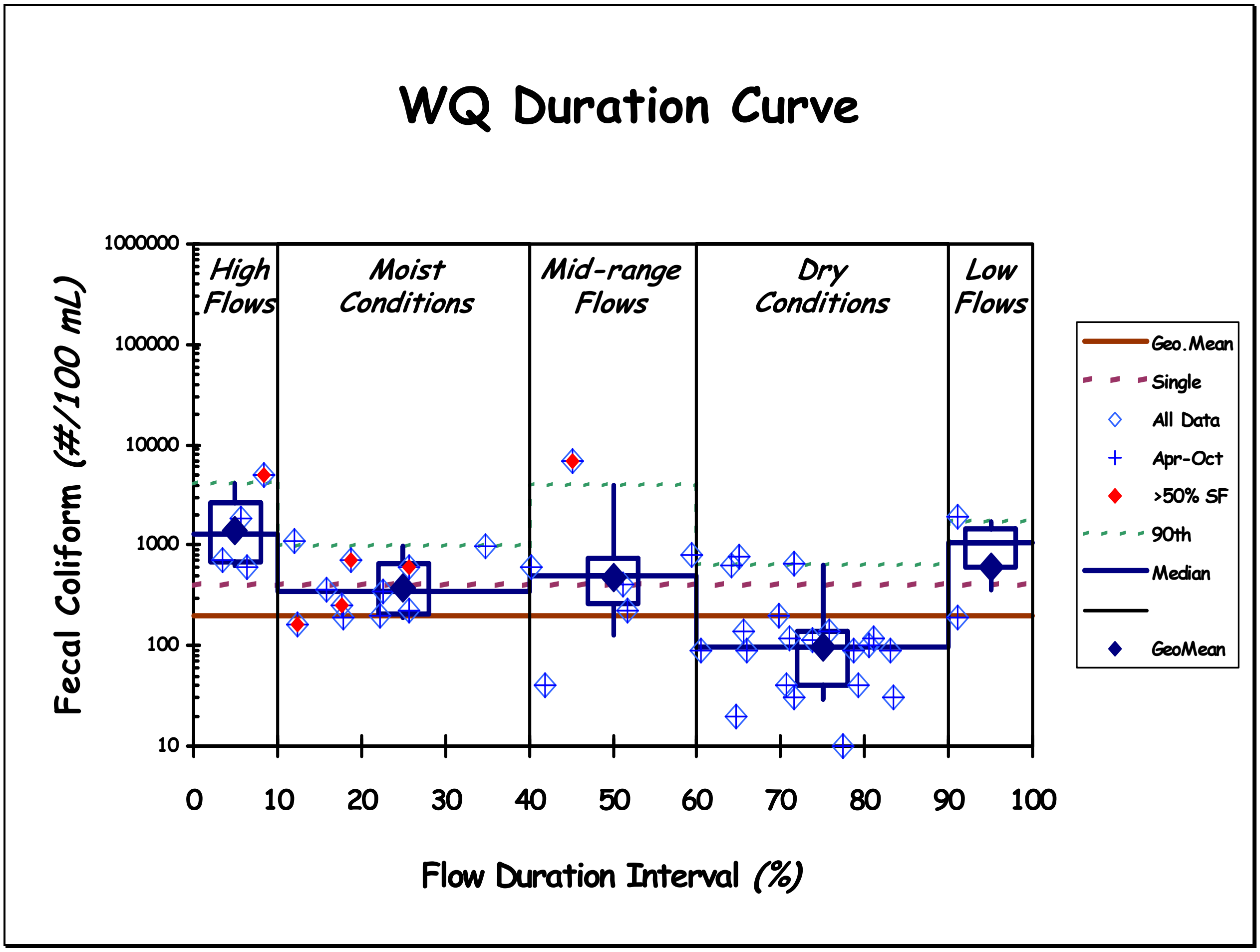


6. TMDL Development

Illinois EPA is using the Duration Curve Method to develop pathogen TMDLs. Appendix B contains Bruce Cleland's 2003 paper entitled *TMDL development form the "bottom up"- part III: duration curves and wet-weather assessments* for more information on the duration curve method.

Water quality duration curves provide a display of the water quality criterion exceedences and the flow conditions associated with it (refer to Figure 16). Flows are ranked from extremely low flows, which are exceeded nearly 100 percent of the time, to extremely high flows, which are rarely exceeded.

Figure 16. Water Quality Durvation Curve



Water quality duration curves for all segments are contained in Appendix A along with the time series fecal coliform data.

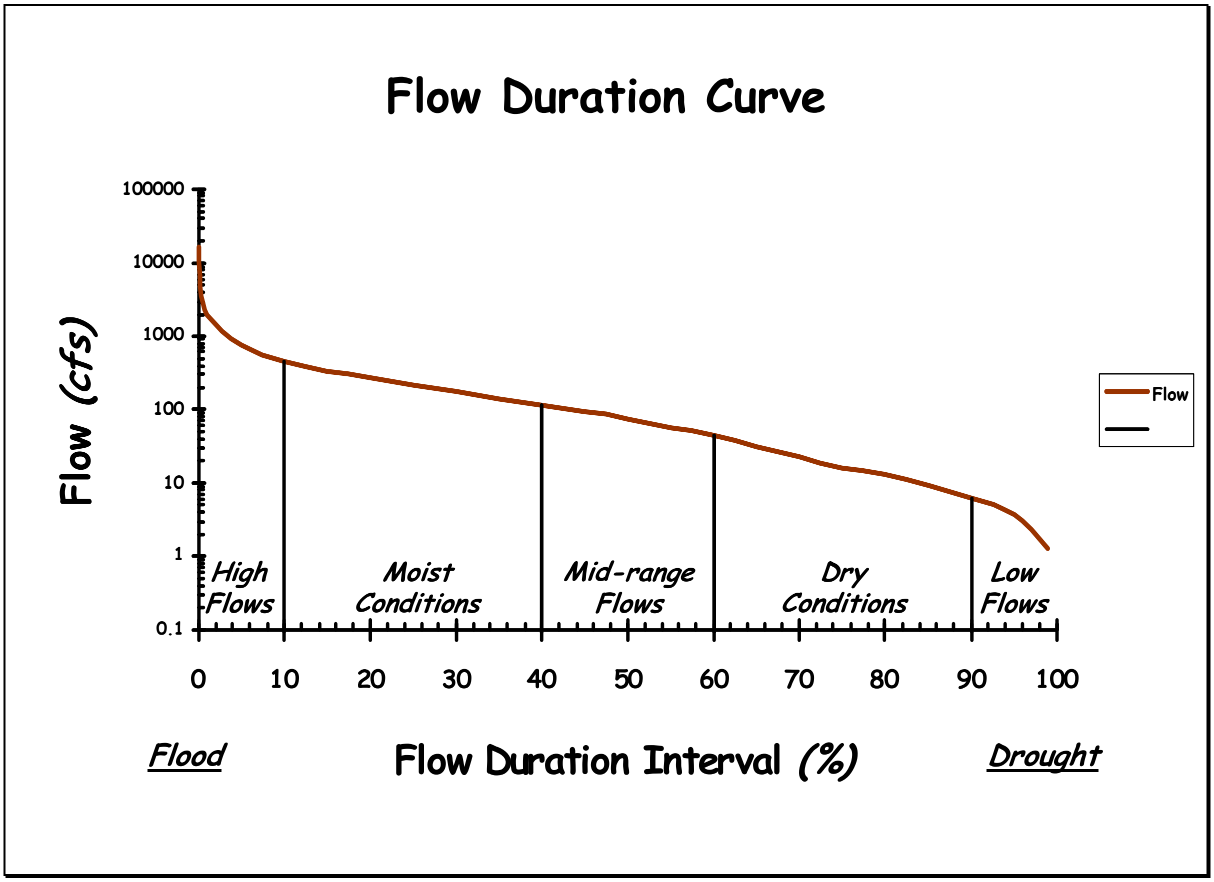
A load duration curve uses the water quality data multiplied by the flow to give a load (refer to Figure 18). The curve is the water quality standard multiplied by the flow. By displaying instantaneous loads calculated from ambient water quality data and the daily average flow on the date of the sample (expressed as a flow duration curve interval), a pattern develops, which describes the characteristics of the impairment. Loads that plot on or above the curve indicate an exceedence of the water quality criterion, while those below the load duration curve show compliance. The pattern of impairment can be examined to see if it occurs across all flow conditions, corresponds strictly to high flow events, or conversely, only to low flow conditions (Cleland 2003). Fecal coliform loads are shown as blue diamonds on the load duration curve and storm driven data are the red diamonds.

The duration curve analysis method considers how stream flow conditions relate to a variety of pollutant loadings and their sources. Exceedences observed in low flow conditions usually indicate point source influences while high flow exceedences indicate non-point source influences and stormwater.

6.1 Load Duration Curve

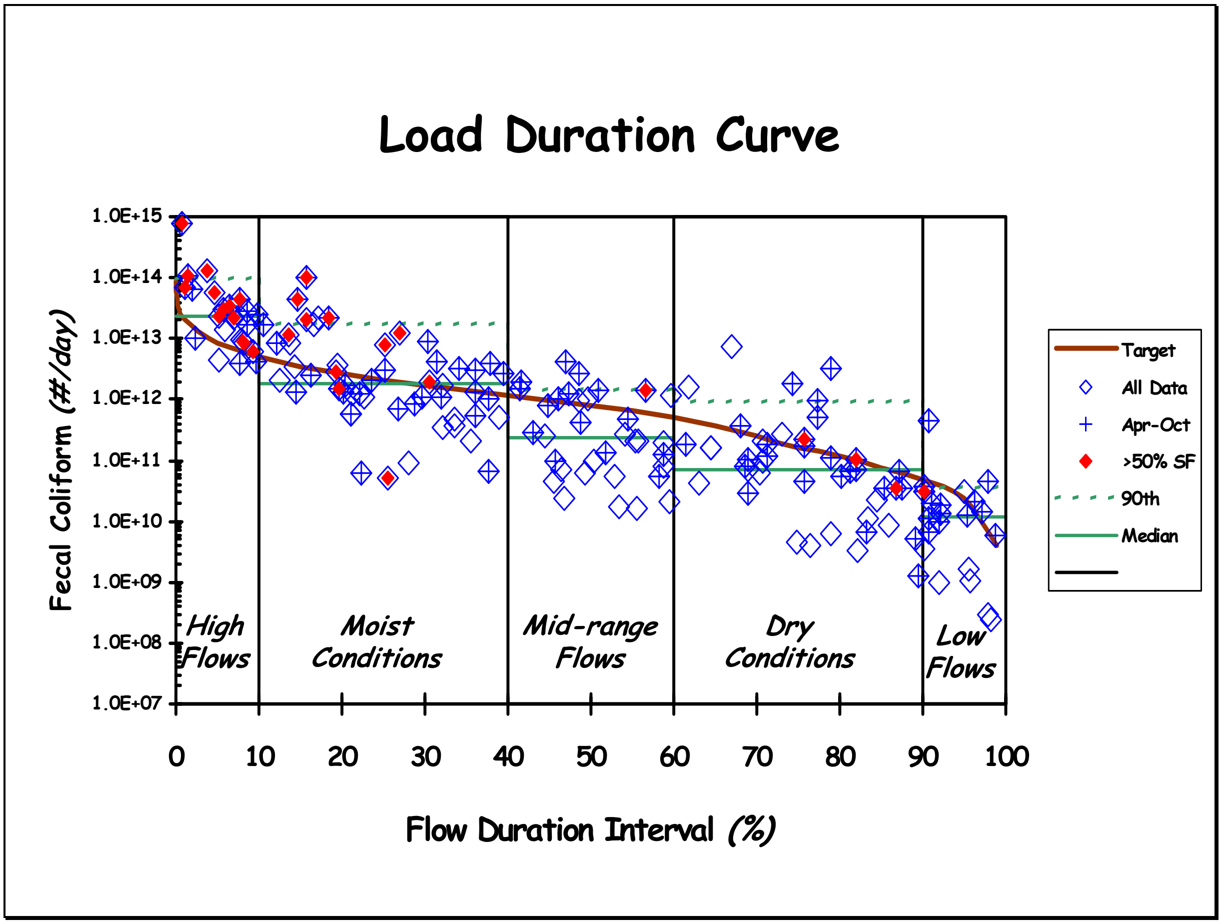
The first step in developing a load duration curve is the flow duration curve, a plot of the flow and the percentage of days flow is exceeded (see Figure 17). USGS stream gages located throughout the watersheds are used for flow data. Flow data is downloaded from the USGS website.

Figure 17. Flow Duration Curve



The percentage of days exceeded is multiplied by the fecal coliform target established as a goal in this TMDL (200cfu/100mL) and a conversion factor, for the maximum allowable load associated with each flow (target load). Then the observed fecal coliform data are multiplied by the daily flow to convert them to loads. The target load and the individual observed loads are plotted. Values above the target load exceed the fecal coliform guideline. Figure 18 is an example of a load duration curve. A load duration curve for all segments will be established.

Figure 18. Load Duration Curve



6.2 TMDL

Allocations

A TMDL is the sum of wasteload allocations (point sources) and load allocations (Nonpoint sources) and natural background such that the capacity of the waterbodies to assimilate pollutant loading is not exceeded. A TMDL must also be developed with seasonal variations and a margin of safety that addressed uncertainty in the analysis.

This TMDL will determine the maximum fecal coliform load the waterbodies can receive to fully support the designated use of primary contact (swimming). Current loads are determined and if they exceed the allowable a load reduction will be given.

The wasteload allocations include both permitted point sources and septic system failure estimates from systems directly discharging to waters. The total daily streamload uses the fecal coliform bacteria geometric mean for the last ten years of data for each specific station and the average flow. Geometric means were looked at for each flow duration interval (see Table 15). The load is the total daily streamload minus the WL.

Allowable fecal coliform concentrations were determined to be 200 cfu/100ml. Allowable wasteloads used the designed average flows from each point source and the effluent limit of 400 cfu/100ml. There are no allowable septic loads because it is illegal to dump untreated waste into streams, so septic loads have to be totally reduced. The allowable load is the total allowable streamload minus the allowable wasteload. Appendix A contains all specific calculations for each stream segment.
Table 16 contains all the allocations for each segment.

Table 15. Geometric Mean at Flow Intervals

	Flow Intervals					
Segments	0-10	11-40	41-60	61-90	90-100	Geo Mean
EID 04	779	938	626	581	227	570
EIE 04	1300	190	519	399	428	466
EIE 05	547	929	696	678	747	709
EI 06	638	551	571	453	311	490
EIG 01	1310	546	346	228	240	423
EI 02	1404	372	477	95	601	427
EOH 01	477	358	585	211	88	284
EO 02	199	512	169	175	37	162
EO 01	519	614	513	265	140	360
EOA 01	129	371	245	341	282	257
EL 01	1005	2294	2344	619	161	884

Table 16. Wasteload and Load Allocations with Reductions

Segment	Load	Daily Load	Allowable Daily Load	Required Reduction	NPDES Reduction
EID 04	WLA	4.59E+11	1.77E+11	61.45%	7.89%
	LA	1.94E+12	6.63E+11	65.73%	
EIE 04	WLA	1.83E+11	1.18E+11	35.8%	9.4%
	LA	1.86E+12	7.60E+11	59.2%	
EIE 05	WLA	2.21E+11	1.19E+11	45.9%	9.3%
	LA	2.89E+12	7.59E+11	73.7%	
EI 06	WLA	6.72E+10	2.23E+10	66.83%	0.00%
	LA	2.38E+12	9.77E+11	58.97%	
EIG 01	WLA	2.59E+10	4.73E+09	81.8%	0.0%
	LA	1.46E+12	6.99E+11	52.2%	
EI 02	WLA	8.38E+11	3.55E+11	57.6%	7.2%
	LA	1.16E+13	5.47E+12	52.8%	
EOH 01	WLA	2.70E+10	7.76E+09	71.2%	0.0%
	LA	9.73E+11	6.96E+11	28.4%	
EO 02	WLA	7.64E+10	3.33E+10	56.38%	0%
	LA	1.84E+12	2.33E+12	0.00%	
EO 01	WLA	1.25E+11	6.25E+10	49.9%	0.0%
	LA	4.13E+12	2.30E+12	44.3%	
EOA 01	WLA	1.06E+12	6.78E+11	35.9%	0.0%
	LA	1.98E+12	1.68E+12	14.8%	
EL 01	WLA	2.98E+11	1.14E+09	99.6%	0.0%
	LA	9.06E+11	2.71E+11	70.1%	

Waters needing NPDES reductions have facilities in their watershed that are exceeding their effluent limit of 400 cfu/100ml. Facilities should be meeting their effluent limit.

The geometric mean for each interval can show which flow periods need reductions (see Table 17). This can be used to look at implementation opportunities.

Table 17. Geometric Means and for Flow Intervals

<table>
<tr><th rowspan="2"></th><th colspan="5">Duration Curve Zone
Geometric Mean (cfu/100ml)</th></tr>
<tr><th>High</th><th>Moist</th><th>Mid</th><th>Dry</th><th>Low</th></tr>
<tr><td>Sugar Creek (EID 04)</td><td>779</td><td>938</td><td>626</td><td>581</td><td>227</td></tr>
<tr><td>Kickapoo Creek (EIE 04)</td><td>1300</td><td>190</td><td>519</td><td>399</td><td>428</td></tr>
<tr><td>Kickapoo Creek (EIE 05)</td><td>547</td><td>929</td><td>696</td><td>678</td><td>747</td></tr>
<tr><td>Salt Creek (EI 06)</td><td>638</td><td>551</td><td>571</td><td>453</td><td>311</td></tr>
<tr><td>Lake Fork (EIG 01)</td><td>1310</td><td>546</td><td>346</td><td>228</td><td>240</td></tr>
<tr><td>Salt Creek (EI 02)</td><td>1404</td><td>372</td><td>477</td><td>95</td><td>601</td></tr>
<tr><td>Flat Branch (EOH 01)</td><td>477</td><td>358</td><td>585</td><td>211</td><td>88</td></tr>
<tr><td>S. Fk. Sangamon R. (EO 02)</td><td>199</td><td>512</td><td>169</td><td>175</td><td>37</td></tr>
<tr><td>S. Fk. Sangamon R. (EO 01)</td><td>519</td><td>614</td><td>513</td><td>265</td><td>140</td></tr>
<tr><td>Sugar Creek (EOA 01)</td><td>129</td><td>371</td><td>245</td><td>341</td><td>282</td></tr>
<tr><td>Spring Creek (EL 01)</td><td>1005</td><td>2294</td><td>2344</td><td>619</td><td>161</td></tr>
<tr><td rowspan="6">Seasonal Considerations
[most likely zone(s) by month]</td><td></td><td colspan="2">*May*</td><td></td><td></td></tr>
<tr><td></td><td colspan="3">*June*</td><td></td></tr>
<tr><td></td><td></td><td colspan="2">*July*</td><td></td></tr>
<tr><td></td><td></td><td></td><td>*August*</td><td></td></tr>
<tr><td></td><td></td><td></td><td>*September*</td><td></td></tr>
<tr><td></td><td></td><td colspan="2">*October*</td><td></td></tr>
<tr><td rowspan="6">Implementation Opportunities</td><td colspan="2">*Long-term CSO plans*</td><td></td><td colspan="2">*Municipal NPDES*</td></tr>
<tr><td></td><td colspan="4">*On-site wastewater management*</td></tr>
<tr><td></td><td colspan="4">*Pasture management & riparian protection*</td></tr>
<tr><td colspan="5">*Urban storm water management*</td></tr>
<tr><td colspan="4">*Open lot agreements*</td><td></td></tr>
<tr><td colspan="2">*Manure management*</td><td></td><td></td><td></td></tr>
</table>

Margin of Safety

Section 303(d)(1)C of the Clean Water Act and USEPA's regulations at 40 CFR 130.7 require that "TMDLs shall be established at levels necessary to attain and maintain the applicable narrative and numerical water quality standards with seasonal variations and a margin of safety which takes into account any lack of knowledge concerning the relationship between effluent limitations and water quality." The margin of safety can either be implicitly incorporated into conservative assumptions used to develop the TMDL or added as a separate explicit component of the TMDL (USEPA, 1991). An implicit margin of safety was used in this report. Fecal die off rates were not used in any calculations. Because the maximum amount of fecal coliform bacteria is used, an overly conservative result is likely.

Seasonality

Seasonality is addressed by expressing the TMDL in terms of the fecal coliform standard for total body contact during the recreational season (May through October) as defined by 35 IL Adm. Code

302.209. Because this is concentration-based TMDL, fecal coliform standard will be met regardless of flow conditions in the applicable season. Seasonal data for fecal coliform samples, flow averages and NPDES monitoring data were used.

Critical Conditions

Each stream segment may have a different critical condition. The load duration curve shows the flow period(s) where there are standard exceedences, which can tie into the sources at those flow conditions. Critical conditions for each segment will be discussed in the implementation plan.

6.3 Implementation

The implementation plan is being done separately for this TMDL. It will be discussed at the next public meeting.

6.4 Public Participation

The public participation process for TMDLs is addressed through the use of a series of public meetings and reports made available to the public. The purpose of the public meetings is to provide information on the TMDL process and to take comments on the draft report. For the first public meetings, Illinois EPA sent out public notices to five newspapers in the watershed; the State Journal Register in Springfield, the Breese Courier in Taylorville, The Courier in Lincoln, The Pantagraph in Bloomington/Normal and the Daily Journal in Clinton. Over 200 public notices were also sent out to organizations/individuals such as the Farm Bureau, Soil and Water Conservation Districts, Extension offices, congress people, and county/ city /village officials. The public notice stated the date and location of the two meetings, July 5th in Lincoln and 6th in Springfield, the intent of the meetings, locations of the Draft Stage One Report and the meeting closure date of July 22. The Report is available online at the TMDL website, www.epa.state.il.us/water/tmdl, and hard copies were mailed to the Lincoln College Library, the Springfield Lincoln Library, the Bloomington Public Library, the Clinton Warner Library, and the Taylorville Public Library. The second public meeting was held August 10th in the Lincoln Library in Springfield and the comment period was open until August 26th. Comments and responses are in Appendix D, the Responsiveness Summary.

7. References

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Appendix A

Individual Watersheds

Appendix A. Individual Watersheds

This appendix contains information specific to the individual waters. For all specific land use acres and percentages refer to Appendix C. The time series graphs display the fecal coliform data by date. The water quality duration curve displays the data by flow. Allocations were based on the geometric mean of flow intervals and average seasonal flow for each stream segment.

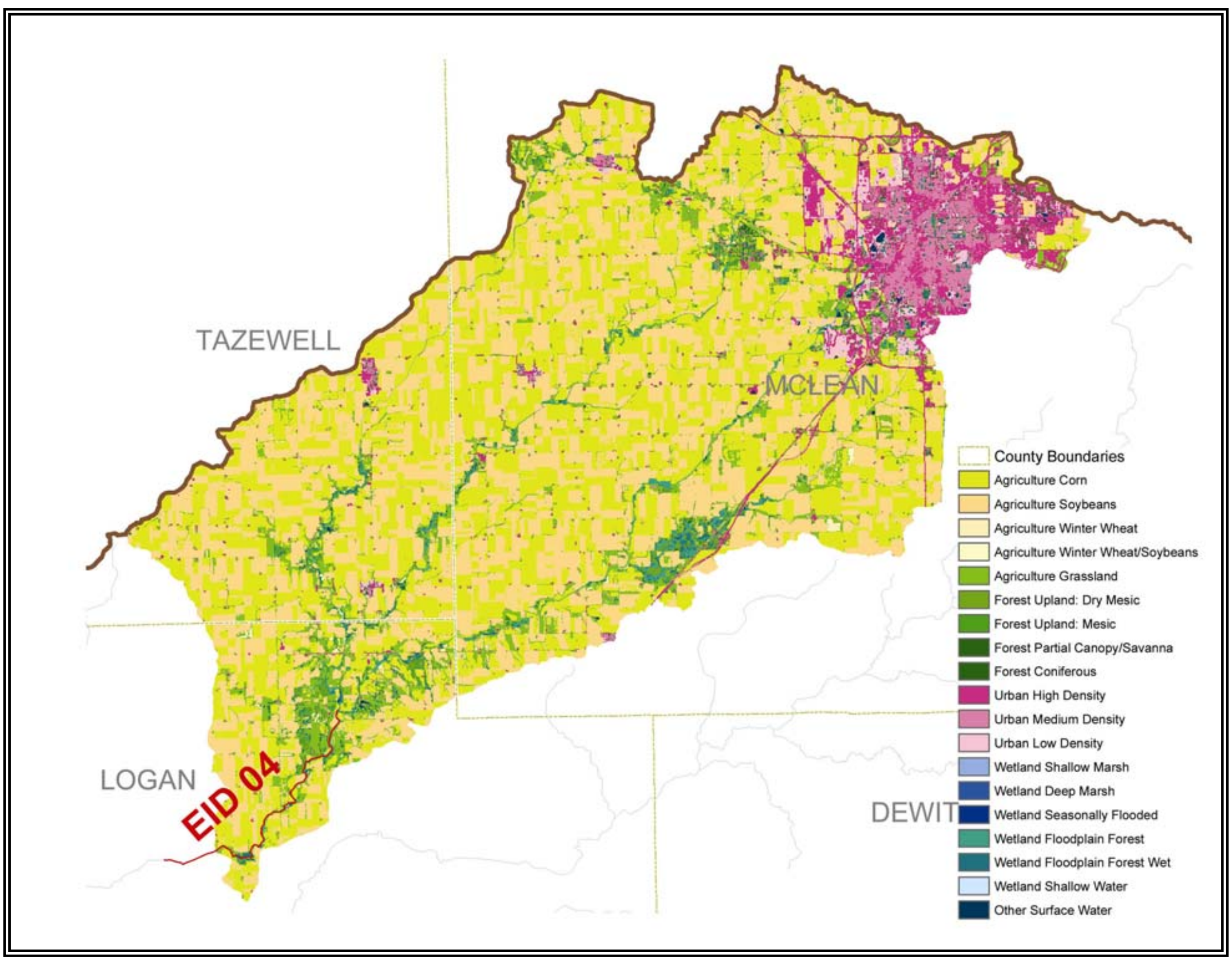
1. Salt Creek of Sangamon River Watershed

A. Segment EID 04- Sugar Creek Watershed

Watershed Description

Sugar Creek Watershed is approximately 210,650 acres (329 square miles) and contains Sugar Creek, which is 57.22 miles long. It flows into the Salt Fork of Sangamon River. Two segments of Sugar Creek are impaired. Sugar Creek (EID 04) is 9.79 miles long and is impaired for fecal coliform bacteria with a potential source of unknown. Segment EID C1, upstream of EID 04 (see Figure 3 for location), is 21.6 miles long and impaired for two impairments: total nitrogen with a potential source of urban runoff/storm sewer; and habitat alteration with potential sources of hydromodification, channelization, habitat modification, and removal of riparian vegetation. This TMDL will address fecal coliform in Sugar Creek.

Figure 1. Land Use in Sugar Creek Watershed

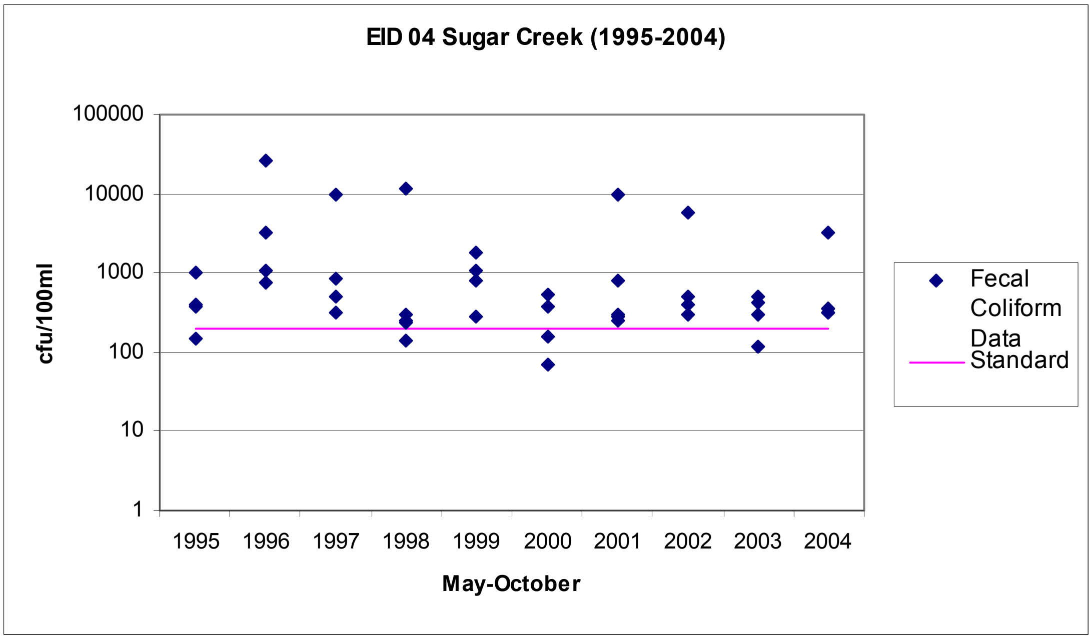


Land use is mainly agricultural with 77% cultivated crops (mostly corn and soybeans) and 9% rural grassland. 10% of the watershed is urban, 2% is forest, and 2% is forest floodplain (see Figure 1). The majority of agriculture land in McLean, Tazewell and Logan Counties are farmed using conventional tillage for corn and conservation tillage for soybeans.

Fecal Coliform Data Assessment

For 1995-2004, there are 43 seasonal samples (May through October) from station EID 01. Out of those, 38 were over 200 cfu/100ml and 22 were over 400 cfu/100ml. A time series plot for fecal coliform samples are in Figure 2.

Figure 2. Time Series Fecal Coliform Data for EID 04.



Potential Sources

There are 18 pipes NPDES permitted to discharge into Sugar Creek (Deer Ridge Homeowners Association has six). Eight of the facilities have fecal coliform bacteria exemptions and do not have to monitor for bacteria. For these exempt facilities, 200 cfu/100ml is used for the discharge. Seven of the facilities that monitor have discharge data that exceed the effluent standard of 400 cfu/100ml. Table 1 has the facilities that monitor and the mean of discharge data.

Bloomington/Normal is one of the largest and fastest growing communities in this watershed. Stormwater runoff from this city is a potential source of bacteria. Both Bloomington and Normal have MS4 stormwater permits. Bloomington has 15,424 municipal acres (24 square miles) and 75 percent of these are in the Sugar Creek Watershed. Normal has 10,425 municipal acres (16 square miles) and 90 percent are in the Sugar Creek Watershed. Ten Percent of the Sugar Creek Watershed contains MS4 stormwater permits.

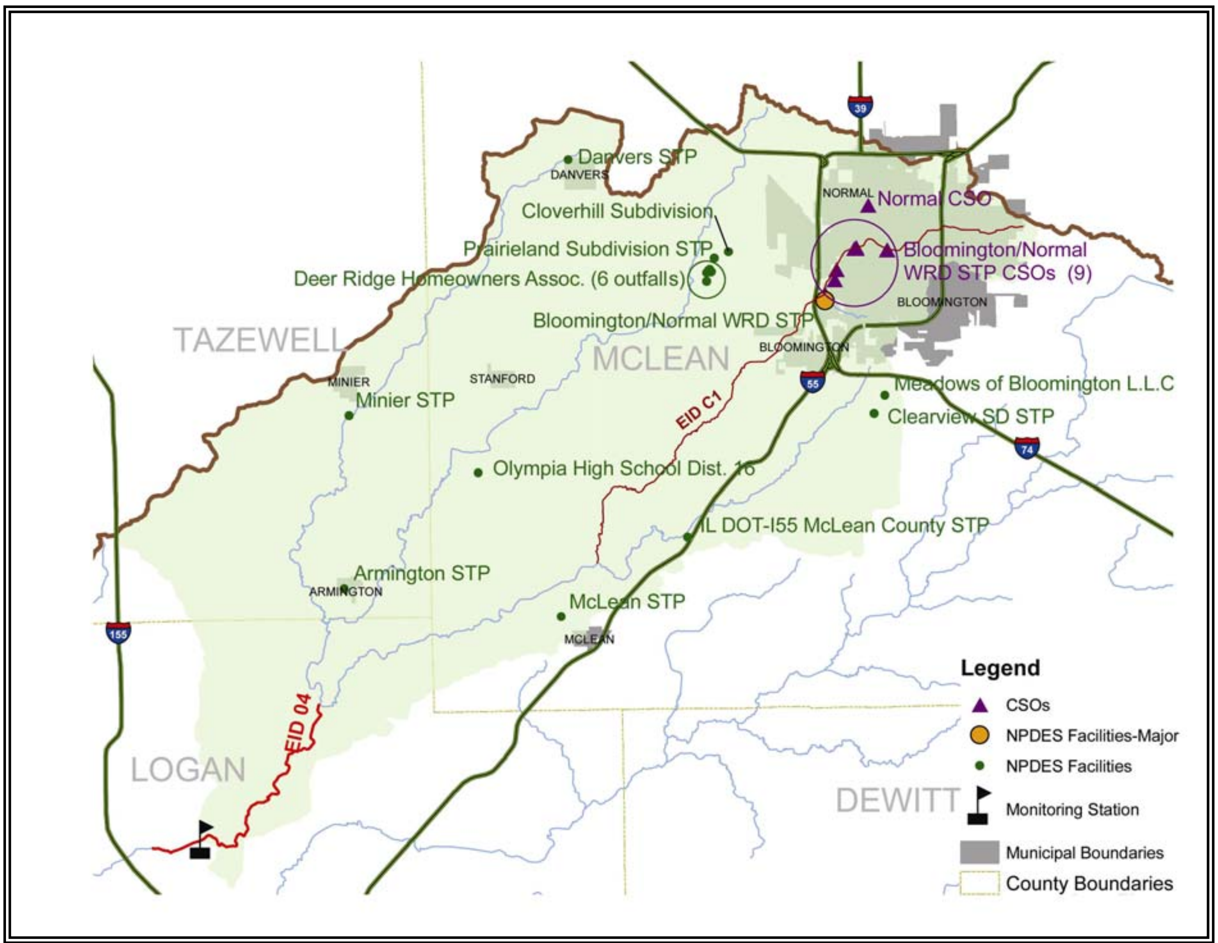
Bloomington/Normal has nine CSOs and Normal has one CSO in the watershed. It is estimated that 24 households have failing septic systems in this watershed and 4.5 of those households have systems directly discharging into streams. McLean and Logan counties have high livestock densities compared to other counties in the watershed. Hogs and pigs make up the majority of animals. Counties in this watershed have low to medium deer densities. Bloomington/Normal STP does land apply biosolids in the watershed.

Table 1. NPDES Facilities in the Sugar Creek Watershed

NPDES ID	Facility Name	Design Average Flow (MGD)	Exempt	DMR Data	Exceed-ences/ Total	Mean of Discharge (cfu/ 100ml)	Discharge cfu/ 100ml/ MGD	Max. Permitted Discharge (cfu/ 100ml/ MGD)
IL0044806	Armington STP	0.04	YR			200	8	8
IL0027731	**Bloomington/Normal WRD STP**	**22.5**	YR			200	4500	4500
IL0059412	Clearview SD STP	0.0191		94-04	0/5	62.2	1.18802	7.64
IL0072168	Cloverhill Subdivision	0.0084		98-04	0	0	0	3.36
ILG580059	Danvers STP	0.14	YR			200	28	28
IL0070823	Deer Ridge Homeowners Assn	0.0039		95-04	19/27	4829	18.8331	1.56
IL0070823	Deer Ridge Homeowners Assn	0.0018		95-04	11/20	1395	2.511	0.72
IL0070823	Deer Ridge Homeowners Assn	0.0028		95-04	26 of 50	2248	6.2944	1.12
IL0070823	Deer Ridge Homeowners Assn	0.0028		95-04	8 of 10	2378	6.6584	1.12
IL0070823	Deer Ridge Homeowners Assn	0.0021		95-04	3 of 12	1135	2.3835	0.84
IL0070823	Deer Ridge Homeowners Assn	0.0081		95-04	11 of 27	3493	28.2933	3.24
IL0062278	IL DOT I-55 McLean County STP	0.005		93-96	0 of 11	11	0.055	2
ILG580162	McLean STP	0.205	YR			200	41	41
IL0050121	Meadows of Bloomington	0.065		95-04	19 of 55	5876	381.94	26
ILG580098	Minier STP	0.18	YR			200	36	36
ILG551022	Olympia High School	0.0318	YR			200	6.36	6.36
IL0074756	Prairieland Subdivision	0.018	S	?		400	7.2	7.2
	Total						5074.717	4674.16

S=Seasonal Exemption
YR=Year Round Exemption

Figure 3. Point Sources in the Sugar Creek Watershed



Allocations

Loads **Sugar Creek**

Total Load-	Geo Mean (cfu/ml)	Annual Seasonal Flow (MGD)	gal/MGD	L/gal	mL/L	cfu/d
	5.7	111	1,000,000	3.785	1000	**2.39E+12**
MS4 Loads	Total Load cfu/d	Ratio MS4 Acres in Watershed	cfu/d			
	2.39E+12	0.099	2.37E+11			
Permitted Wasteload (with DMR data)-	NPDES Discharge (cfu/ml/MGD)	gal/MGD	L/gal	mL/L	cfu/d	
	50.7471672	1,000,000	3.785	1000	1.92E+11	
Septic Wasteload -	Households	fecal conc(cfu/ml)*	discharge (gal/person/d)	people/ house	ml/gal	cfu/d
	4.5	1.00E+04	70	2.5	3785.2	2.98E+10
Wasteload-	MS4	Permitted WL	Septic	cfu/d		
	2.37E+11	1.92E+11	2.98E+10	**4.59E+11**		
Load-	Total Annual Load -	Wasteload =	cfu/d			
	2.39E+12	4.59E+11	**1.94E+12**			

Allowable Load

Permitted Wasteload-	NPDES Discharge (cfu/ml/MGD)	gal/MGD	L/gal	mL/L	cfu/d	
	46.7416	1,000,000	3.785	1000	**1.77E+11**	
Total Allowable Load-	Geo Mean (cfu/ml)	Annual Seasonal Flow (MGD)	gal/MGD	L/gal	mL/L	cfu/d
	2	111	1,000,000	3.785	1000	**8.40E+11**
Load Allowable-	Total Allowable Load	Allowable Wasteload	cfu/d			
	8.40E+11	1.77E+11	**6.63E+11**			

Load	Daily Load	Allowable Daily Load	Required Reduction	NPDES Reduction
WLA	4.59E+11	1.77E+11	61.45%	7.89%
LA	1.94E+12	6.63E+11	65.73%	
Total	2.39E+12	8.40E+11	64.91%	

* Horsley & Witten 1996 10^6/100ml

Discharge data shows that facilities in the watershed have exceeded their effluent standard of 400 cfu/100ml. Facilities need to meet the standard.

Duration Curves and Implementation

Figures 4-7 display the duration curves for Sugar Creek. Table 2 is the geometric mean at each flow interval along with general implementation opportunities.

Figure 4. Duration Curve for Fecal Coliform- 1995-2004

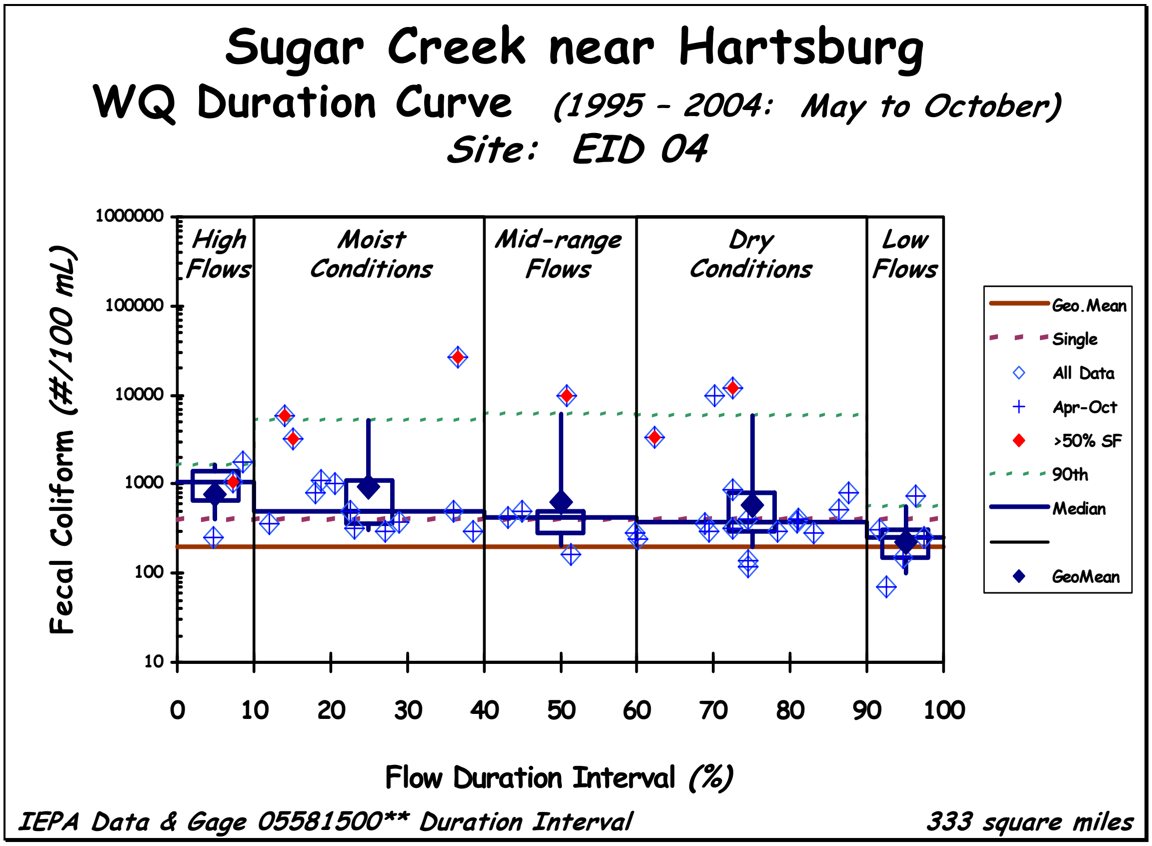


Figure 4. Duration Curve for Fecal Coliform- 1978-2004

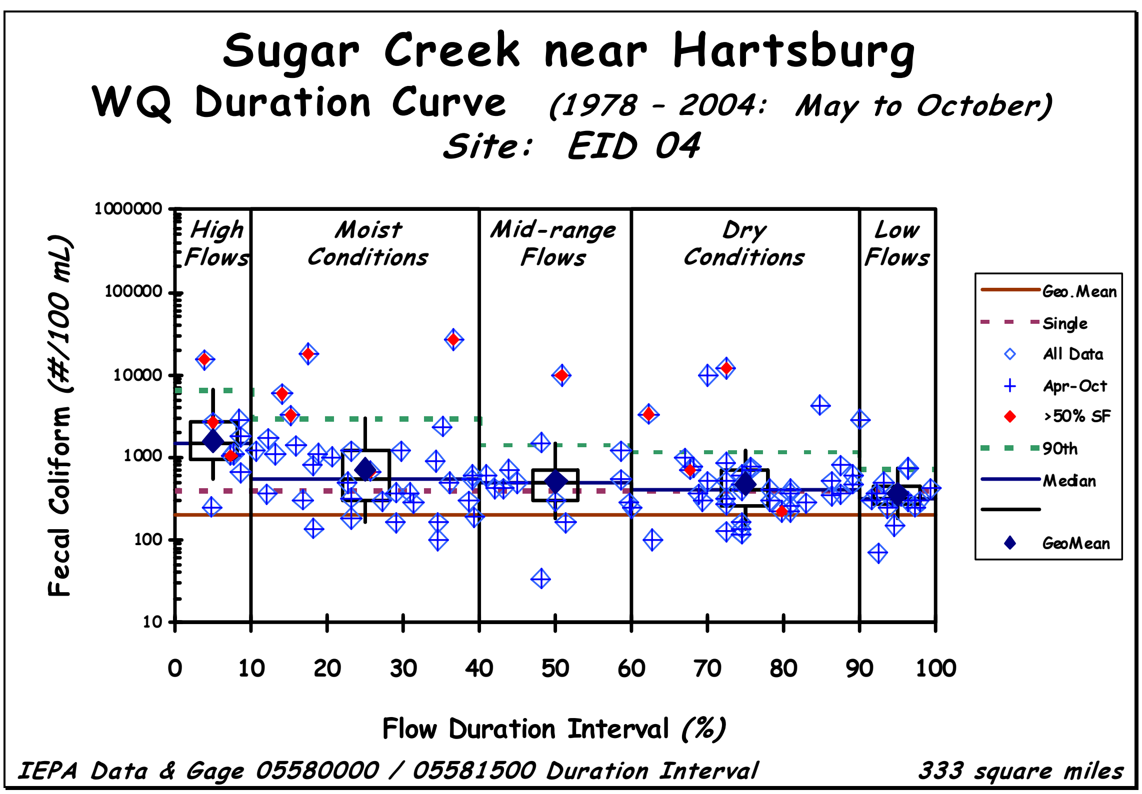


Figure 5. Duration Curve for Phosphorus

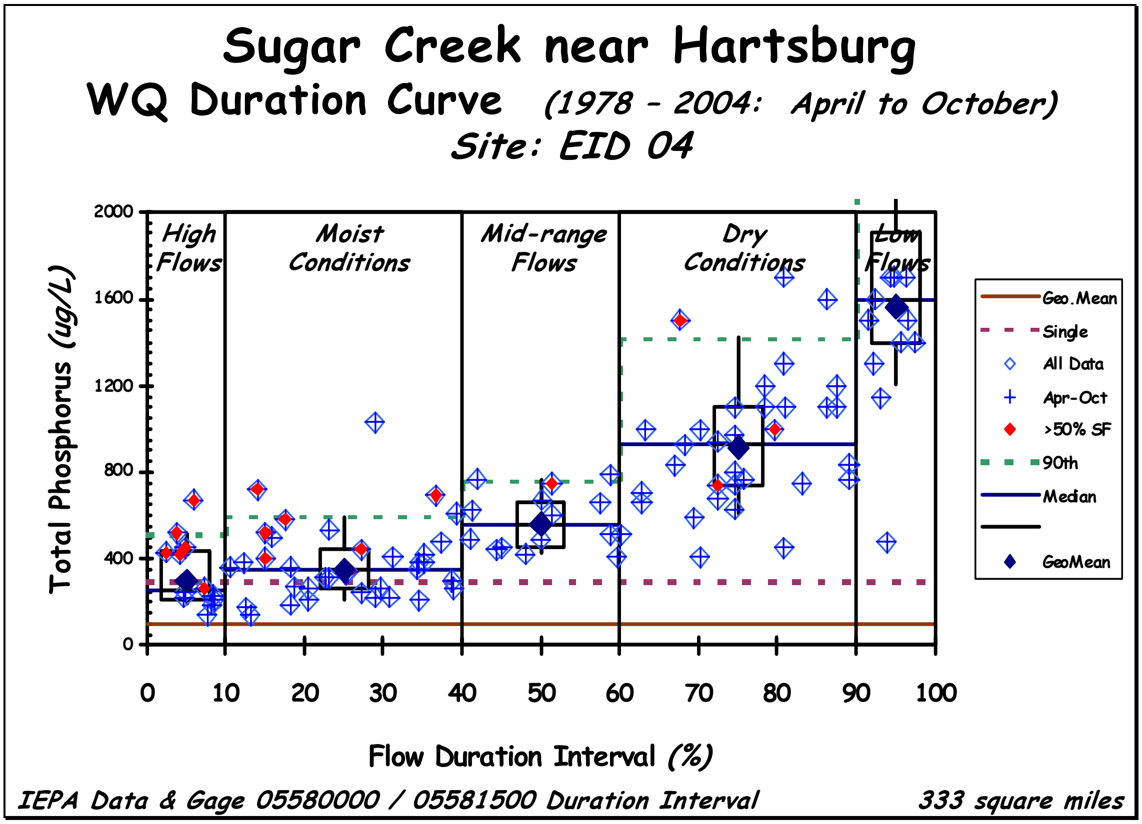


Figure 6. Duration Curve for Nitrite+Nitrate

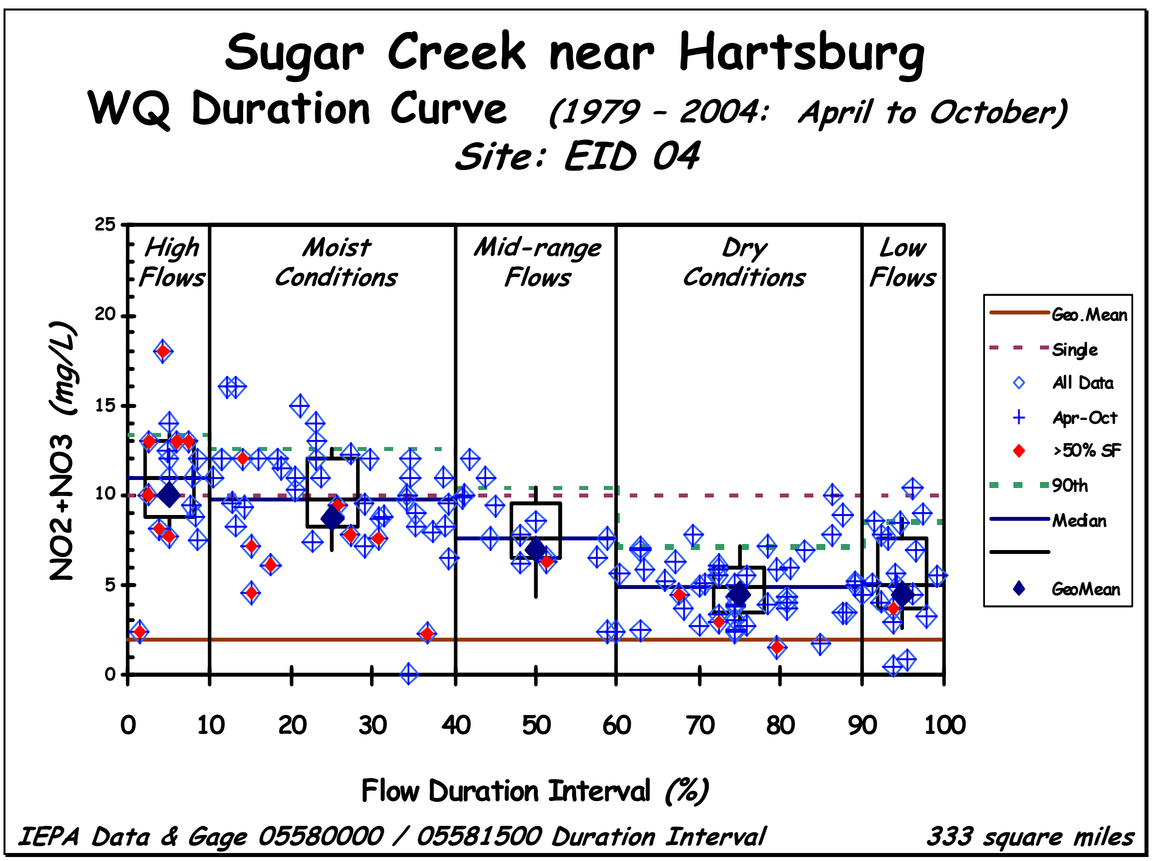


Figure 7. Duration Curve for TSS

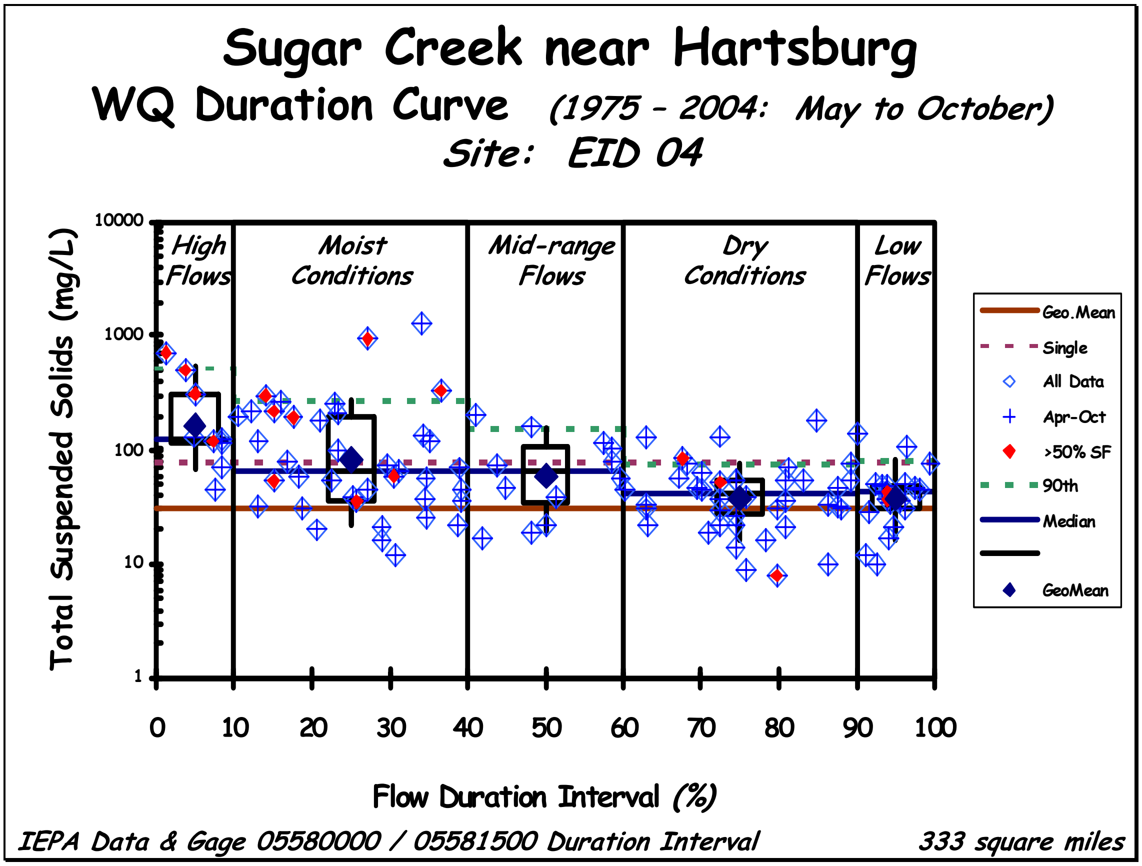


Table 2. Geometric Means at Flow Intervals for EID 04

	Duration Curve Zone Geometric Mean (cfu/100ml)				
	High	**Moist**	**Mid**	**Dry**	**Low**
Sugar Creek (EID 04)	779	938	626	581	227
Seasonal Considerations [most likely zone(s) by month]		*May*			
			June		
			July		
				August	
				September	
			October		
Implementation Opportunities	***Long-term CSO plans***			***Municipal NPDES***	
			On-site wastewater management		
			Pasture management & riparian protection		
			Urban storm water management		
			Open lot agreements		
	Manure management				

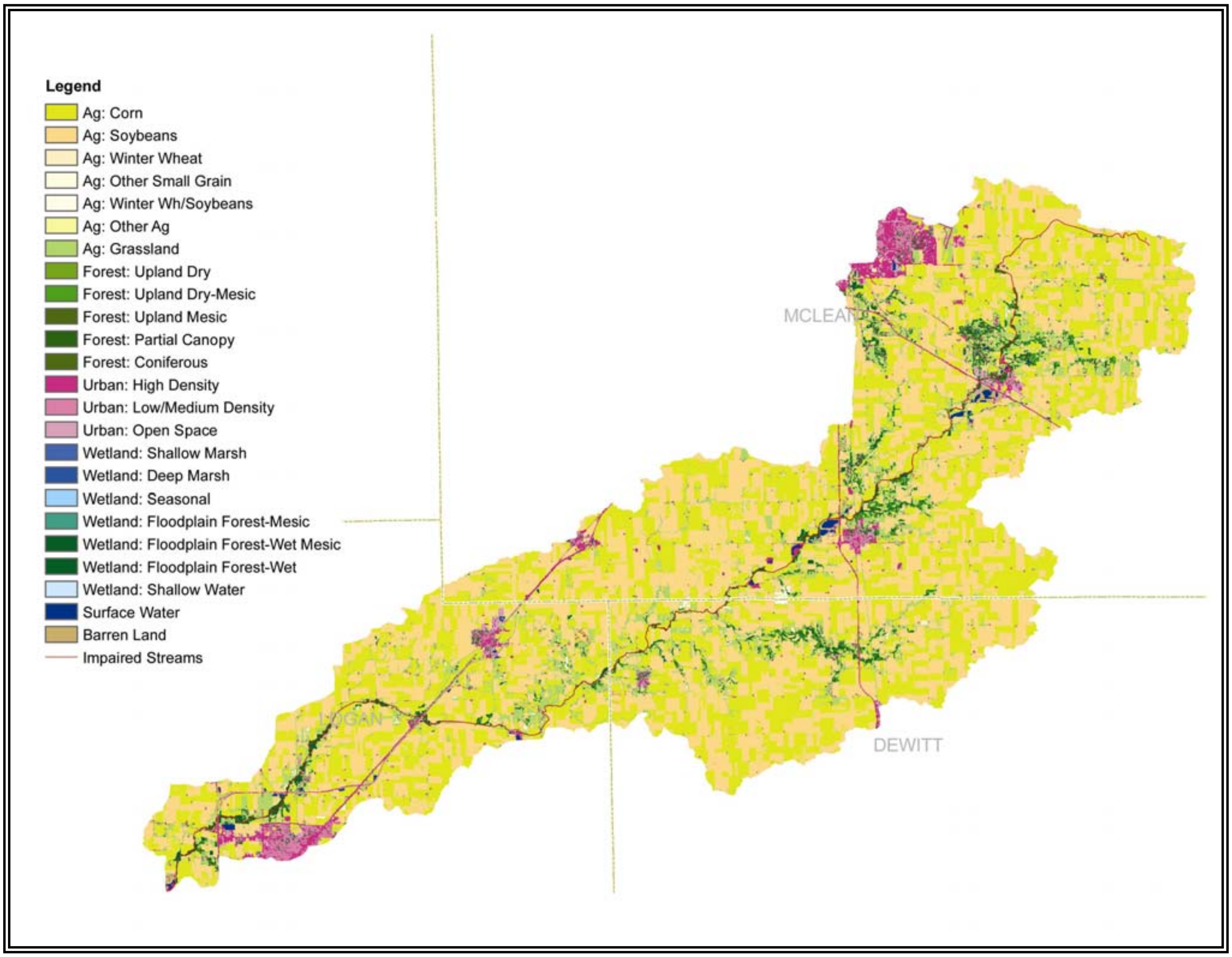
B. Kickapoo Creek EIE 04 and EIE 05

Watershed Description

Kickapoo Creek Watershed is approximately 212,270 acres (332 square miles) and contains the entire Kickapoo Creek (EIE 04 and EIE 05) that is 61.35 miles long. Kickapoo Creek is impaired for fecal coliform bacteria with a potential source of unknown. There is no other impaired stream in this watershed.

Land use is mainly agricultural with 80% cultivated crops (mostly corn and soybeans) and 11 % rural grassland. 5% of the watershed is urban, 2% is forest and 2% is forest floodplain (see Figure 8). The majority of agriculture land in McLean, Dewitt and Logan Counties are farmed using conventional tillage for corn and conservation tillage for soybeans.

Figure 8. Land Use for Kickapoo Creek Watershed



Fecal Coliform Data Assessment

For 1995-2004, there were 43 seasonal samples (May through October) from station EIE 04. Out of those, 30 were over 200 cfu/100ml and 27 were over 400 cfu/100ml. A time series plot for fecal coliform samples are in Figure 9.

For 1995-2004, there were 58 seasonal samples (May through October) from station EIE 05. Out of those, 54 were over 200 cfu/100ml and 46 were over 400 cfu/100ml. A time series plot for fecal coliform samples are in Figure 10.

Figure 9. Time Series Fecal Coliform Data for EIE 04

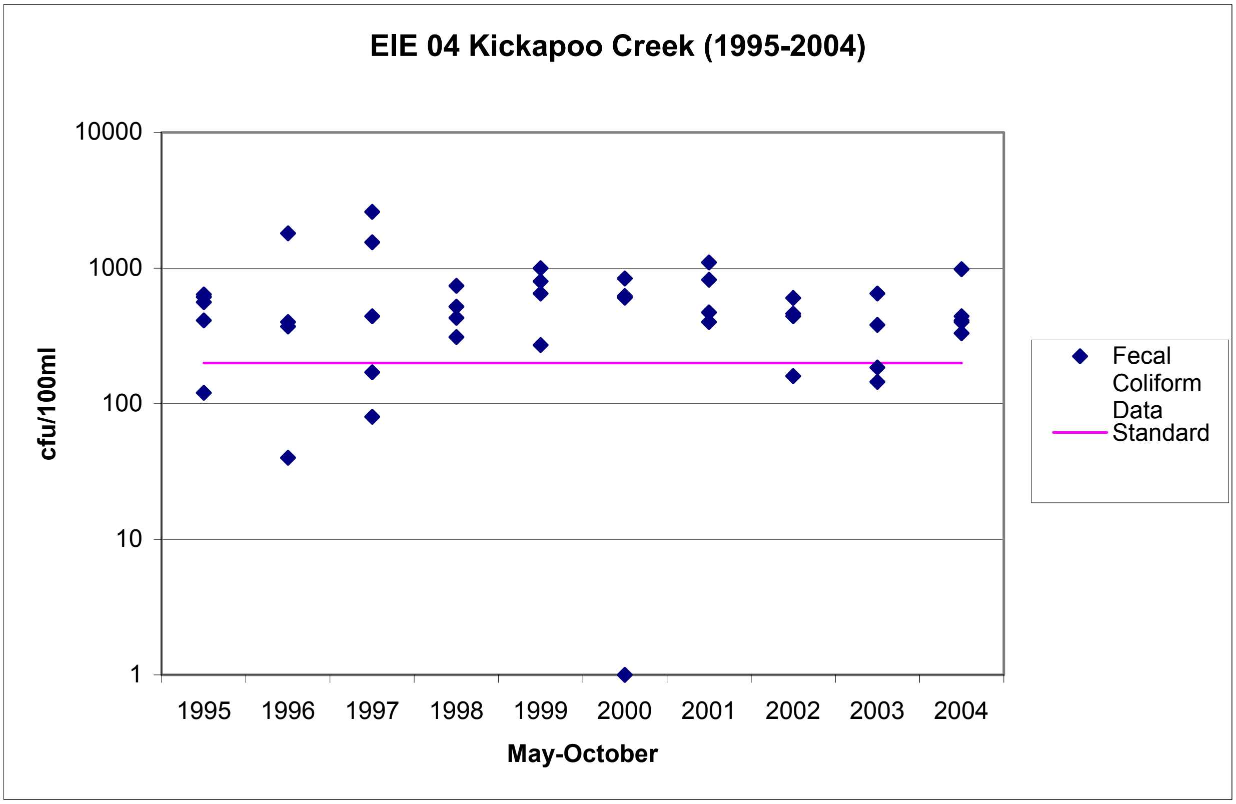
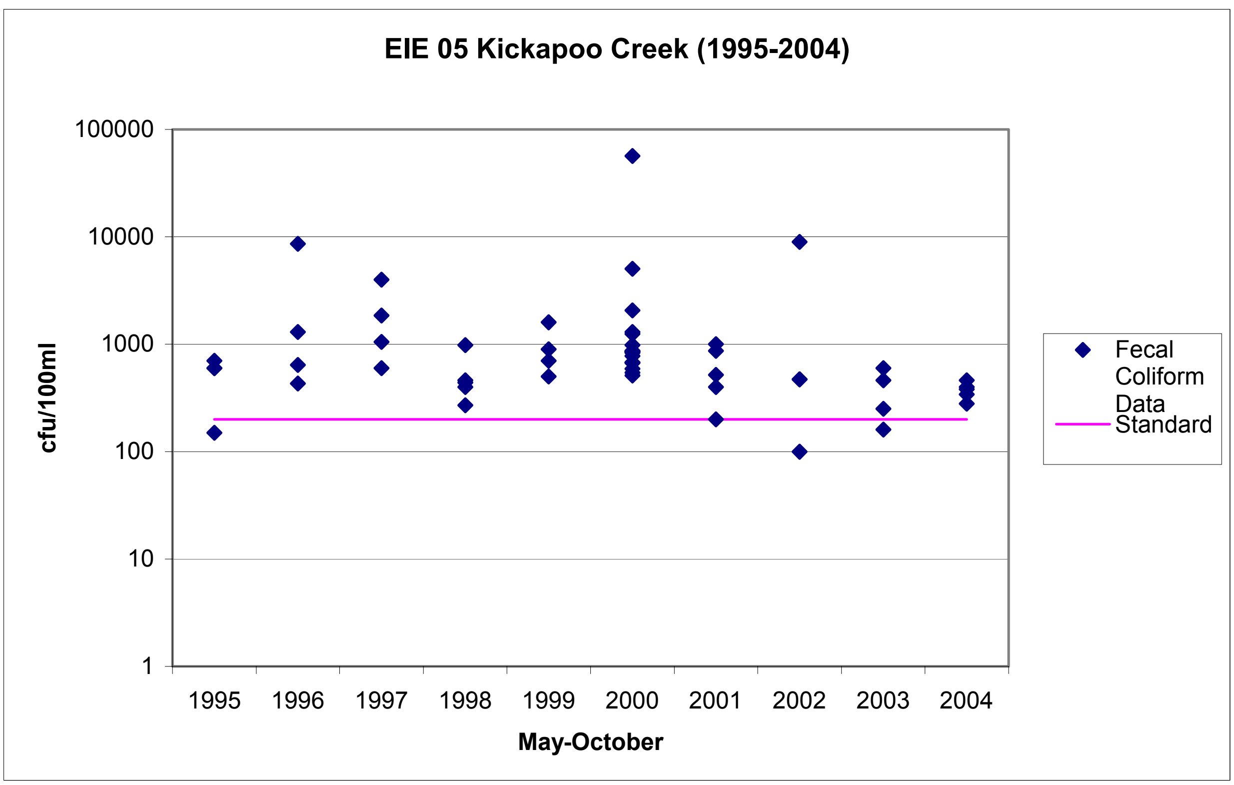


Figure 10. Time Series Data for Fecal Coliform Data for EIE 05



Potential Sources

There are ten facilities permitted to discharge into Kickapoo Creek (see Figure 11). Five of the facilities have fecal coliform exemptions and do not have to monitor for bacteria. For those facilities with exemptions, 200 cfu/100 ml will be used for the discharge. The Bloomington/Normal facility's permit was effective July of this year and no data was found in the permit system. Four subdivisions have all exceeded the permit limits. Lincoln is not included in this watershed because it discharges downstream of the monitoring station.

Bloomington/Normal is one of the largest and fastest growing communities in this watershed. Stormwater runoff from this city is a potential source of bacteria. Bloomington has MS4 stormwater permits. Bloomington has 15,424 municipal acres (24 square miles) and 25 percent of these are in the Kickapoo Creek Watershed. Two Percent of the Kickapoo Creek Watershed contains MS4 stormwater permits.

The only CSO is Lincoln, which is downstream of the monitoring station. It is estimated that 27 houses have failing septic systems in this watershed and 5 of those households have systems directly discharging into streams. McLean and Logan counties have high livestock densities compared to other counties in the watershed. Hogs and pigs are the majority of animals. Counties in this watershed have low to medium deer densities. Lincoln STP is permitted to land apply 900 dry tons of sewage sludge a year in the watershed.

Figure 11. Kickapoo Creek Watershed

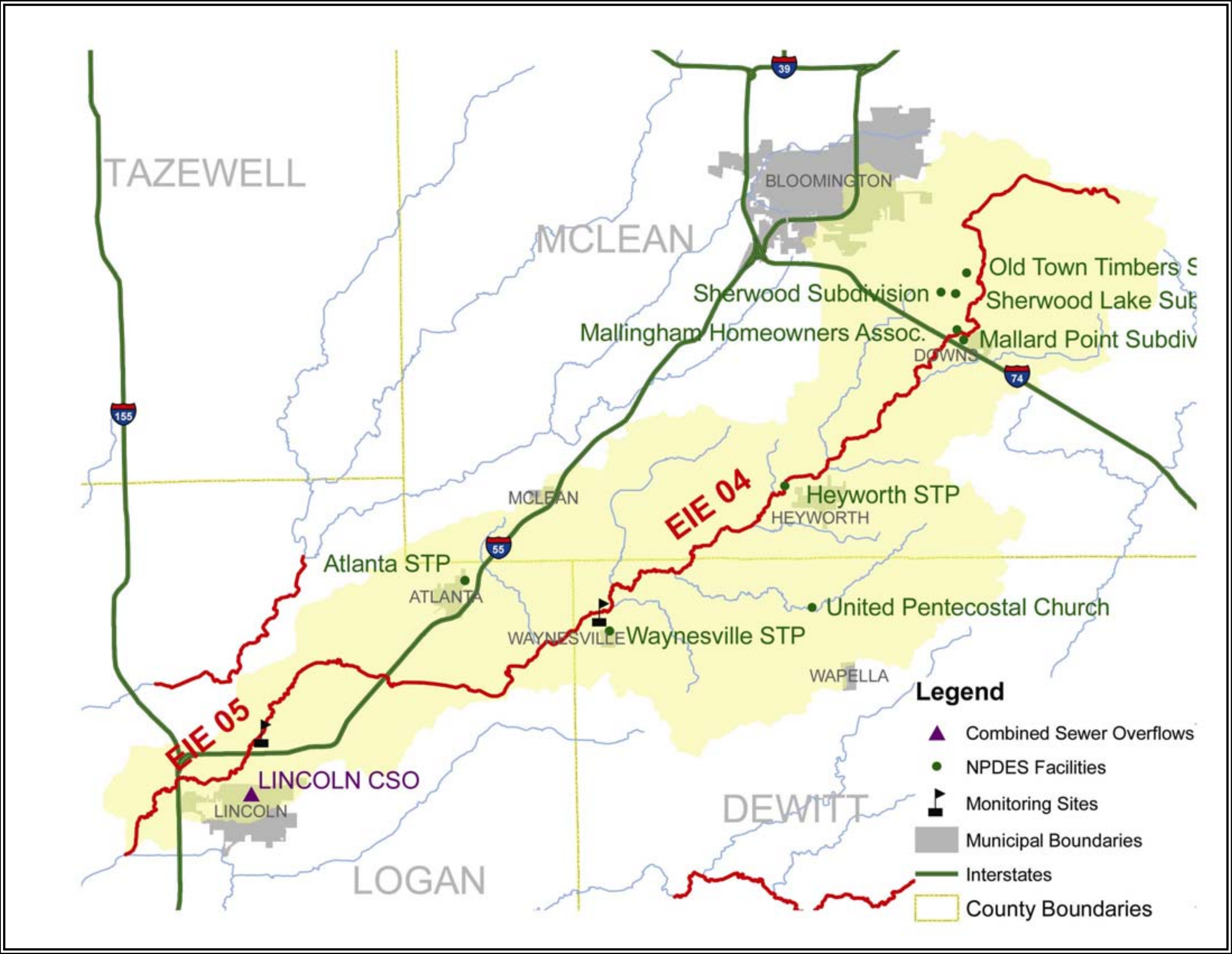


Table 3. NPDES Facilities in the Kickapoo Creek Watershed

NPDES ID	Facility Name	Design Average Flow (MGD)	Exempt	DMR Data	Exceed-ences/ Total	Mean of Discharge (cfu/ 100ml)	Discharge cfu/ 100ml/ MGD	Max. Permitted Discharge (cfu/ 100ml/ MGD)
IL0073504	**BLOOMINGTON/NORMAL SE WRD**	**7.5**		**New Facility**		**400**	**3000**	**3000**
IL0022993	HEYWORTH STP	0.4	YR			200	80	80
IL0071404	MALLARD POINT SUBDIVISION	0.016		96-02	16/21	8920	142.72	6.4
IL0073563	MALLINGHAM HOMEOWNERS ASSN	0.0133		99-04	20/26	4521	60.1293	5.32
IL0071323	OLD TOWN TIMBERS STP	0.008		96-04	14/17	16419	131.352	3.2
IL0075892	SHERWOOD LAKE SUBDIVISION	0.02	S			400	8	8
IL0074551	SHERWOOD SUBDIVISION	0.013		2002-2004	2 of 7	639	8.307	5.2
IL0059331	UNITED PENTECOSTAL CHURCH	0.03	YR			200	6	6
	Kickapoo EIE 04						3436.5083	3114.12
ILG580181	ATLANTA STP	0.1915	YR			200	38.3	38.3
IL0065447	WAYNESVILLE STP	0.011	YR			200	2.2	2.2
	Kickapoo EIE 05						3477.0083	3154.62

Allocations

EIE 04

Annual Loads **Kickapoo 04**

Total Load-	Geo Mean (cfu/ml)	Annual Seasonal Flow (MGD)	gal/MGD	L/gal	mL/L	cfu/d
	4.66	116	1,000,000	3.785	1000	**2.05E+12**
MS4 Load	Total Load (cfu/d)	Ratio MS4 Acres in Watershed	cfu/d			
	2.05E+12	0.018	3.68E+10			
Permitted Wasteload (with DMR data)-	NPDES Discharge (cfu/ml/MGD)	gal/MGD	L/gal	mL/L	cfu/d	
	34.365083	1,000,000	3.785	1000	1.30E+11	
Septic Wasteload -	Households	fecal conc(cfu/ml)*	discharge (gal/person/d)	people/ house	ml/gal	cfu/d
	2.5	1.00E+04	70	2.5	3785.2	1.66E+10
Wasteload-	MS4	Permitted WL	Septic	cfu/d		
	3.68E+10	1.30E+11	1.66E+10	**1.83E+11**		
Load-	Total Annual Load -	Wasteload =	cfu/d			
	2.05E+12	1.83E+11	**1.86E+12**			

Allowable Load

Permitted Wasteload- using effluent limit 400	NPDES Discharge (cfu/ml/MGD)	gal/MGD	L/gal	mL/L	cfu/d	
	31.1412	1,000,000	3.785	1000	**1.18E+11**	
Total Allowable Load-	Geo Mean (cfu/ml)	Annual Seasonal Flow (MGD)	gal/MGD	L/gal	mL/L	cfu/d
	2	116	1,000,000	3.785	1000	**8.78E+11**
Load Allowable-	Total Allowable Load	Allowable Wasteload	cfu/d			

	8.78E+11	1.18E+11	**7.60E+11**

Load	Daily Load	Allowable Daily Load	Required Reduction	NPDES Reduction
WLA	1.83E+11	1.18E+11	35.75%	9%
LA	1.86E+12	7.60E+11	59.18%	
Total	2.05E+12	8.78E+11	57.08%	

* Horsley & Witten 1996 10^6/100ml

EIE 05

Annual Loads **Kickapoo05**

Total Load-	Geo Mean (cfu/ml)	Annual Seasonal Flow (MGD)	gal/MGD	L/gal	mL/L	cfu/d
	7.08	116	1,000,000	3.785	1000	**3.11E+12**
MS4 Load-	Total Load (cfu/d)	Ratio MS4 Acres in Watershed				
	3.11E+12	0.018	5.60E+10			
Permitted Wasteload (with DMR data)-	NPDES Discharge (cfu/ml/MGD)	gal/MGD	L/gal	mL/L	cfu/d	
	34.770083	1,000,000	3.785	1000	1.32E+11	
Septic Wasteload -	Households	fecal conc(cfu/ml)*	discharge (gal/person/d)	people/ house	ml/gal	cfu/d
	5	1.00E+04	70	2.5	3785.2	3.31E+10
Wasteload-	MS4	Permitted WL	Septic	cfu/d		
	5.60E+10	1.32E+11	3.31E+10	**2.21E+11**		
Load-	Total Load -	Wasteload =	cfu/d			
	3.11E+12	2.21E+11	**2.89E+12**			

Allowable Load

Permitted Wasteload-	NPDES Discharge (cfu/ml/MGD)	gal/MGD	L/gal	mL/L	cfu/d	
	31.5462	1,000,000	3.785	1000	**1.19E+11**	
Total Allowable Load-	Geo Mean (cfu/ml)	Annual Seasonal Flow (MGD)	gal/MGD	L/gal	mL/L	cfu/d
	2	116	1,000,000	3.785	1000	**8.78E+11**
Load Allowable-	Total Allowable Load	Allowable Wasteload	cfu/d			
	8.78E+11	1.19E+11	**7.59E+11**			

Load	Estimated Daily Load	Allowable Daily Load	Required Reduction	NPDES Reduction
WLA	2.21E+11	1.19E+11	45.89%	9%
LA	2.89E+12	7.59E+11	73.73%	
Total	3.11E+12	8.78E+11	71.75%	

* Horsley & Witten 1996 10^6/100ml

Discharge data shows that facilities in the watershed have exceeded their effluent standard of 400 cfu/100ml. Facilities need to meet the standard.

Duration Curves and Implementation

Figures 12-21 display the water quality duration curves for Kickapoo Creek EIE 04 and EIE 05. and Table 4 gives the geometric means at each flow interval along with general implementation opportunities.

Figure 12. Duration Curve for Fecal Coliform- 1995-2004

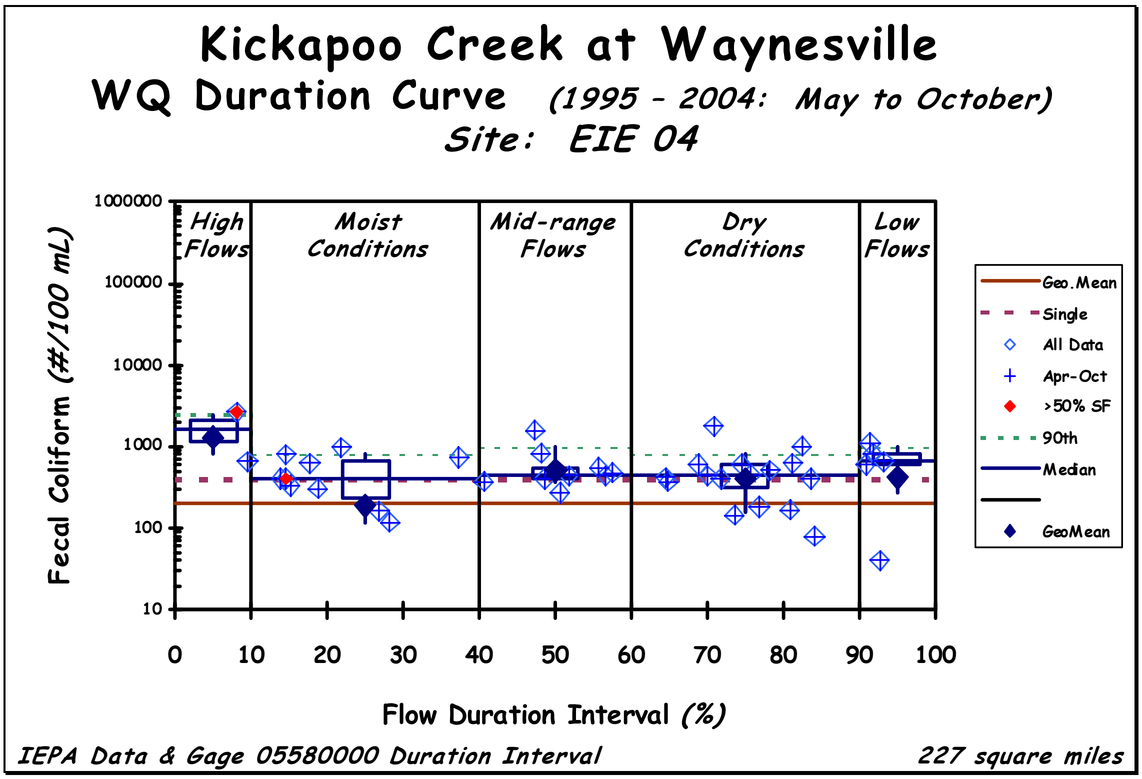


Figure 13. Duration Curve for Fecal Coliform- 1978-2004

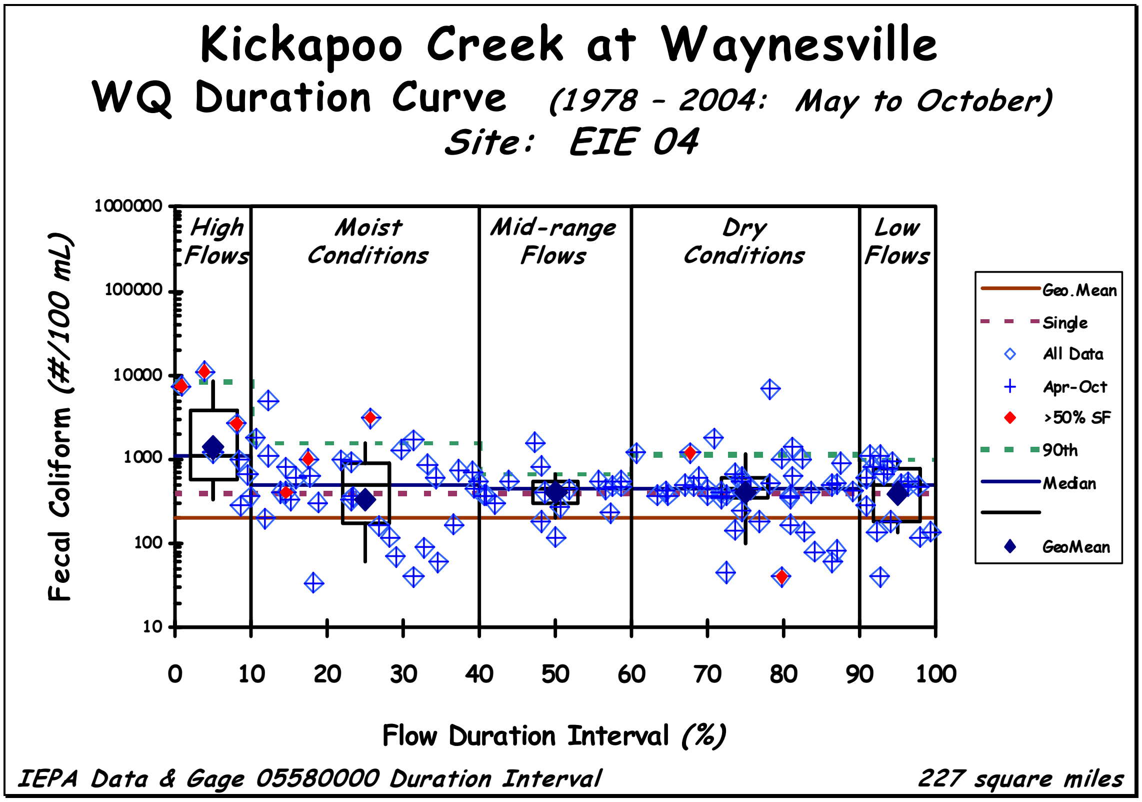


Figure 14. Duration Curve for Phosphorus

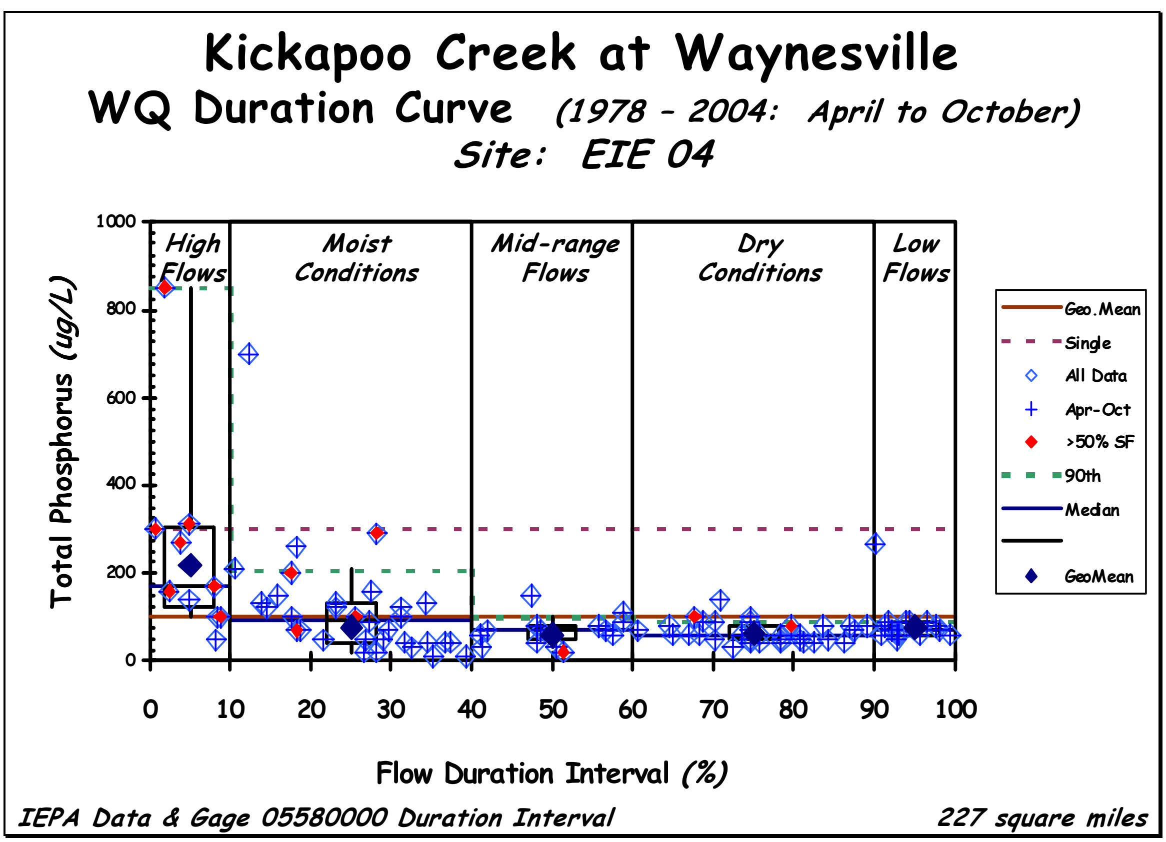


Figure 15. Duration Curve for Nitrite+Nitrate

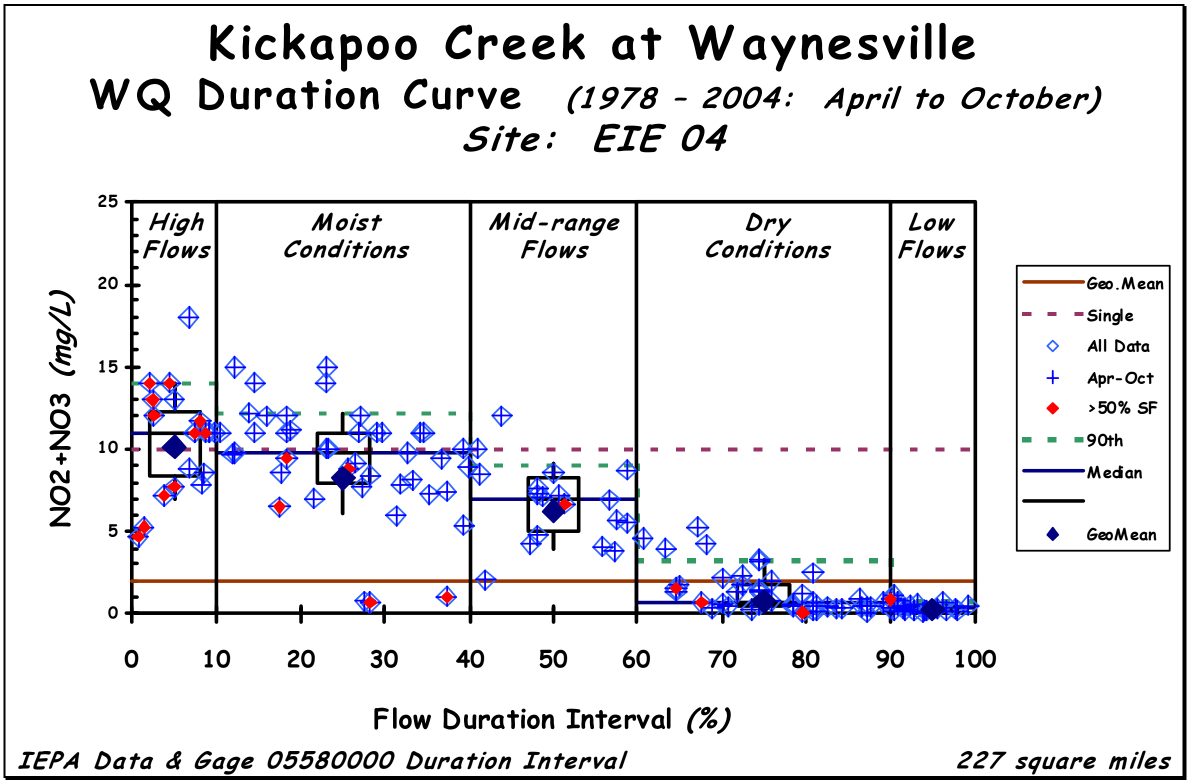


Figure 16. Duration Curve for TSS

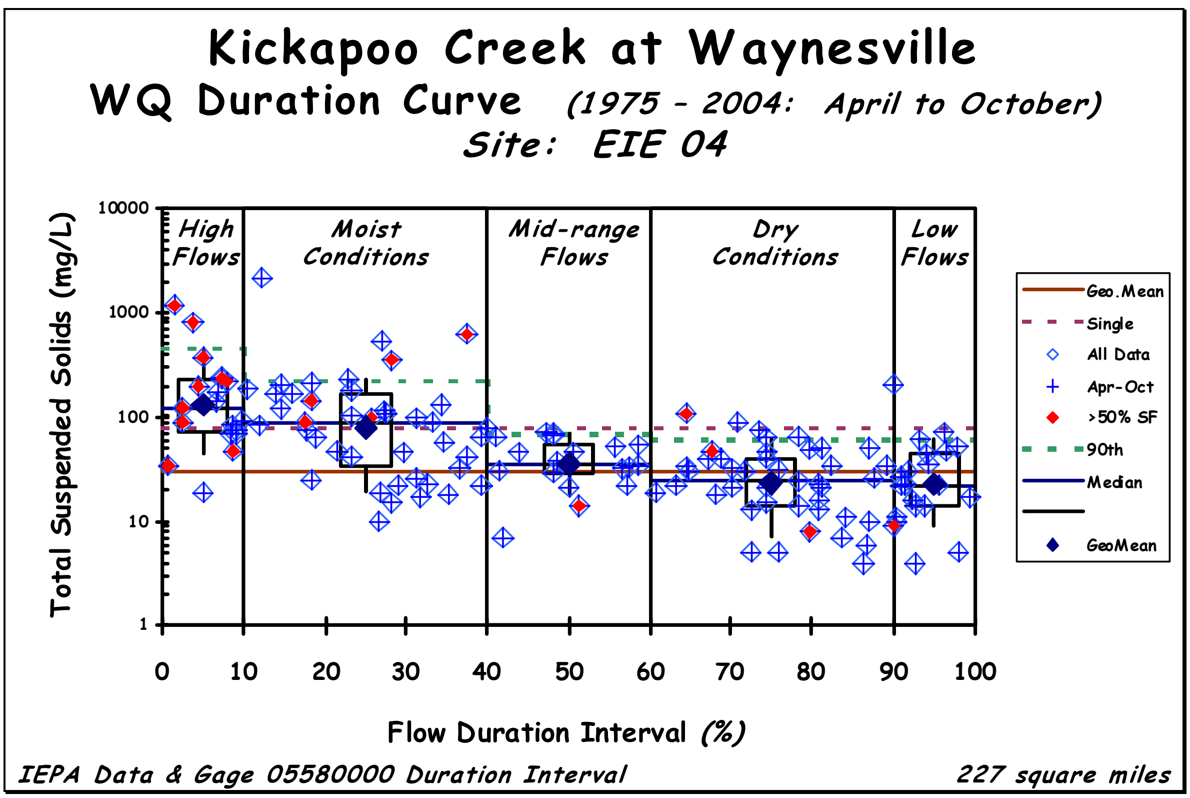


Table 4. Geometric Means at Flow Intervals

<table>
<tr><td rowspan="2"></td><td colspan="5">Duration Curve Zone
Geometric Mean (cfu/100ml)</td></tr>
<tr><td>High</td><td>Moist</td><td>Mid</td><td>Dry</td><td>Low</td></tr>
<tr><td>Kickapoo Creek (EIE 04)</td><td>1300</td><td>190</td><td>519</td><td>399</td><td>428</td></tr>
<tr><td rowspan="6">Seasonal Considerations

[most likely zone(s) by month]</td><td></td><td colspan="2">May</td><td></td><td></td></tr>
<tr><td></td><td></td><td colspan="2">June</td><td></td></tr>
<tr><td></td><td></td><td colspan="2">July</td><td></td></tr>
<tr><td></td><td></td><td></td><td>August</td><td></td></tr>
<tr><td></td><td></td><td></td><td>September</td><td></td></tr>
<tr><td></td><td></td><td colspan="2">October</td><td></td></tr>
<tr><td rowspan="6">Implementation Opportunities</td><td colspan="2">Long-term CSO plans</td><td></td><td colspan="2">Municipal NPDES</td></tr>
<tr><td></td><td colspan="4">On-site wastewater management</td></tr>
<tr><td></td><td colspan="4">Pasture management & riparian protection</td></tr>
<tr><td colspan="5">Urban storm water management</td></tr>
<tr><td colspan="4">Open lot agreements</td><td></td></tr>
<tr><td colspan="2">Manure management</td><td></td><td></td><td></td></tr>
</table>

Figure 17. Duration Curve for Fecal Coliform- 1995-2004

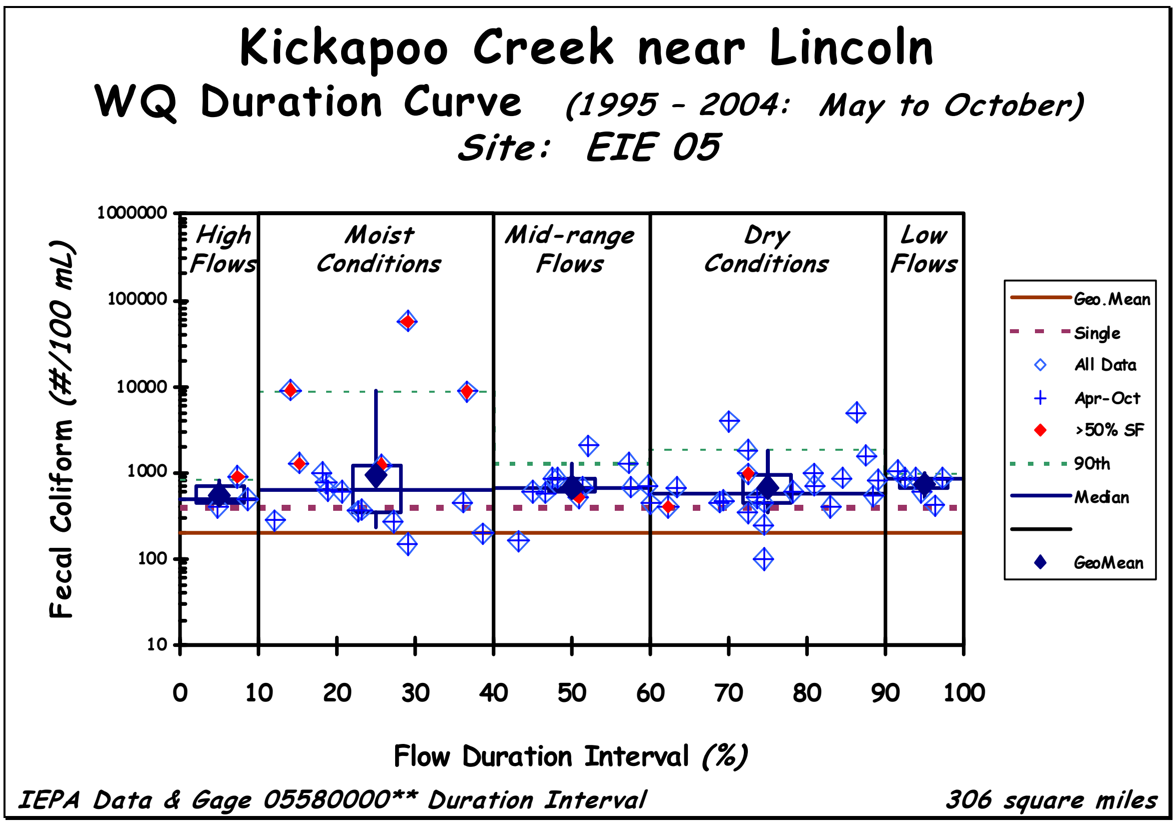


Figure 18. Duration Curve for Fecal Coliform- 1978-2004

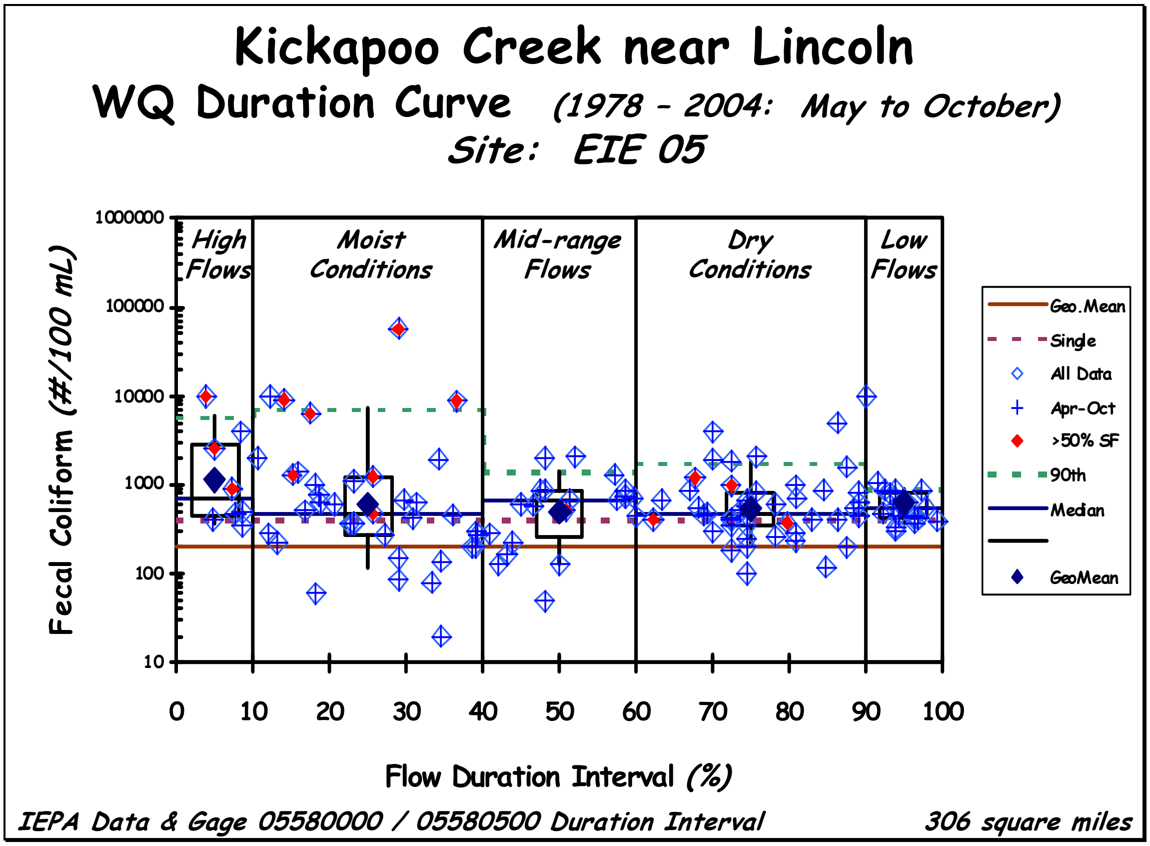


Figure 19. Duration Curve for Phosphorus

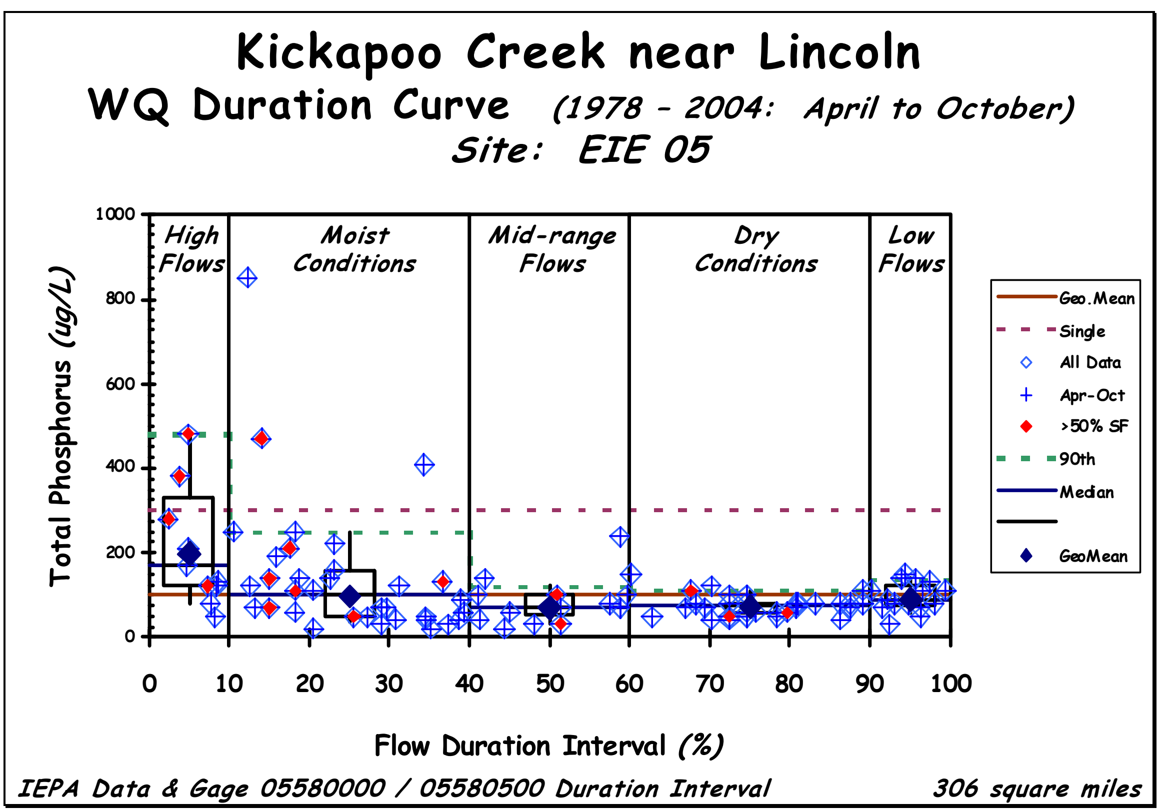


Figure 20. Duration Curve for Nitrite+Nitrate

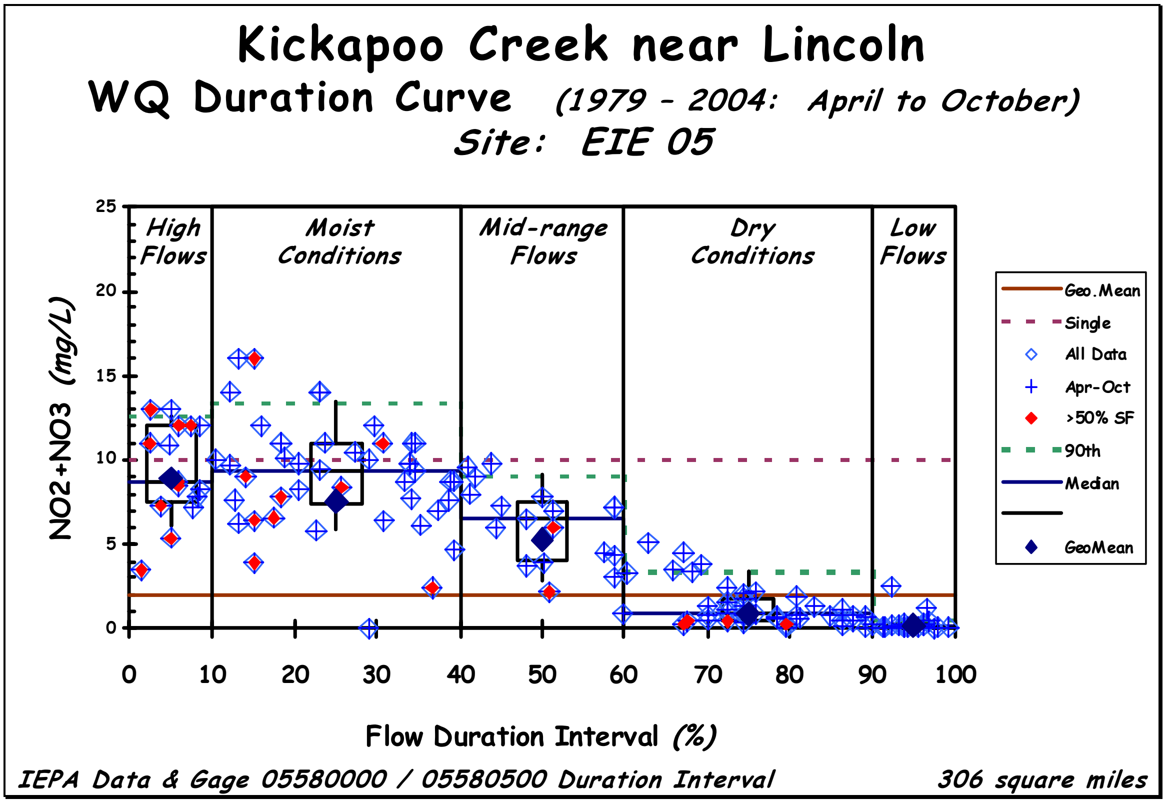


Figure 21. Duration Curve for TSS

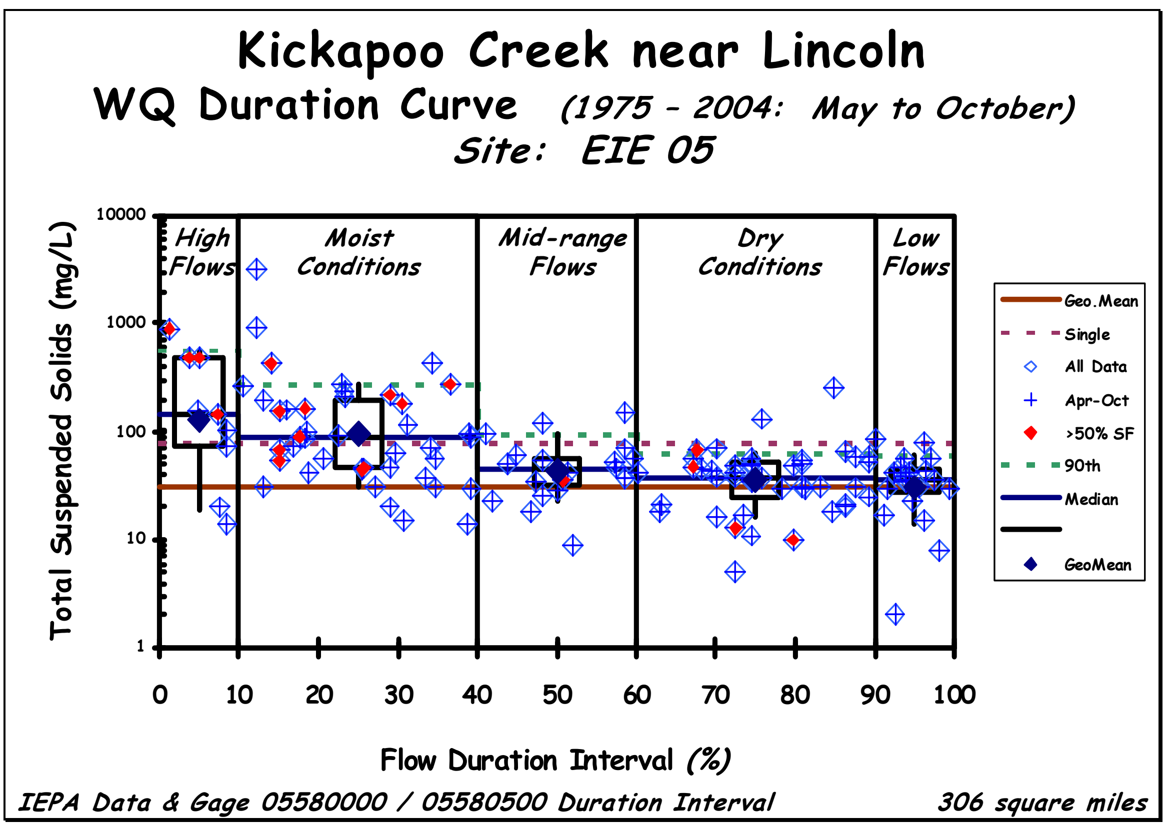


Table 5. Geometric Means at Flow Intervals

<table>
<tr><td rowspan="2"></td><td colspan="5">Duration Curve Zone
Geometric Mean (cfu/100ml)</td></tr>
<tr><td>High</td><td>Moist</td><td>Mid</td><td>Dry</td><td>Low</td></tr>
<tr><td>Kickapoo Creek (EIE 05)</td><td>547</td><td>929</td><td>696</td><td>678</td><td>747</td></tr>
<tr><td rowspan="6">Seasonal Considerations

[most likely zone(s) by month]</td><td></td><td colspan="2">May</td><td></td><td></td></tr>
<tr><td></td><td colspan="3">June</td><td></td></tr>
<tr><td></td><td></td><td colspan="2">July</td><td></td></tr>
<tr><td></td><td></td><td></td><td>August</td><td></td></tr>
<tr><td></td><td></td><td></td><td>September</td><td></td></tr>
<tr><td></td><td></td><td colspan="2">October</td><td></td></tr>
<tr><td rowspan="6">Implementation Opportunities</td><td colspan="2">Long-term CSO plans</td><td></td><td colspan="2">Municipal NPDES</td></tr>
<tr><td></td><td colspan="4">On-site wastewater management</td></tr>
<tr><td></td><td colspan="4">Pasture management & riparian protection</td></tr>
<tr><td colspan="5">Urban storm water management</td></tr>
<tr><td colspan="4">Open lot agreements</td><td></td></tr>
<tr><td colspan="2">Manure management</td><td></td><td></td><td></td></tr>
</table>

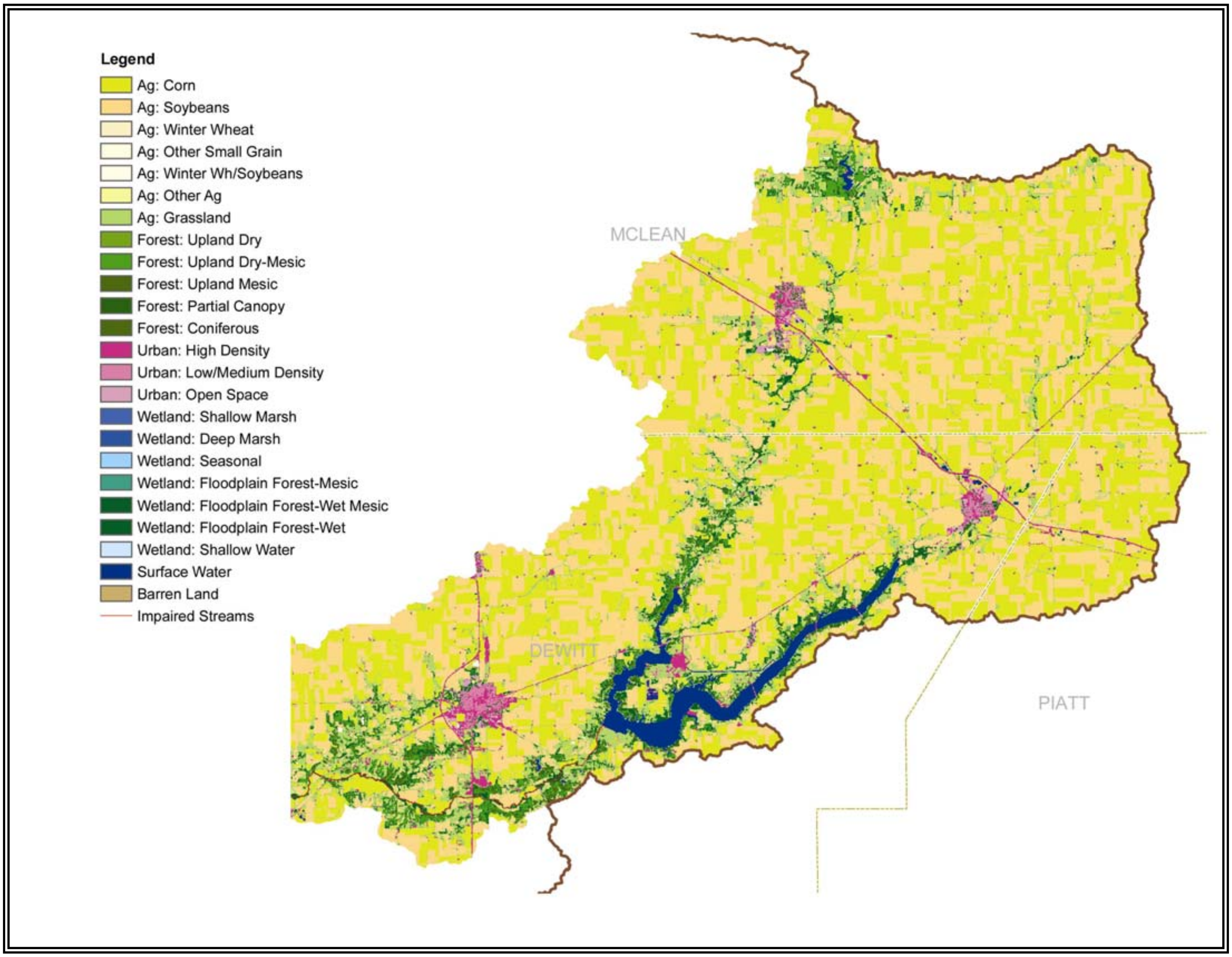
C. Salt Creek of Sangamon River EI 06

Watershed Description

This segment of Salt Creek (EI 06) is 15.63 miles long and goes from Clinton Lake to the confluence with Tenmile Creek. The watershed is approximately 245,480 acres (384 square miles). Salt Creek (EI 06) is impaired for fecal coliform bacteria with a potential source of unknown. Clinton Lake (REI) is on the 303(d) List of impaired waters for excessive algal growth due to industrial point source(s) and nonirrigated row crop production.

Land use is mainly agricultural with 78% cultivated crops (mostly corn and soybeans) and 11% rural grassland. 4% of the watershed is forest, 3% is urban and 2% is floodplain forest (see Figure 22). The majority of agriculture land in McLean, Dewitt and Piatt Counties are farmed using conventional tillage for corn and conservation tillage for soybeans. Macon County is conventional tillage for corn and soybeans.

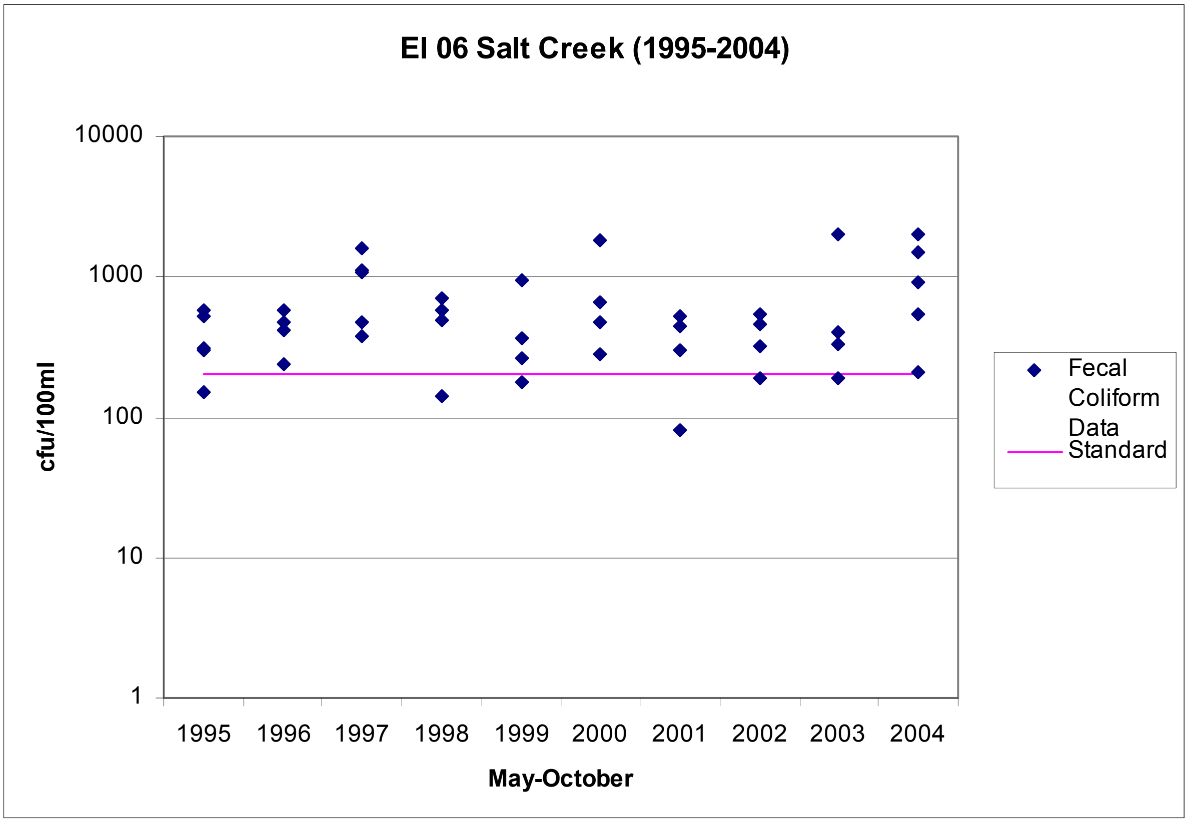
Figure 22. Land Use in Salt Creek EI 06 Watershed



Fecal Coliform Data Assessment

For 1995-2004, there were 43 seasonal samples (May through October) from Station EID 01. Out of those, 37 were over 200 cfu/100ml and 26 were over 400 cfu/100ml. A time series plot for fecal coliform samples are in Figure 23.

Figure 23. Time Series Fecal Coliform Data for EI 06



Potential Sources

There are nine facilities permitted to discharge in the Salt Creek (EI06) Watershed. Seven of the facilities are fecal coliform exemptions and do not monitor for bacteria. For those exempted facilities, 200 cfu/100ml is used for the discharge. Kenney STP discharges below the monitoring station and is not considered in the loads.

Farmer City and Leroy both have CSOs. It is estimated that 36 households have failing septic systems in this watershed and 6.8 of those households have systems directly discharging in the stream. McLean county has one of the highest livestock densities in the watershed and Dewitt has one of the lowest. Hogs and pigs make up the majority of animals. This watershed has low to medium deer densities compared to other counties.

Figure 24. Salt Creek EI 06 Watershed

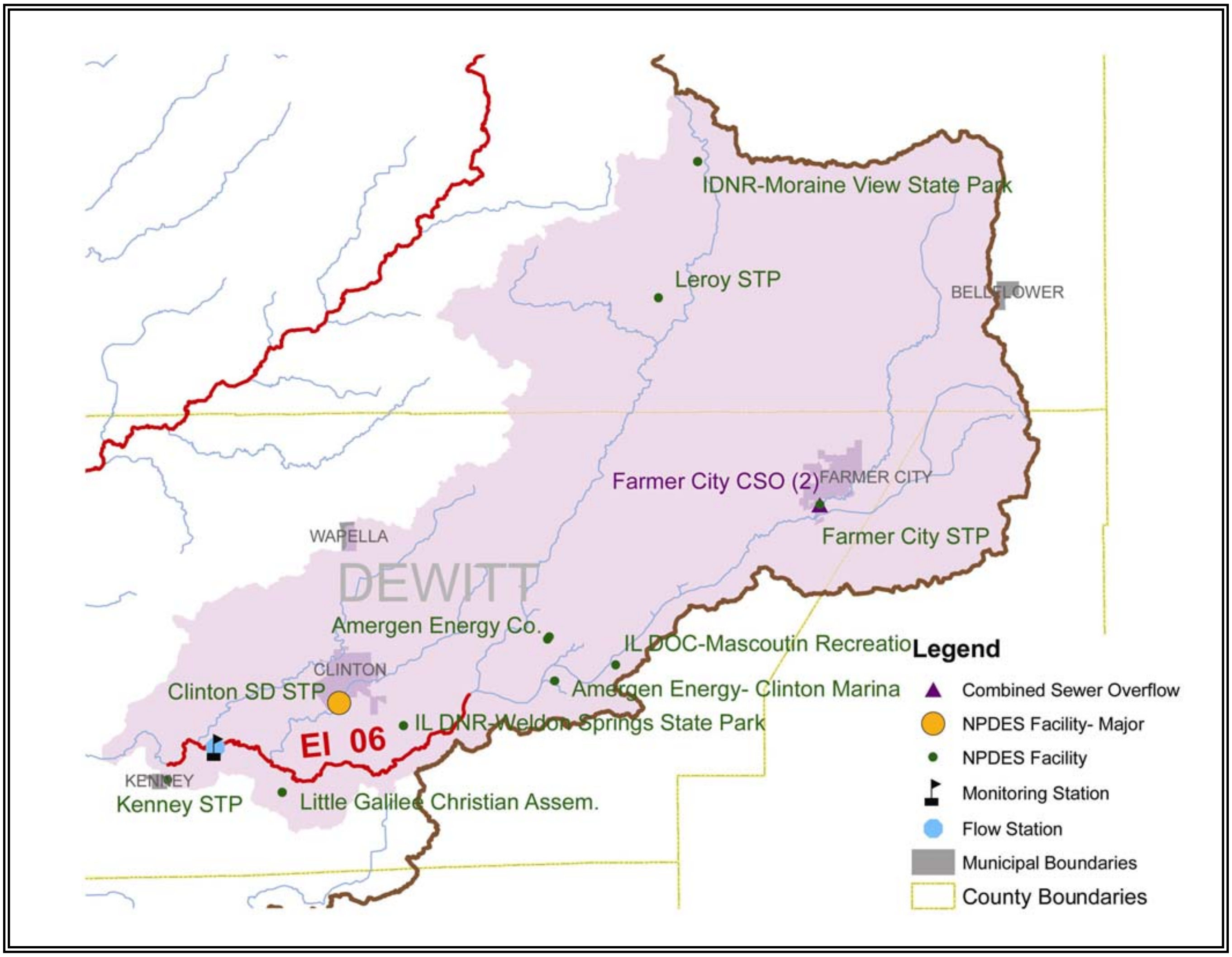


Table 6. NPDES Facilities in the Salt Creek EI06 Watershed

NPDES ID	Facility Name	Design Average Flow (MGD)	Exempt	DMR Data	Exceed-ences/ Total	Mean of Discharge (cfu/ 100ml)	Discharge cfu/ 100ml/ MGD	Max. Permitted Discharge (cfu/ 100ml/ MGD)
IL0036919	AMERGEN ENERGY CO,LLC-CLINTON	0.0930		Not in permit		400	37.2	37.2
IL0023612	**CLINTON SD STP**	**1.6800**	YR			200	336	336
IL0022462	FARMER CITY STP	0.3600	YR			200	72	72
IL0072877	IDNR-MORAINE VIEW STATE PARK	0.0210	YR			200	4.2	4.2
IL0070386	IL DNR-WELDON SPRINGS STATE PK	0.0113		2000-2004		64	0.7232	4.52
IL0062961	IL DOC-MASCOUTIN RECREATION	0.0272	S	2000-2004		34	0.9248	0.9248
IL0021563	LEROY STP	0.6570	YR			200	131.4	131.4
IL0071200	LITTLE GALILEE CHRISTIAN ASSEM	0.0130	YR			200	2.6	2.6
							585.048	588.8448

Allocations

Annual Loads **Salt 06**

Permitted Wasteload (with DMR data)-	NPDES Discharge (cfu/ml/MGD)	gal/MGD	L/gal	mL/L	cfu/d	
	5.85048	1,000,000	3.785	1000	2.21E+10	
Septic Wasteload -	Households	fecal conc(cfu/ml)*	discharge (gal/person/d)	people/ house	ml/gal	cfu/d
	6.8	1.00E+04	70	2.5	3785.2	4.50E+10
Wasteload-	Permitted WL	Septic	cfu/d			
	2.21E+10	4.50E+10	**6.72E+10**			
Total Load-	Geo Mean (cfu/ml)	Annual Seasonal Flow (MGD)	gal/MGD	L/gal	mL/L	cfu/d
	4.9	132	1,000,000	3.785	1000	**2.45E+12**
Load-	Total Annual Load -	Wasteload =	cfu/d			
	2.45E+12	6.72E+10	**2.38E+12**			

Allowable Load

Permitted Wasteload- using effluent limit 400	NPDES Discharge (cfu/ml/MGD)	gal/MGD	L/gal	mL/L	cfu/d	
	5.888448	1,000,000	3.785	1000	**2.23E+10**	
Total Allowable Load-	Geo Mean (cfu/ml)	Annual Seasonal Flow (MGD)	gal/MGD	L/gal	mL/L	cfu/d
	2	132	1,000,000	3.785	1000	**9.99E+11**
Load Allowable-	Total Allowable Load	Allowable Wasteload	cfu/d			
	9.99E+11	2.23E+10	**9.77E+11**			

Load	Estimated Daily Load	Allowable Daily Load	Required Reduction	NPDES Reduction
WLA	6.72E+10	2.23E+10	66.83%	0%
LA	2.38E+12	9.77E+11	58.97%	
Total	2.45E+12	9.99E+11	59.18%	

* Horsley & Witten 1996 10^6/100ml

Duration Curves and Implementation

Figures 25-29 display the water quality duration curves for Salt Creek (EI 06) and Table 7 contains the geometric mean at all flow intervals.

Figure 25. Duration Curve for Fecal Coliform- 1995-2004

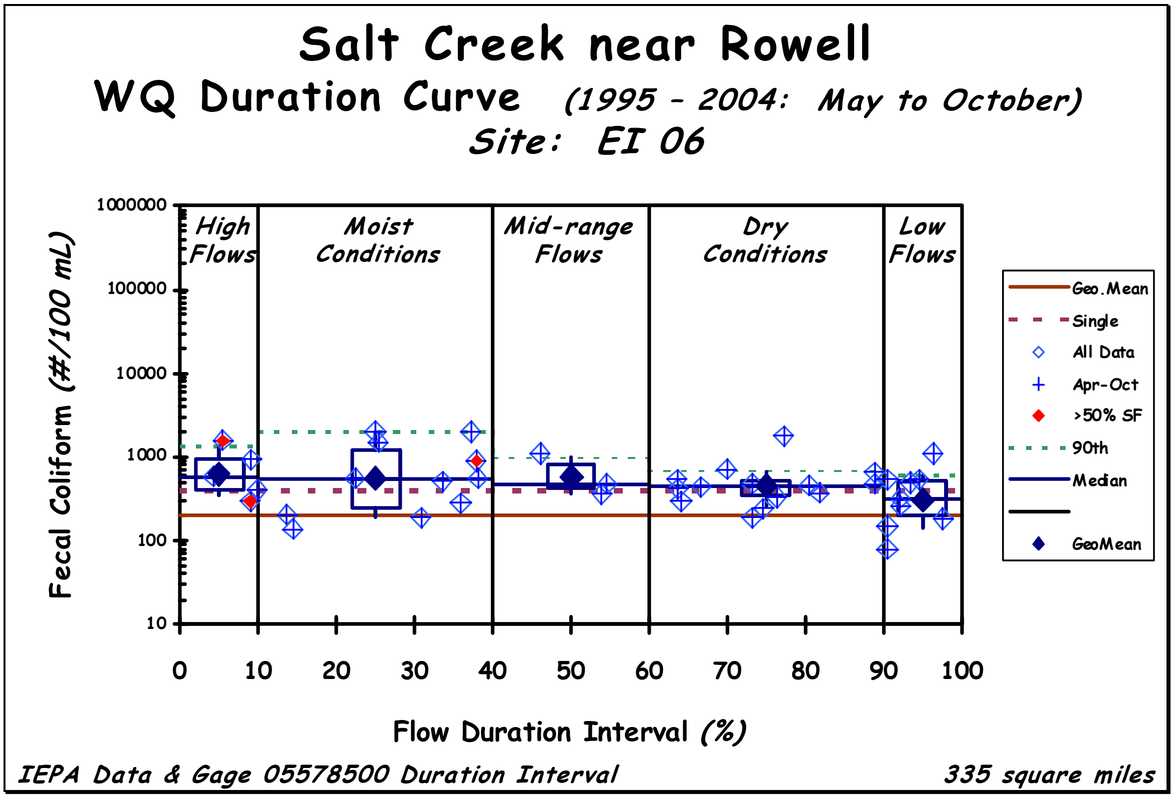


Figure 26. Duration Curve for Fecal Coliform 1978-2004

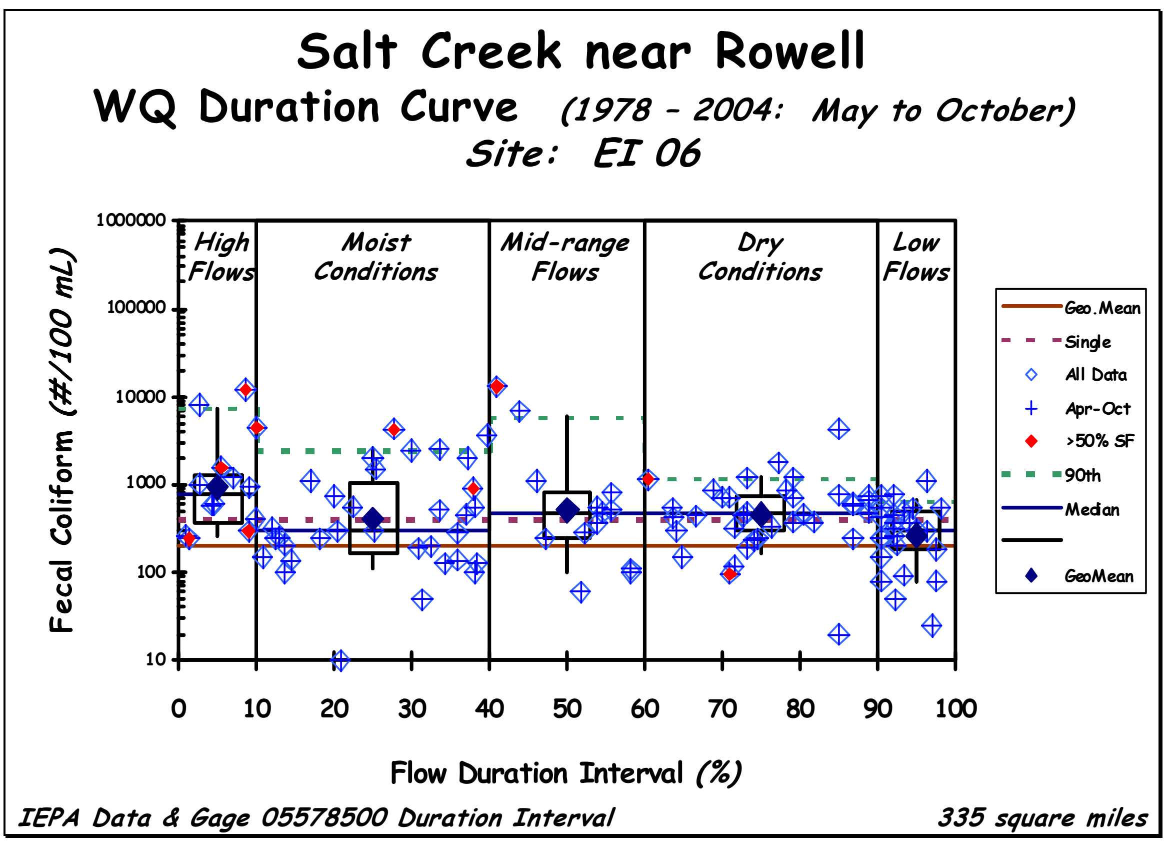


Figure 27. Duration Curve for Phosphorus

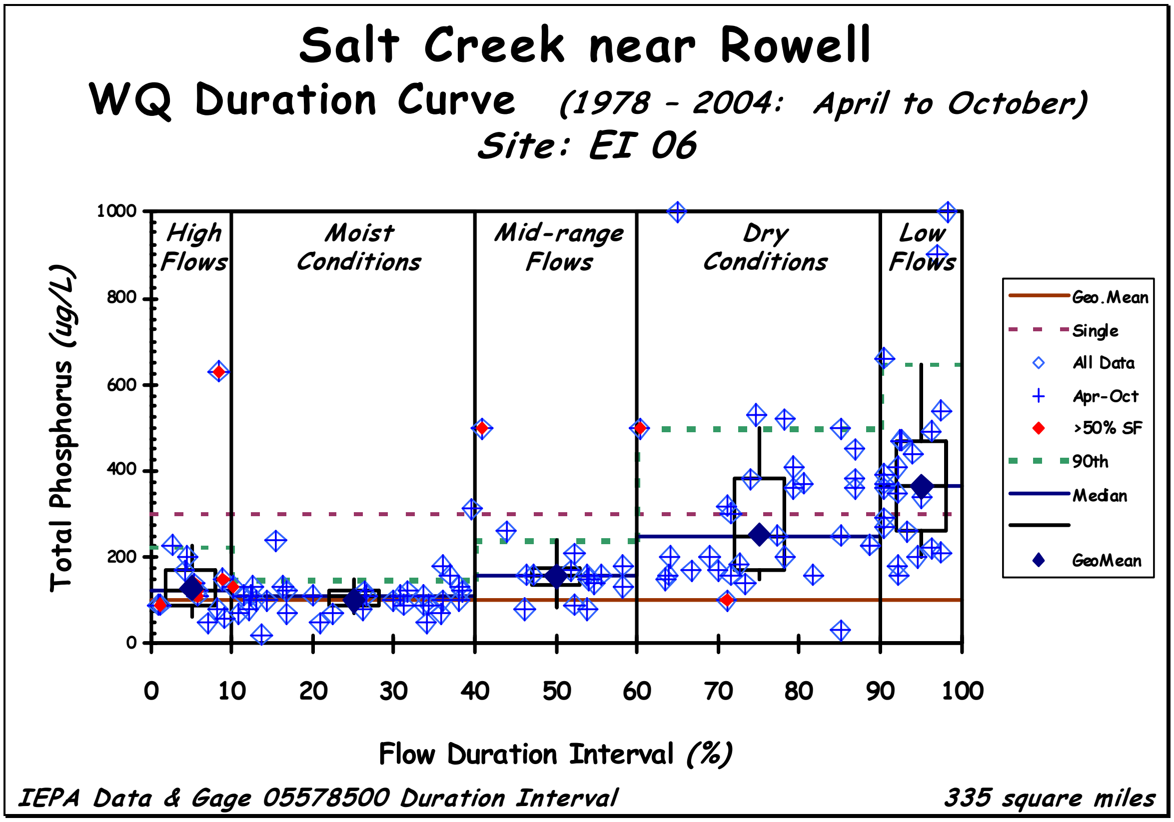


Figure 28. Duration Curve for Nitrite+Nitrate

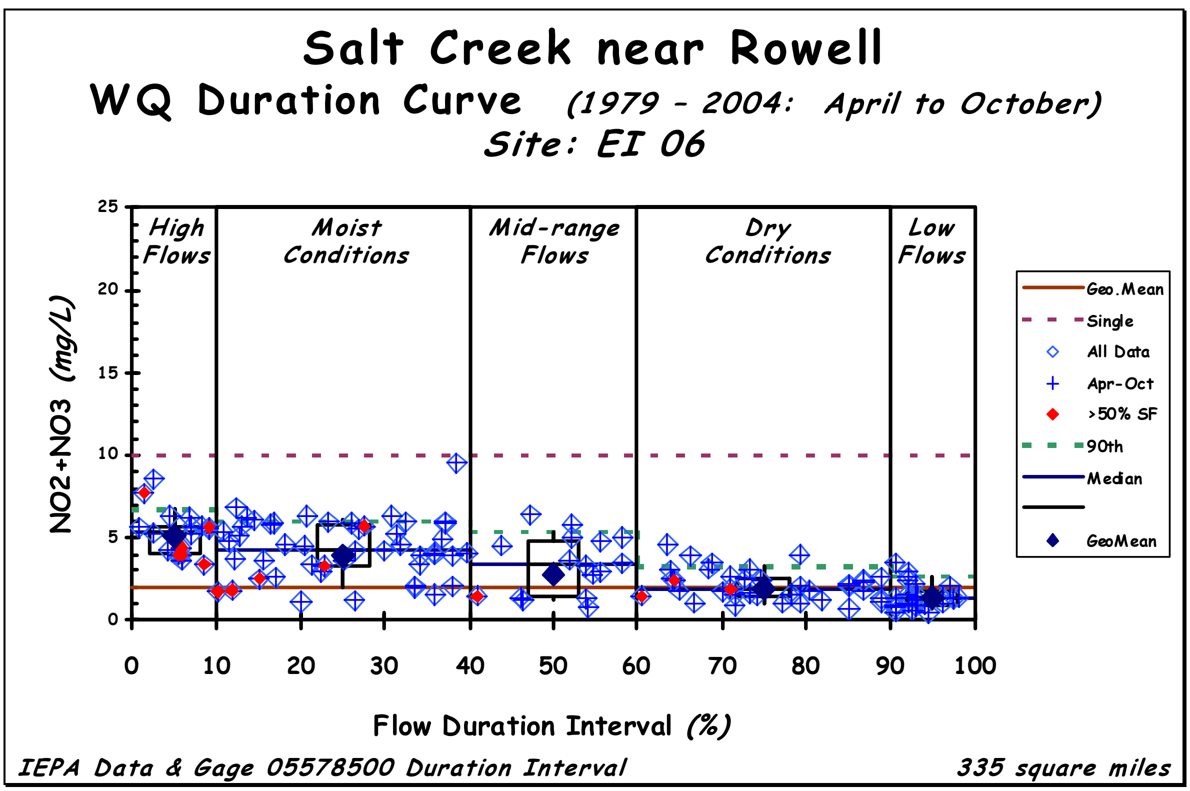


Figure 29. Duration Curve for TSS

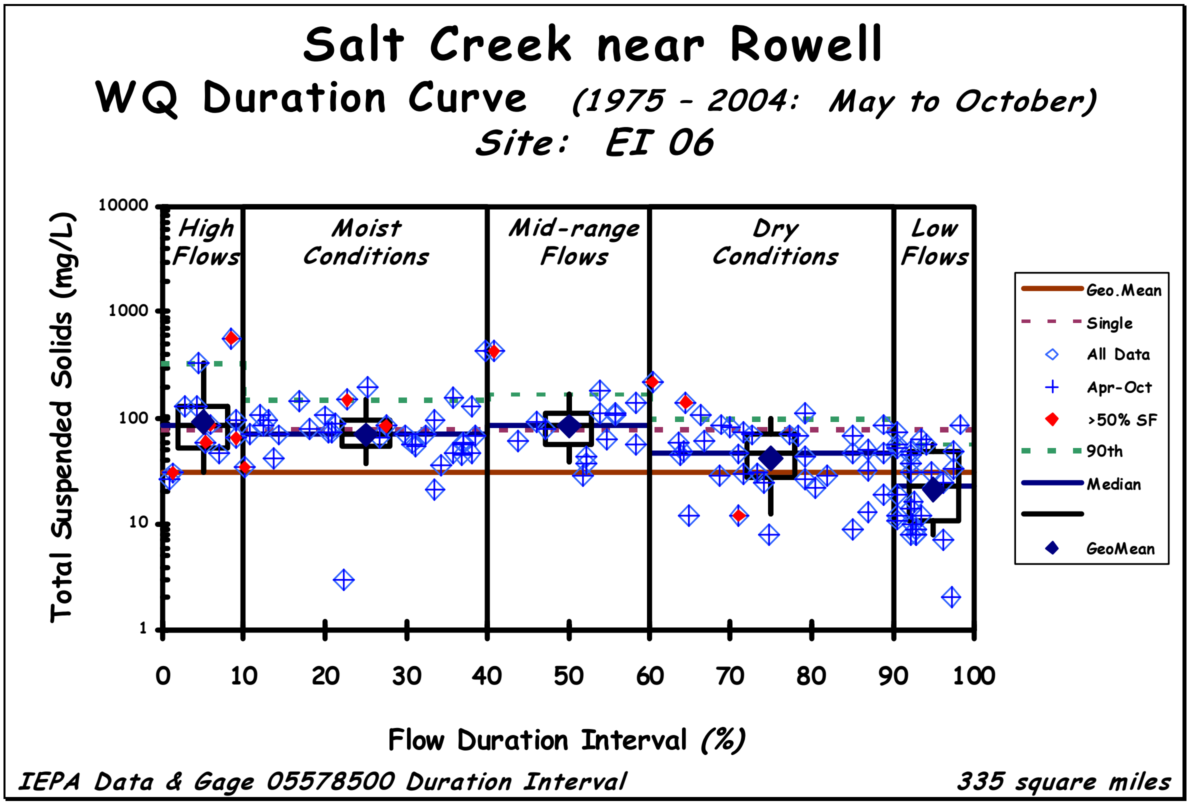


Table 7. Geometric Means at Flow Intervals

	Duration Curve Zone Geometric Mean (cfu/100ml)				
	High	**Moist**	**Mid**	**Dry**	**Low**
Salt Creek (EI 06)	638	551	571	453	311
Seasonal Considerations *[most likely zone(s) by month]*		***May***			
		June			
			July		
				August	
				September	
			October		
Implementation Opportunities	***Long-term CSO plans***			***Municipal NPDES***	
		On-site wastewater management			
		Pasture management & riparian protection			
	Urban storm water management				
	Open lot agreements				
	Manure management				

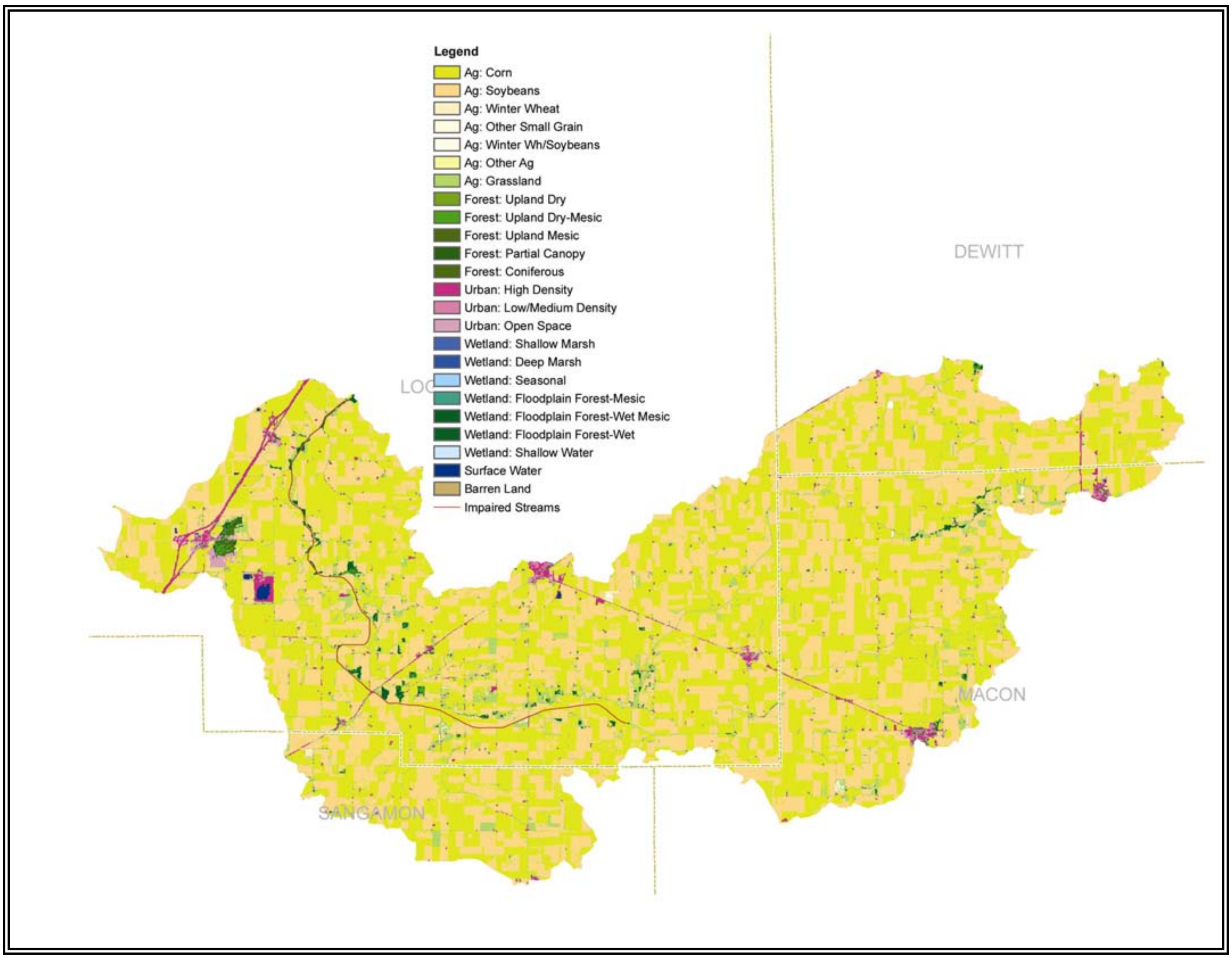
D. Lake Fork EIG 01

Watershed Description

Lake Fork Watershed is approximately 175,600 acres (274 square miles) and contains 21.04 miles of Lake Fork (EIG 01). Lake Fork is impaired for fecal coliform bacteria with a potential source of unknown. North Fork Lake Fork and South Fork Lake Fork diverge into Lake Fork that then flows into Salt Creek. No other stream is impaired in this watershed.

Land use in the watershed is mainly agricultural with 90% cultivated crops (mostly corn and soybeans) and 6% rural grasslands. 2% is urban and less than one percent are forest and floodplain forest (see Figure 30). The majority of the land cover in Logan County is reduced-till for corn and no-till for soybeans. The majority of agriculture land in Logan, Dewitt and Sangamon Counties are farmed using conventional tillage for corn and conservation tillage for soybeans. Macon County is conventional tillage for corn and soybeans.

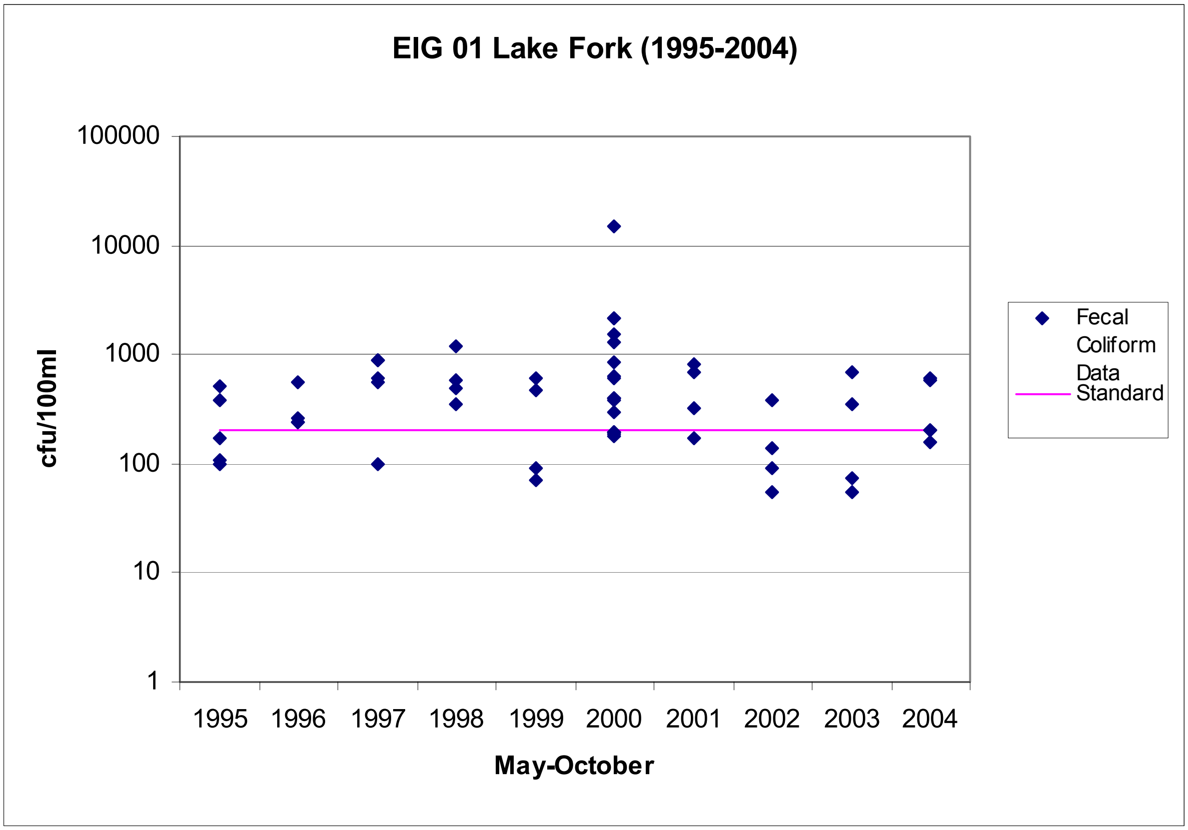
Figure 30. Land Use for Lake Fork Watershed



Fecal Coliform Data Assessment

For 1995-2004, there are 56 seasonal samples (May through October) from station EIG 01. 36 were over 200 cfu/100ml and 27 were over 400 cfu/100ml. A time series plot for fecal coliform samples are in Figure 31.

Figure 31. Time Series Fecal Coliform Data for EIG 01.



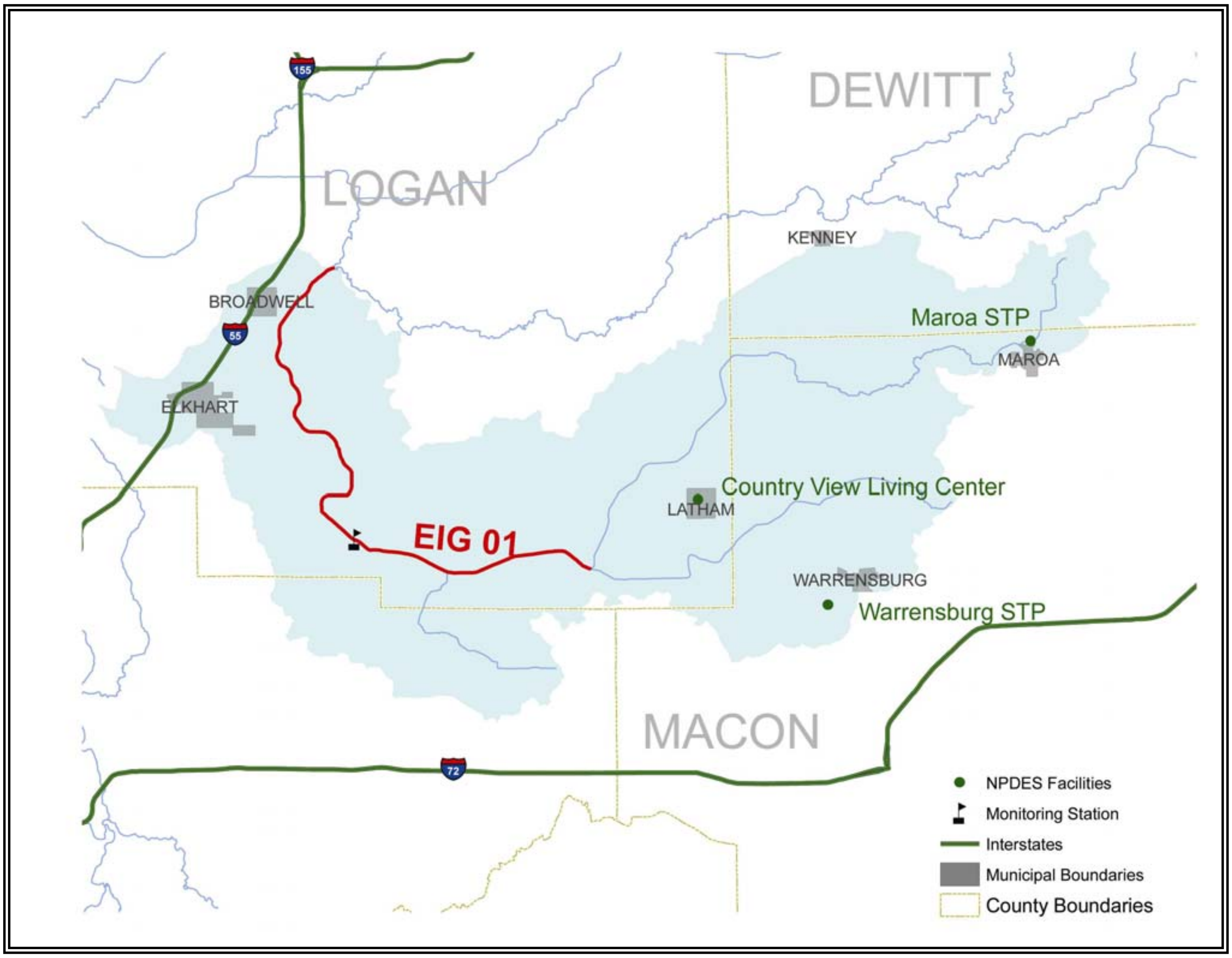
Potential Sources

There are four point sources in the watershed and they all have fecal coliform exemptions and do not monitor for fecal coliform. For these exempted facilities, 200 cfu/100ml is used for the discharge. 17 Households in the watershed are estimated to have failed and 3.2 of those households discharge directly to the stream. Logan county has a high livestock density and Macon county has one of the lowest. Hogs and pigs are a majority of the animals. Logan and Macon counties have the lowest deer densities in the watershed.

Table 8. NPDES Facilities in Lake Fork Watershed

NPDES ID	Facility Name	Design Average Flow (MGD)	Exempt	DMR Data	Exceed-ences/ Total	Mean of Discharge (cfu/ 100ml)	Discharge cfu/ 100ml/ MGD	Max. Permitted Discharge (cfu/ 100ml/ MGD)
ILG551010	Country View Living Center	0.0144	YR			200	2.88	2.88
IL0025208	Maroa STP	0.3600	YR			200	72	72
IL0034215	Warrensburg STP	0.2500	YR			200	50	50
							124.88	124.88

Figure 32. Lake Fork Watershed



Allocations

Annual Loads **Lake Fork**

Permitted Wasteload (with DMR data)-	NPDES Discharge (cfu/ml/MGD)	gal/MGD	L/gal	mL/L	cfu/d	
	1.2488	1,000,000	3.785	1000	4.73E+09	
Septic Wasteload -	Households	fecal conc(cfu/ml)*	discharge (gal/person/d)	people/ house	ml/gal	cfu/d
	3.2	1.00E+04	70	2.5	3785.2	2.12E+10
Wasteload-	Permitted WL	Septic	cfu/d			
	4.73E+09	2.12E+10	**2.59E+10**			
Total Annual Load-	Geo Mean (cfu/ml)	Annual Seasonal Flow (MGD)	gal/MGD	L/gal	mL/L	cfu/d
	4.23	93	1,000,000	3.785	1000	**1.49E+12**
Load-	Total Annual Load -	Wasteload =	cfu/d			
	1.49E+12	2.59E+10	**1.46E+12**			

Allowable Load

Permitted Wasteload- using effluent limit 400	NPDES Discharge (cfu/ml/MGD)	gal/MGD	L/gal	mL/L	cfu/d	
	1.2488	1,000,000	3.785	1000	**4.73E+09**	
Total Allowable Load-	Geo Mean (cfu/ml)	Annual Seasonal Flow (MGD)	gal/MGD	L/gal	mL/L	cfu/d
	2	93	1,000,000	3.785	1000	**7.04E+11**
Load Allowable-	Total Allowable Load	Allowable Wasteload	cfu/d			
	7.04E+11	4.73E+09	**6.99E+11**			

Load	Daily Load	Allowable Daily Load	Required Reduction	NPDES Reduction
WLA	2.59E+10	4.73E+09	81.77%	0%
LA	1.46E+12	6.99E+11	52.20%	
Total	1.49E+12	7.04E+11	52.72%	

* Horsley & Witten 1996 10^6/100ml

Duration Curves and Implementation

Figures 33-37 display the water quality duration curves for Lake Fork and Table 9 has the geometric means at each flow interval along with general implementation opportunities.

Figure 33. Duration Curve for Fecal Coliform- 1995-2004

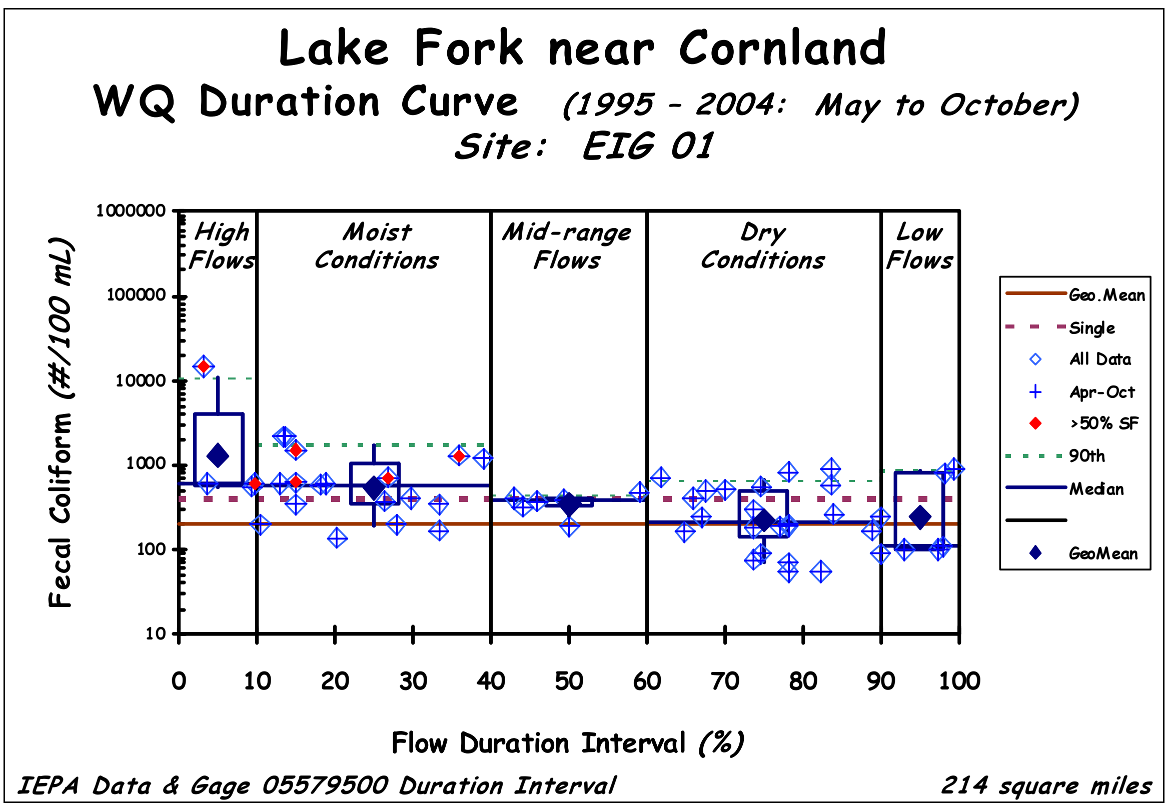


Figure 34. Duration Curve for Fecal Coliform 1972-2004.

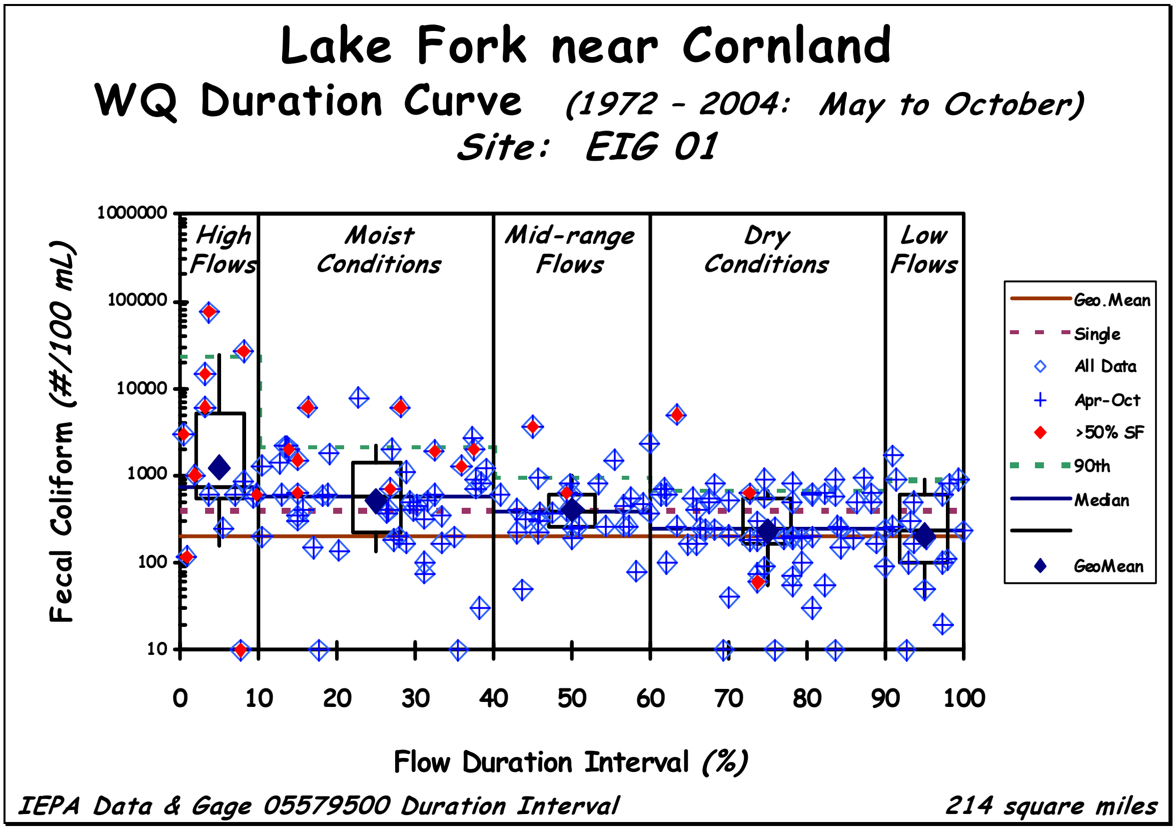


Figure 35. Duration Curve for Phosphorus

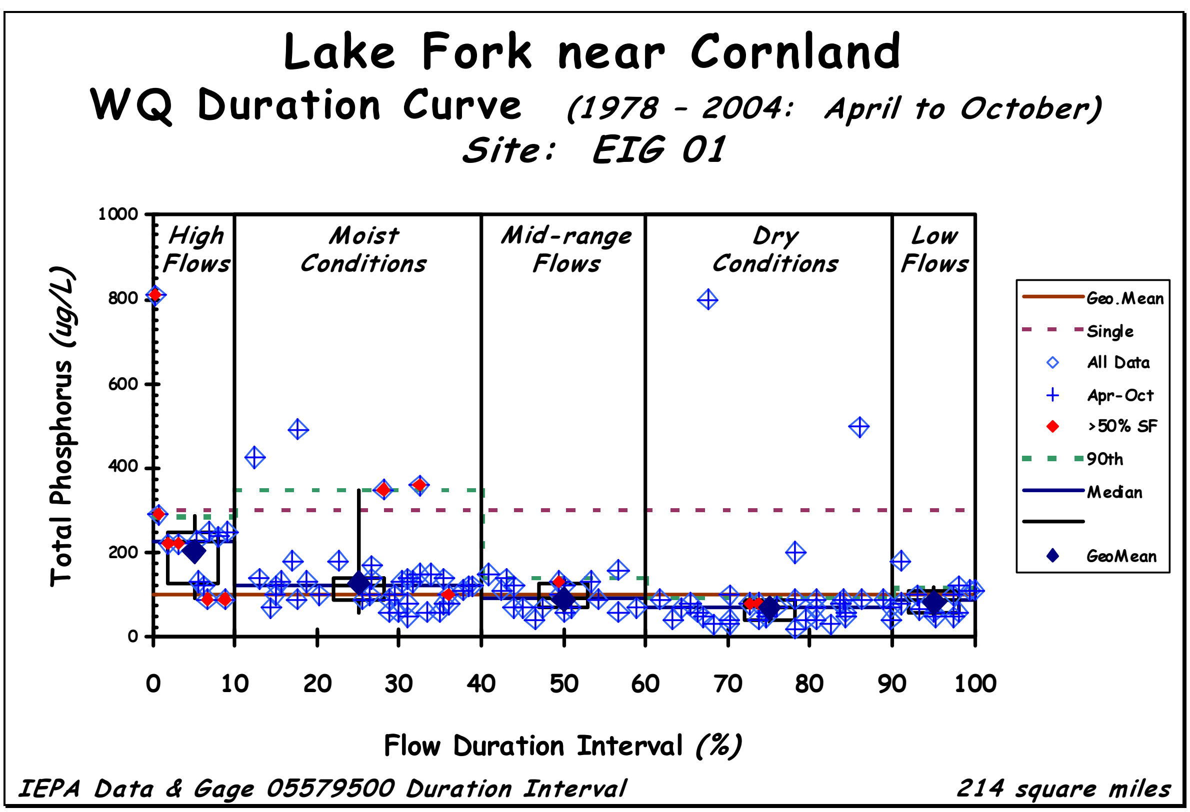


Figure 36. Duration Curve for Nitrite+Nitrate

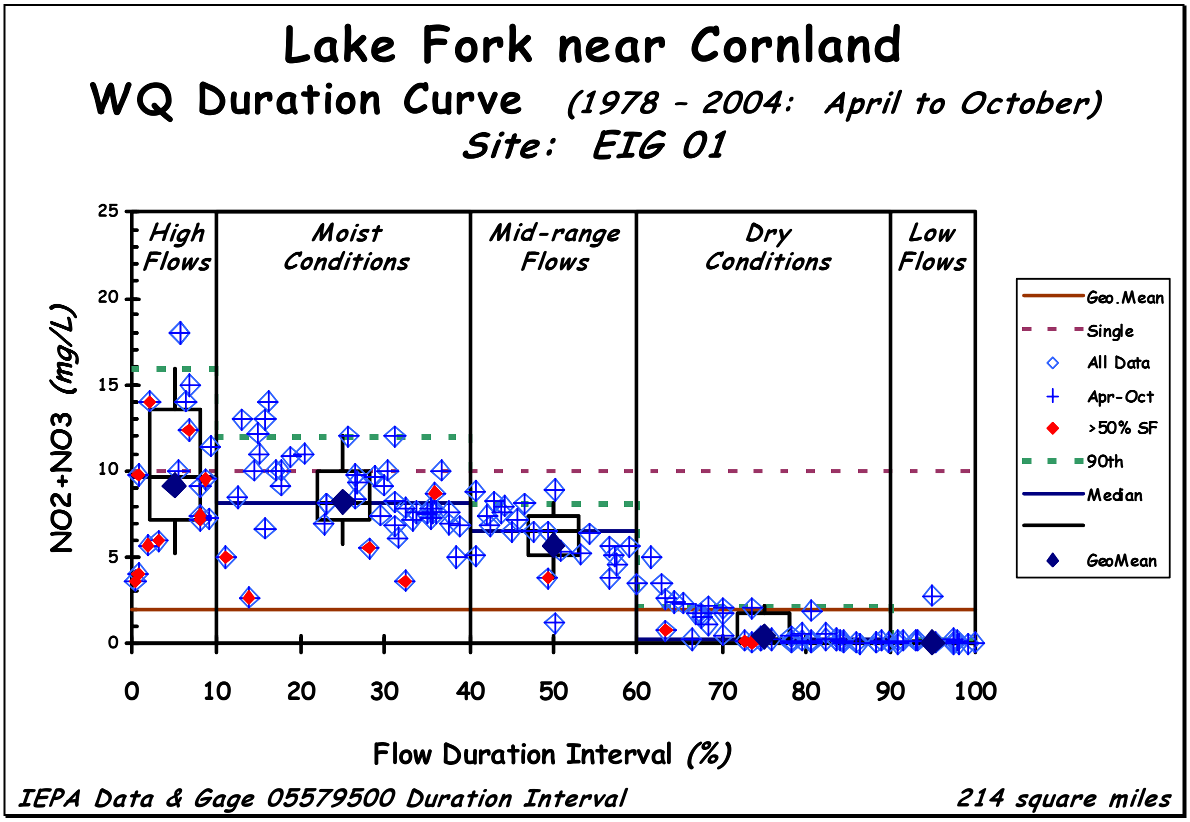


Figure 37. Duration Curve for TSS

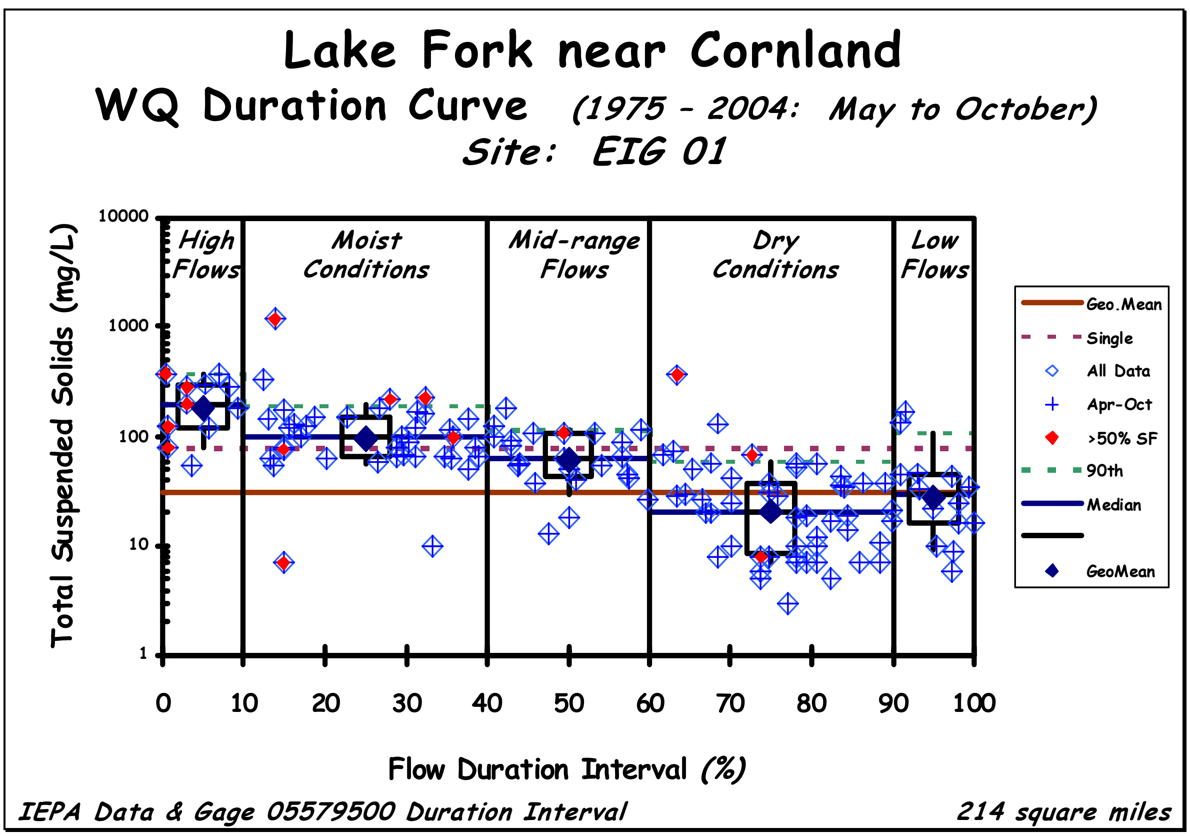


Table 9. Geometric Means at Flow Intervals

<table>
<tr><th rowspan="2"></th><th colspan="5">Duration Curve Zone
Geometric Mean (cfu/100ml)</th></tr>
<tr><th>High</th><th>Moist</th><th>Mid</th><th>Dry</th><th>Low</th></tr>
<tr><td>Lake Fork (EIG 01)</td><td>1310</td><td>546</td><td>346</td><td>228</td><td>240</td></tr>
<tr><td rowspan="6">Seasonal Considerations

[most likely zone(s) by month]</td><td></td><td colspan="2">May</td><td></td><td></td></tr>
<tr><td></td><td colspan="3">June</td><td></td></tr>
<tr><td></td><td></td><td colspan="2">July</td><td></td></tr>
<tr><td></td><td></td><td></td><td>August</td><td></td></tr>
<tr><td></td><td></td><td></td><td>September</td><td></td></tr>
<tr><td></td><td></td><td colspan="2">October</td><td></td></tr>
<tr><td rowspan="6">Implementation Opportunities</td><td colspan="2">Long-term CSO plans</td><td></td><td colspan="2">Municipal NPDES</td></tr>
<tr><td></td><td colspan="4">On-site wastewater management</td></tr>
<tr><td></td><td colspan="4">Pasture management & riparian protection</td></tr>
<tr><td colspan="5">Urban storm water management</td></tr>
<tr><td colspan="4">Open lot agreements</td><td></td></tr>
<tr><td colspan="2">Manure management</td><td></td><td></td><td></td></tr>
</table>

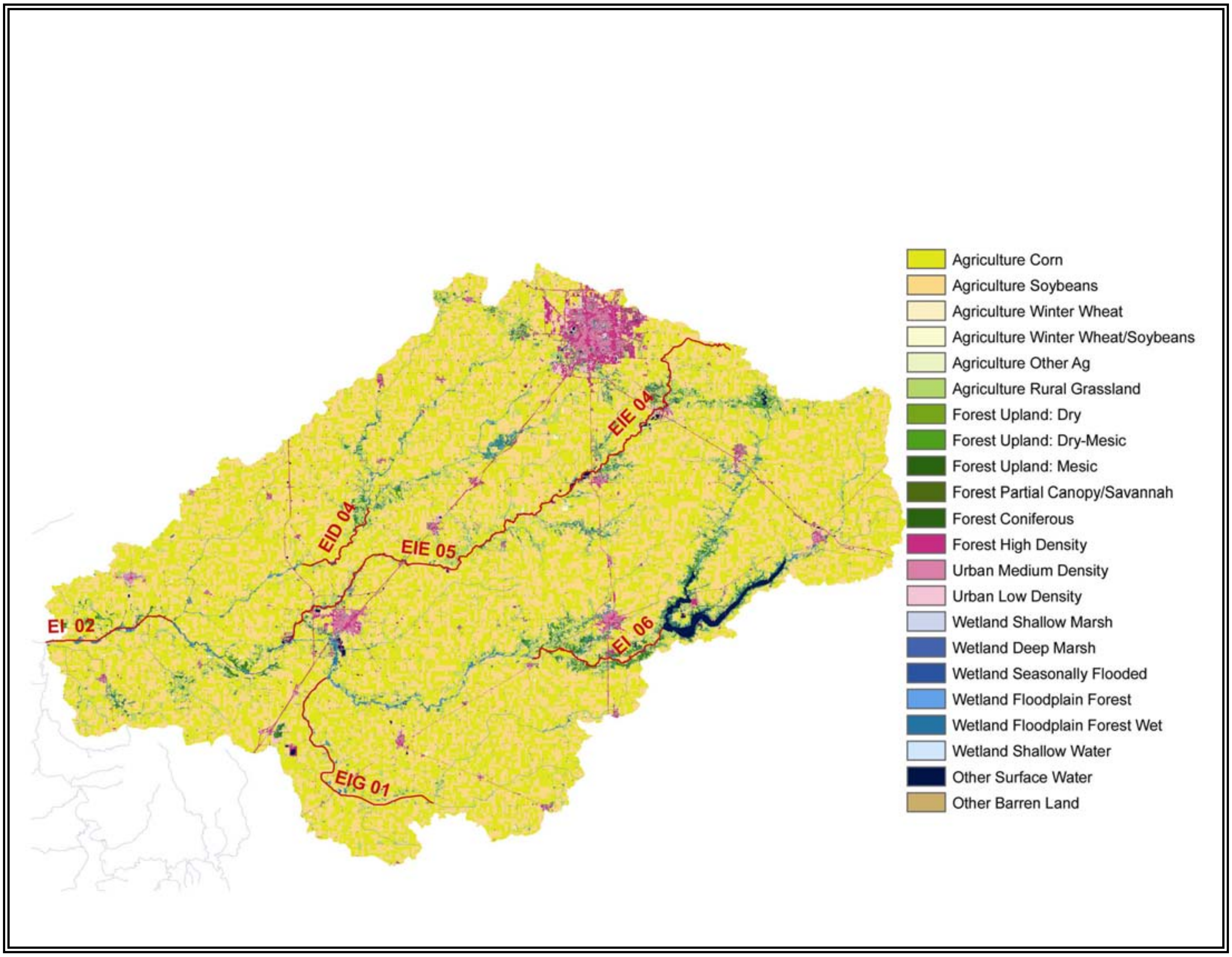
Salt Creek of Sangamon River EI 02

Watershed Characteristics

Sugar Creek (EID 04), Kickapoo Creek (EIE 04 and 05), Salt Creek (EI 06) and Lake Fork (EIG 01), all flow into Salt Creek (EI 02). This watershed is approximately 1,182,630 acres (1848 square miles). Salt Creek (EI 02) is 11 miles long and impaired for fecal coliform bacteria with a potential source of unknown.

Land use is mainly agricultural with 83% cultivated land and 9% rural grassland. 4% of the watershed is urban, 2% is forest and 2% is forest floodplain. The majority of agriculture lands in most of the counties in this watershed are farmed using conventional tillage for corn and conservation tillage for soybeans.

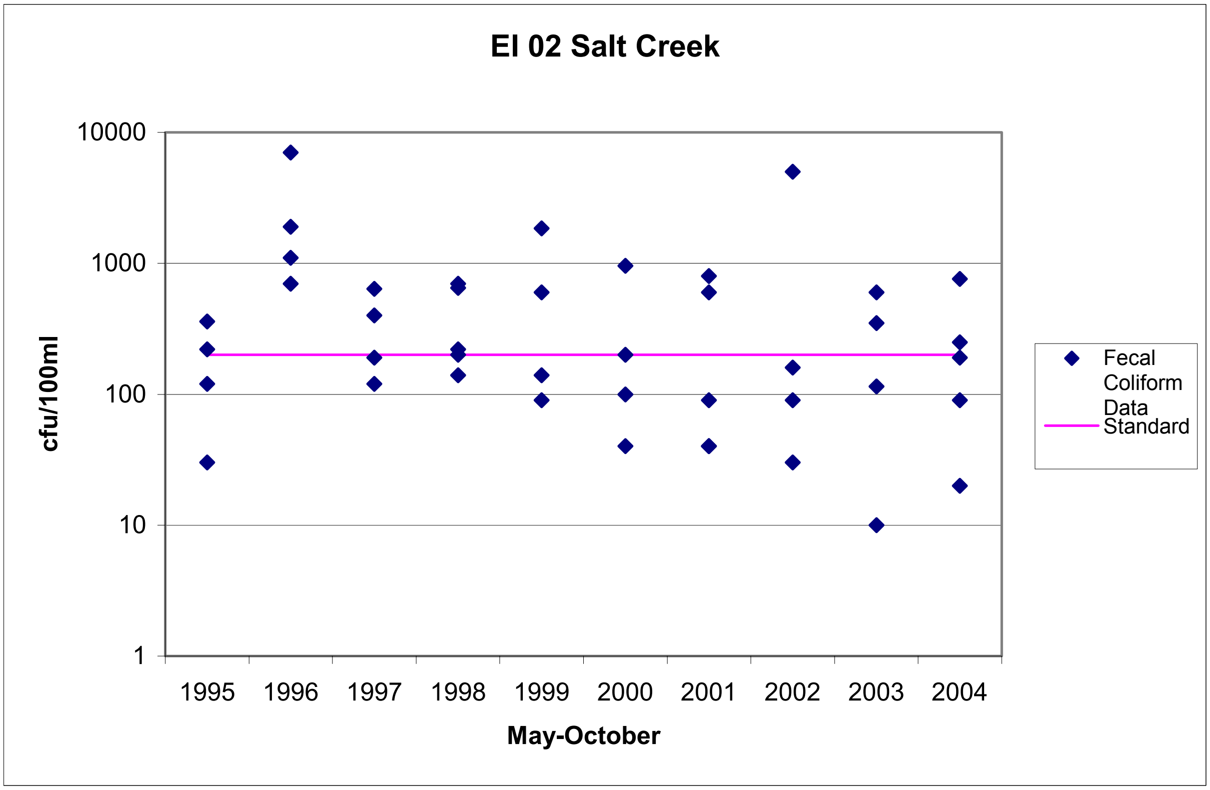
Figure 38. Landuse in Salt Creek Watershed



Fecal Coliform Data Assessment

For 1995-2004, there are 43 seasonal samples (May through October) from Station EI 02. Out of those, 21 were over 200 cfu/100ml and 16 were over 400 cfu/100ml. A time series plot for fecal coliform samples are in Figure 39.

Figure 39. Fecal Coliform Data for EI 02



Potential Sources

There 41 permits issued to facilities discharging into salt creek watershed. 24 of the facilities have fecal coliform exemptions and do not have to monitor for bacteria. For those exempted facilities, 200cfu/100ml is used for the discharge. Of the 17 that monitor, 12 have exceeded the standard of 400 cfu/100ml.

Stormwater runoff from urban areas is a potential source of bacteria. Both Bloomington and Normal have MS4 stormwater permits. Bloomington has 15,424 municipal acres (24 square miles) and Normal has 9,383 municipal acres (16 square miles) in the watershed. Ten Percent of the Salt Creek Watershed contains MS4 stormwater permits.

Farmer City, Leroy, Lincoln, Normal and Bloomington/Normal (9) have CSOs. 145 households in this watershed are estimated to have failing septic system and 28 of those households discharge directly to the streams.

Livestock varies throughout the watershed. Figure 7 in the TMDL Report gives livestock numbers by county. McLean, Logan and Tazewell have the highest livestock counts per county and Macon and Dewitt have the lowest. Deer densities vary from 1 deer per square mile in Macon to 9 deer per square mile in Mclean. Compared to the whole watershed, the deer density is medium to low. Lincoln and Bloomington/Normal both apply sewage sludge in this watershed.

Figure 40. Salt Creek EI 02 Watershed

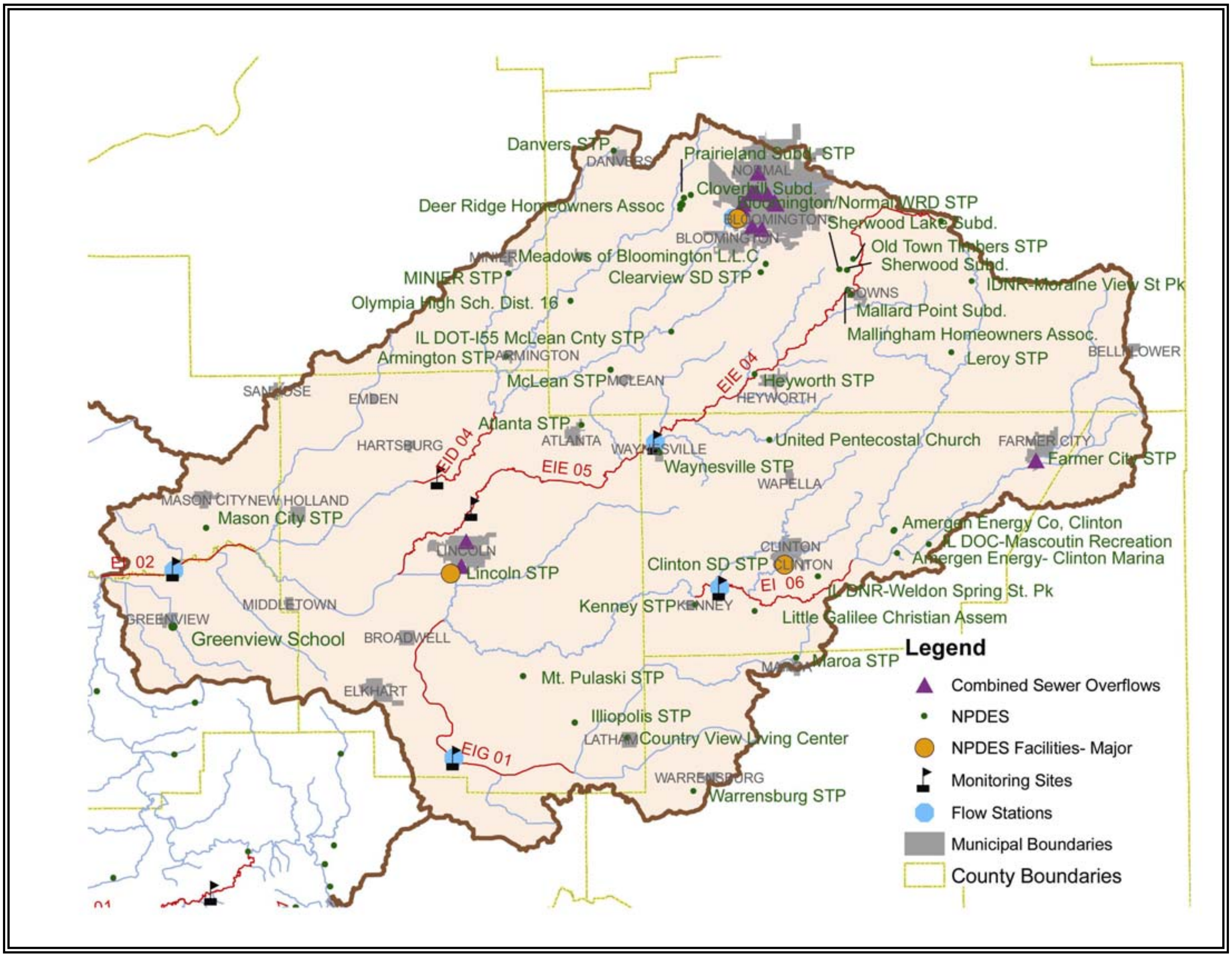


Table 10. NPDES Facilities in Salt Fork EI 06 Watershed

NPDES ID	Facility Name	Design Average Flow (MGD)	Exempt	DMR Data	Exceed-ences/ Total	Mean of Discharge (cfu/ 100ml)	Discharge cfu/ 100ml/ MGD	Max. Permitted Discharge (cfu/ 100ml/ MGD)
IL0036919	Amergen Energy-Clinton	0.0930		Not in permit		400	37.2	37.2
IL0044806	Armington STP	0.04	YR			200	8	8
ILG580181	Atlanta STP	0.1915	YR			200	38.3	38.3
IL0073504	**Bloomington/Normal SE WRD STP**	**7.5**		**New Facility**		**400**	**3000**	**3000**
IL0027731	**Bloomington/Normal WRD STP**	**22.5**	**YR**			**200**	**4500**	**4500**
IL0059412	Clearview SD STP	0.0191		94-04	0/5	62	1.1842	7.64
IL0023612	**Clinton SD STP**	**1.6800**	**YR**			**200**	**336**	**336**
IL0072168	Cloverhill Subdivision	0.0084		98-04	0	0	0	3.36
ILG551010	Country View Living Center	0.0144	YR			200	2.88	2.88
ILG580059	Danvers STP	0.14	YR			200	28	28
IL0070823	Deer Ridge Homeowners Assn	0.0039		95-04	19 of 27	4829	18.8331	1.56
IL0070823	Deer Ridge Homeowners Assn	0.0018		95-04	11 of 20	1395	2.511	0.72
IL0070823	Deer Ridge Homeowners Assn	0.0028		95-04	26 of 50	2248	6.2944	1.12
IL0070823	Deer Ridge Homeowners Assn	0.0028		95-04	8 of 11	2378	6.6584	1.12
IL0070823	Deer Ridge Homeowners Assn	0.0021		95-04	3 of 12	1135	2.3835	0.84

IL0070823	Deer Ridge Homeowners Assn	0.0081		95-04	11 of 27	3493	28.2933	3.24
IL0022462	Farmer City STP	0.3600	YR			200	72	72
IL0044776	Greenview High School	0.0074	YR			200	1.48	1.48
IL0022993	Heyworth STP	0.4	YR			200	80	80
IL0072877	IDNR- Moraine State Park	0.0210	YR			200	4.2	4.2
IL0070386	IDNR- Weldon Springs State Park	0.0113		2001-2004		64	0.7232	0.7232
IL0062961	IL DOC Mascoutin Recreation	0.0272	S	2001-2004		34	0.9248	0.9248
IL0062278	IL DOT I-55 McLean County STP	0.005		93-96	0 of 11	11	0.055	2
IL0021563	Leroy STP	0.6570	YR			200	131.4	131.4
IL0029564	**Lincoln STP**	**4.1900**	**S**		**1 of 96**	**178**	**745.8200**	**745.82**
IL0071200	Little Galilee Christian Assembly	0.0130	YR			200	2.6	2.6
IL0071404	Mallard Point Subdivision	0.016		96-02	16/21	8920	142.72	6.4
IL0073563	Mallingham Homeowners Assoc	0.0133		99-04	20/26	4521	60.1293	5.32
IL0025208	Maroa STP	0.3600	YR			200	72	72
IL0029815	Mason City STP	0.4700	YR			200	94	94
ILG580162	McLean STP	0.205	YR			200	41	41
IL0050121	Meadows of Bloomington	0.065		95-04	19/55	5876	381.94	26
ILG580098	Minier STP	0.18	YR			200	36	36
IL0071323	Old Town Timbers STP	0.008		96-04	14/17	16419	131.352	3.2
ILG551022	Olympia High School	0.0318	YR			200	6.36	6.36
IL0074756	Prairieland Subdivision	0.018	S	?		400	7.2	7.2
IL0075892	Sherwood Lake Subdivision	0.02	S	?		400	8	8
IL0074551	Sherwood Subdivision	0.013		2002-2004	2 of 7	639	8.307	5.2
IL0059331	United Pentecostal Church	0.03	YR			200	6	6
IL0034215	Warrensburg STP	0.2500	YR			200	50	50
IL0065447	Waynesville STP	0.011	YR			200	2.2	2.2
							10102.949	9380.008

Allocations

Annual Loads **Salt Creek 02**

Total Annual Load-	Geo Mean (cfu/ml)	Annual Seasonal Flow (MGD)	gal/MGD	L/gal	mL/L	cfu/d
	4.27	769	1,000,000	3.785	1000	**1.24E+13**
MS 4 Load-	Total Load (cfu/d)	Ratio MS4 Acres in Watershed	cfu/d			
	1.24E+13	0.022	2.73E+11			
Permitted Wasteload (with DMR data)-	NPDES Discharge (cfu/ml/MGD)	gal/MGD	L/gal	mL/L	cfu/d	
	101.029492	1,000,000	3.785	1000	3.82E+11	
Septic Wasteload -	Households	fecal conc(cfu/ml)*	discharge (gal/person/d)	people/ house	ml/gal	cfu/d
	27.5	1.00E+04	70	2.5	3785.2	1.82E+11
Wasteload-	MS4	Permitted WL	Septic	cfu/d		
	2.73E+11	3.82E+11	1.82E+11	**8.38E+11**		
Load-	Total Annual Load -	Wasteload =	cfu/d			
	1.24E+13	8.38E+11	**1.16E+13**			

Allowable Load

Permitted Wasteload- using effluent limit 400	NPDES Discharge (cfu/ml/MGD)	gal/MGD	L/gal	mL/L	cfu/d	
	93.80008	1,000,000	3.785	1000	**3.55E+11**	
Total Allowable Load-	Geo Mean (cfu/ml)	Annual Seasonal Flow (MGD)	gal/MGD	L/gal	mL/L	cfu/d
	2	769	1,000,000	3.785	1000	**5.82E+12**

Load Allowable-	Total Allowable Load	Allowable Wasteload	cfu/d
	5.82E+12	3.55E+11	**5.47E+12**

Load	Daily Load	Allowable Daily Load	Required Reduction	NPDES Reduction
WLA	8.38E+11	3.55E+11	57.63%	7.16%
LA	1.16E+13	5.47E+12	52.84%	
Total	1.24E+13	5.82E+12	53.16%	

* Horsley & Witten 1996 10^6/100ml

Discharge data shows that facilities in the watershed have exceeded their effluent standard of 400 cfu/100ml. Facilities need to meet the standard.

Duration Curves and Implementation

Figures 41-45 display the water quality duration curves for Salt Creek (EI 02) and Table 11 gives the geometric means for all flow intervals and general implementation opportunities.

Figure 41. Duration Curve for Fecal Coliform- 1995-2004

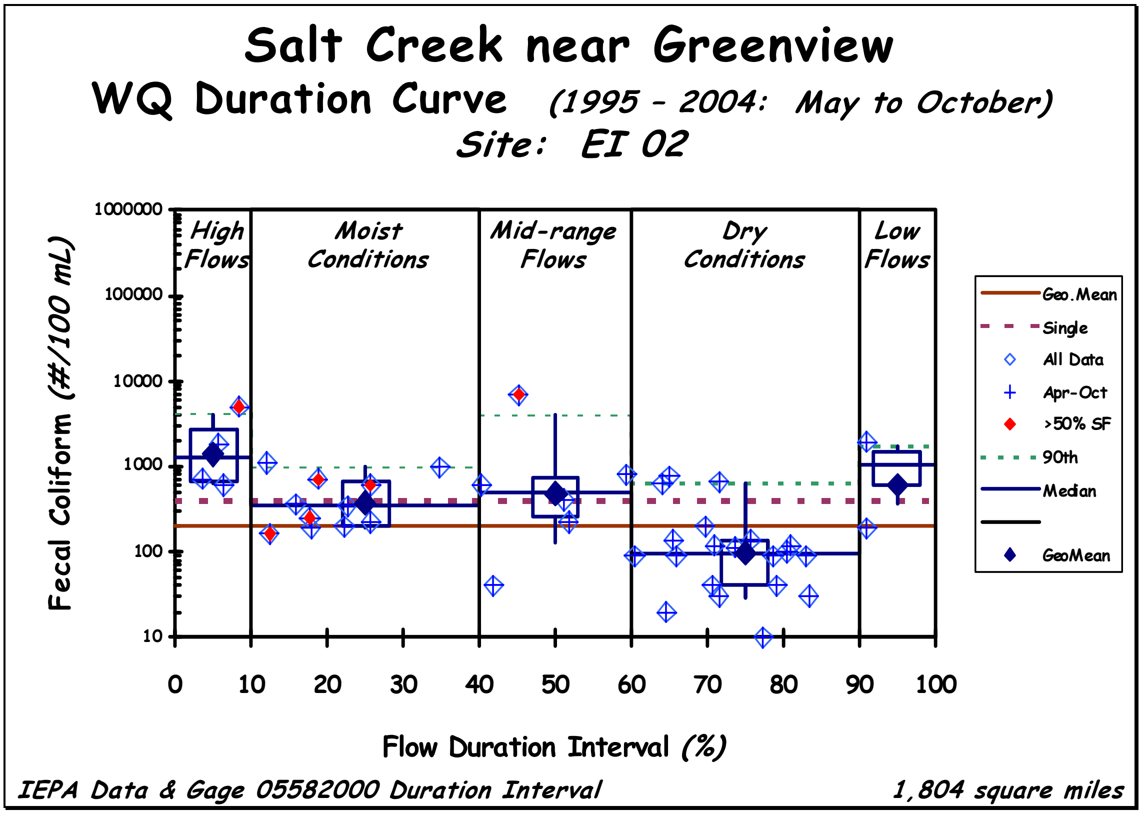


Figure 42. Duration Curve for Fecal Coliform- 1978-2004

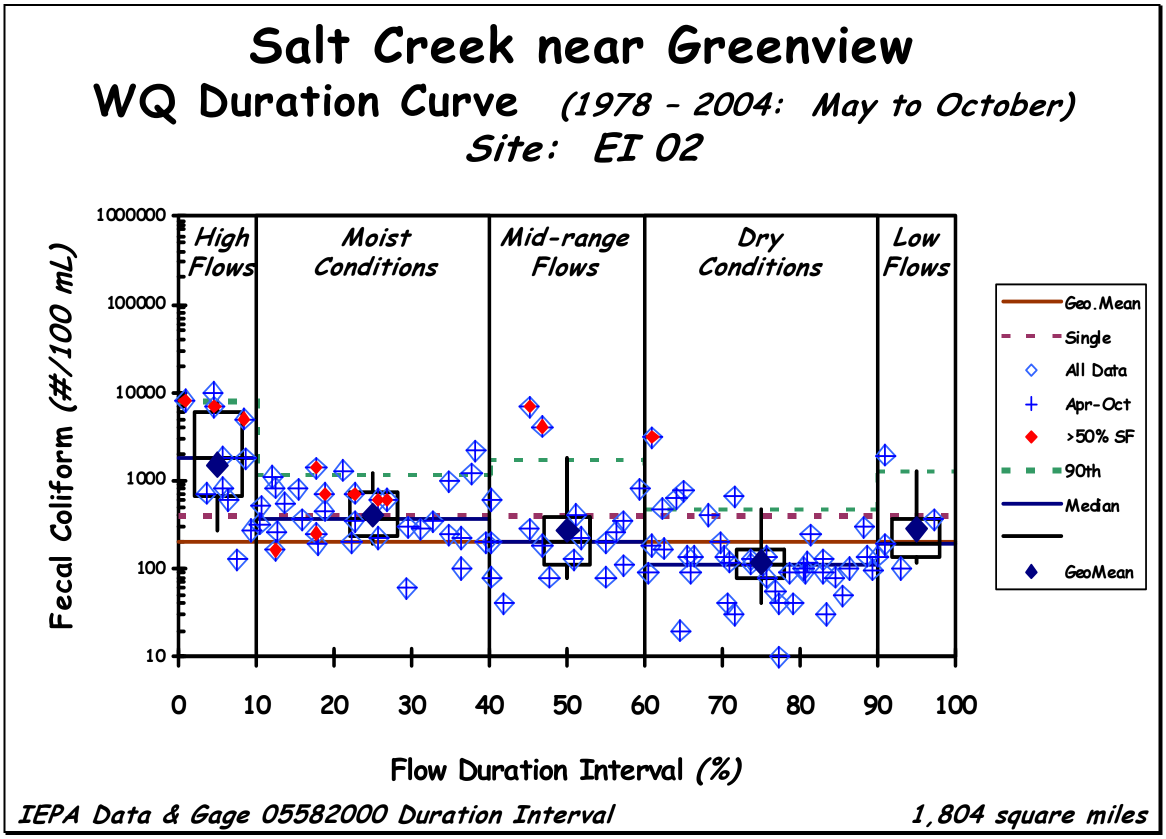


Figure 43. Duration Curve for Phosphorus

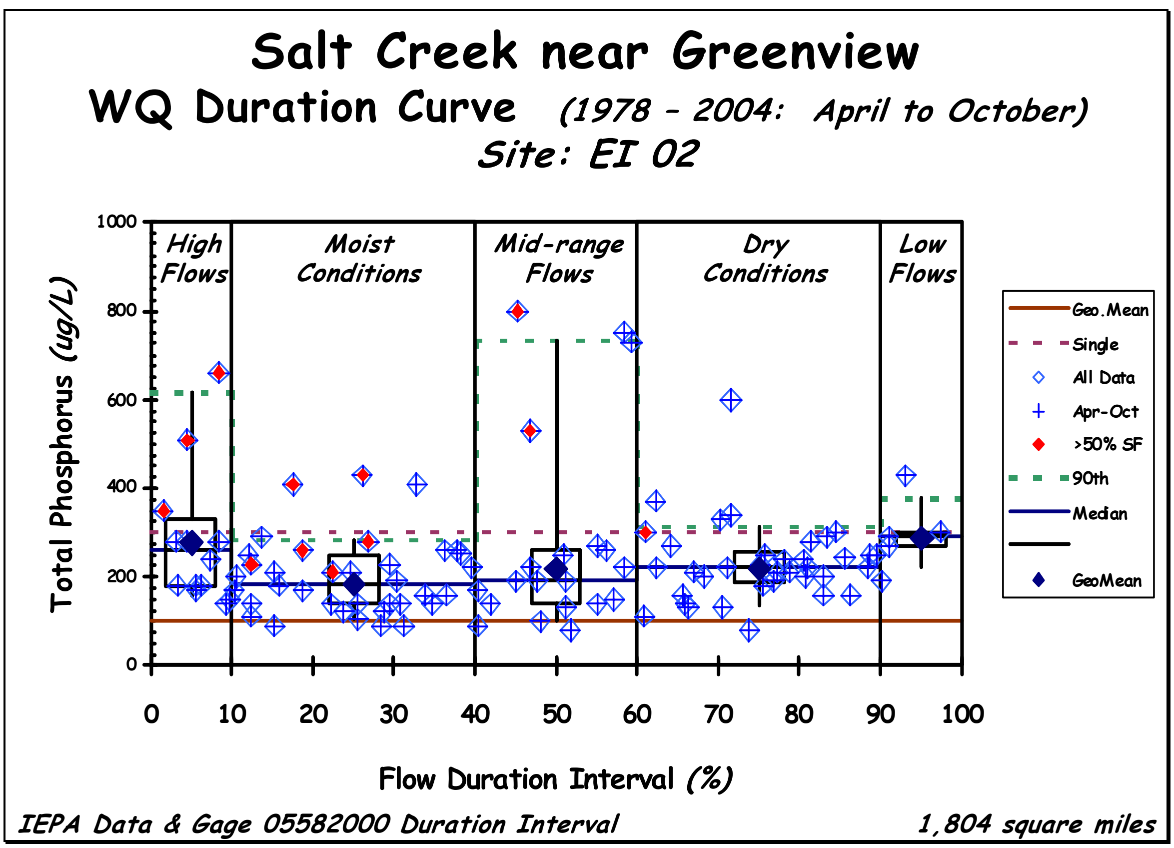


Figure 44. Duration Curve for Nitrite+Nitrate

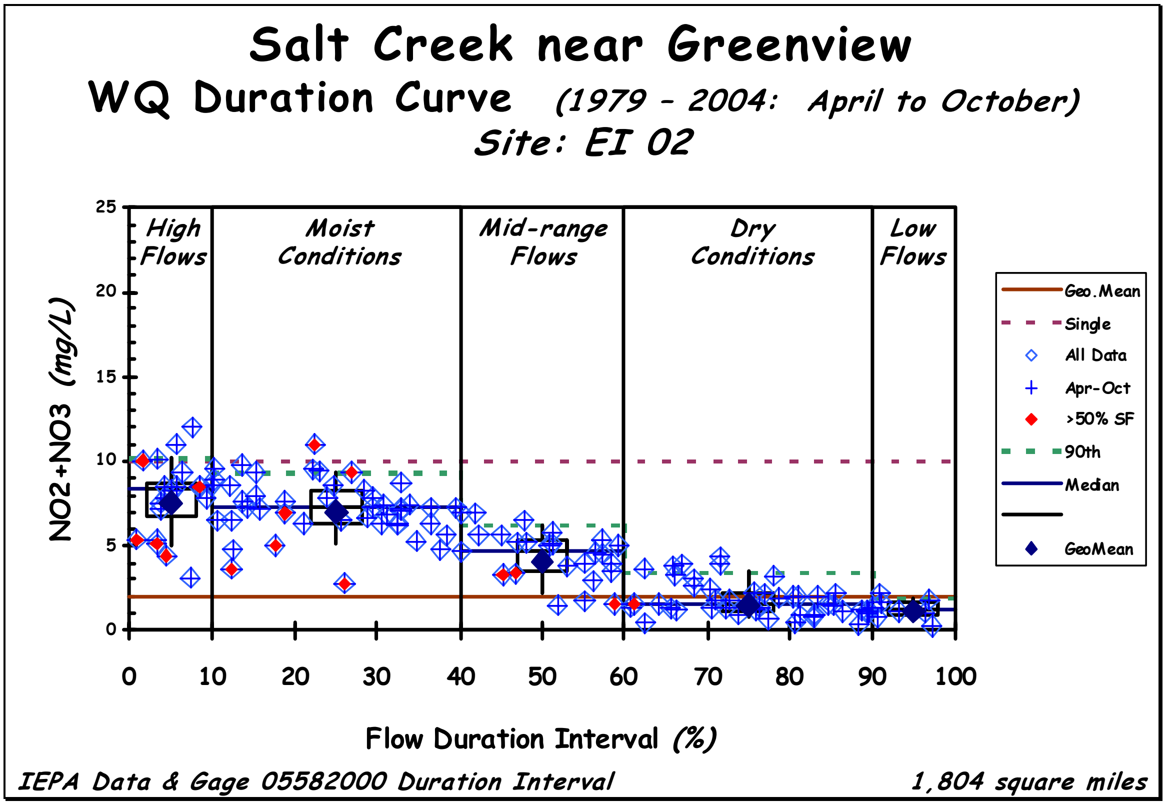


Figure 45. Duration Curve for TSS

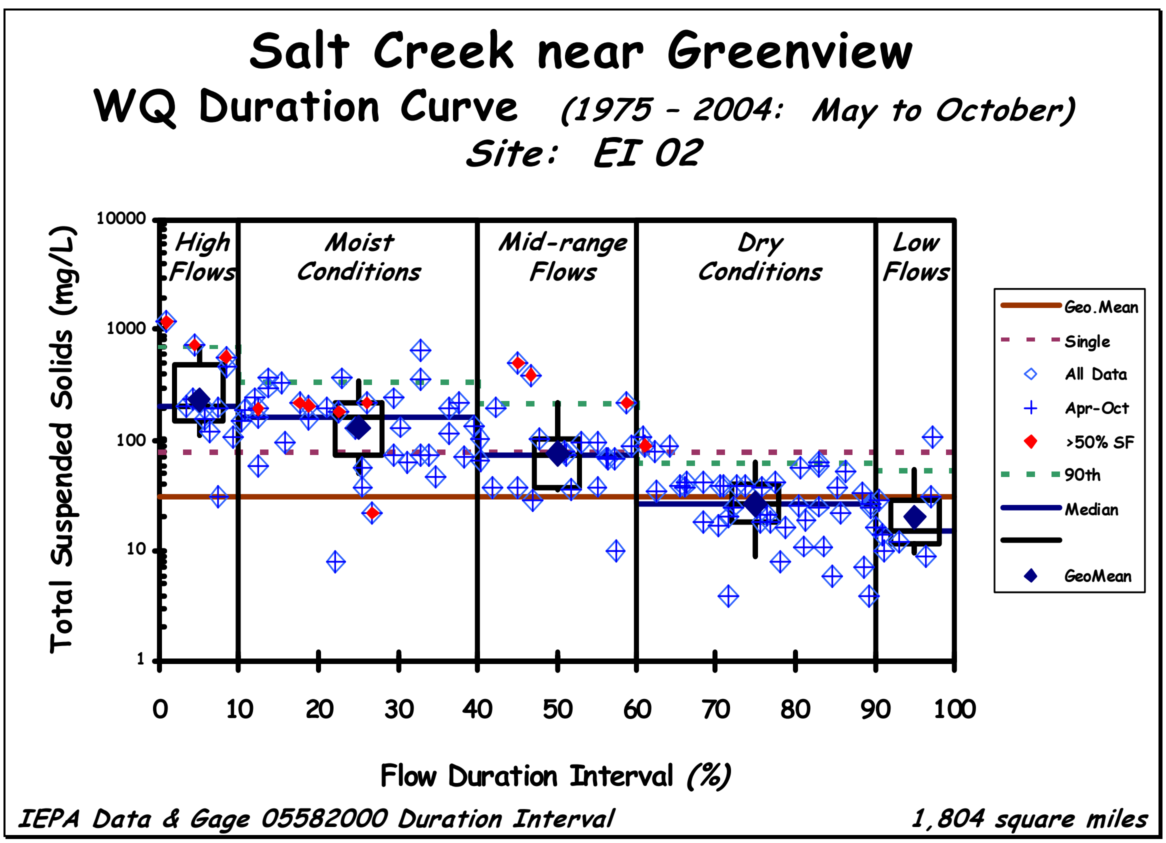


Table 11. Geometric Means for Flow Intervals

<table>
<tr><th rowspan="2"></th><th colspan="5">Duration Curve Zone
Geometric Mean (cfu/100ml)</th></tr>
<tr><th>High</th><th>Moist</th><th>Mid</th><th>Dry</th><th>Low</th></tr>
<tr><td>Salt Creek (EI 02)</td><td>1404</td><td>372</td><td>477</td><td>95</td><td>601</td></tr>
<tr><td rowspan="6">Seasonal Considerations

[most likely zone(s) by month]</td><td></td><td colspan="2">May</td><td></td><td></td></tr>
<tr><td></td><td colspan="3">June</td><td></td></tr>
<tr><td></td><td></td><td colspan="2">July</td><td></td></tr>
<tr><td></td><td></td><td></td><td>August</td><td></td></tr>
<tr><td></td><td></td><td></td><td>September</td><td></td></tr>
<tr><td></td><td></td><td colspan="2">October</td><td></td></tr>
<tr><td rowspan="6">Implementation Opportunities</td><td colspan="2">Long-term CSO plans</td><td></td><td colspan="2">Municipal NPDES</td></tr>
<tr><td></td><td colspan="4">On-site wastewater management</td></tr>
<tr><td></td><td colspan="4">Pasture management & riparian protection</td></tr>
<tr><td colspan="5">Urban storm water management</td></tr>
<tr><td colspan="4">Open lot agreements</td><td></td></tr>
<tr><td colspan="2">Manure management</td><td></td><td></td><td></td></tr>
</table>

2. Lower Sangamon River Watershed

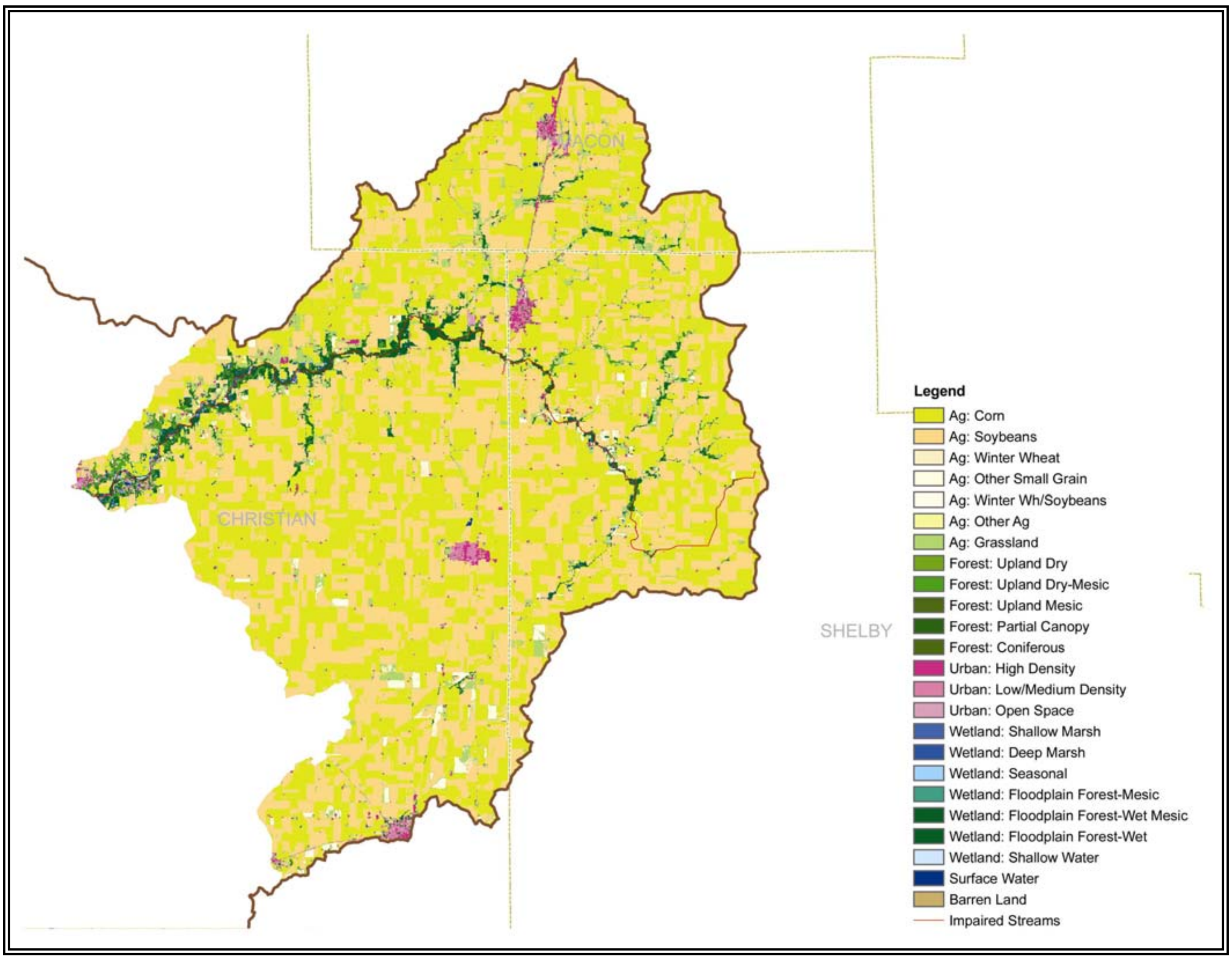
A. Flat Branch EOH 01

Watershed Characteristics

Flat Branch is 36.13 miles long and flows into the South Fork of Sangamon River. It is impaired for five causes: siltation, Low DO, habitat alteration and suspended solids with potential sources of agriculture, channelization, and natural sources; and fecal coliform bacteria with a potential source of unknown. This TMDL will address fecal coliform bacteria. No other water in this watershed is on the 303(d) List.

Land use is mainly agricultural with 89% cultivated crops and 5% rural grassland. 2% is urban, 2% is forest and 2% is floodplain forest. The majority of agriculture land in Macon, Shelby and Christian Counties are farmed using conventional tillage for corn and soybeans.

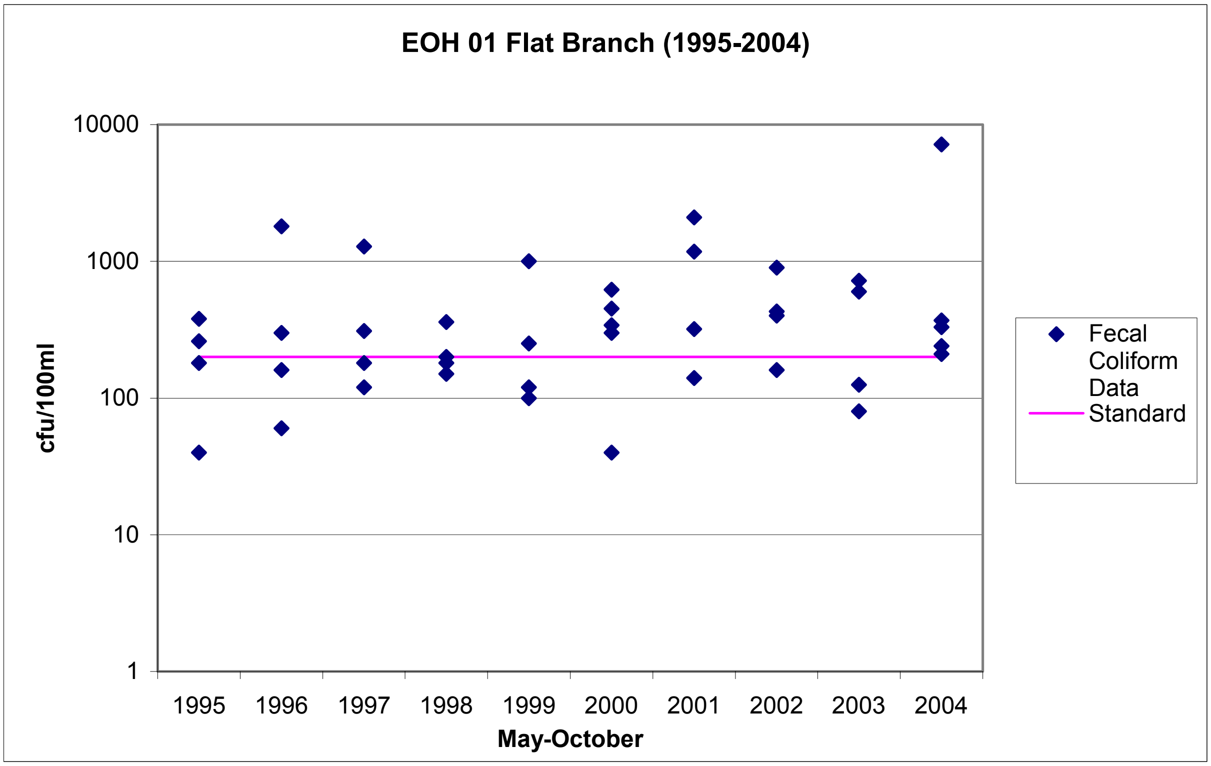
Figure 46. Land Use in the Flat Branch Watershed



Fecal Coliform Data Assessment

For 1995-2004, there are 42 seasonal samples (May through October) from station EOH 01. 26 are over 200 cfu/100ml and 12 were over 400 cfu/100 ml. A time series plot for fecal coliform samples are in Figure 47.

Figure 47. Fecal Coliform Data for EOH 01



Potential Sources

There are five facilities discharging into the Flat Branch Watershed. All of these facilties have fecal coliform exemptions and do not have to monitor for bacteria. For these exempted facilities, 200 cfu/100ml is used for the discharge. Urban stormwater is a potential source of bacteria. There are no large towns in this watershed and no known CSOs. Shelby County has high livestock densities and Christian has medium compared to other counties in the entire watershed. There are low to medium deer densities throughout this watershed.

Figure 48. Flat Branch Watershed

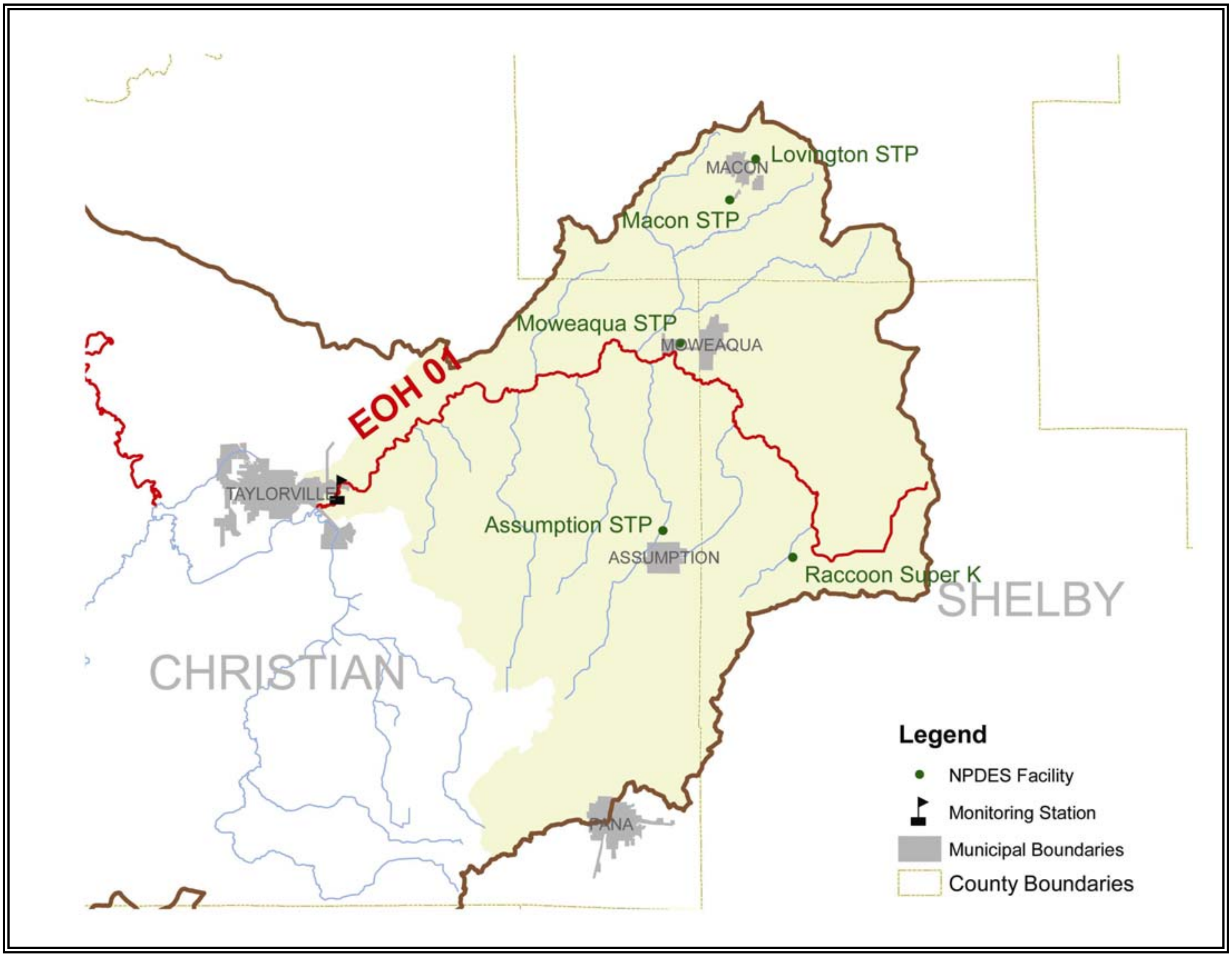


Table 12. NPDES Facilities in Flat Branch Watershed

NPDES ID	Facility Name	Design Average Flow (MGD)	Exempt	DMR Data	Exceed-ences/ Total	Mean of Discharge (cfu/ 100ml)	Discharge cfu/ 100ml/ MGD	Max. Permitted Discharge (cfu/ 100ml/ MGD)
IL0020907	ASSUMPTION STP	0.3900	YR			200	78	78
IL0024210	LOVINGTON STP	0.2000	YR			200	40	40
ILG580141	MACON STP	0.2140	YR			200	42.8	42.8
ILG580134	MOWEAQUA STP	0.2200	YR			200	44	44
IL0053252	RACCOON SUPER K	0.0015	YR			200	0.3	0.3
							205.1	205.1

Allocations

Annual Loads **Flat Branch**

Permitted Wasteload (with DMR data)-	NPDES Discharge (cfu/ml/MGD)	gal/MGD	L/gal	mL/L	cfu/d	
	2.051	1,000,000	3.785	1000	7.76E+09	
Septic Wasteload -	Households	fecal conc(cfu/ml)*	discharge (gal/person/d)	people/ house	ml/gal	cfu/d
	2.9	1.00E+04	70	2.5	3785.2	1.92E+10
Wasteload-	Permitted WL	Septic	cfu/d			
	7.76E+09	1.92E+10	**2.70E+10**			
Total Annual Load-	Geo Mean (cfu/ml)	Annual Seasonal Flow (MGD)	gal/MGD	L/gal	mL/L	cfu/d
	2.84	93	1,000,000	3.785	1000	**1.00E+12**
Load-	Total Annual Load -	Wasteload =	cfu/d			
	1.00E+12	2.70E+10	**9.73E+11**			

Allowable Load

Permitted Wasteload- using effluent limit 400	NPDES Discharge (cfu/ml/MGD)	gal/MGD	L/gal	mL/L	cfu/d	
	2.051	1,000,000	3.785	1000	**7.76E+09**	
Total Allowable Load-	Geo Mean (cfu/ml)	Annual Seasonal Flow (MGD)	gal/MGD	L/gal	mL/L	cfu/d
	2	93	1,000,000	3.785	1000	**7.04E+11**
Load Allowable-	Total Allowable Load	Allowable Wasteload	cfu/d			
	7.04E+11	7.76E+09	**6.96E+11**			

Load	Daily Load	Allowable Daily Load	Required Reduction	NPDES Reduction
WLA	2.70E+10	7.76E+09	71.22%	0%
LA	9.73E+11	6.96E+11	28.42%	
Total	1.00E+12	7.04E+11	29.58%	

* Horsley & Witten 1996 10^6/100ml

NPDES permits do not need modified.

Duration Curves and Implementation

Figures 49-53 display the water quality duration curves for Flat Branch and Table 13 gives the geometric means at flow intervals and general implementation opportunities.

Figure 49. Duration Curve for Fecal Coliform 1995-2004

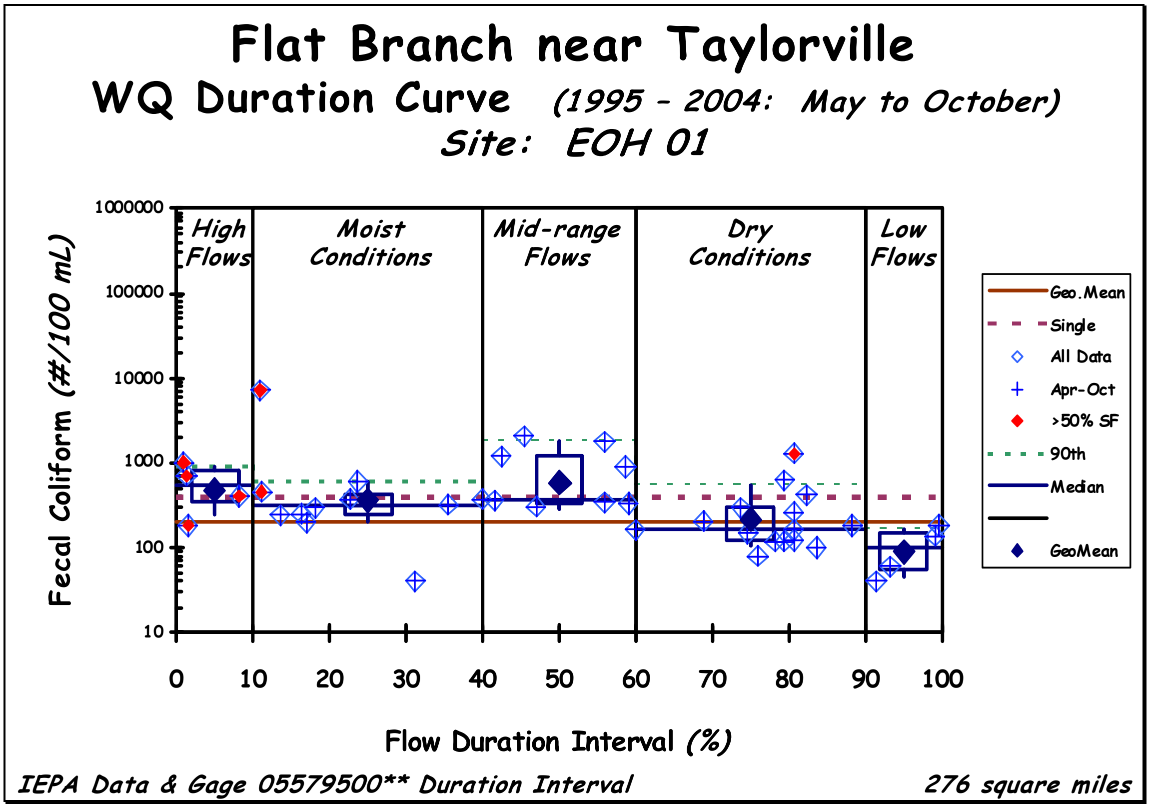


Figure 50. Duration Curve for Fecal Coliform- 1979-2004

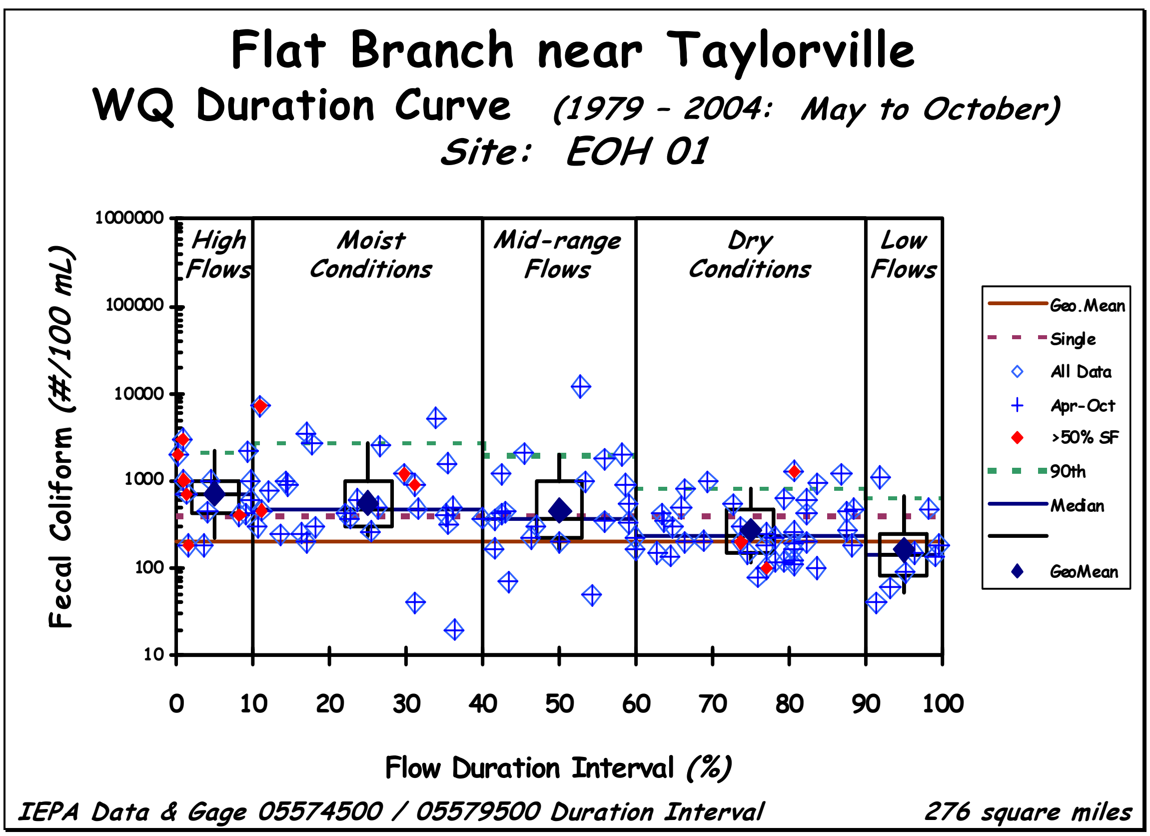


Figure 51. Duration Curve for Phosphorus

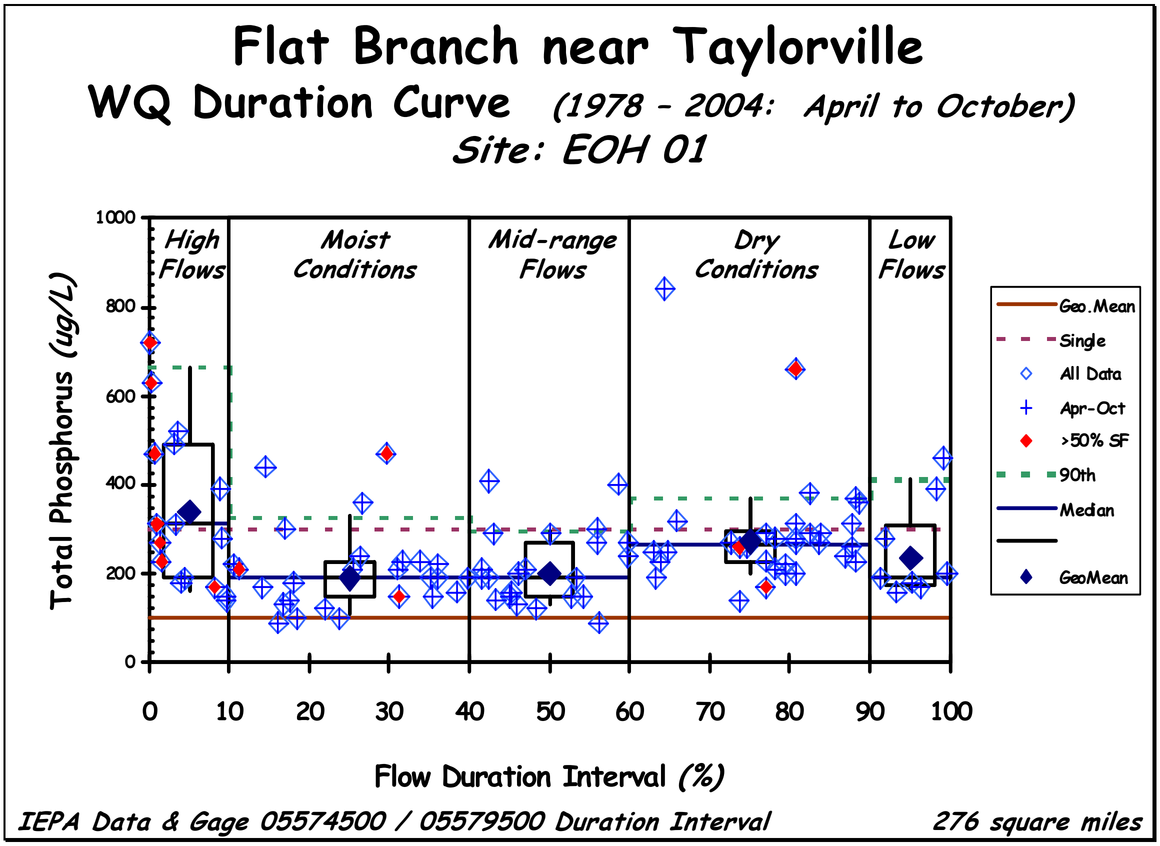


Figure 52. Duration Curve for Nitrite+Nitrate

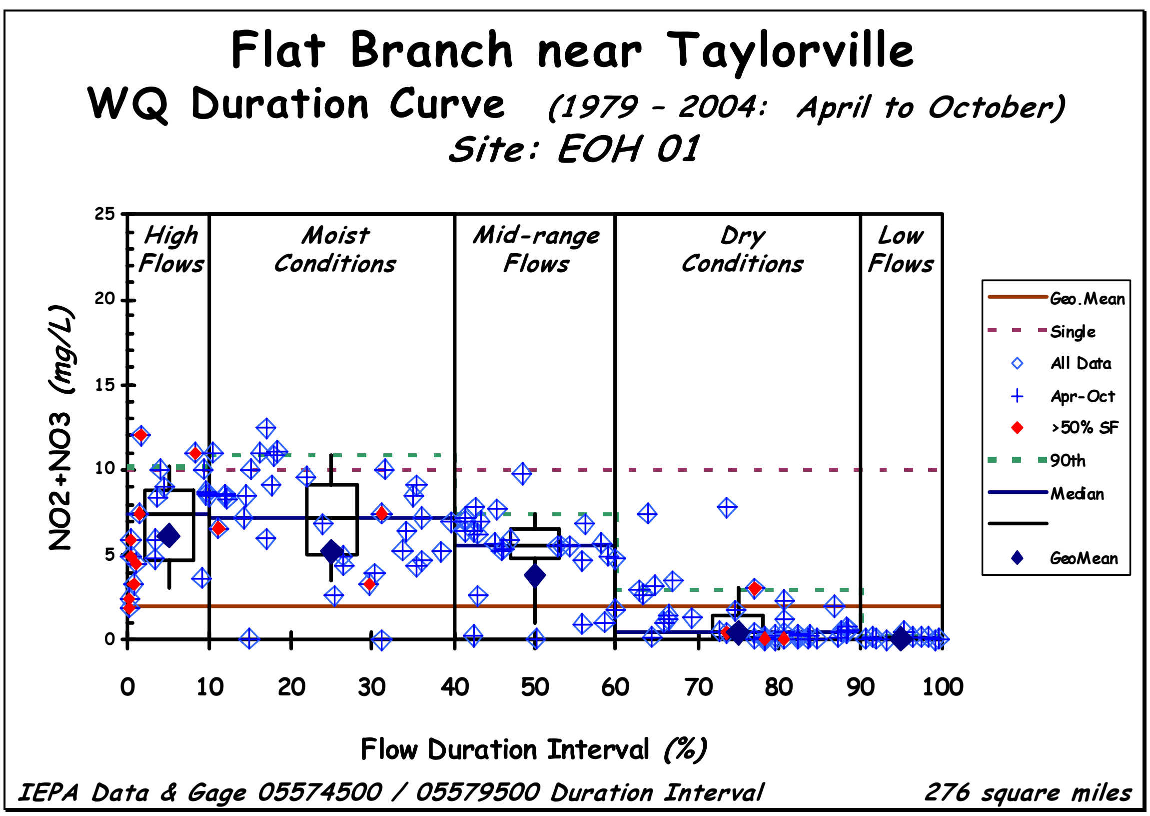


Figure 53. Duration Curve for TSS

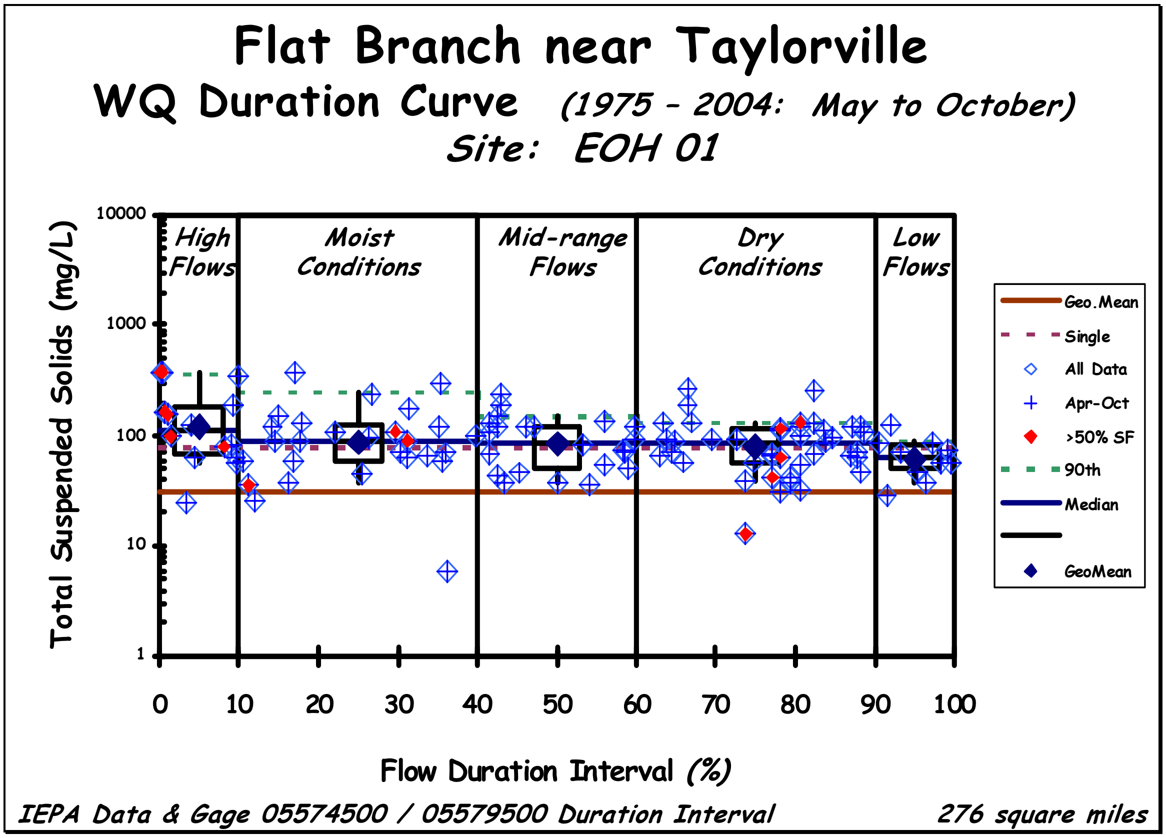


Table 13. Geometric Means at Flow Intervals

<table>
<tr><td rowspan="2"></td><td colspan="5">Duration Curve Zone
Geometric Mean (cfu/100ml)</td></tr>
<tr><td>High</td><td>Moist</td><td>Mid</td><td>Dry</td><td>Low</td></tr>
<tr><td>Flat Branch (EOH 01)</td><td>477</td><td>358</td><td>585</td><td>211</td><td>88</td></tr>
<tr><td rowspan="6">Seasonal Considerations

[most likely zone(s) by month]</td><td></td><td colspan="2">May</td><td></td><td></td></tr>
<tr><td></td><td colspan="3">June</td><td></td></tr>
<tr><td></td><td></td><td colspan="2">July</td><td></td></tr>
<tr><td></td><td></td><td></td><td>August</td><td></td></tr>
<tr><td></td><td></td><td></td><td>September</td><td></td></tr>
<tr><td></td><td></td><td colspan="2">October</td><td></td></tr>
<tr><td rowspan="6">Implementation Opportunities</td><td colspan="2">Long-term CSO plans</td><td></td><td colspan="2">Municipal NPDES</td></tr>
<tr><td></td><td colspan="4">On-site wastewater management</td></tr>
<tr><td></td><td colspan="4">Pasture management & riparian protection</td></tr>
<tr><td colspan="5">Urban storm water management</td></tr>
<tr><td colspan="4">Open lot agreements</td><td></td></tr>
<tr><td colspan="2">Manure management</td><td></td><td></td><td></td></tr>
</table>

B. South Fork Sangamon River EO 02

Watershed Description

South Fork Sangamon River Watershed contains 16.09 miles of South Fork Sangamon River that is impaired for fecal coliform with a potential impairment of unknown. The watershed also contains Flat Branch which is discussed in the previous section. There are five other water segments in this watershed that are impaired but not for fecal coliform bacteria (see Table 14). Segment EO 13 and Taylorville Lake have a TMDL in progress at this time.

Land use is mainly agricultural with 87% cultivated crops and 4% rural grassland. 3% is urban, 3% is forest, and 2% is floodplain forest. The majority of agriculture land in Macon, Shelby and Christian Counties are farmed using conventional tillage for corn and soybeans.

Figure 54. Land Use in the South Fork Sangamon Watershed

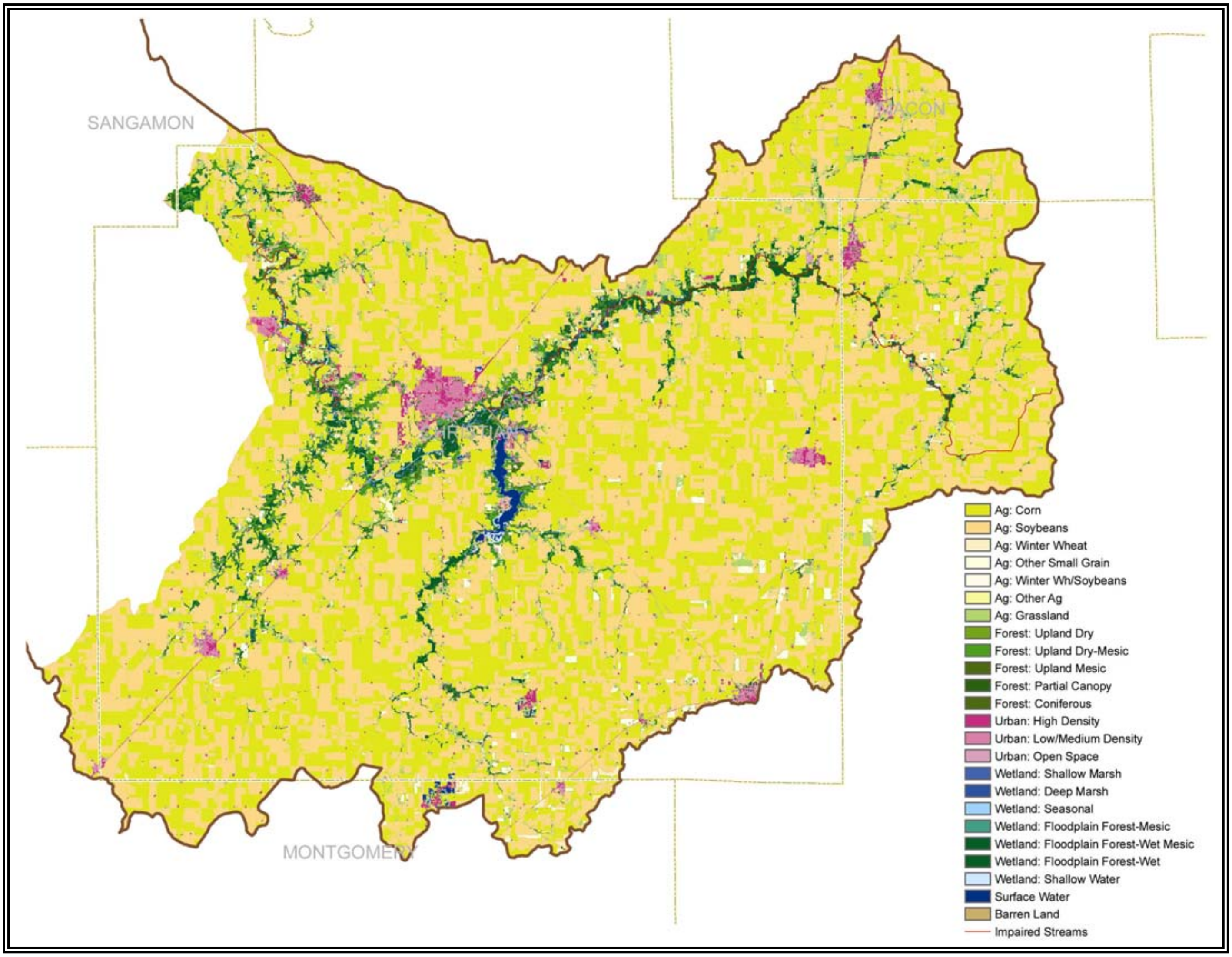


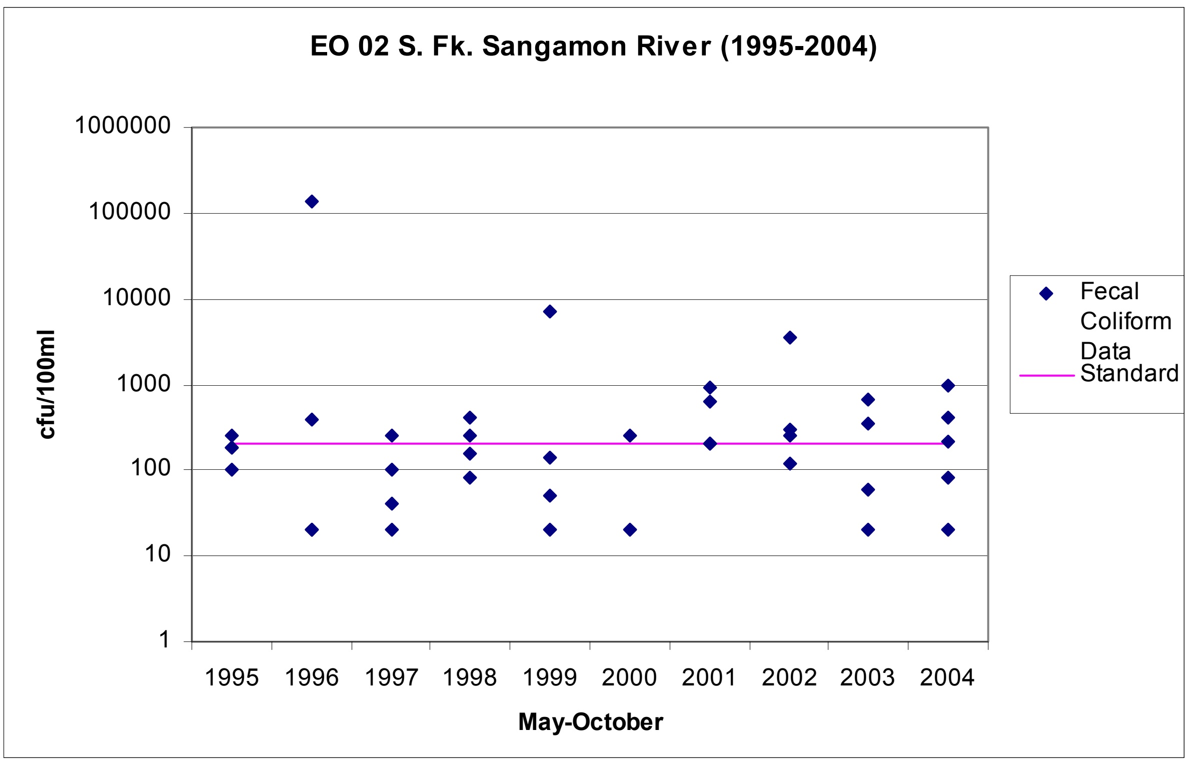
Table 14. Other Waters in S. Fk. Sangamon River Watershed

Segment ID	Segment Name	Potential Impairments	Potential Sources
EO 13	S. Fk. Sangamon R.	Boron, manganese, siltation, DO, chlordane	Agriculture, hydrologic modification, unknown
REC	Taylorville Lake	Manganese, phosphorus, DO, suspended solids, algal growth, chordane	Crop production, flow regulation, recreation, forest/grassland, unknown
EO 05	S. Fk. Sangamon R.	Manganese, siltation, DO, chlordane	Agriculture, resource extraction, unknown
EO 04	S. Fk. Sangamon R.	Totol nitrogen, siltation, DO, suspended solids, chlordane	Agriculture, mine tailings, unknown
EOF 05	Bear Cr.	DO, habitat alteration	Agriculture

Fecal Coliform Data Assessment

For 1995-2004, there are 39 seasonal samples (May through October) form station EO 02. There are 18 that were over 200 cfu/100ml and nine that were over 400 cfu/100ml. A time series plot for fecal coliform samples are in Figure 55.

Figure 55. Fecal Coliform for EO 02



Potential Sources

There are 12 facilities that discharge in the South Fork Sangamon (EO 02) watershed. Five of them are the same as the Flat Branch's discharges because Flat Branch flows into the South Fork River. Sangchris State Park, Edinburg WWTP, Kincaid STP and South Fork STP are all downstream of the monitoring station and there effluent will not be considered for this segment. All the other facilties have fecal coliform exemptions and do not monitor for bacteria. For exempted facilities, 200 cfu/100ml is used for the discharge. Stormwater runoff from urban areas is a potential source of bacteria. There are no known CSOs in this watershed. Christian county has a medium to low livestock density. Deer populations are low in Christian county.

Figure 56. South Fork Sangamon River EO 02 Watershed

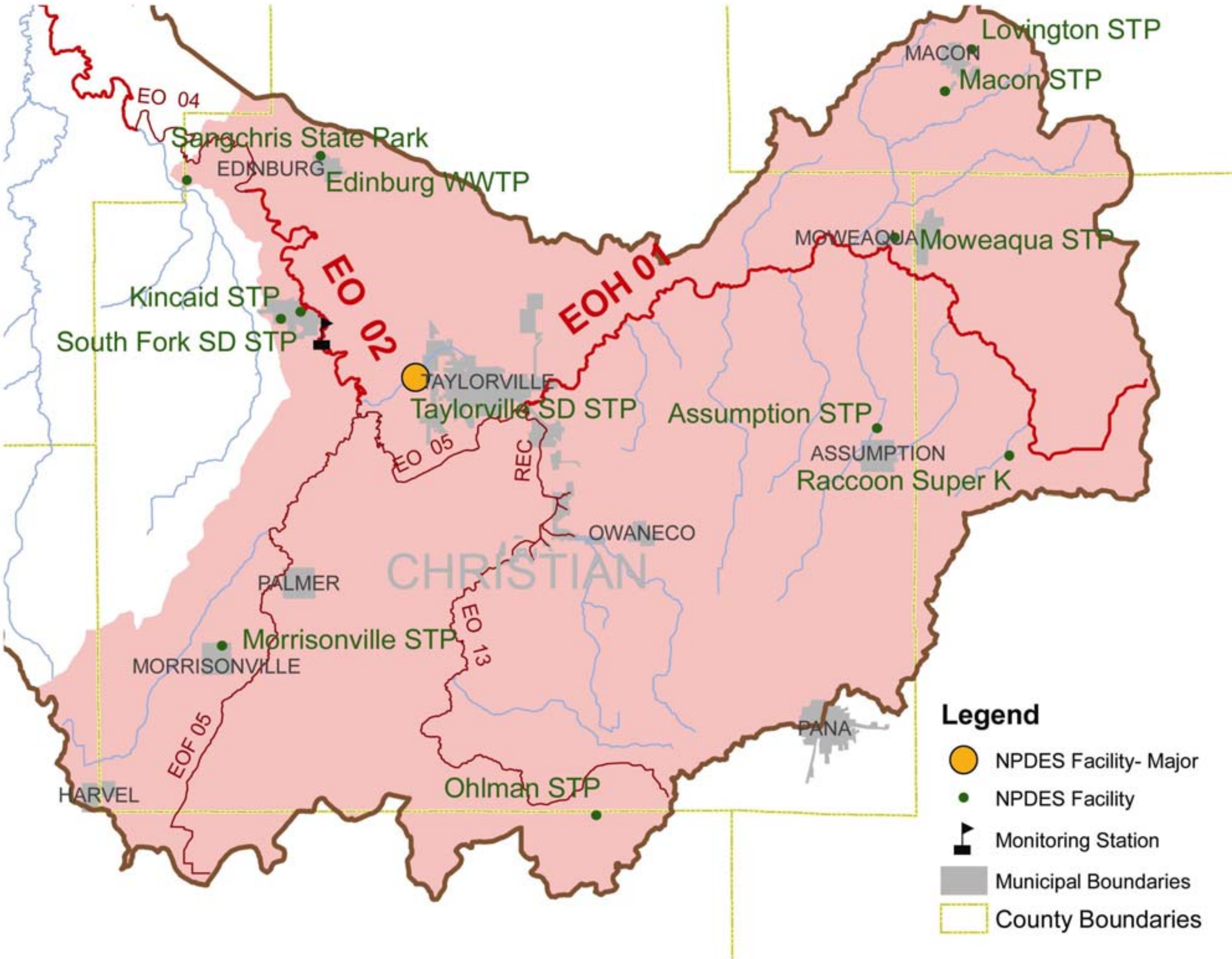


Table 15. NPDES Facilities in South Fork Sangamon River EO 02

NPDES ID	Facility Name	Design Average Flow (MGD)	Exempt	DMR Data	Exceed-ences/ Total	Mean of Discharge (cfu/ 100ml)	Discharge cfu/ 100ml/ MGD	Max. Permitted Discharge (cfu/ 100ml/ MGD)
IL0020907	ASSUMPTION STP	0.3900	YR			200	78	78
IL0024210	LOVINGTON STP	0.2000	YR			200	40	40
ILG580141	MACON STP	0.2140	YR			200	42.8	42.8
IL0025101	MORRISONVILLE STP	0.3300	YR			200	66	66
ILG580134	MOWEAQUA STP	0.2200	YR			200	44	44
IL0032671	OHLMAN STP	0.0250	YR			200	5	5
IL0053252	RACCOON SUPER K	0.0015	YR			200	0.3	0.3
IL0031356	**TAYLORVILLE SD STP**	**3.0200**	**YR**			200	604	604
							880.1	880.1

Allocations

Annual Loads **S. Fork Sangamon (EO 02)**

Permitted Wasteload (with DMR data)-	NPDES Discharge (cfu/ml/MGD)	gal/MGD	L/gal	mL/L	cfu/d	
	8.801	1,000,000	3.785	1000	3.33E+10	
Septic Wasteload -	Households	fecal conc(cfu/ml)*	discharge (gal/person/d)	people/ house	ml/gal	cfu/d
	6.5	1.00E+04	70	2.5	3785.2	4.31E+10
Wasteload-	Permitted WL	Septic	cfu/d			
	3.33E+10	4.31E+10	**7.64E+10**			
Total Load-	Geo Mean (cfu/ml)	Annual Seasonal Flow (MGD)	gal/MGD	L/gal	mL/L	cfu/d
	1.62	312	1,000,000	3.785	1000	**1.91E+12**
Load-	Total Annual Load -	Wasteload =	cfu/d			
	1.91E+12	7.64E+10	**1.84E+12**			

Allowable Load

Permitted Wasteload- using effluent limit 400	NPDES Discharge (cfu/ml/MGD)	gal/MGD	L/gal	mL/L	cfu/d	
	8.801	1,000,000	3.785	1000	**3.33E+10**	
Total Allowable Load-	Geo Mean (cfu/ml)	Annual Seasonal Flow (MGD)	gal/MGD	L/gal	mL/L	cfu/d
	2	312	1,000,000	3.785	1000	**2.36E+12**
Load Allowable-	Total Allowable Load	Allowable Wasteload	cfu/d			
	2.36E+12	3.33E+10	**2.33E+12**			

Load	Daily Load	Allowable Daily Load	Required Reduction	NPDES Reduction
WLA	7.64E+10	3.33E+10	56.38%	0%
LA	1.84E+12	2.33E+12	0%	
Total	1.91E+12	2.36E+12	0%	

Duration Curves and Implementation

Figures 57-61 display the water quality duration curves for South Fork Sangamon (EO 02) and Table 16 contains the geometric means at all flow intervals and general implementation opportunities.

Figure 57. Duration Curve for Fecal Coliform 1995-2004

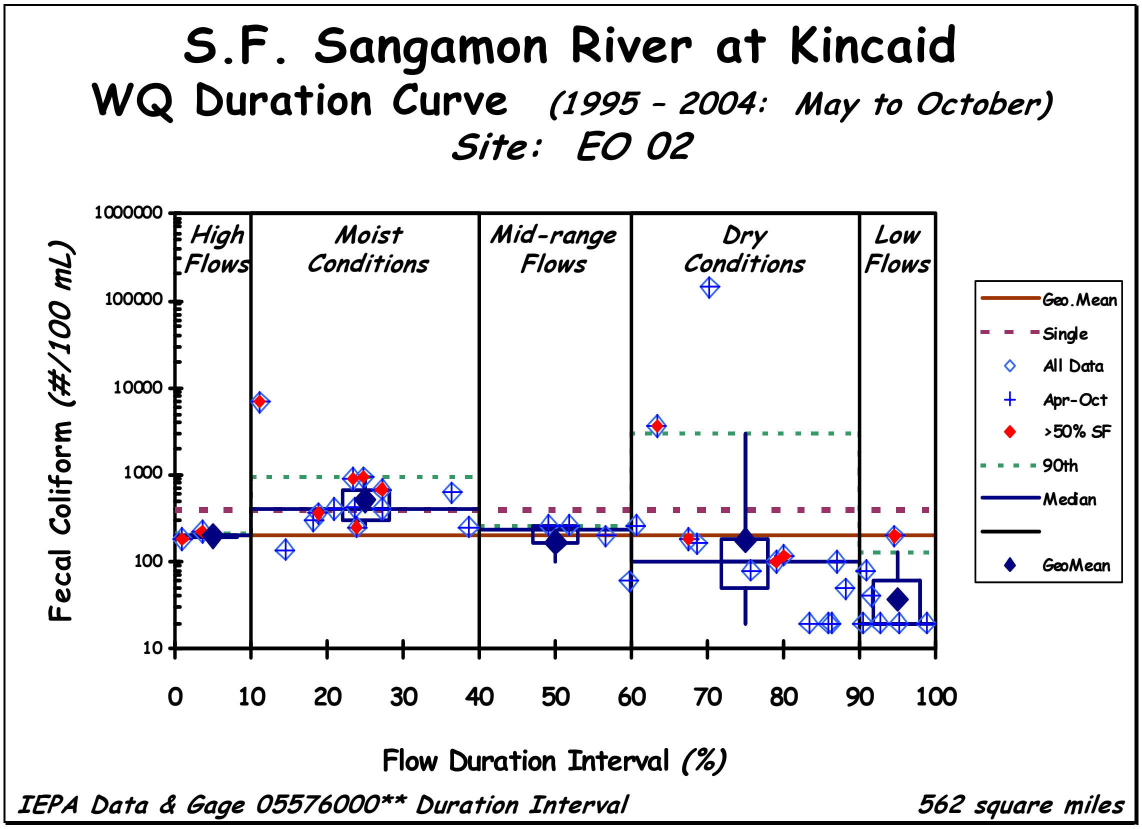


Figure 58. Duration Curve for Fecal Coliform- 1978-2004

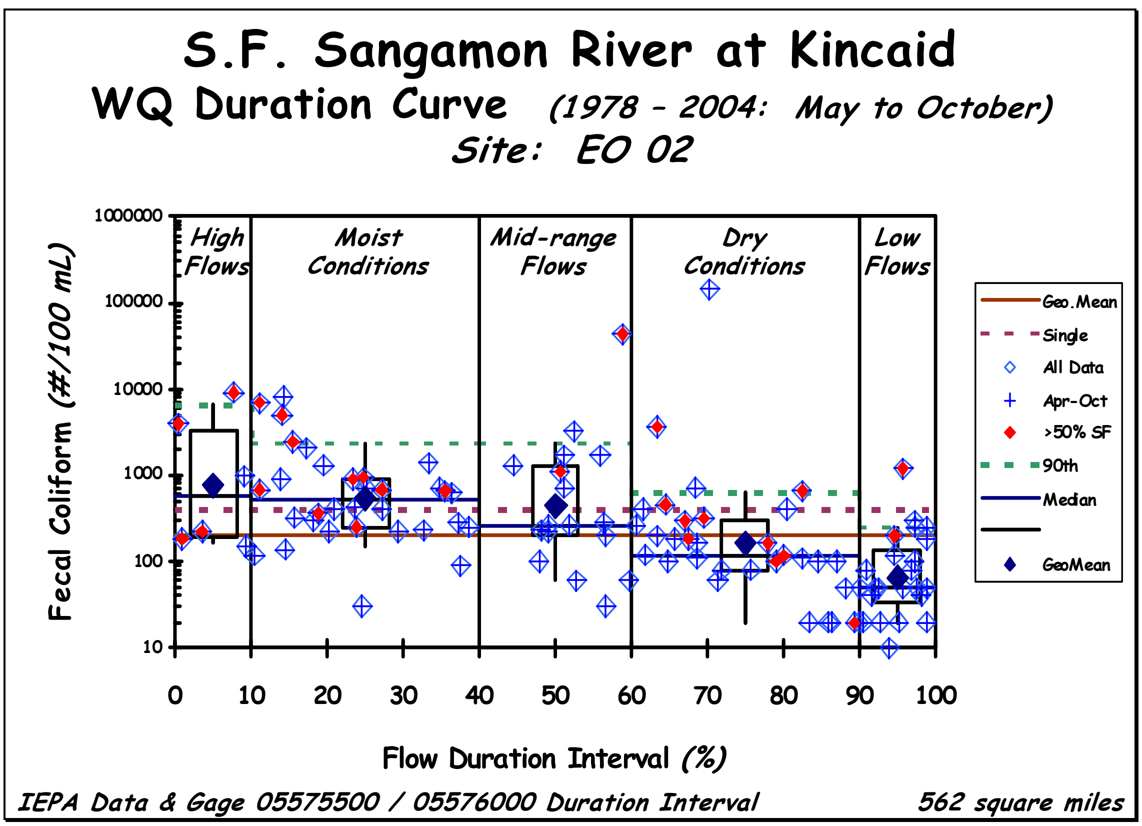


Figure 59. Duration Curve for Phosphorus

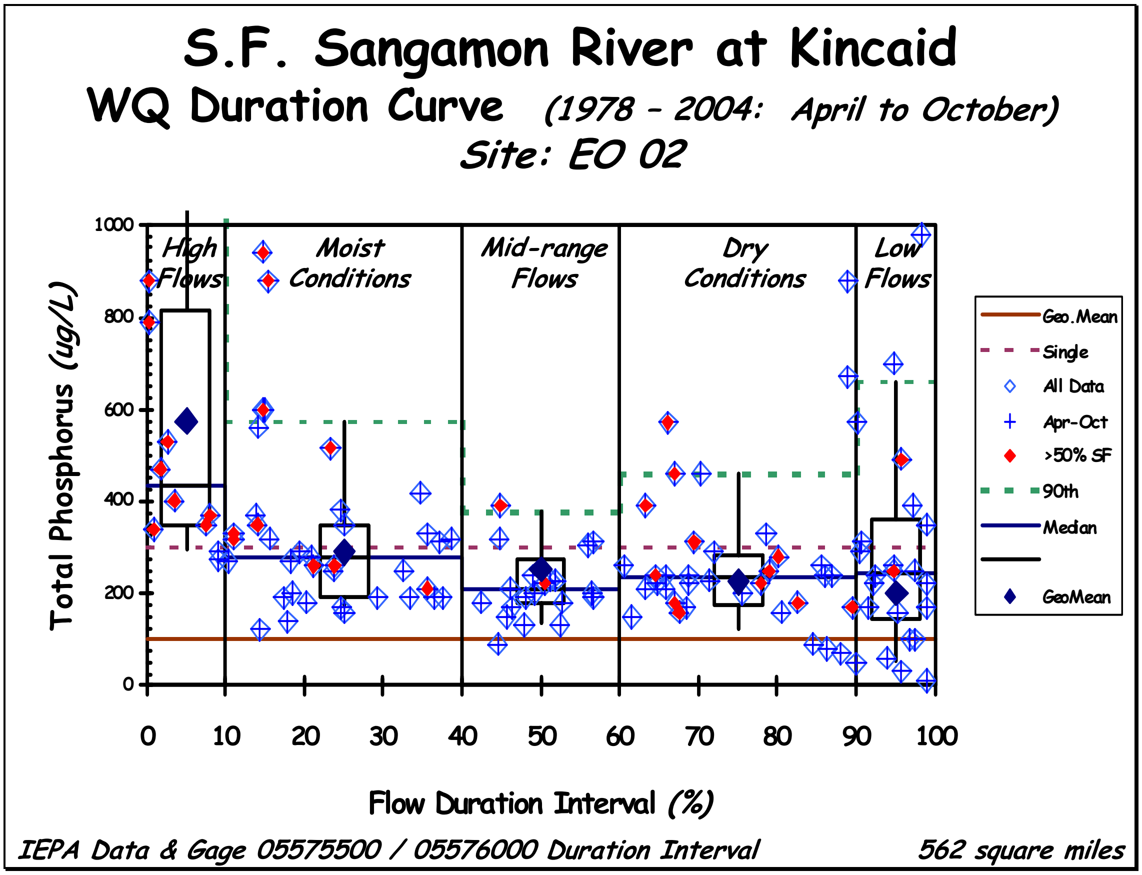


Figure 60. Duration Curve for Nitrite+Nitrate

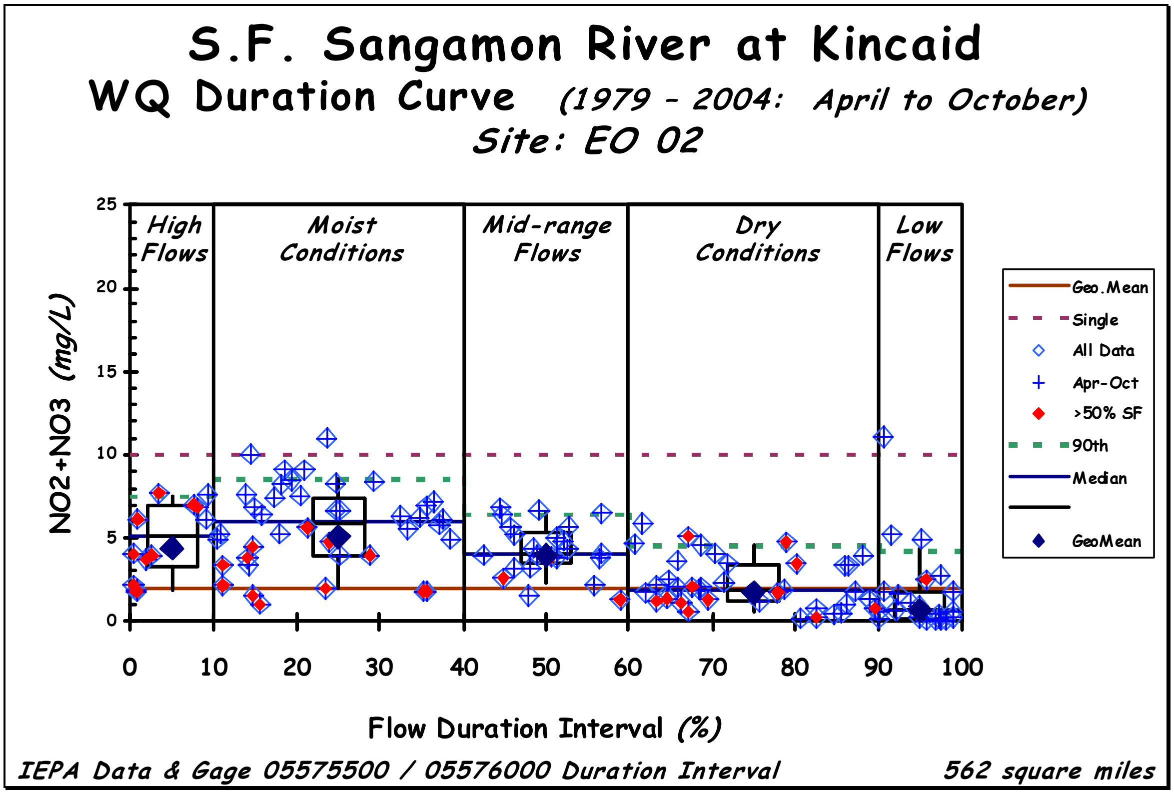


Figure 61. Duration Curve for TSS

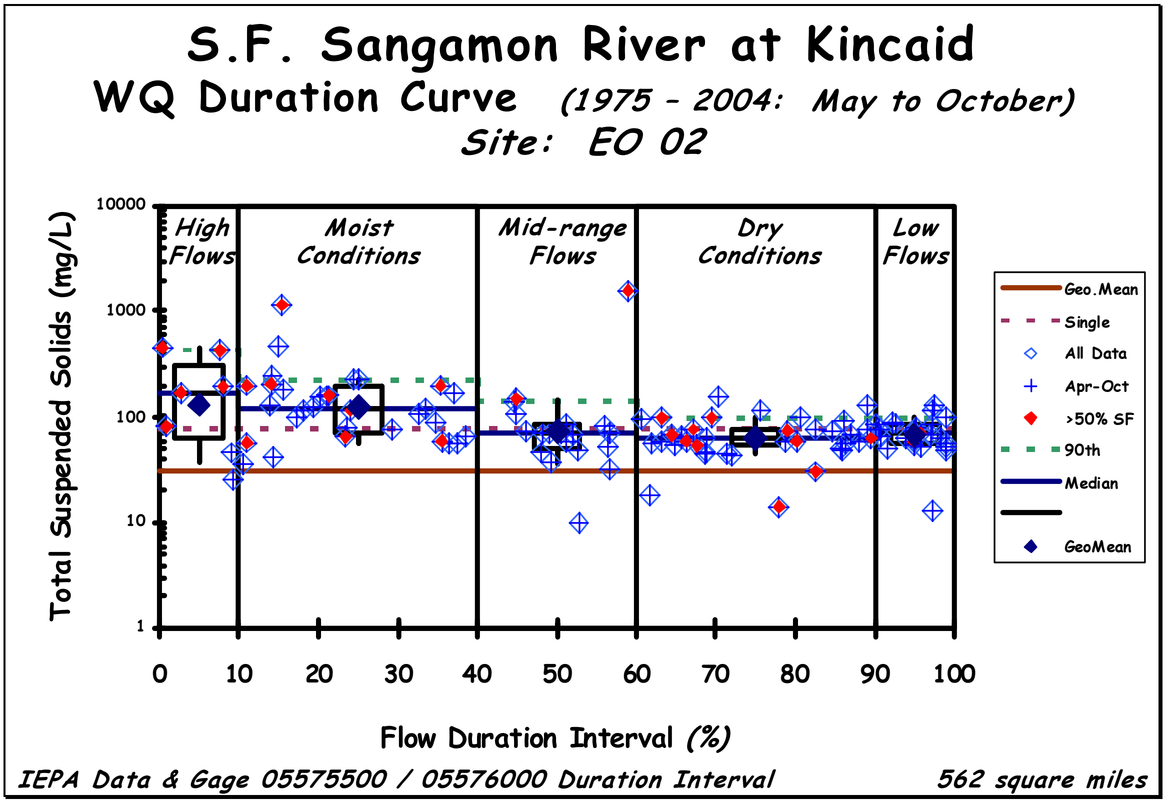


Table 16. Geometric Means at Flow Intervals

<table>
<tr><td rowspan="2"></td><td colspan="5">Duration Curve Zone
Geometric Mean (cfu/100ml)</td></tr>
<tr><td>High</td><td>Moist</td><td>Mid</td><td>Dry</td><td>Low</td></tr>
<tr><td>S. Fk. Sangamon R.(EO 02)</td><td>199</td><td>512</td><td>169</td><td>175</td><td>37</td></tr>
<tr><td rowspan="6">Seasonal Considerations

[most likely zone(s) by month]</td><td></td><td colspan="2">May</td><td></td><td></td></tr>
<tr><td></td><td colspan="3">June</td><td></td></tr>
<tr><td></td><td></td><td colspan="2">July</td><td></td></tr>
<tr><td></td><td></td><td></td><td>August</td><td></td></tr>
<tr><td></td><td></td><td></td><td>September</td><td></td></tr>
<tr><td></td><td></td><td colspan="2">October</td><td></td></tr>
<tr><td rowspan="6">Implementation Opportunities</td><td colspan="2">Long-term CSO plans</td><td></td><td colspan="2">Municipal NPDES</td></tr>
<tr><td></td><td colspan="4">On-site wastewater management</td></tr>
<tr><td></td><td colspan="4">Pasture management & riparian protection</td></tr>
<tr><td colspan="5">Urban storm water management</td></tr>
<tr><td colspan="4">Open lot agreements</td><td></td></tr>
<tr><td colspan="2">Manure management</td><td></td><td></td><td></td></tr>
</table>

C. South Fork Sangamon River EO 01

Watershed Description

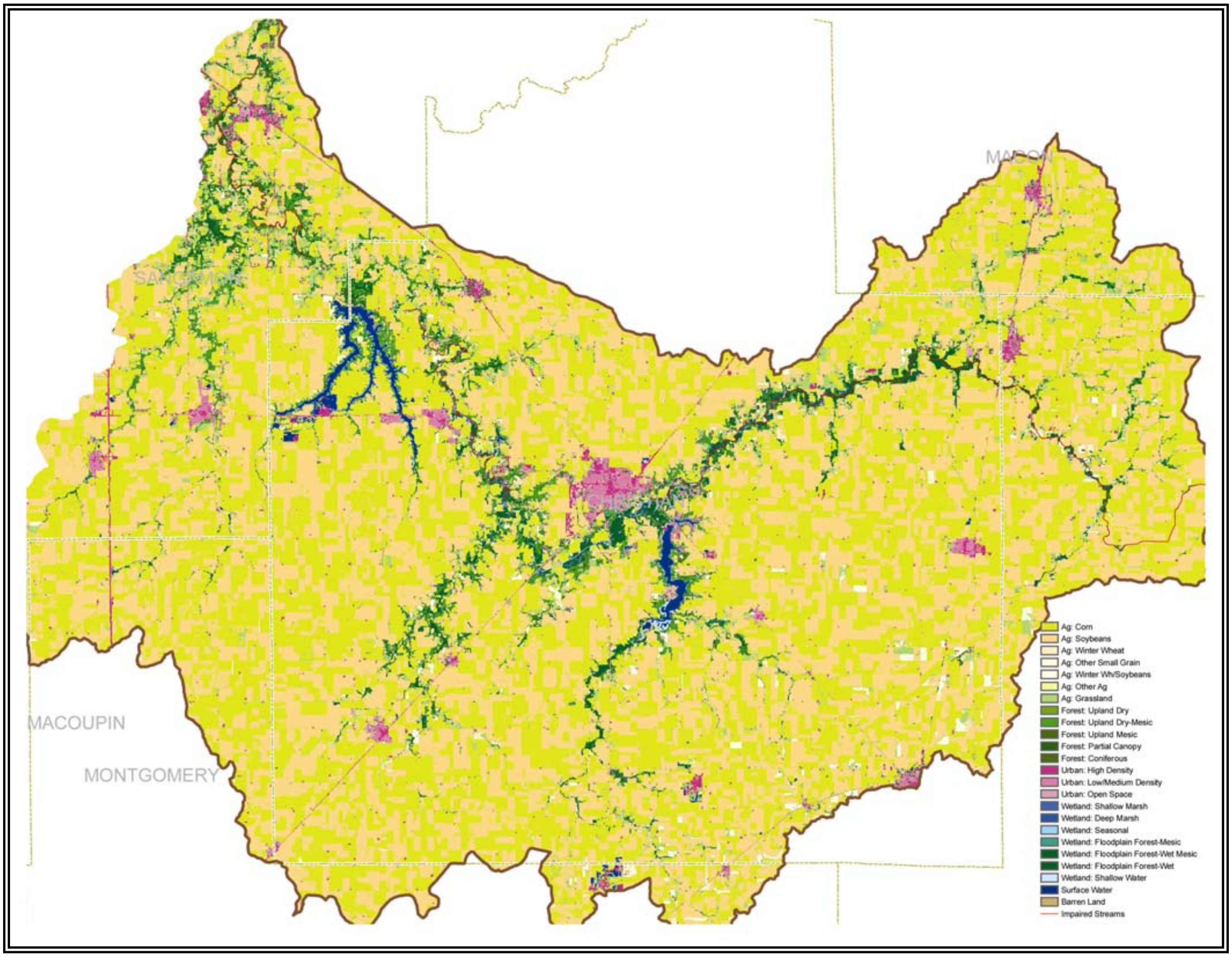
South Fork Sangamon (EO 01) watershed contains 15.55 miles of Segment EO 01 along with the previously discussed segments of EO 02 and EOH 01. There are eight other segments in this watershed that are impaired, but not for fecal coliform (see Table 17).

Table 17. Other Waters in the S. Fork Sangamon (EO 01) Watershed

Segment ID	Segment Name	Potential Impairments	Potential Sources
EO 13	S. Fk. Sangamon R.	Boron, manganese, siltation, DO, chlordane	Agriculture, hydrologic modification, unknown
REC	Taylorville Lake	Manganese, phosphorus, DO, suspended solids, algal growth, chlordane	Crop production, flow regulation, recreation, forest/grassland, unknown
EO 05	S. Fk. Sangamon R.	Manganese, siltation, DO, chlordane	Agriculture, resource extraction, unknown
EO 04	S. Fk. Sangamon R.	Total nitrogen, siltation, DO, suspended solids, chlordane	Agriculture, mine tailings, unknown
EOF 05	Bear Cr.	DO, habitat alteration	Agriculture
REB	Sangchris Lake	DO, algal growth	Crop production, flow modification, marinas, forest/grassland

Lane use is mainly agricultural with 86% cultivated crops and 5% rural grassland. 3% is forest, 3% is urban and 2% is forest floodplain. The majority of agriculture land in Shelby, Christian and Macon Counties are farmed using conventional tillage for corn and soybeans. Sangamon County uses conventional tillage for corn and conservation tillage for soybeans.

Figure 62. Land Use in the South Fork Sangamon (EO 01) Watershed



Fecal Coliform Data Assessment

For 1995-2004, there are 54 seasonal samples (May through October) from station EO 01. 34 were over 200 cfu/100ml and 34 were over 200 cfu/100ml. A time series plot for fecal coliform samples are in Figure 63.

Potential Sources

There are 17 facilities that discharge into this watershed. All but 2 have fecal coliform exemptions and do not monitor for fecal coliform. For those exempted facilities, 200 cfu/100ml is used for the discharge. Sangchris is supposed to monitor, but the data has not been found. Kincaid Generation does not have an exemption, but the permit does not include fecal coliform. Stormwater from urban areas is a potential source of bacteria. Taylorville has a CSO.

Figure 63. Fecal Coliform Data for EO 01

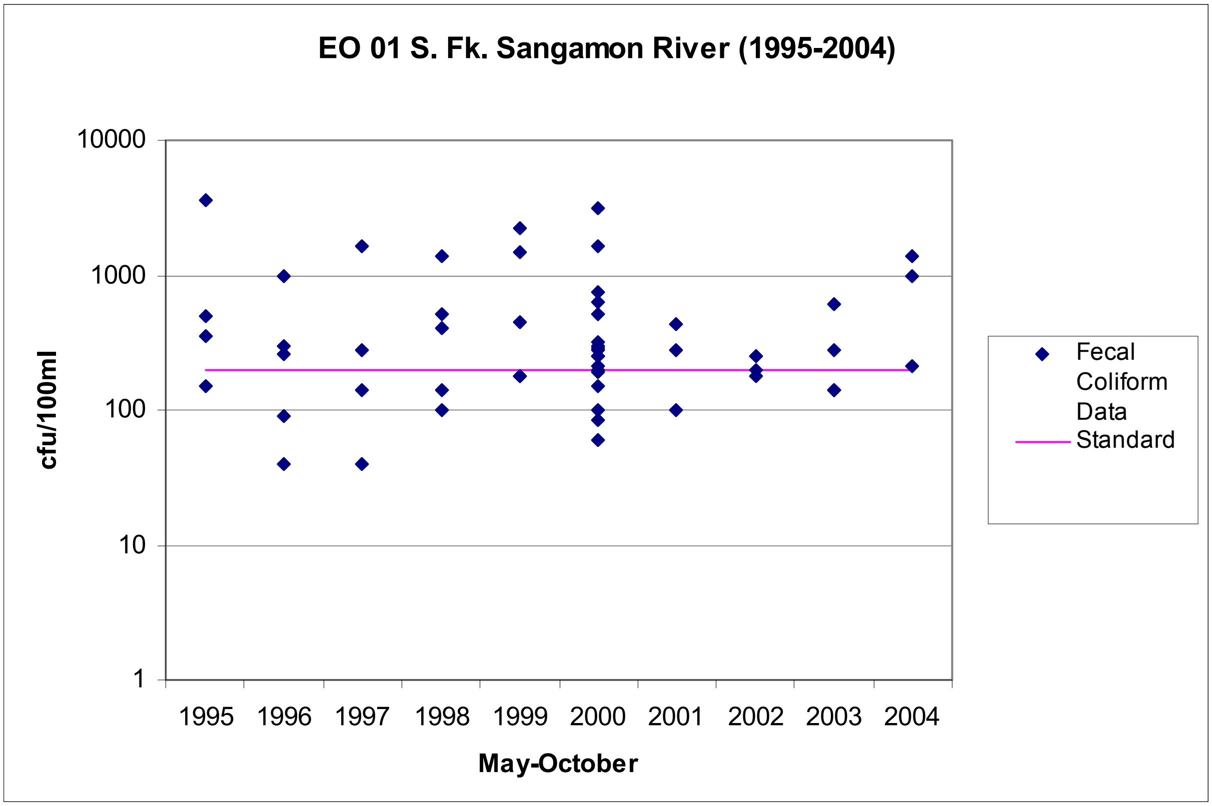
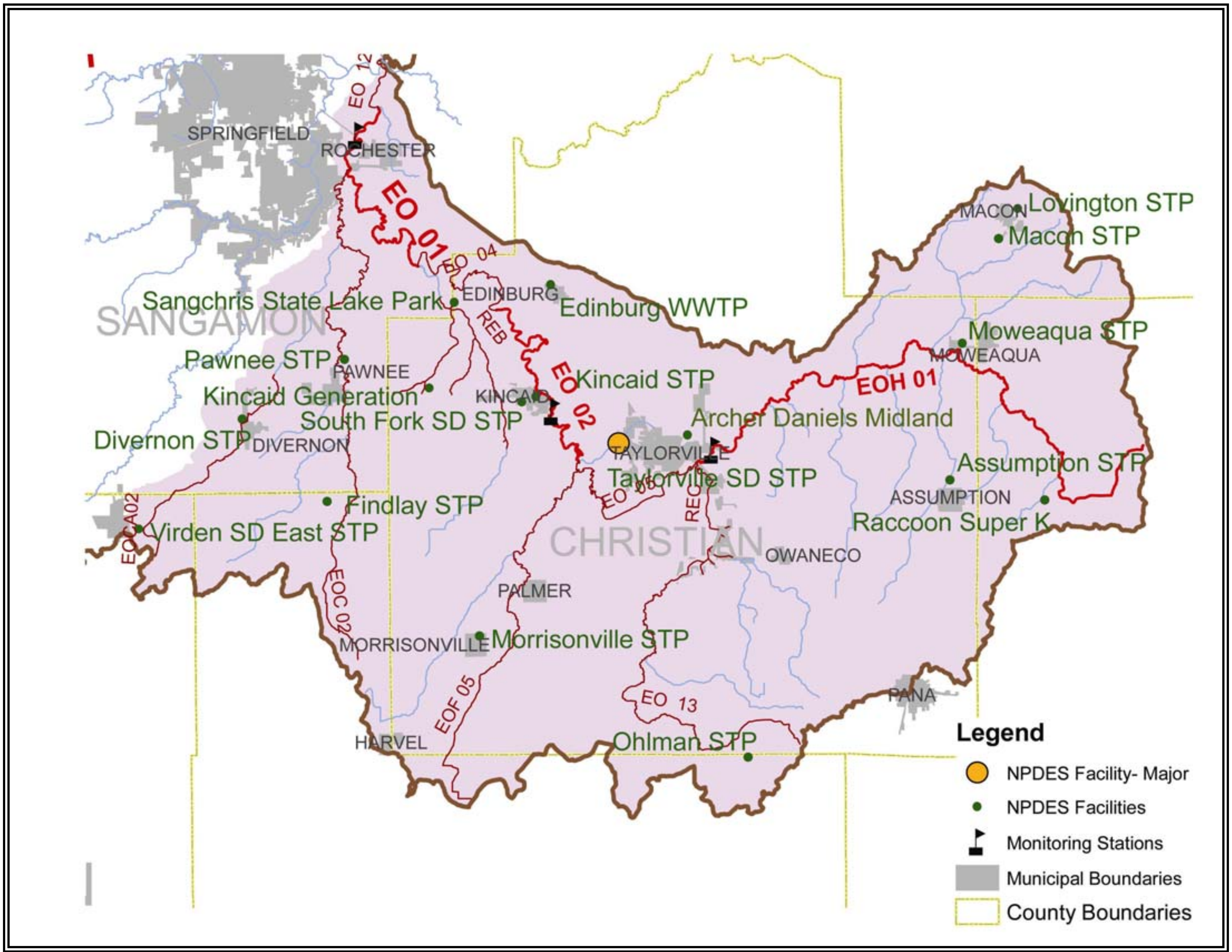


Table 18. NPDES Facilities in the South Fork Sangamon Watershed EO 01

NPDES ID	Facility Name	Design Average Flow (MGD)	Exempt	DMR Data	Exceed-ences/ Total	Mean of Discharge (cfu/ 100ml)	Discharge cfu/ 100ml/ MGD	Max. Permitted Discharge (cfu/ 100ml/ MGD)
IL0020907	ASSUMPTION STP	0.3900	YR			200	78	78
ILG580175	DIVERNON STP	0.1400	YR			200	28	28
IL0025372	EDINBURG WWTP	0.3000	YR			200	60	60
IL0020524	FINDLAY STP	0.1000	S			4703	470.3	470.3
IL0051811	IL DNR-SANGCHRIS LK PRK	0.0020				400	0.8	0.8
IL0002241	KINCAID GENERATION	0.0015		Not in permit		400	0.6	0.6
IL0048607	KINCAID STP	0.2500	YR			200	50	50
IL0024210	LOVINGTON STP	0.2000	YR			200	40	40
ILG580141	MACON STP	0.2140	YR			200	42.8	42.8
IL0025101	MORRISONVILLE STP	0.3300	YR			200	66	66
ILG580134	MOWEAQUA STP	0.2200	YR			200	44	44
IL0032671	OHLMAN STP	0.0250	YR			200	5	5
IL0033324	PAWNEE STP	0.3000	YR			200	60	60
IL0053252	RACCOON SUPER K	0.0015	YR			200	0.3	0.3
IL0050148	SOUTH FORK SD STP	0.1020	YR			200	20.4	20.4
IL0031356	**TAYLORVILLE SD STP**	**3.0200**	**YR**			**200**	**604**	**604**
IL0066087	VIRDEN SD EAST STP	0.4000	YR			200	80	80
							1650.2	1650.2

Figure 64. South Fork Sangamon (EO 01) Watershed



Allocations

Annual Loads **S. Fork Sangamon (EO 01)**

Permitted Wasteload (with DMR data)-	NPDES Discharge (cfu/ml/MGD)	gal/MGD	L/gal	mL/L	cfu/d	
	16.502	1,000,000	3.785	1000	6.25E+10	
Septic Wasteload -	Households	fecal conc(cfu/ml)*	discharge (gal/person/d)	people/ house	ml/gal	cfu/d
	9.4	1.00E+04	70	2.5	3785.2	6.23E+10
Wasteload-	Permitted WL	Septic	cfu/d			
	6.25E+10	6.23E+10	**1.25E+11**			
Total Annual Load-	Geo Mean (cfu/ml)	Annual Seasonal Flow (MGD)	gal/MGD	L/gal	mL/L	cfu/d
	3.6	312	1,000,000	3.785	1000	**4.25E+12**
Load-	Total Annual Load -	Wasteload =	cfu/d			

	4.25E+12	1.25E+11	**4.13E+12**

Allowable Load

Permitted Wasteload- using effluent limit 400	NPDES Discharge (cfu/ml/MGD)	gal/MGD	L/gal	mL/L	cfu/d	
	16.502	1,000,000	3.785	1000	**6.25E+10**	
Total Allowable Load-	Geo Mean (cfu/ml)	Annual Seasonal Flow (MGD)	gal/MGD	L/gal	mL/L	cfu/d
	2	312	1,000,000	3.785	1000	**2.36E+12**
Load Allowable-	Total Allowable Load	Allowable Wasteload	cfu/d			
	2.36E+12	6.25E+10	**2.30E+12**			

Load	Daily Load	Allowable Daily Load	Required Reduction	NPDES Reduction
WLA	1.25E+11	6.25E+10	49.92%	0%
LA	4.13E+12	2.30E+12	44.28%	
Total	4.25E+12	2.36E+12	44.44%	

* Horsley & Witten 1996 10^6/100ml

NPDES permits do not need modified.

Duration Curves and Implementation

Figures 65-69 display the water quality duration curves for South Fork Sangamon River (EO 01) and Table 19 contains the geometric means for all flow intervals and general implementation opportunities.

Figure 65. Duration Curve for Fecal Coliform- 1995-2004

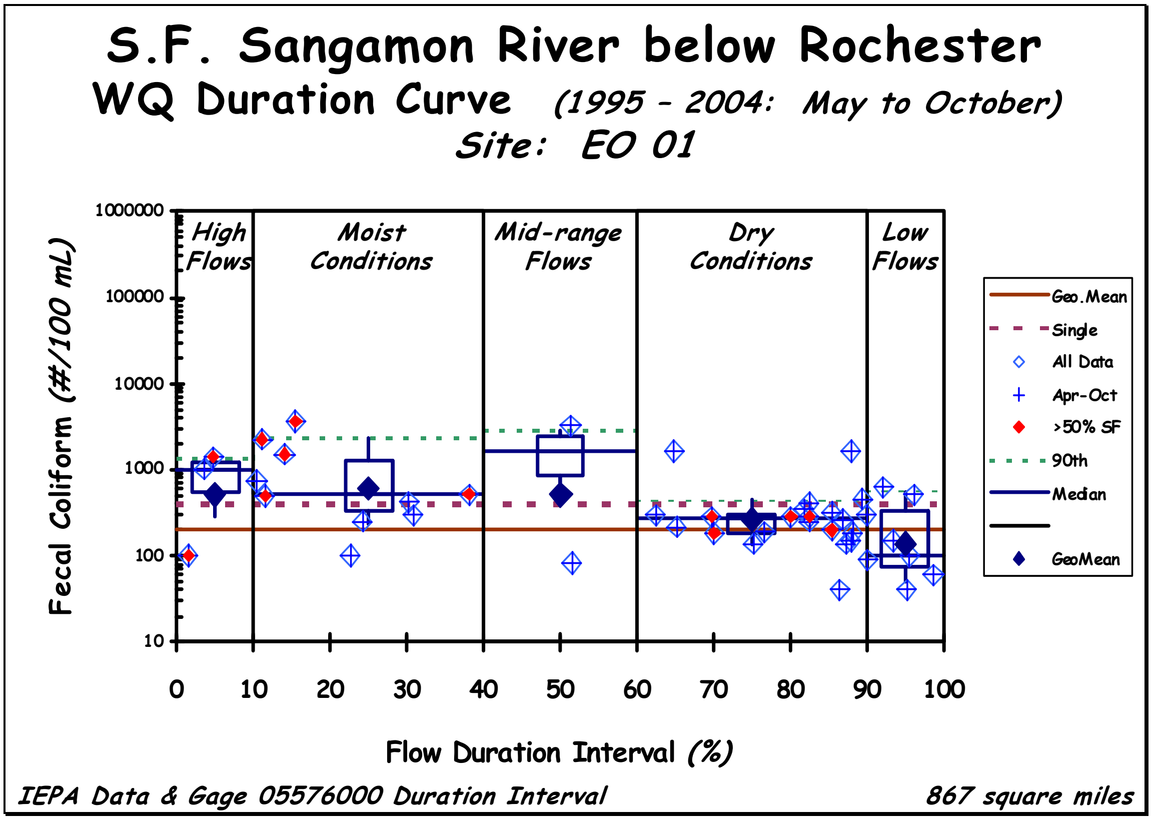


Figure 66. Duration Curve for Fecal Coliform- 1978-2004

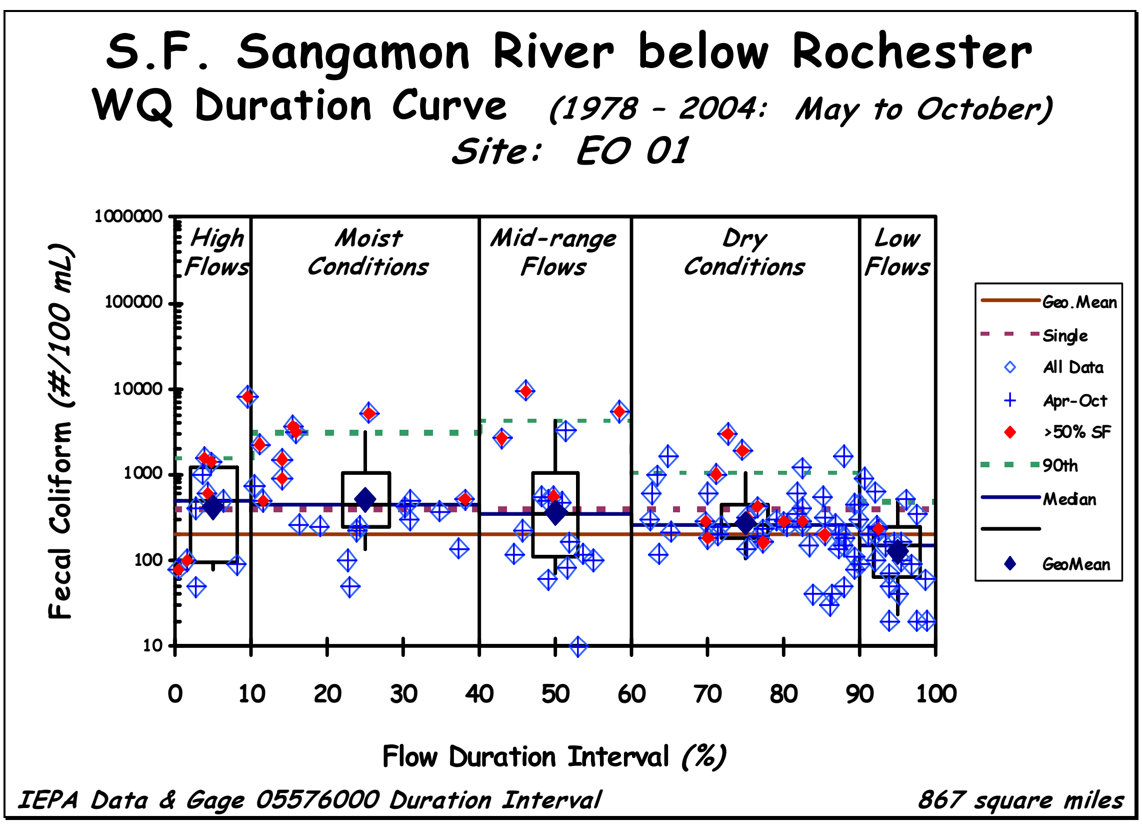


Figure 67. Duration Curve for Phosphorus

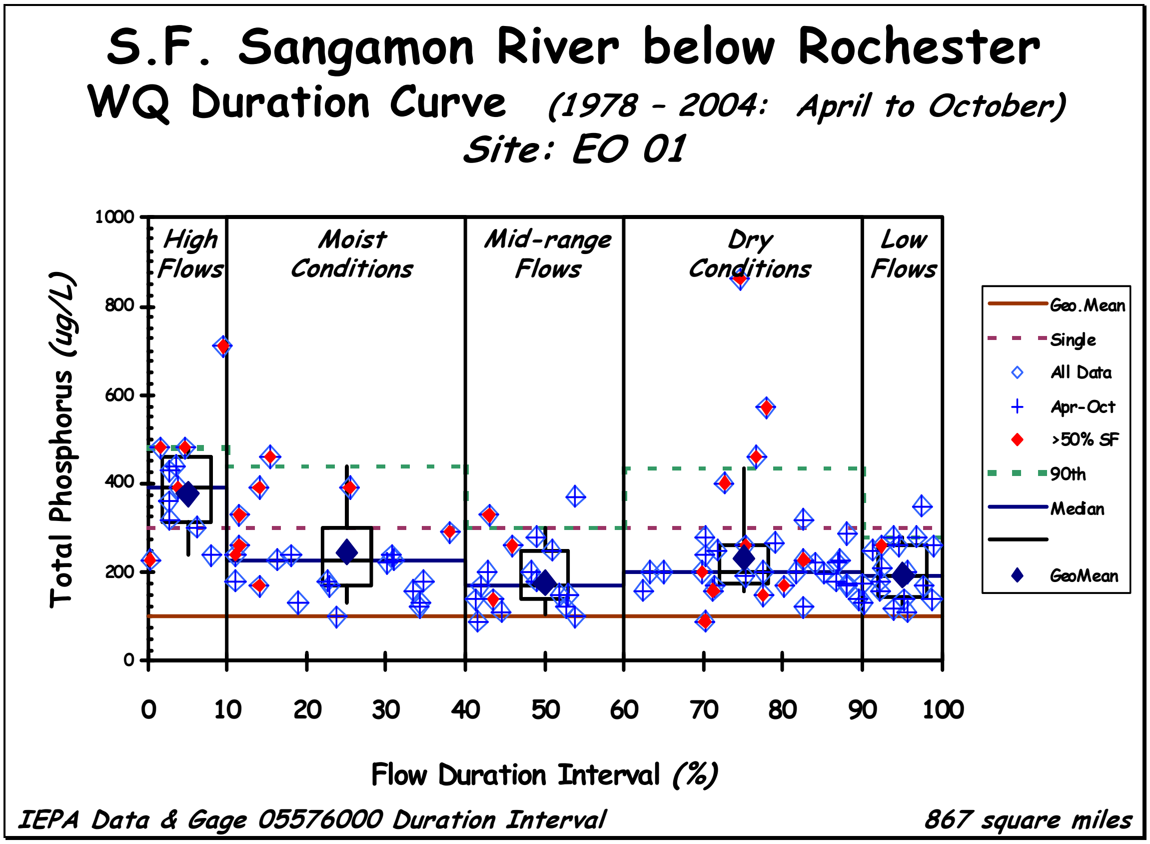


Figure 68. Duration Curve for Nitrite+Nitrate

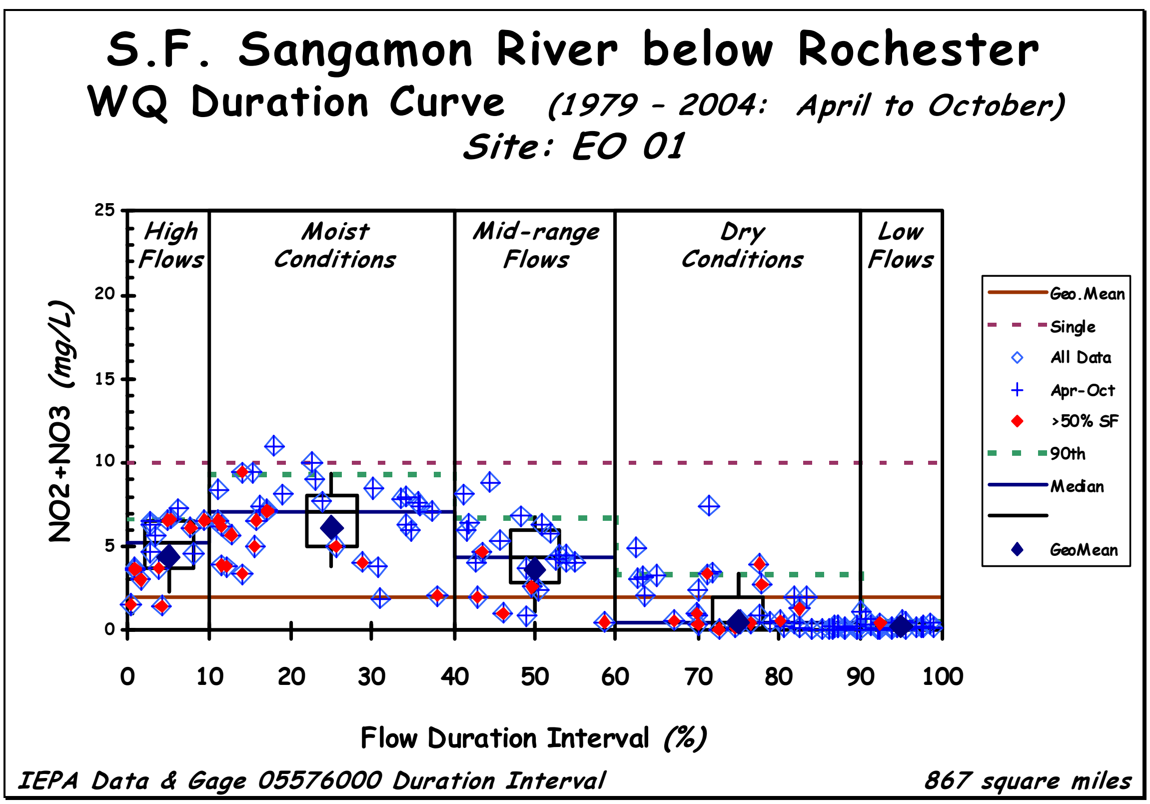


Figure 69. Duration Curve for TSS

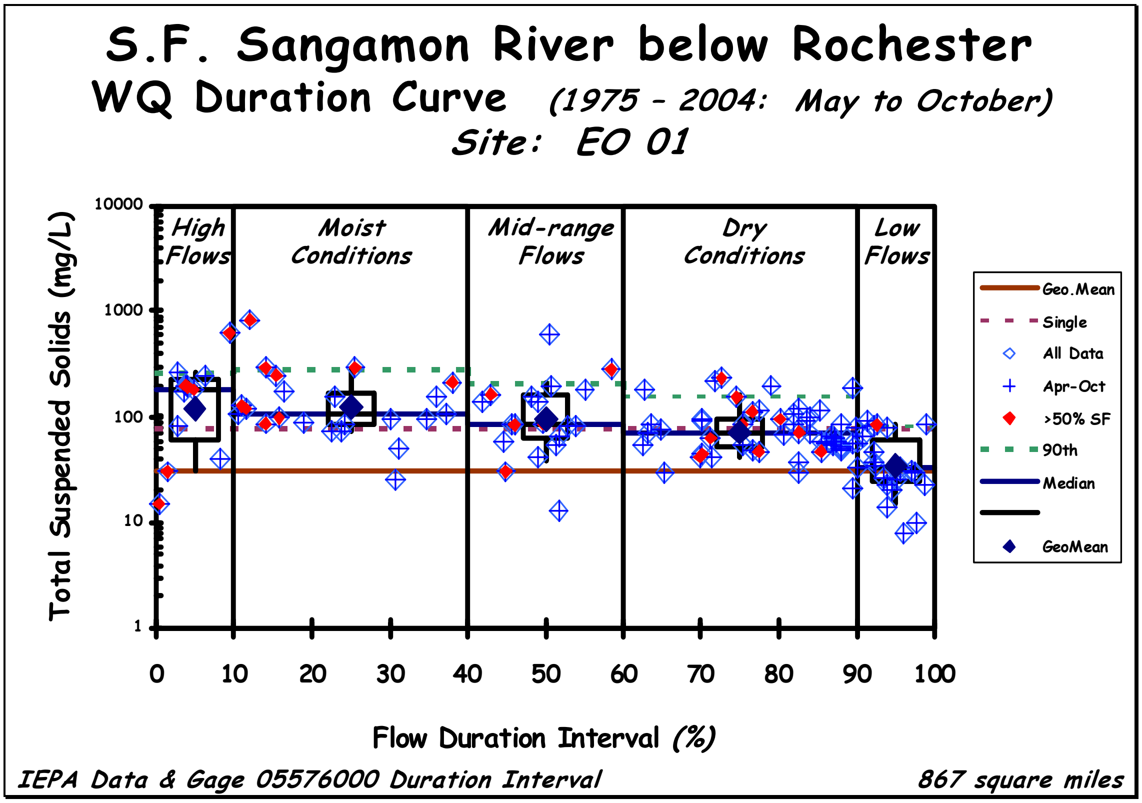


Table 19. Geometric Means for Flow Intervals

	Duration Curve Zone Geometric Mean (cfu/100ml)				
	High	**Moist**	**Mid**	**Dry**	**Low**
S. Fk. Sangamon R. (EO 01)	519	614	513	265	140
Seasonal Considerations *[most likely zone(s) by month]*		*May*			
			June		
			July		
				August	
				September	
			October		
Implementation Opportunities	*Long-term CSO plans*			*Municipal NPDES*	
			On-site wastewater management		
			Pasture management & riparian protection		
		Urban storm water management			
		Open lot agreements			
	Manure management				

D. Sugar Creek EOA 01

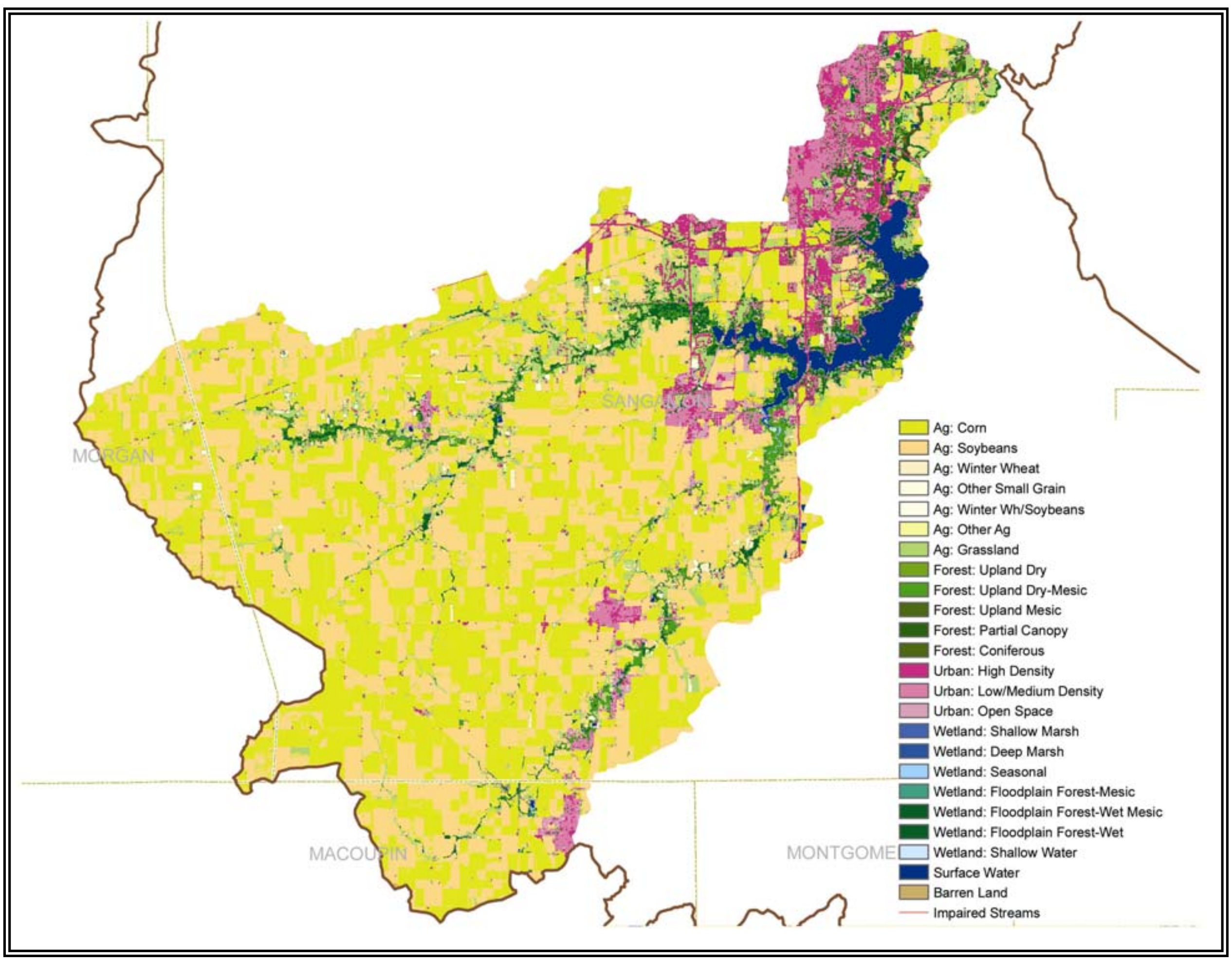
Watershed Description

Sugar Creek Watershed contains the impaired segment of Sugar Creek (EOA 01), which is 3.9 miles long. It is impaired for boron, siltation, DO, and fecal coliform bacteria with potential sources of industrial point source, combined sewer overflow, urban runoff/ storm sewers, upstream impoundment and unknown. There are five other segments impaired in this watershed, but not for fecal coliform (see Table 20).

Table 20. Other Impaired Segments in Watershed

Segment ID	Segment Name	Potential Impairment	Potential Source
EOA 04	Sugar Cr.	DO, habitat alteration, phosphorus	Municipal point source, agriculture, hydrologic modification
EOA 06	Sugar Cr.	Boron, habitat alteration, phosporus	Industrial point source, municipal point source, agriculture, upstream impoundment
EOAD11	Hoover Branch	Siltation	Agriculture, urban runoff/ storm sewers
EOAF01	Clear Lake Ave Cr.	Habitat alteration	Urban runoff/ storm sewers
REF	Lake Springfield	Phosphorus, suspended solids, algal growth	Municipal point source, row crop ag, streambank modification, recreation/ tourism, forest/ grassland

Figure 70. Land Use in the Sugar Creek (EOA 01) Watershed

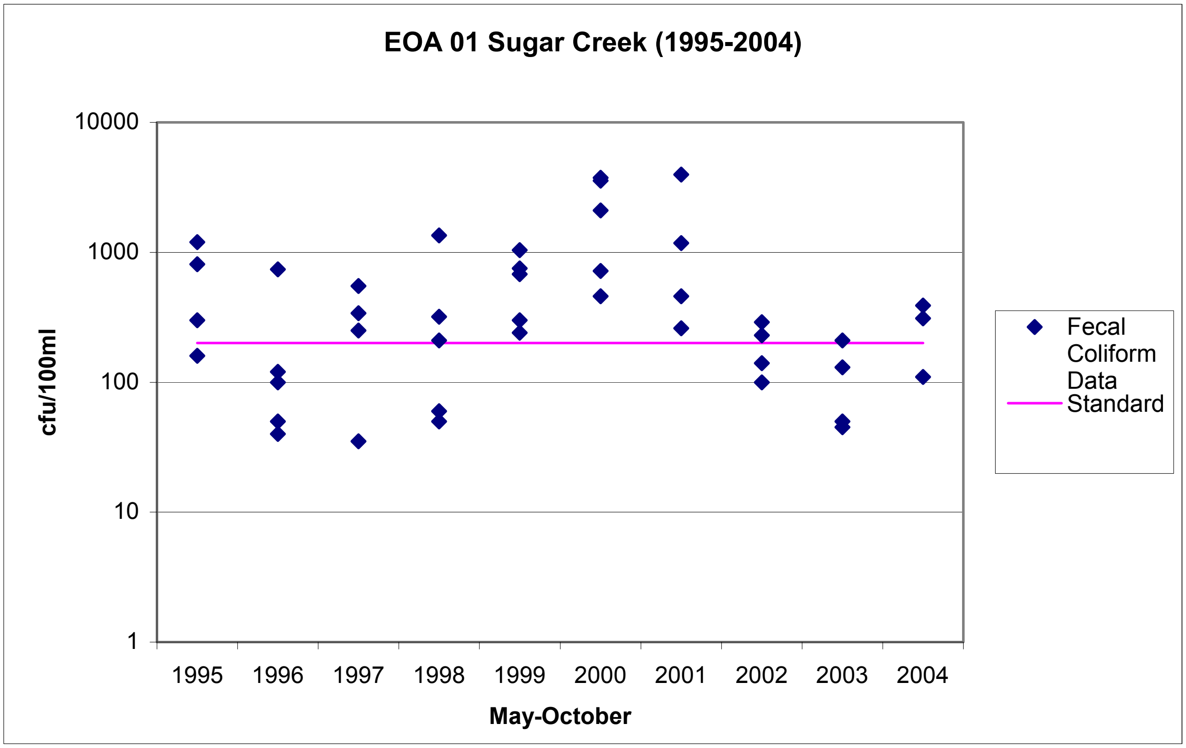


Land use is mainly agricultural with 75% cultivated crops and 7% rural grassland. 9% is urban, 4% is forest and 2% is floodplain forest. The majority of agriculture land in Sangamon County is farmed using conventional tillage for corn and conservation tillage for soybeans.

Fecal Coliform Data Assessment

For 1995-2004, there were 43 seasonal samples (May through October) from station EOA 01. 29 samples were over 200 cfu/100ml and 19 were over 400 cfu/100ml. A time series plot for fecal coliform samples are in Figure 71.

Figure 71. Fecal Coliform Data for EOA 01



Point Sources

There are nine NPDES facilities discharging in the watershed. Both Lincoln Trails Mobile Home Park and Springfield Sugar Creek Sewage Treatment Plant discharge downstream of the monitoring station and their effluent will not be considered for this segment. All of these facilities now have fecal coliform exemptions and do not monitor for fecal coliform bacteria. For exempted facilities, 200 cfu/100ml is used for the discharge.

Stormwater runoff from Chatham and Springfield is a potential source of bacteria. Chatham is the fastest growing city in the watershed. Both Chatham and Springfield have MS4 permits. Chatham contains 3,318 municipal acres (5 square miles) in the watershed. Springfield has 38,717 municipal acres (60 square miles) and 47% are in the watershed. Twelve percent of the watershed contains MS4 stormwater permits.

Figure 72. Sugar Creek EOA 01 Watershed

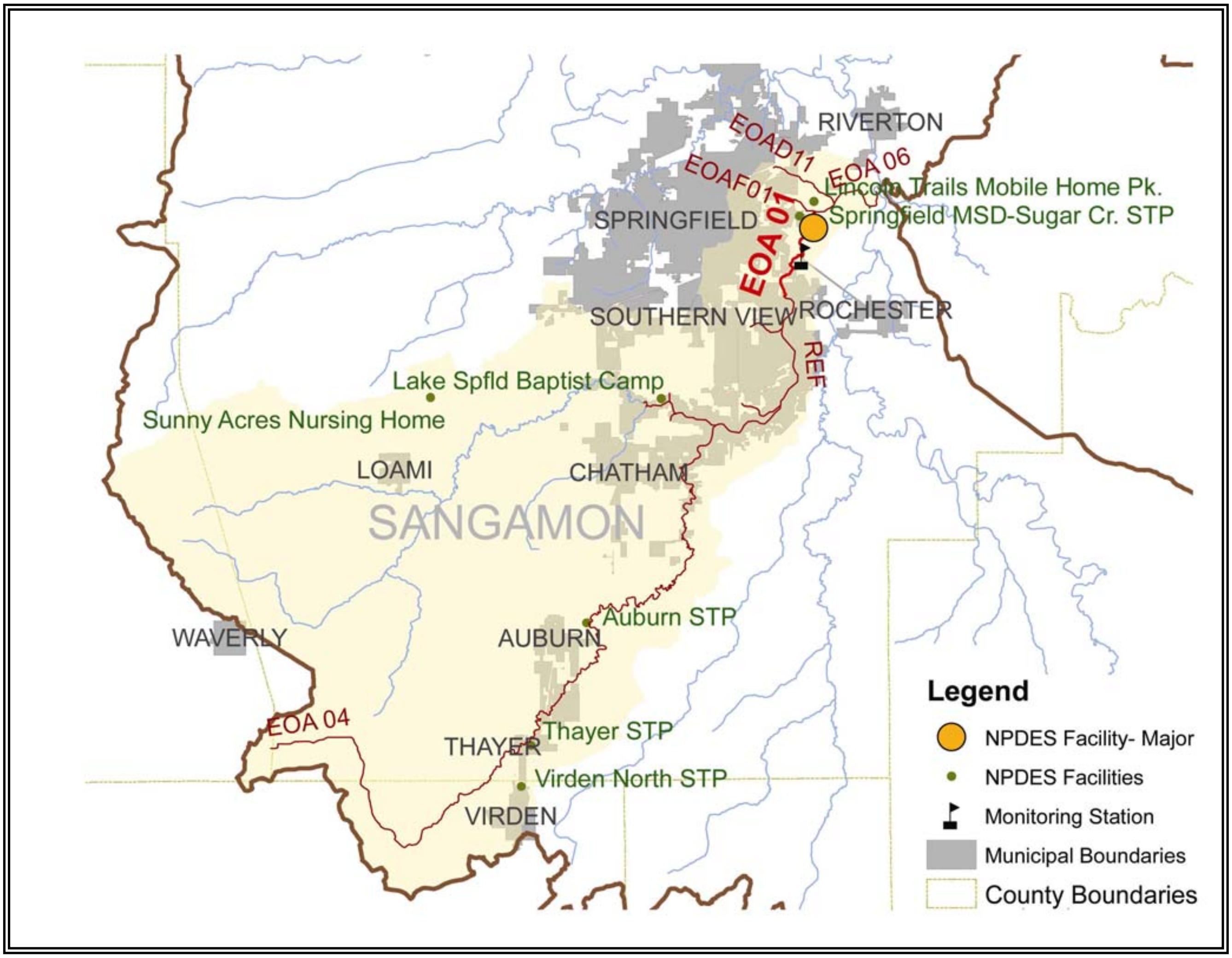


Table 21. NPDES Facilities in Sugar Creek EOA01 Watershed

NPDES ID	Facility Name	Design Average Flow (MGD)	Exempt	DMR Data	Exceed-ences/ Total	Mean of Discharge (cfu/ 100ml)	Discharge cfu/ 100ml/ MGD	Max. Permitted Discharge (cfu/ 100ml/ MGD)
IL0022403	AUBURN STP	0.6200	YR			200	124	124
IL0050253	LAKE SPFLD BAPTIST CAMP	0.0150	S			1181500	17722.5	17722.5
IL0068683	SUNNY ACRES NURSING HOME	0.0110	YR			200	2.2	2.2
IL0059374	THAYER STP	0.0842	YR			200	16.84	16.84
IL0023426	VIRDEN NORTH STP	0.2000	YR			200	40	40
							17905.54	17905.54

Allocations

Annual Loads **Sugar Creek (EOA 01)**

Total Load-	Geo Mean (cfu/ml)	Annual Seasonal Flow (MGD)	gal/MGD	L/gal	mL/L	cfu/d
	2.57	312	1,000,000	3.785	1000	**3.03E+12**
MS4 Load-	Total Load (cfu/d)	Ratio MS4 in Watershed	cfu/d			
	3.03E+12	0.119	3.61E+11			
Permitted Wasteload (with DMR data)-	NPDES Discharge (cfu/ml/MGD)	gal/MGD	L/gal	mL/L	cfu/d	
	179.0554	1,000,000	3.785	1000	6.78E+11	
Septic Wasteload -	Households	fecal conc(cfu/ml)*	discharge (gal/person/d)	people/ house	ml/gal	cfu/d
	2.8	1.00E+04	70	2.5	3785.2	1.85E+10
Wasteload-	MS4	Permitted WL	Septic	cfu/d		
	3.61E+11	6.78E+11	1.85E+10	**1.06E+12**		
Load-	Total Annual Load -	Wasteload =	cfu/d			
	3.03E+12	1.06E+12	**1.98E+12**			

Allowable Load

Permitted Wasteload- using effluent limit 400	NPDES Discharge (cfu/ml/MGD)	gal/MGD	L/gal	mL/L	cfu/d	
	179.0554	1,000,000	3.785	1000	**6.78E+11**	
Total Allowable Load-	Geo Mean (cfu/ml)	Annual Seasonal Flow (MGD)	gal/MGD	L/gal	mL/L	cfu/d
	2	312	1,000,000	3.785	1000	**2.36E+12**
Load Allowable-	Total Allowable Load	Allowable Wasteload	cfu/d			
	2.36E+12	6.78E+11	**1.68E+12**			

Load	Daily Load	Allowable Daily Load	Required Reduction	NPDES Reduction
WLA	1.06E+12	6.78E+11	35.91%	0%
LA	1.98E+12	1.68E+12	14.84%	
Total	3.03E+12	2.36E+12	22.18%	

* Horsley & Witten 1996 10^6/100ml

NPDES permits do not need modified.

Duration Curve and Implementation

Figures 73-77 display the water quality duration curves for Sugar Creek (EOA 01) and Table 22 contains the geometric means at each flow interval along with general implementation opportunities.

Figure 73. Duration Curve for Fecal Coliform- 1995-20041

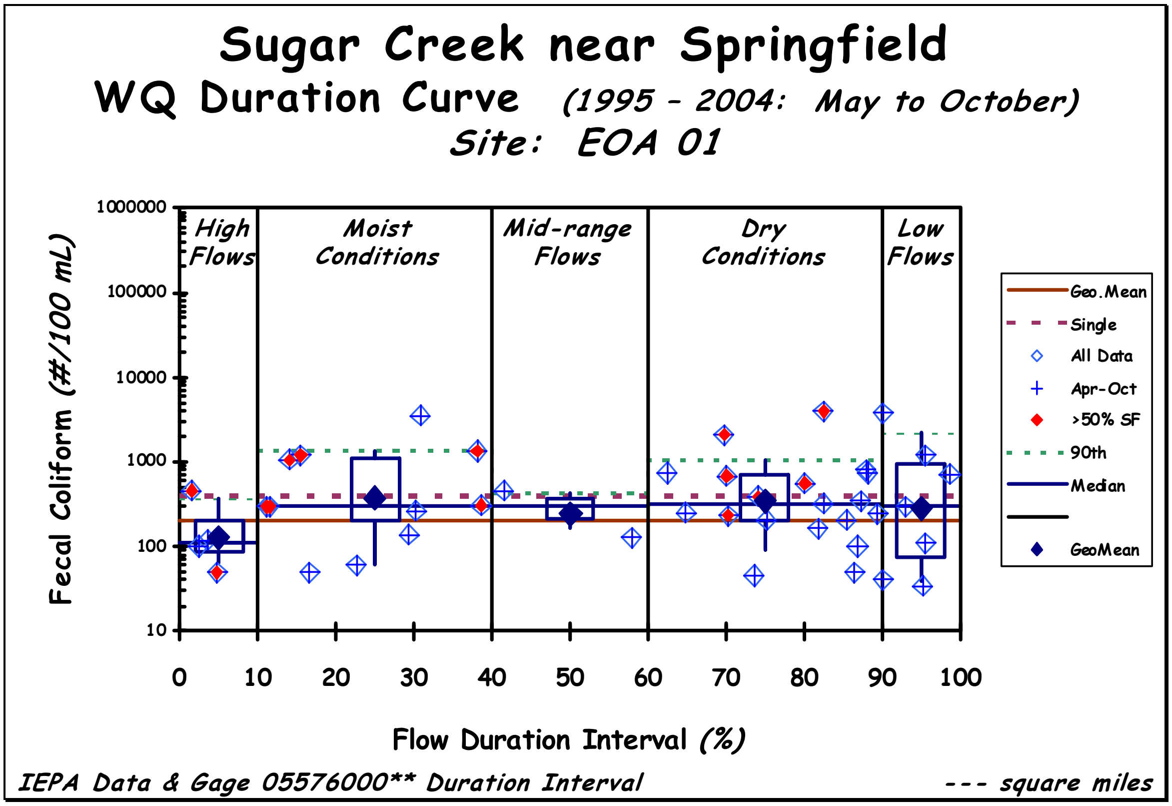


Figure 74. Duration Curve for Fecal Coliform- 1979-2004

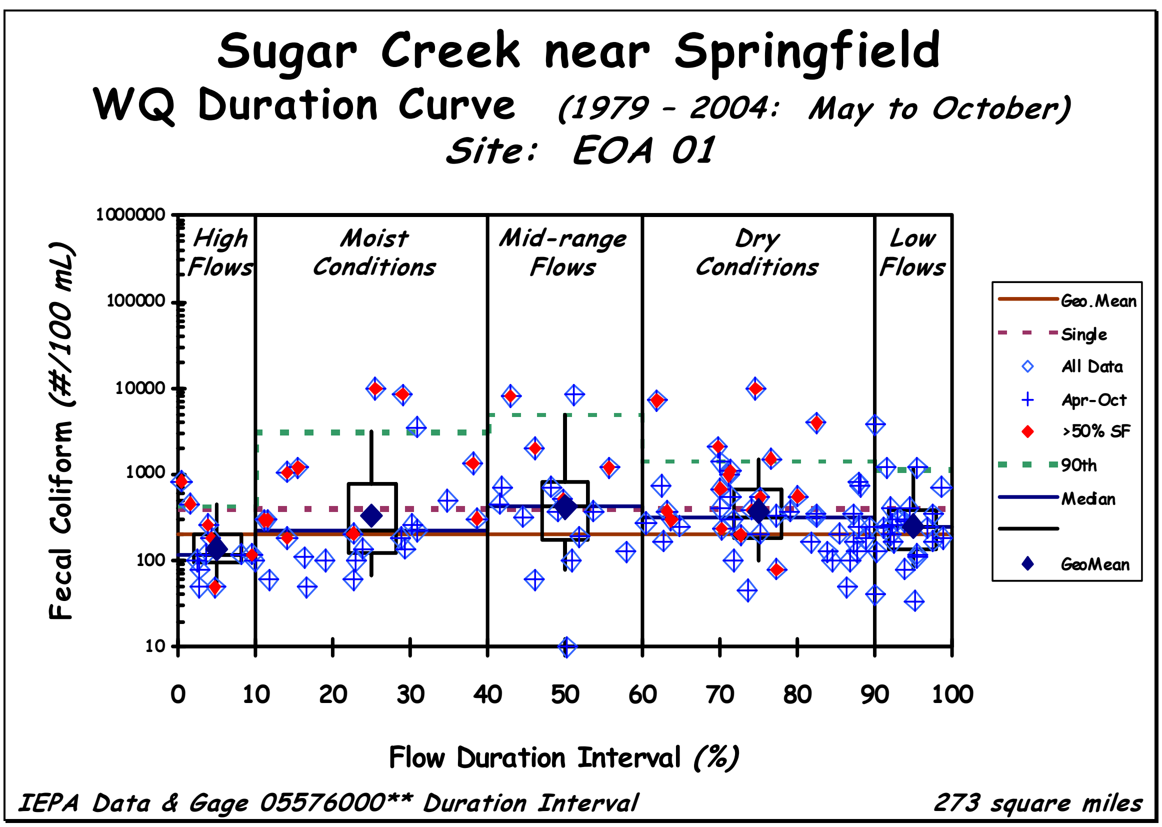


Figure 75. Duration Curve for Phosphorus

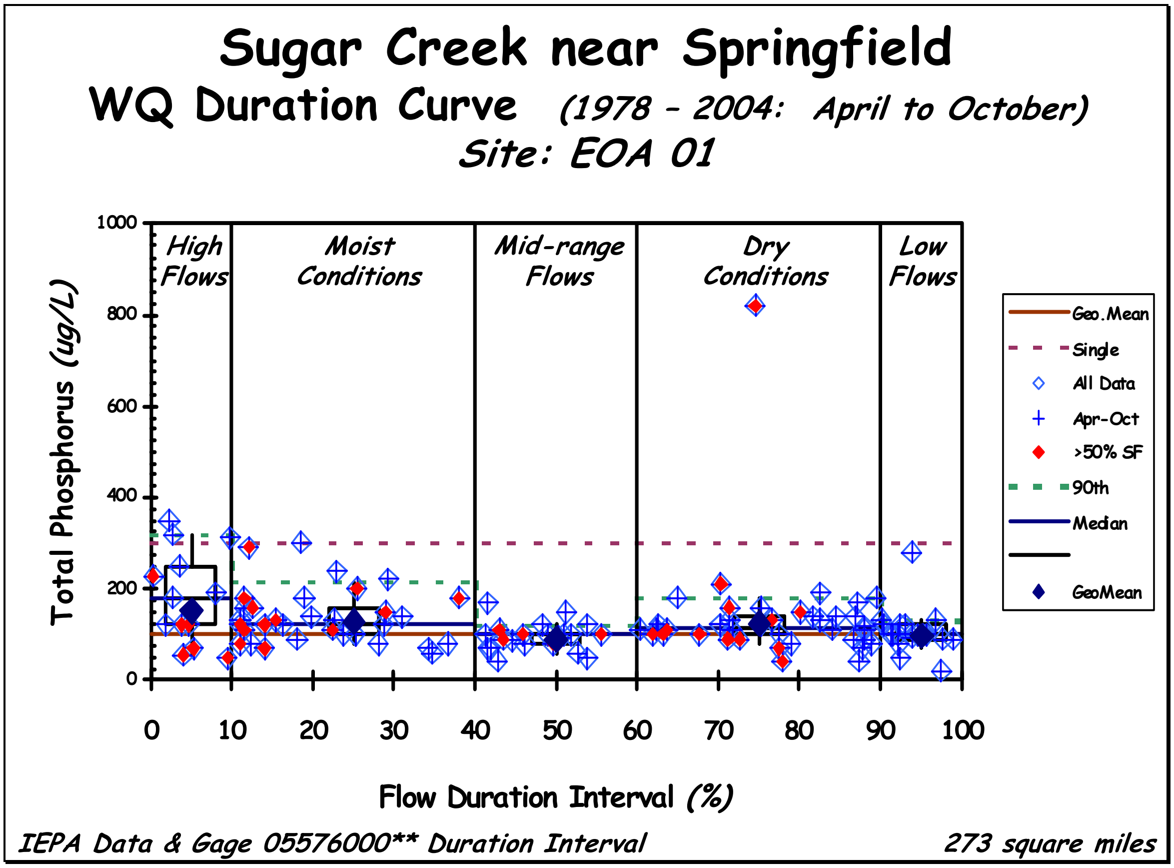


Figure 76. Duration Curve for Nitrite+Nitrate

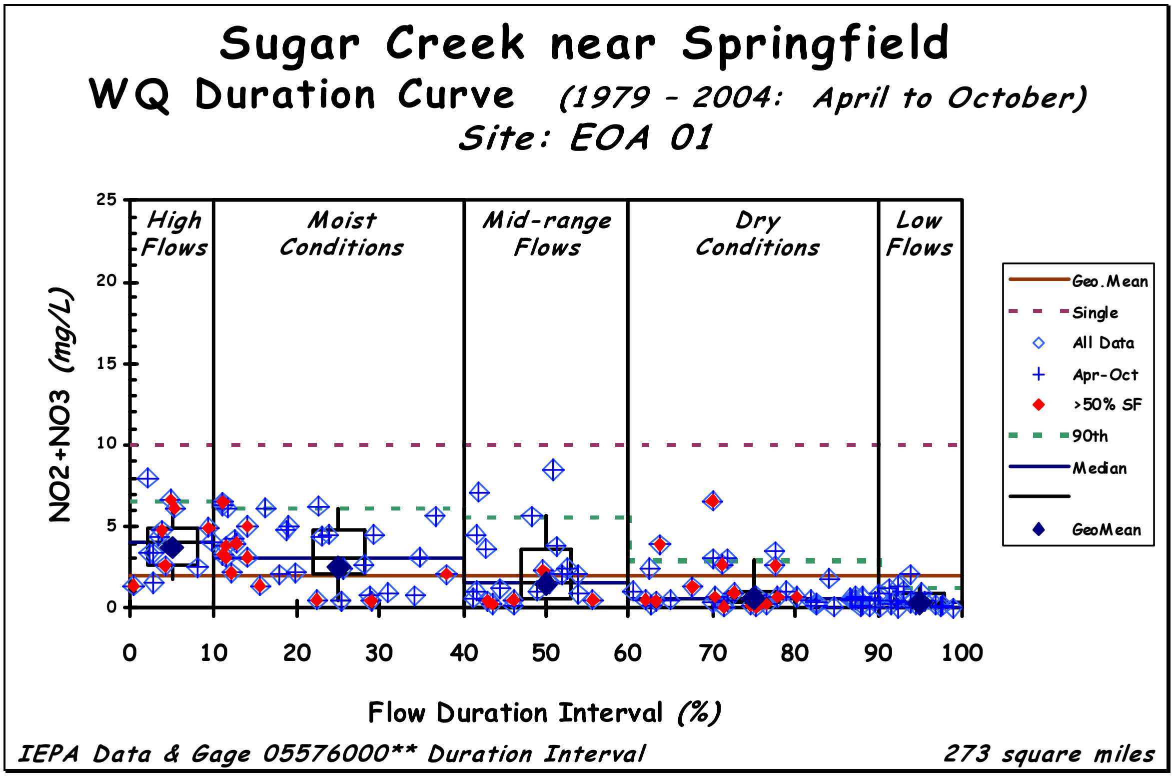


Figure 77. Duration Curve for TSS

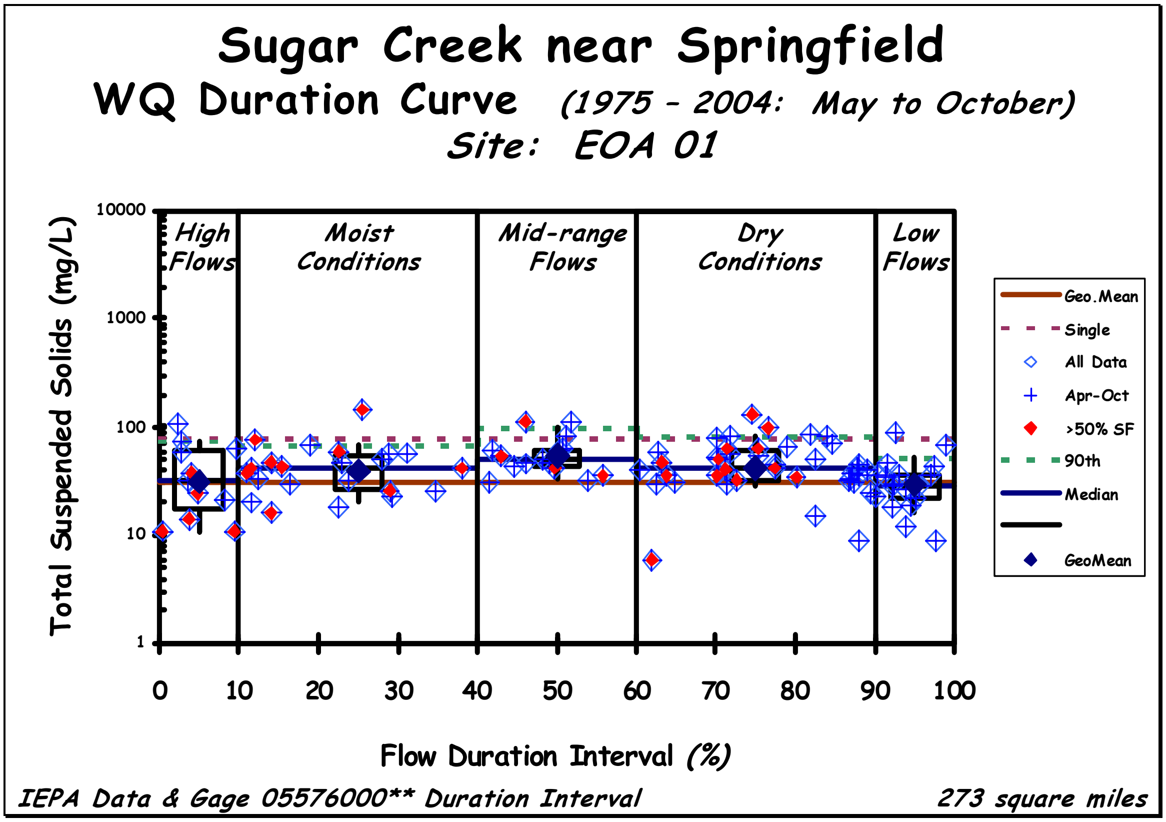


Table 22. Geometric Means at Flow Intervals

<table>
<tr><td rowspan="2"></td><td colspan="5">Duration Curve Zone
Geometric Mean (cfu/100ml)</td></tr>
<tr><td>High</td><td>Moist</td><td>Mid</td><td>Dry</td><td>Low</td></tr>
<tr><td>Sugar Creek (EOA 01)</td><td>129</td><td>371</td><td>245</td><td>341</td><td>282</td></tr>
<tr><td rowspan="6">Seasonal Considerations

[most likely zone(s) by month]</td><td></td><td colspan="2">May</td><td></td><td></td></tr>
<tr><td></td><td colspan="3">June</td><td></td></tr>
<tr><td></td><td></td><td colspan="2">July</td><td></td></tr>
<tr><td></td><td></td><td></td><td>August</td><td></td></tr>
<tr><td></td><td></td><td></td><td>September</td><td></td></tr>
<tr><td></td><td></td><td colspan="2">October</td><td></td></tr>
<tr><td rowspan="6">Implementation Opportunities</td><td colspan="2">Long-term CSO plans</td><td></td><td colspan="2">Municipal NPDES</td></tr>
<tr><td></td><td colspan="4">On-site wastewater management</td></tr>
<tr><td></td><td colspan="4">Pasture management & riparian protection</td></tr>
<tr><td colspan="5">Urban storm water management</td></tr>
<tr><td colspan="4">Open lot agreements</td><td></td></tr>
<tr><td colspan="2">Manure management</td><td></td><td></td><td></td></tr>
</table>

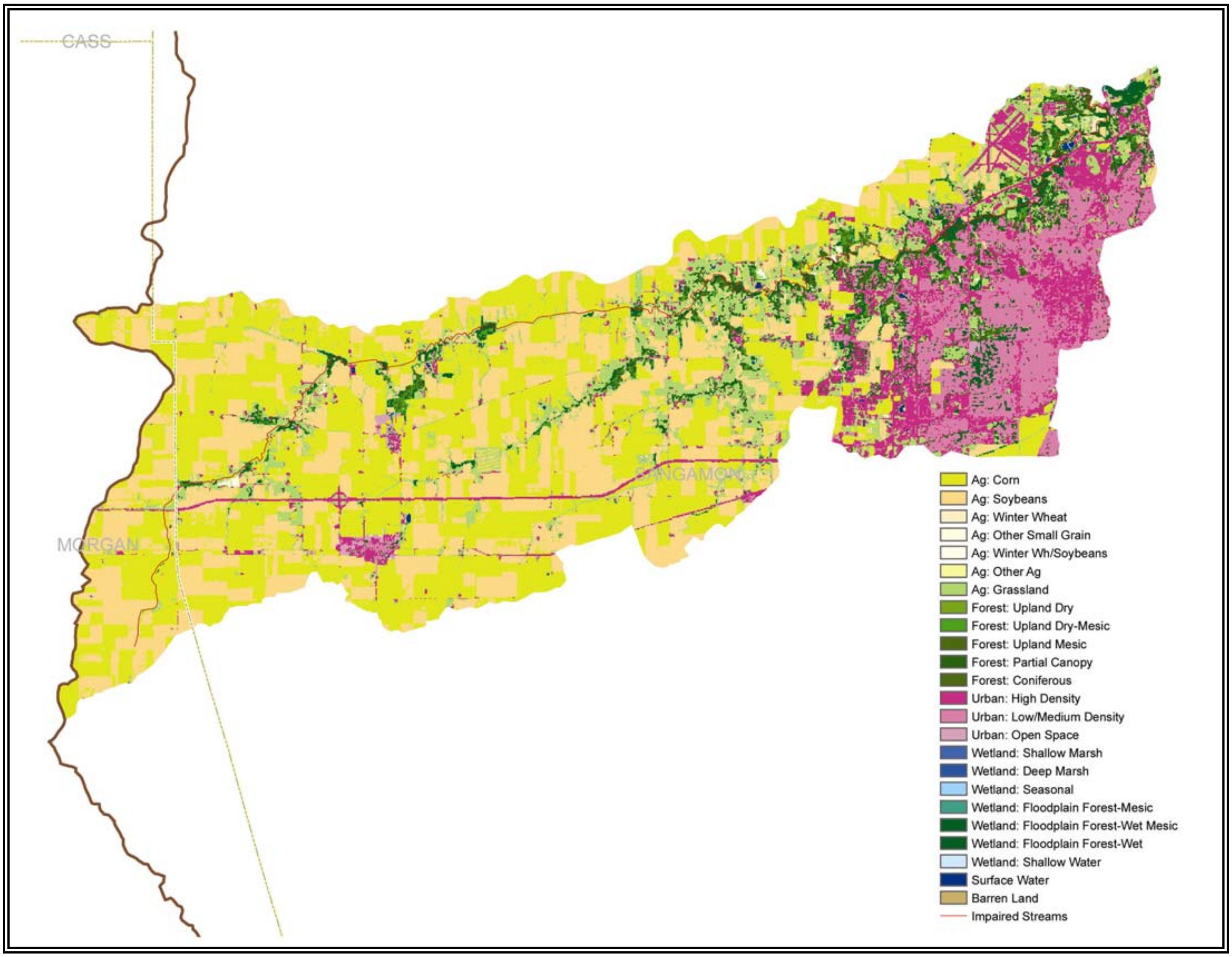
E. Spring Creek EL 01

Watershed Description

Spring Creek Watershed contains the entire length of Spring Creek (EL 01)- 34.51 miles. It is impaired for nitrogen, DO, habitat alteration, phosphorus and fecal coliform bacteria. The potential sources are agriculture, channelization, urban runoff/storm sewers, natural sources and unknown.

Land use is mainly agricultural with 72% cultivated crops and 12% rural grassland. 19% is urban, 4% is forest and 3% is floodplain forest. The majority of agriculture land in Sangamon County is farmed using conventional tillage for corn and conservation tillage for soybeans.

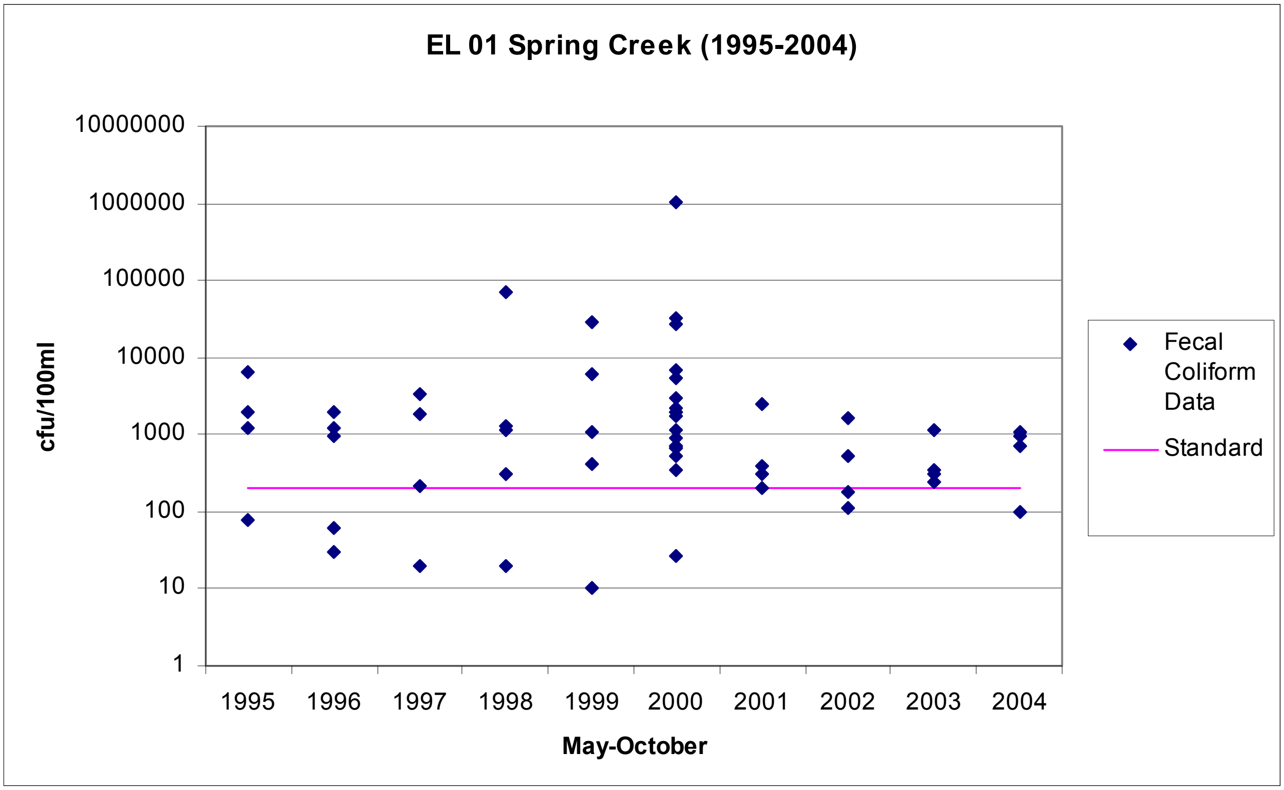
Figure 78. Land Use in Spring Creek Watershed



Fecal Coliform Data Assessment

For 1995-2004, there are 58 seasonal samples (May through October) from station EL 01. Out of those, 48 were over 200 cfu/100ml and 39 were over 400 cfu/100ml. A time series plot for fecal coliform samples are in Figure 79.

Figure 79. Fecal Coliform for EL 01



Potential Sources

There is one NPDES permitted facility in the watershed and it has a fecal coliform exemption and does not monitor for it. For this exempted facility, 200 cfu/100ml is used for the discharge.

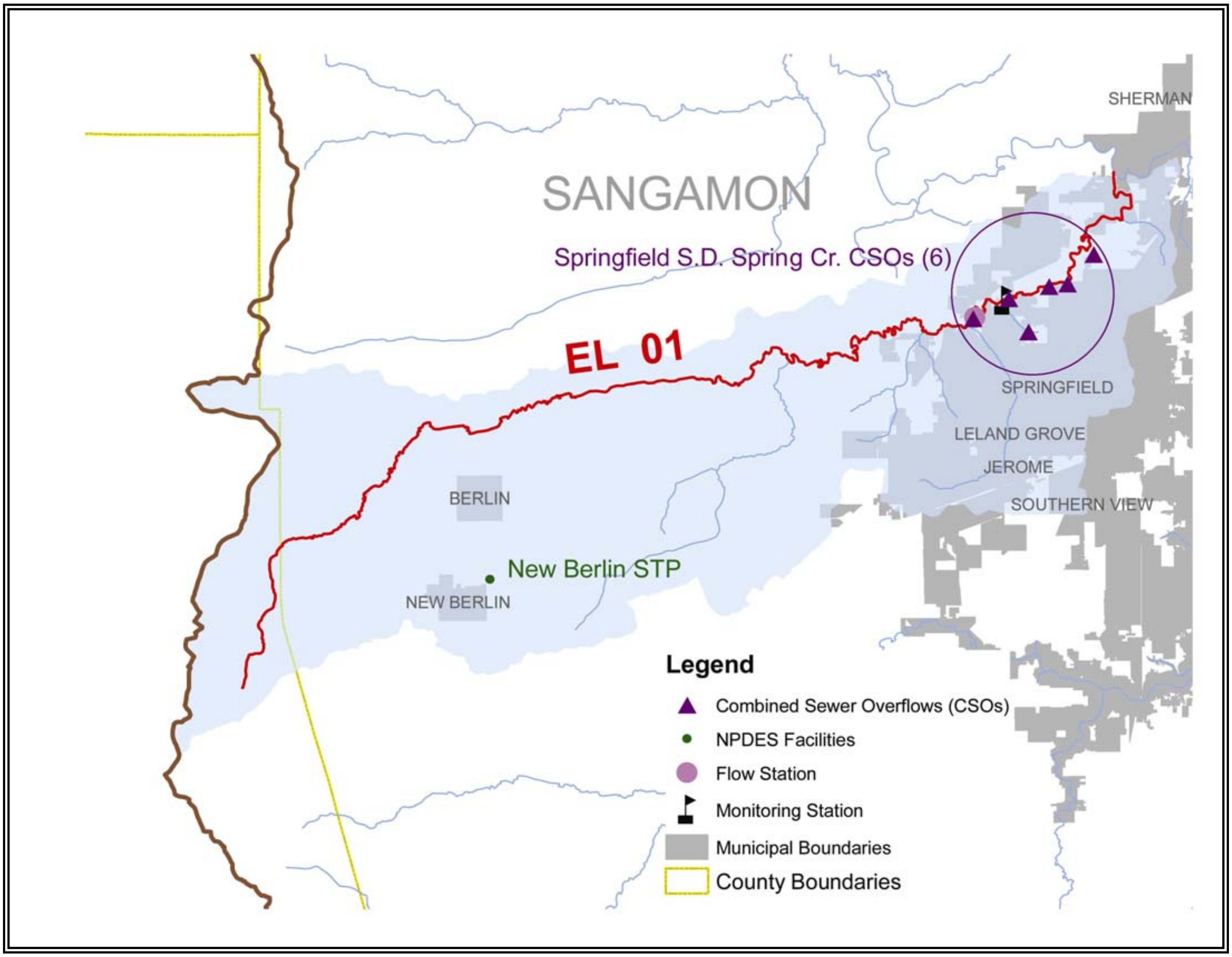
Stormwater runoff from Springfield is a potential source of bacteria. Springfield has 38,717 municipal acres and 47% are in the watershed. 24% of the watershed has MS4 permits.

There are six CSOs in this watershed and two of them discharge upstream of the monitoring station.

Table 23. NPDES Facilities in Spring Creek Watershed

NPDES ID	Facility Name	Design Average Flow (MGD)	Exempt	DMR Data	Exceed-ences/ Total	Mean of Discharge (cfu/ 100ml)	Discharge cfu/ 100ml/ MGD	Max. Permitted Discharge (cfu/ 100ml/ MGD)
ILG580171	NEW BERLIN STP	0.1500	YR			200	30	30

Figure 80. Spring Creek Watershed



Allocations

Annual Loads **Spring Creek**

Total Load-	Geo Mean (cfu/ml)	Annual Seasonal Flow (MGD)	gal/MGD	L/gal	mL/L	cfu/d
	8.84	36	1,000,000	3.785	1000	**1.20E+12**
MS4 Load-	Total Load (cfu/d)	Ratio MS4 Acres in Watershed	cfu/d			
	1.20E+12	0.24	2.89E+11			
Permitted Wasteload (with DMR data)-	NPDES Discharge (cfu/ml/MGD)	gal/MGD	L/gal	mL/L	cfu/d	
	0.3	1,000,000	3.785	1000	1.14E+09	
Septic Wasteload -	Households	fecal conc(cfu/ml)*	discharge (gal/person/d)	people/ house	ml/gal	cfu/d
	1.2	1.00E+04	70	2.5	3785.2	7.95E+09

Wasteload-	MS4	Permitted WL	Septic	cfu/d
	2.89E+11	1.14E+09	7.95E+09	**2.98E+11**
Load-	Total Annual Load -	Wasteload =	cfu/d	
	1.20E+12	2.98E+11	**9.06E+11**	

Allowable Load

Permitted Wasteload- using effluent limit 400	NPDES Discharge (cfu/ml/MGD)	gal/MGD	L/gal	mL/L	cfu/d	
	0.3	1,000,000	3.785	1000	**1.14E+09**	
Total Allowable Load-	Geo Mean (cfu/ml)	Annual Seasonal Flow (MGD)	gal/MGD	L/gal	mL/L	cfu/d
	2	36	1,000,000	3.785	1000	**2.73E+11**
Load Allowable-	Total Allowable Load	Allowable Wasteload	cfu/d			
	2.73E+11	1.14E+09	**2.71E+11**			

Load	Daily Load	Allowable Daily Load	Required Reduction	NPDES Reduction
WLA	2.98E+11	1.14E+09	99.62%	0%
LA	9.06E+11	2.71E+11	70.06%	
Total	1.20E+12	2.73E+11	77.38%	

* Horsley & Witten 1996 10^6/100ml

NPDES permits do not need modified.

Duration Curves and Implementation

Figures 81-85 display the water quality duration curves for Spring Creek and Table 24 contains the geometric means at all flow intervals along with general implementation opportunities.

Figure 81. Duration Curve for Fecal Coliform- 1995-2004

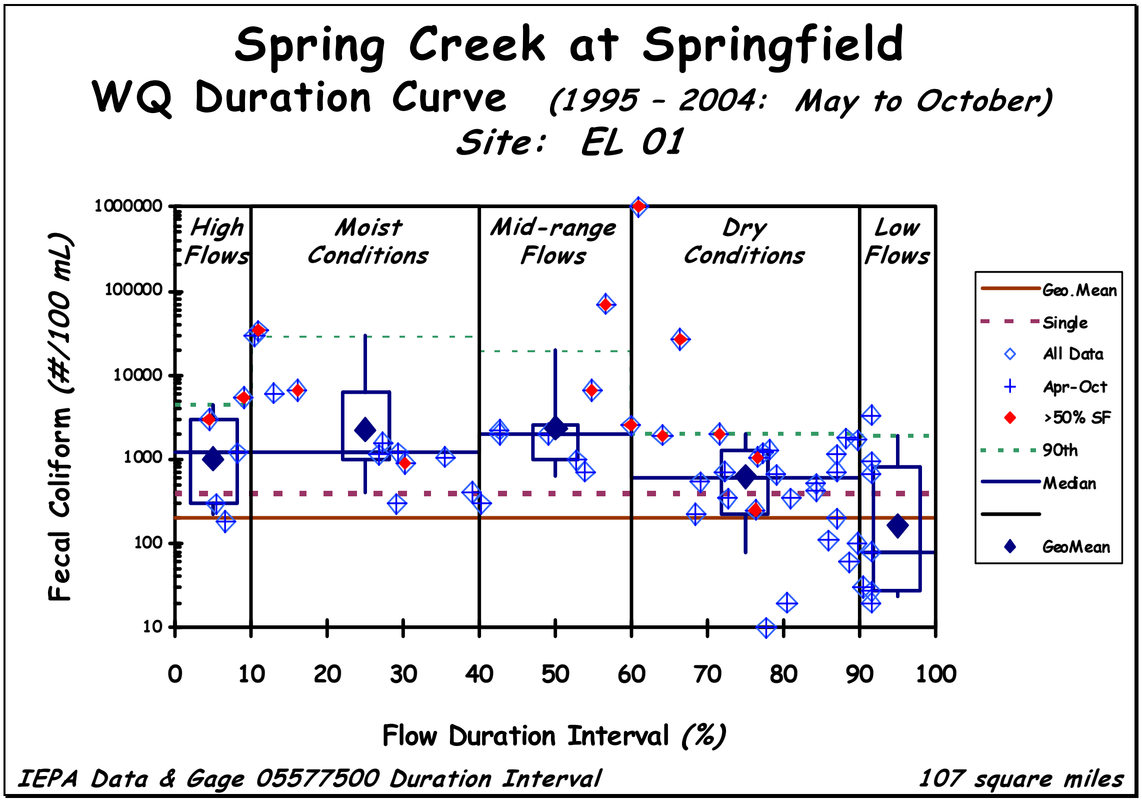


Figure 82. Duration Curve for Fecal Coliform- 1979-2004

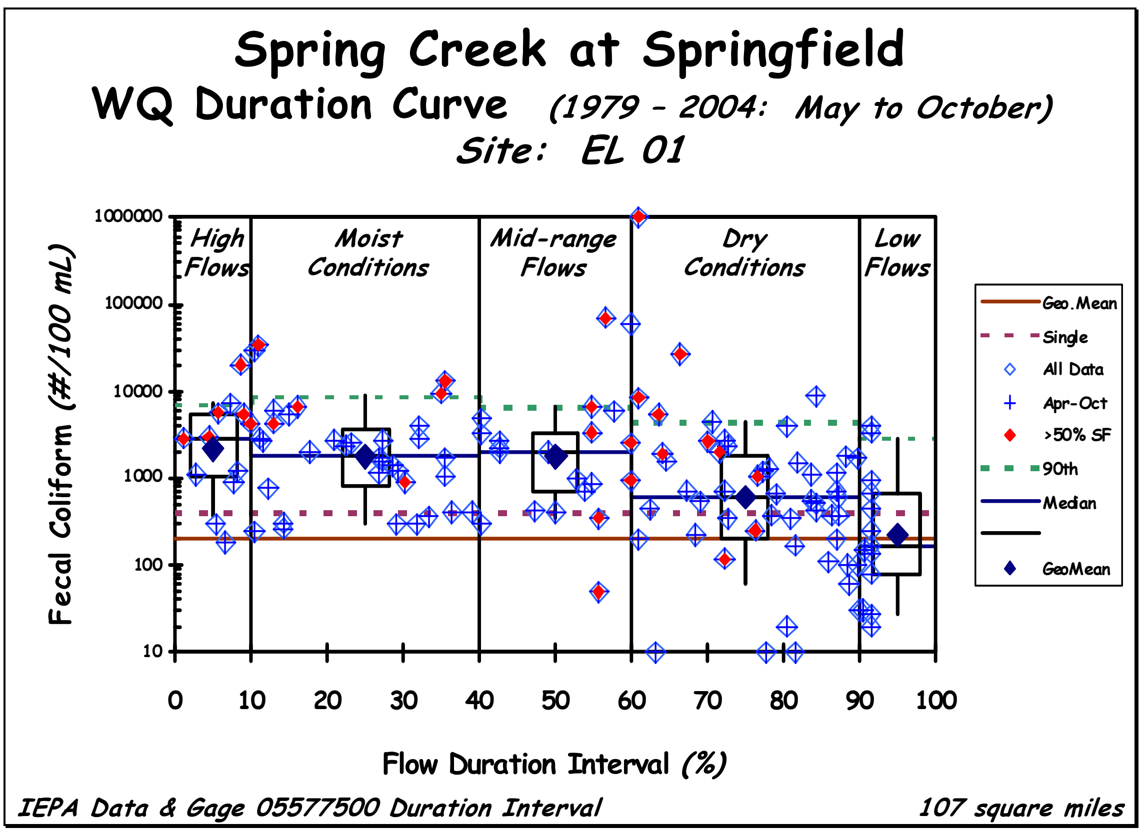


Figure 83. Duration Curve for Phosphorus

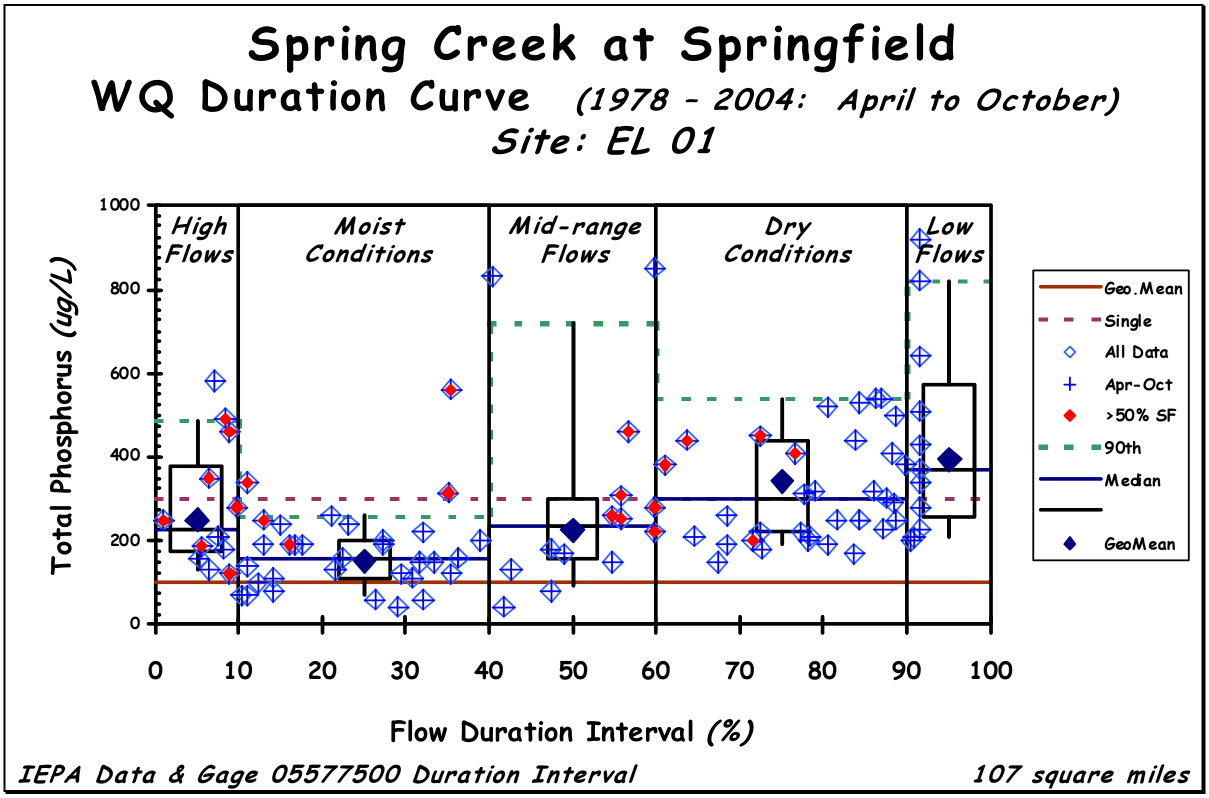


Figure 84. Duration Curve for Nitrite+Nitrate

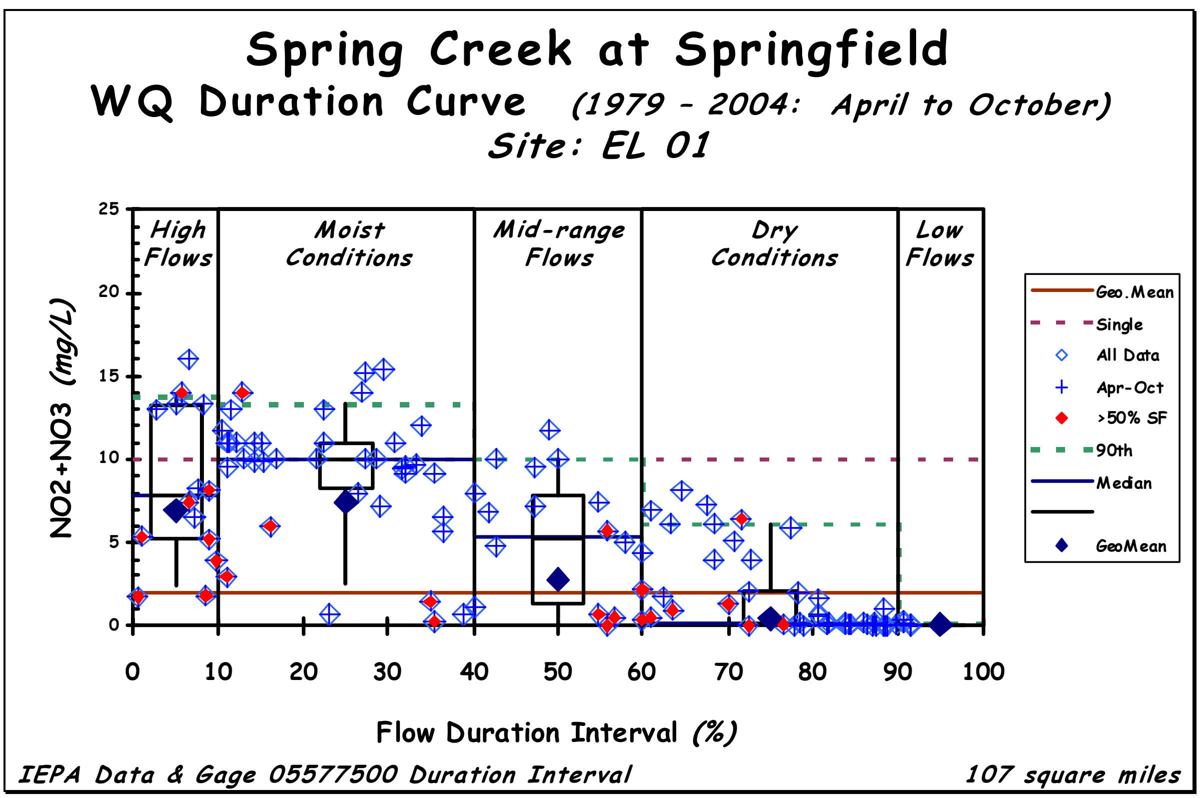


Figure 85. Duration Curve for TSS

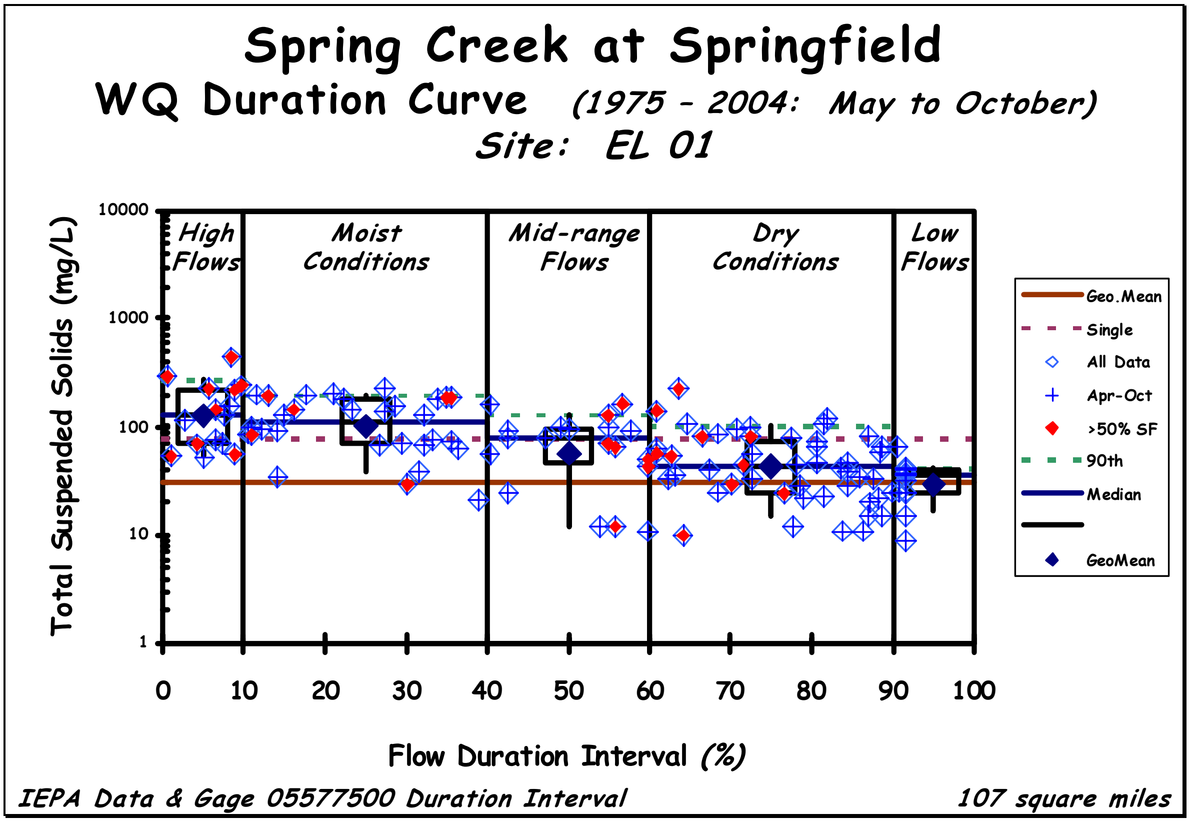


Table 24. Geometric Means for Flow Intervals

	Duration Curve Zone Geometric Mean (cfu/100ml)				
	High	Moist	Mid	Dry	Low
Spring Creek (EL 01)	1005	2294	2344	619	161
Seasonal Considerations *[most likely zone(s) by month]*		*May*	*May*		
		June	*June*	*June*	
			July	*July*	
				August	
				September	
			October	*October*	
Implementation Opportunities	*Long-term CSO plans*	*Long-term CSO plans*		*Municipal NPDES*	*Municipal NPDES*
		On-site wastewater management	*On-site wastewater management*	*On-site wastewater management*	*On-site wastewater management*
		Pasture management & riparian protection	*Pasture management & riparian protection*	*Pasture management & riparian protection*	*Pasture management & riparian protection*
	Urban storm water management	*Urban storm water management*	*Urban storm water management*	*Urban storm water management*	*Urban storm water management*
	Open lot agreements	*Open lot agreements*	*Open lot agreements*	*Open lot agreements*	
	Manure management	*Manure management*			

Appendix B

TMDL Development from the "Bottom Up"- Part II: Using Duration Curves to Connect the Pieces

TMDL DEVELOPMENT FROM THE "BOTTOM UP" – PART II: USING DURATION CURVES TO CONNECT THE PIECES

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ABSTRACT

Reasonable assurance, trading, and adaptive management are key parts of the TMDL process where technical considerations intersect policy issues. Tools are needed which promote effective communication between TMDL developers and those responsible for implementing actions that will lead to measurable water quality improvements. With the large number of TMDLs that must be completed, limited resources, and the complex, inter-related nature of water programs – the "two Ps" are critical to success – *practical* approaches and *partnerships*.

Watershed analysis has been used to build a *"bottom up"* approach towards TMDL development as one way to establish a meaningful, value-added framework which links water quality concerns to proposed solutions. A *"bottom up"* approach takes advantage of networks of programs and authorities across jurisdictional lines. Information on management measures related to both source control and delivery reduction methods are incorporated into the allocation part of TMDL development. Duration curves can support a *"bottom up"* approach through enhanced targeting.

Kansas has been utilizing load duration curves for the past several years as a key part of their TMDL development process. The expanded use of flow duration curves offers an opportunity for enhanced targeting, both in TMDL development and in water quality restoration efforts. In particular, duration curves can add value to the TMDL process by identifying targeted areas, targeted programs, targeted activities, and targeted participants.

Flow duration curve analysis identifies intervals, which can be used as a general indicator of hydrologic condition (i.e. wet versus dry and to what degree). This indicator can help point problem solution discussions towards relevant watershed processes, important contributing areas, and key delivery mechanisms. These are all important considerations when identifying those controls that might be most appropriate and under what conditions. In addition, duration curves also provide a context for evaluating both monitoring data and modeling information. This offers another way to look at identifying data needs where adaptive management is being considered or utilized.

KEYWORDS

Duration curves, watershed analysis, BMP targeting, adaptive management

INTRODUCTION

A strength of the total maximum daily load (TMDL) program is its ability to support development of information-based, water quality management strategies. If done properly, a TMDL can inform, empower, and energize citizens, local communities, and States to improve water quality at the local, watershed level -- the basic information derived from a sound TMDL can liberate the creative energies of those most likely to benefit from reduced pollutant loadings to their own waters *(Tracy Mehan, November 2001)*. With this in mind, tools are needed which promote effective communication between TMDL developers and those responsible for implementing actions that will lead to measurable water quality improvements.

Reasonable assurance, trading, and adaptive management are key parts of the TMDL process where technical considerations intersect policy issues. As a result, technical achievability of pollution control practices has received an increasing amount of attention over the past several years. Two issues that often confront TMDL developers include methods to assess technical achievability and the level of precision needed to develop load reduction estimates. With the large number of TMDLs that must be completed, limited resources, and the complex, inter-related nature of water programs – the "two Ps" are critical to success – *practical* approaches and *partnerships*.

From a practitioner's perspective, there are a number of challenges associated with most technical methods. Empirical approaches rely on the existence of sufficient water quality data to adequately describe important relationships. Alternative approaches that use models require the availability of a unique expertise, information on pollutant source and delivery processes as well as watershed specific data, such as geographic information system (GIS) coverages. Furthermore, public involvement is fundamental to successful TMDL development and implementation. Key stakeholders in the watershed must be engaged in the process in order to achieve meaningful results with measurable water quality improvements. It is also a challenge to explain technical concepts and information in *"plain English"*. For instance, models must be viewed as tools, not solutions --- the use of a model does not automatically guarantee environmental improvement. Both the users and the public must understand how analytical results were derived, in order to avoid the *"paralysis through analysis"* syndrome.

"BOTTOM UP" APPROACHES

An important key to the success of the TMDL program, in terms of engaging the public, is building linkages to other programs, such as nonpoint source (NPS) management. Many successful efforts to develop TMDLs, for example, have involved the §319 program as a way to utilize local groups in data collection, analysis, and implementation. Watershed analysis has been used to build a *"bottom up"* approach towards TMDL development as another way to establish a meaningful, value-added framework which links water quality concerns to proposed solutions.

TMDL development using a *"bottom up"* approach considers the interaction between watershed processes, disturbance activities, and available methods to reduce pollutant loadings, specifically Best Management Practices (BMPs). A *"bottom up"* approach takes advantage of networks of programs and authorities across jurisdictional lines. Information on management measures related to both source control and delivery reduction methods can be incorporated into the allocation part of TMDL development.

DURATION CURVES

Duration curves can support a *"bottom up"* approach through enhanced targeting. As background, traditional approaches towards TMDL development tend to focus on targeting a single value, which typically depends on a water quality criterion and some design flow. The single number concept does not work well when dealing with impairments caused by NPS pollutant inputs *(Stiles, 2001)*. One of the more important concerns regarding nonpoint sources is variability in stream flows, which cause different loading mechanisms to dominate under different flow regimes.

Due to the wide range of variability that can occur in stream flows, hydrologists have long been interested in knowing the percentage of days in a year when given flows occur. Generally, the percentage of time during which specified flows are equaled or exceeded may be compiled in the form of a flow duration curve. This is a cumulative frequency curve of flow quantities without regard to chronology of occurrence *(Leopold, 1994)*. Duration curves may express daily, weekly, or monthly average flows. The most common form of the flow duration curve is the percentage of days in a year that the mean daily flow is equaled or exceeded

Duration curves characterize the percent occurrence of flow rates over a long period of time *(Bonta, 2002)*. Discharge rates are typically sorted from the highest value to the lowest. Using this convention, flow duration intervals are defined, which are expressed as a percentage with zero corresponding to the highest stream discharge in the record (i.e. flood conditions) and 100 to the lowest (i.e. drought conditions). Thus, a flow duration interval of eighty associated with a stream discharge of *"y"* cubic feet per second (cfs) implies that eighty percent of all observed stream discharge values are at or above *"y"* cfs.

Because NPS pollution is often driven by runoff events, TMDL development should consider factors that ensure adequate water quality across a range of flow conditions. In keeping with this idea, Kansas derived a simple TMDL development method based on duration curves, which avoids constraints associated with using a single flow number. Kansas has been utilizing duration curves for the past several years as a key part of their TMDL development process *(Stiles, 2001)*. The initial focus in Kansas was to provide a way to identify whether point or nonpoint sources are the major contributors of concern to water quality problems. Similarly, Bonta *(2002)* described the use of a derived distribution approach, which combines flow duration information with water quality data to develop concentration duration curves (CDCs) and load rate duration curves (LRDCs).

Enhanced Targeting

The expanded use of flow duration curves offers an opportunity for enhanced targeting, both in TMDL development and in water quality restoration efforts. In particular, duration curves can add value to the TMDL process by identifying targeted participants (e.g. NPDES permitees) at critical flow conditions, targeted programs (e.g. Conservation Reserve Program), targeted activities (e.g. conservation tillage or contour farming), and targeted areas (e.g. bank stabilization projects).

Flow duration intervals can be used as a general indicator of hydrologic condition (i.e. wet versus dry and to what degree). This indicator can help point problem solution discussions towards relevant watershed processes, important contributing areas, and key delivery mechanisms. These are all important considerations when identifying those controls that might be most appropriate and under what conditions.

Figure 1 represents the first of several hypothetical examples to illustrate the potential use of duration curves, both as a diagnostic indicator and as a communication tool for targeting in the TMDL process. The target curve in Figure 1 is derived using flow duration intervals that correspond to stream discharge values and numeric criteria for E. Coli. Several TMDL practitioners have described this technique *(Stiles, 2001; Sullivan, 2002; Sheely, 2002)*. The area circled on the right side of the duration curve represents hydrologic conditions where the target is exceeded, specifically low flows. In this example, wastewater treatment plants exert a significant influence at low flows. Thus, duration curves support a *"bottom up"* approach towards TMDL development and water quality restoration by identifying targeted participants, namely point sources.

***Figure 1*.** Duration Curve as General Indicator of Hydrologic Condition

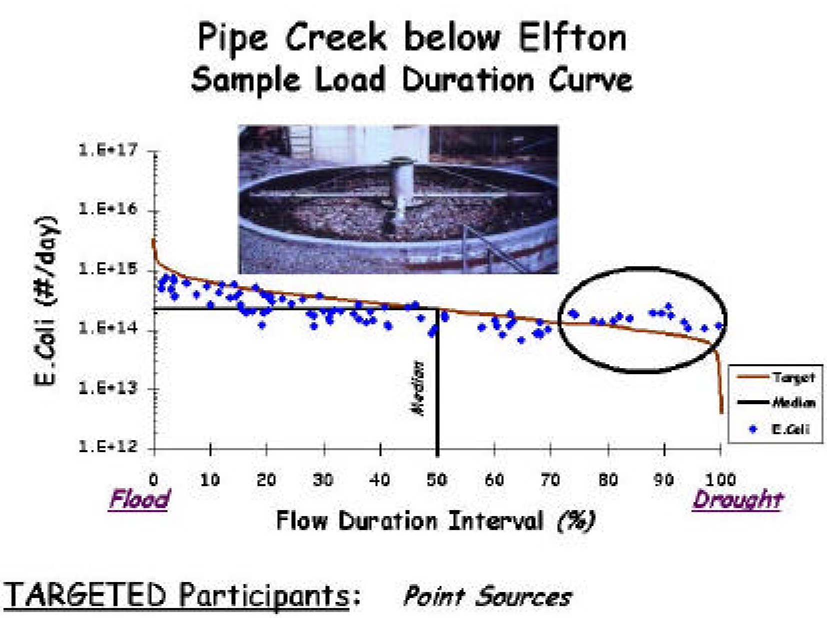
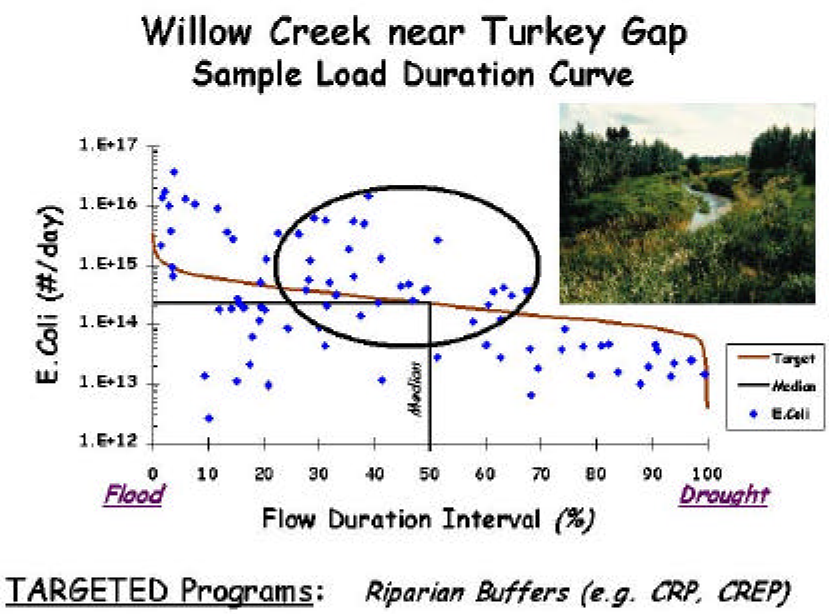


Figure 2 illustrates the added value duration curves can provide by highlighting potential contributing areas. As seen in this hypothetical example, the target is met when the hydrologic condition of the watershed is above a flow duration interval of 70 (generally dry, base flow conditions). Problems start to develop under mid-range flow conditions, as indicated by the circled area. For this particular watershed, the increases may be the result of pollutant delivery associated with rainfall and runoff from riparian areas. Again, duration curves can be used as a diagnostic tool, which supports a *"bottom up"* approach towards TMDL development and water quality restoration by identifying targeted programs, namely those focused on riparian protection.

Figure 2. Duration Curve with Contributing Area Focus



The focus on contributing areas is further illustrated with another hypothetical example, shown in Figure 3, where total suspended solids is the pollutant of concern. Here, the duration curve is expressed in terms of yield to show how derived distributions from a flow duration curve can be extended to other measures, again as a simple targeting tool. In this example, observed values only exceed the target when the hydrologic condition of the watershed is below 55 (generally higher flows). These conditions are generally associated with more saturated soils when a larger portion of the watershed drainage area is potentially contributing runoff. In this case, consideration might be given to targeted activities such as conservation tillage or contour strips.

***Figure 3*.** Duration Curve with Contributing Area Focus

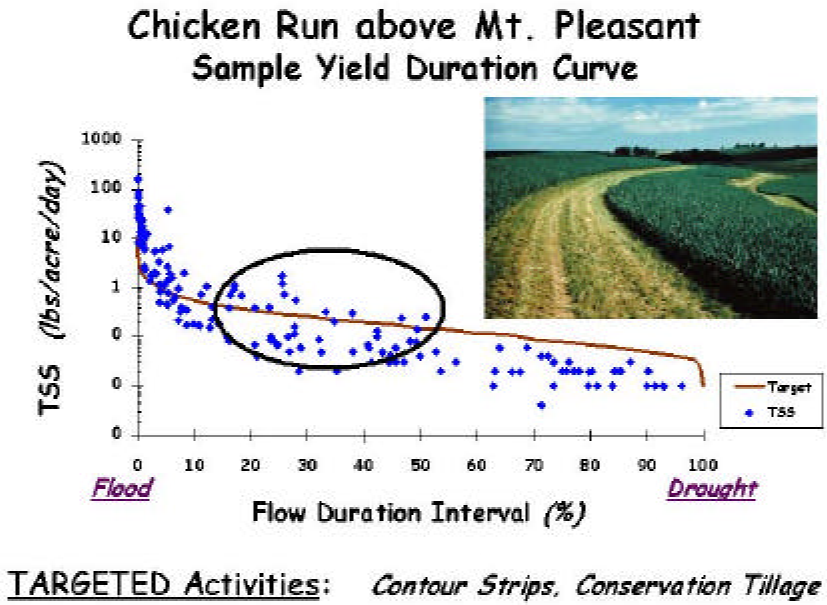
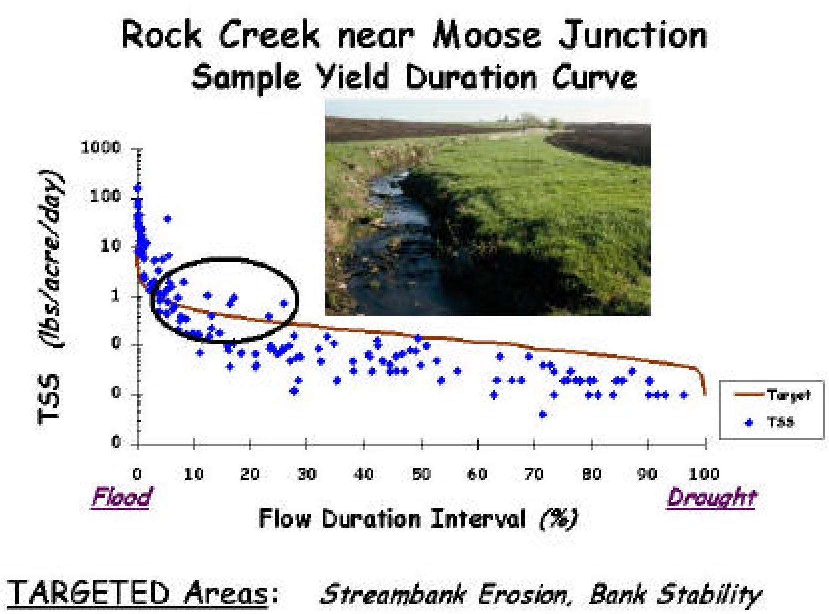


Figure 4 illustrates the last hypothetical example, which shows the potential use of duration curves as a diagnostic tool. In this situation, the target is only exceeded at intervals below 30. This hydrologic condition is associated with much higher stream discharge rates, where delivery mechanisms could include streambank erosion processes. Targeted areas to consider in a *"bottom up"* approach for this example might focus on bank stabilization efforts.

***Figure 4*.** Duration Curve with Delivery Mechanism Focus



Technical Achievability and *"Bottom Up"* Approaches

Technical achievability is a major factor generally considered when looking at reasonable assurance (another is the institutional framework to support NPS load reduction efforts, so that point source waste load allocations can fit within the TMDL). An example from the Pacific Northwest illustrates one way in which technical achievability was considered in development of a *"bottom up"* NPS-only TMDL. Specifically, the Simpson Northwest Timberlands TMDL, established by the State of Washington with technical assistance from EPA Region 10, contained allocations based on an achievability analysis.

Simpson, in accordance with the Endangered Species Act [ESA §10], developed a Habitat Conservation Plan (HCP). The Simpson HCP describes a suite of management, assessment, and monitoring actions. Simpson's conservation program emphasizes the protection of riparian forests coupled with erosion control as a primary strategy to satisfy ESA §10. Specific management prescriptions designed to reduce the input of pollutants into streams within the plan area include: riparian conservation reserves; road management; unstable slope protection; and a wetlands conservation program. Riparian management strategies in the HCP are designed to eliminate temperature increases due to human activities and to prevent delivery of excess sediment to the streams. Allocations in the TMDL are designed to achieve similar results. The allocations were derived using effective shade and sediment delivery targets based on information from the HCP.

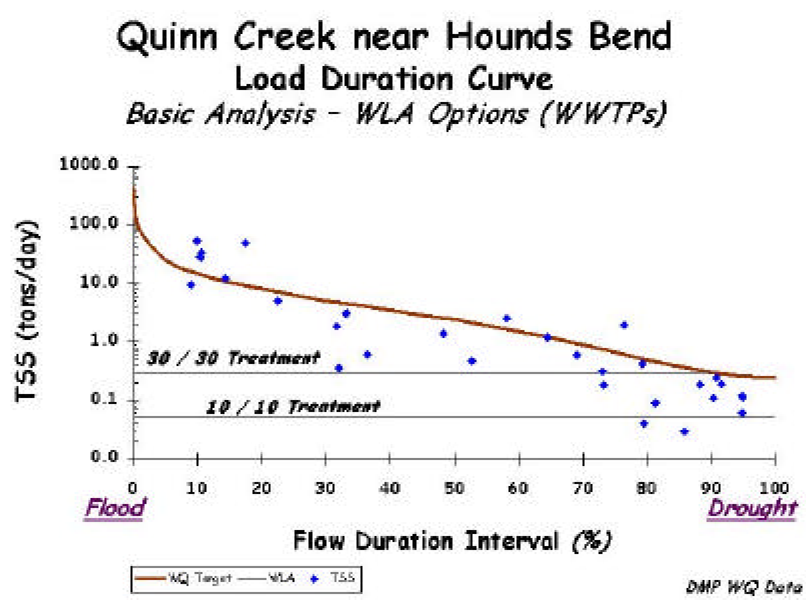
These targets were based on an analysis of expected results from implementing the HCP management prescriptions. Effective shade allocations were based on achievability estimates using channel classification information combined with characteristics of mature riparian vegetation and buffer widths associated with HCP prescriptions for each channel class. Similarly, sediment delivery allocations were based on rapid sediment budget estimates of the percent of the load that could be controlled through implementation of HCP prescriptions. Thus, TMDL development took advantage of the work underway. The measures were linked to specific source areas and to appropriate actions needed to solve identified water quality problems. This *"bottom up"* approach gives major consideration to the actions that can be implemented. Any gaps can be readily identified and filled using the concept of *"adaptive management"*.

Connecting *"Bottom Up"* Practices with *"Top Down"* Targets

When developing an analysis of technical achievability for *"blended waters"*, duration curves offer a straightforward approach. The nature of the analysis allows one to compare the relative contribution of point versus nonpoint source loads across the range of flow conditions. This can be useful when evaluating specific control options, particularly if there is variation in the effectiveness of load reduction practices based on the hydrologic condition of the watershed. In terms of pollutant trading, load duration curves can also ensure that options being considered reflect *"apples for apples"* rather than *"apples for oranges"*.

Figure 5 uses a simple example to illustrate the use of load duration curves in an achievability analysis. This example starts with an evaluation of point source contributions in the watershed. These are relatively continuous discharges that do not exhibit the wide range of flow variation observed with NPS inputs. Figure 5 shows how possible allocations might look using two different treatment options.

***Figure 5*.** Waste Load Allocation Options Using a Duration Curve Approach



Depending on watershed characteristics, a logical next step that extends the achievability analysis to nonpoint sources could focus on those contributing areas most likely to deliver runoff generated during low flow conditions, such as riparian areas. The analysis might consider, for example, a range of buffer widths that could be applied to different channel types in the watershed. Figure 6 illustrates one possible way, using duration curves, to frame an evaluation of load allocation options regarding estimated pollutant reductions from riparian areas.

Similarly, extending the analysis to consider other potential NPS inputs could focus on expected load reduction estimates that might be achieved using BMPs appropriate to the source area / delivery mechanism of concern. One example might be estimating expected load reductions to be achieved using grassed waterways or conservation tillage. The resulting TMDL would be the aggregate analysis of practices considered for implementation in the watershed plan. Figure 7 illustrates the concept using duration curves to aggregate load reduction estimates for point sources and riparian areas. This approach highlights critical conditions to consider in the development of TMDL allocation strategies. This approach can also help distinguish legitimate trading options from those that target different conditions.

***Figure 6*.** Load Allocation Options Using a Duration Curve Approach

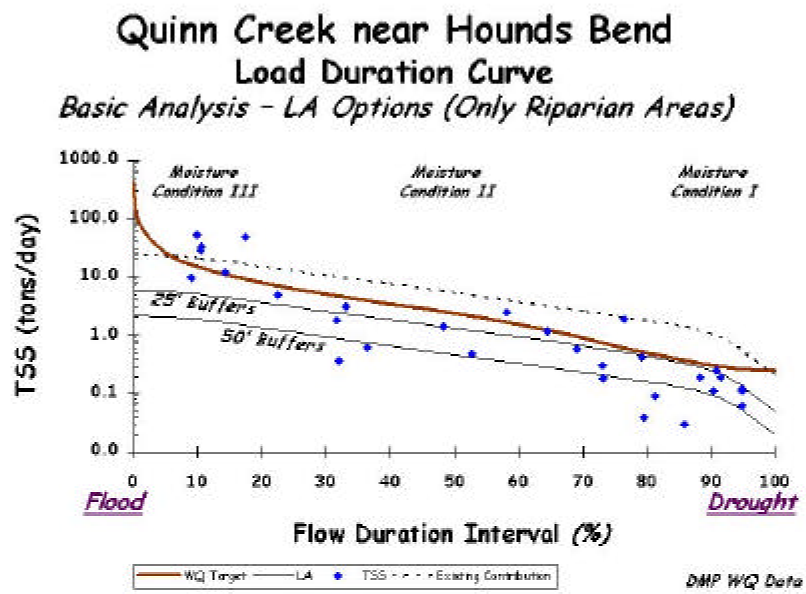
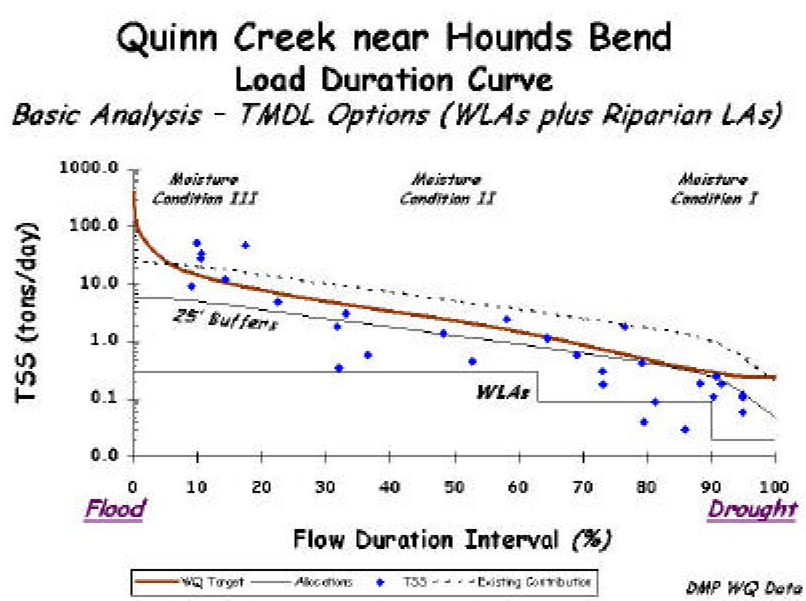


***Figure 7*.** Using Duration Curves to Evaluate Allocation Strategies



ADAPTIVE MANAGEMENT

Duration curves also provide a context for evaluating both monitoring data and modeling information. This offers another way to look at identifying data needs where adaptive management is being considered or utilized. Specifically, adaptive management plays a key role in the implementation process for achieving load reductions. Using a value-added *"bottom up"* approach, TMDL development occurs using the best available data. Progress towards achieving load allocations are periodically assessed through phased implementation using measurable milestones.

Adaptive management must be built into the process from the beginning. If a TMDL process or design does not have a component that can incorporate mid-course corrections, uncertainty and the differing views people have on it will hamper success *(Poole, 2001)*. Developing a policy that incorporates adaptive management can help resolve the problem. Under adaptive management, a watershed plan should not be held up due to a lack of data and information for the *"perfect solution"*. The process should use an iterative approach that continues while better data are collected, results analyzed, and the watershed plan enhanced, as appropriate. Thus, implementation can focus on a cumulative reduction in loadings under a plan that is flexible enough to allow for refinement, which better reflects the current state of knowledge about the system and is able to incorporate new, innovative techniques.

SUMMARY

A *"bottom up"* approach towards TMDL development is one way to establish a meaningful, value-added framework which links water quality concerns to proposed solutions. TMDL development using a *"bottom up"* approach considers the interaction between watershed processes, disturbance activities, and available methods to reduce pollutant loadings, specifically BMPs. A *"bottom up"* approach also takes advantage of networks of programs and authorities across jurisdictional lines. Information on management measures related to both source control and delivery reduction methods can be incorporated into the allocation part of TMDL development.

Duration curves can support a *"bottom up"* approach through enhanced targeting. Traditional approaches towards TMDL development tend to focus on targeting a single value, typically dependent on a criterion and some design flow. Single number concepts do not work well when dealing with impairments caused by NPS pollutants. Because NPS pollution is often driven by runoff events, TMDL development should consider factors that ensure adequate water quality across a range of flow conditions.

The expanded use of flow duration curves offers an opportunity for enhanced targeting, both in TMDL development and in water quality restoration efforts. In particular, duration curves can add value to the TMDL process by identifying targeted participants (e.g. NPDES permitees) at critical flow conditions, targeted programs (e.g. Conservation Reserve Program), targeted activities (e.g. conservation tillage or contour farming), and targeted areas (e.g. bank stabilization projects).

Flow duration intervals can be used as a general indicator of hydrologic condition (i.e. wet versus dry and to what degree). This indicator can help point problem solution discussions towards relevant watershed processes, important contributing areas, and key delivery mechanisms. These are all important considerations when identifying those controls that might be most appropriate and under what conditions. Because of the potential utility as a diagnostic indicator and as a communication tool for targeting in the TMDL process, duration curves also provide a context for evaluating both monitoring data and modeling information. This offers another way to look at identifying data needs where adaptive management is being considered or utilized.

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Appendix C

Data Tables

Appendix C. Data

This appendix contains data used in the TMDL Report- Table 1 is Land Use in Each Subwatershed and Table 2 is Exempted Facility Discharge Data.

Table 1. Land Use in Each Subwatershed

The Illinois Interagency Landscape Classification Project (IILCP) completed the Land Cover of Illinois 1999-2000 (http://www.agr.state.il.us/gis/landcover99-00.html). The following table is land use for each specific watershed in the TMDL Appendix A.

Land Use Class Names	Sugar Creek (EID 01) Acres	%	Kickapoo Creek (EIE 04 and 05) Acres	%	Salt Creek (EI 06) Acres	%	Lake Fork (EIG 01) Acres	%	Salt Creek (EI 02) Acres	%	Flat Branch (EOH 01) Acres	%	S. Fk. Sangamon River (EO 02) Acres	%	S. Fk. Sangamon River (EO 01) Acres	%	Sugar Creek (EOA 01) Acres	%	Spring Creek (EL 01) Acres	%
Corn	80481	38.2	83218	39.2	96280	39.2	87359	49.7	505579	42.8	83139	47.0	182565	45.8	256316	45.9	71976	39.7	27261	35.3
Soybeans	81944	38.9	85681	40.4	95079	38.7	72166	41.1	470489	39.8	71920	40.7	159545	40.0	218247	39.1	63288	34.9	20301	26.3
Winter Wheat	315	0.1	205	0.1	146	0.1	230	0.1	1690	0.1	636	0.4	1598	0.4	1894	0.3	439	0.2	75	0.1
Other Small Grains											1309	0.7	2285	0.6	2576	0.5	359	0.2	14	0.0
Winter Wheat/Soybeans	207	0.1	381	0.2	148	0.1	89	0.1	1201	0.1	613	0.3	1605	0.4	1787	0.3	205	0.1	73	0.1
Other Agriculture									40	0.0	204	0.1	1027	0.3	1571	0.3	271	0.1	0	0.0
Rural Grassland	19144	9.1	23617	11.1	26433	10.8	10324	5.9	105581	8.9	8367	4.7	16369	4.1	25611	4.6	13482	7.4	9445	12.2
Total Ag	**182091**	**86.4**	**193103**	**91.0**	**218086**	**88.8**	**170168**	**96.9**	**1084580**	**91.7**	**166187**	**94.0**	**364994**	**91.5**	**508002**	**90.9**	**150020**	**82.6**	**57167**	**74.0**
Upland-Dry									61	0.0							1	0.0	0	0.0
Upland- Dry Mesic	1663	0.8	1346	0.6	4991	2.0	273	0.2	9873	0.8	1634	0.9	7031	1.8	11146	2.0	3126	1.7	689	0.9
Upland-Mesic	569	0.3	507	0.2	2228	0.9	176	0.1	4673	0.4	130	0.1	704	0.2	1124	0.2	427	0.2	712	0.9
Partial Canopy/Savanna	1993	0.9	1851	0.9	1958	0.8	386	0.2	7366	0.6	807	0.5	2168	0.5	3533	0.6	2682	1.5	1898	2.5
Coniferous	11	0.0	28	0.0	4	0.0	1	0.0	70	0.0	2	0.0	2	0.0	25	0.0	28	0.0	22	0.0
Total Forest	**4237**	**2.0**	**3732**	**1.8**	**9181**	**3.7**	**835**	**0.5**	**22043**	**1.9**	**2572**	**1.5**	**9905**	**2.5**	**15827**	**2.8**	**6264**	**3.5**	**3321**	**4.3**
High Density	10622	5.0	6280	3.0	4511	1.8	2525	1.4	28396	2.4	1548	0.9	4157	1.0	6390	1.1	7592	4.2	6820	8.8
Medium Density	6188	2.9	2668	1.3	1552	0.6	523	0.3	12736	1.1	1267	0.7	4527	1.1	6346	1.1	7115	3.9	7215	9.3
Urban Open Space	3694	1.8	1841	0.9	1267	0.5	625	0.4	8355	0.7	505	0.3	1520	0.4	2042	0.4	1992	1.1	364	0.5
Total Urban	**20503**	**9.7**	**10789**	**5.1**	**7330**	**3.0**	**3674**	**2.1**	**49487**	**4.2**	**3320**	**1.9**	**10204**	**2.6**	**14778**	**2.6**	**16700**	**9.2**	**14399**	**18.6**

Land Use Class Names	Sugar Creek (EID 01) Acres	%	Kickapoo Creek (EIE 04 and 05) Acres	%	Salt Creek (EI 06) Acres	%	Lake Fork (EIG 01) Acres	%	Salt Creek (EI 02) Acres	%	Flat Branch (EOH 01) Acres	%	S. Fk. Sangamon River (EO 02) Acres	%	S. Fk. Sangamon River (EO 01) Acres	%	Sugar Creek (EOA 01) Acres	%	Spring Creek (EL 01) Acres	%
Shallow Marsh/Wet Meadow	14	0.0	34	0.0	30	0.0	3	0.0	175	0.0	468	0.3	1419	0.4	1839	0.3	223	0.1	7	0.0
Deep Marsh	9	0.0	7	0.0	14	0.0	4	0.0	50	0.0	51	0.0	268	0.1	475	0.1	126	0.1	1	0.0
Seasonally/ Temp. Flooded	34	0.0	50	0.0	141	0.1	3	0.0	531	0.0	222	0.1	1100	0.3	1673	0.3	236	0.1	20	0.0
Floodplain Forest: Mesic											4	0.0	20	0.0	20	0.0				
Floodplain Forest: Wet-Mesic	1440	0.7	1600	0.8	2167	0.9	311	0.2	7308	0.6	321	0.2	452	0.1	723	0.1	361	0.2	461	0.6
Floodplain Forest: Wet	1961	0.9	2035	1.0	3131	1.3	417	0.2	10448	0.9	3316	1.9	8316	2.1	10628	1.9	3476	1.9	1752	2.3
Shallow Water	38	0.0	77	0.0	138	0.1	19	0.0	473	0.0	178	0.1	784	0.2	945	0.2	75	0.0	26.1	0.0
Total Wetland	**3495**	**1.7**	**3801**	**1.8**	**5623**	**2.3**	**758**	**0.4**	**18984**	**1.6**	**4559**	**2.6**	**12359**	**3.1**	**16304**	**2.9**	**4496**	**2.5**	2267	**2.9**
Surface Water	326	0.2	692	0.3	5266	2.1	168	0.1	7260	0.6	61	0.0	1184	0.3	3529	0.6	3965	2.2	**105**	0.1
Barren and Exposed Land			156	0.1					279	0.0	40	0.0	176	0.0	252	0.0	79	0.0	0	0.0
Total Other	**326**	**0.2**	**848**	**0.4**	**5266**	**2.1**	**168**	**0.1**	**7540**	**0.6**	**101**	**0.1**	**1360**	**0.3**	**3781**	**0.7**	**4044**	**2.2**	**104.625**	**0.1**
Total Acres	**210652**		**212273**		**245485**		**175602**		**1182633**		**176740**		**398822**		**558691**		**181524**		**77258**	

Table 2. Exempted Facility Discharge Data

	Samples							
Exempted Facility	**1**	**2**	**3**	**4**	**5**	**Mean**	**Data Year**	**Note**
Altanta STP	45	5	2	6		**15**	1989	
Armington STP	5000					**5000**	1999	
Assumption STP	217					**217**	86-88	
Auburn STP	1130					**1130**	1989	
Bloomington/Normal WRD	33341					**33341**	1989	average of geomeans (many samples)
Clinton STP	2553					**2553**	1989	
Country View Living Center	35					**35**	1993	
Danvers STP	0	400	60			**153**	1988	
Divernon STP	229	42	72	58		**100**	1989	
Edinburg WWTP	520	390	370	510	335	**425**	1988	
Farmer City STP	1023					**1023**	1989	

	Samples							
Exempted Facility	**1**	**2**	**3**	**4**	**5**	**Mean**	**Data Year**	**Note**
Findlay STP	1000	210	3600	14000		**4703**	1993	Seasonal
Greenview High Sch.	3020	1275	1785	840		**1730**	1990	
Heyworth STP	240	180	100	200		**180**	1988	
Kenney STP	11000	940000	460000	80		**352770**	1994	
Kincaid STP	105	102	290	60		**139**	1990	
Lake Springfield Baptist Camp	1800000	286000	1440000	1200000		**1181500**	1992	
Leroy STP	20	40	170	20	0	**50**	1989	
Little Galilee Christian Assem.	8335	2700	100	2175		**3328**	1996	
Lovington STP	7200	3600	5800	6000	8400	**6200**	1990	
Macon STP	6200	5400	4800	10000		**6600**	1989	
Maroa STP	70	140	55	290		**139**	1993	
McLean STP	63	400	980	50		**373**	1989	
Minier STP	320	60	150	150		**170**	1989	
Moraine View State Park	5000					**5000**	1998	
Morrisonville STP	600	1600	60	720		**745**	1989	
Moweaqua STP	890	TNTC	400	400	99	**447**	1991	
New Berlin STP	300	125	700	500		**406**	1992	
Ohlman STP	5000					**5000**	1998	
Olympia High Sch.	330	100	40	0		**118**	1989	
Pawnee STP	750	610	700	800		**715**	1992	
Raccoon Super K	1300					**1300**	1992	
South Fork STP	5000					**5000**	1994	Estimate
Sunny Acres Nursing Home	5374	7400	6300	9800		**7219**	1991	
Taylorville STP	150	538	2865	630		**1046**	1989	
Thayer STP	5000					**5000**	1989	
United Pentecostal Ch.	3300					**3300**	1996	
Virden East STP	40	780	580	580		**495**	1989	
Virden North STP						**885**	88-89	8 samples
Warrensburg STP	20	0	50	30		**25**	1994	
Waynesville STP	220	340	220	1100		**470**	1992	

Appendix D

Responsiveness Summary

September 8, 2005

Responsiveness Summary

This responsiveness summary responds to substantive questions and comments received during the public comment period from August 2, 2005 through August 26, 2005 postmarked, including those from the August 10, 2005 public meeting discussed below.

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 Regional Fecal Coliform TMDL on Salt Creek of Sangamon River and Lower Sangamon River Watersheds contains eleven impaired segments. This report details the watershed characteristics, fecal coliform impairment, bacteria sources, load and wasteload allocations, and reductions for each segment. The Illinois EPA implements the TMDL program in accordance with Section 303(d) of the federal Clean Water Act and regulations thereunder.

Background

The river segments targeted for TMDL development are Salt Creek (EI 02 and EI 06), Sugar Creek (EID 04), Kickapoo Creek (EIE 04 and EIE 05), Lake Fork (EIG 01), Flat Branch (EOH 01), South Fork Sangamon River (EO 01 and EO 02), Sugar Creek (EOA 01) and Spring Creek (EL 01). The project area is 2,487,649 acres (3,887 square miles) and includes all or part of fifteen counties in central Illinois. Land use in the watershed is predominately agriculture. These river segments are listed on the Illinois EPA 2004 Section 303(d) List as being impaired for primary contact use with the potential cause of fecal coliform bacteria (pathogens). The Clean Water Act and USEPA regulations require that states develop TMDLs for waters on the Section 303(d) List.

Public Meetings

Public meetings were held in Lincoln and Springfield on July 5 and 6, 2005, and in Springfield August 10, 2005. The Illinois EPA provided public notice for all meetings by placing display ads in five newspapers in the watershed; the State Journal Register in Springfield, the Breese Courier in Taylorville, The Courier in Lincoln, The Pantagraph in Bloomington/Normal and the Daily Journal in Clinton. Notices went out the week of July 11 and August 1. These notices gave the date, time, location, and purpose of the meetings. It also provided references to obtain additional information about this specific site, the TMDL Program and other related issues. Over 200 individuals and organizations were also sent the public notice by first class mail. The draft TMDL Report was available for review at Lincoln College Library, the Springfield Lincoln Library, the Bloomington Public Library, the Clinton Warner Library and the Taylorville Public Library and also on the Agency's web page at http://www.epa.state.il.us/water/tmdl .

Public meetings on July 5 and 6 started at 6:30 p.m. One person attended the first and eight attended to the second of these meetings. The public meeting on Wednesday, August 10, 2005, started at 6:30 p.m. It was attended by approximately eight people and concluded at 8:45 p.m. with the meeting record remaining open until midnight, August 26, 2005.

Questions and Comments

Data

1. While data on fecal coliform concentrations in impaired segments are presented, there is little discussion of, and almost no direct data presented on, fecal coliform loads from the identified point and nonpoint sources. The report should describe and present available data on loads and discuss what additional data will be needed to develop the TMDL.

   Response
   In the Stage 1 Report, we included a section that describes the impairment for each segment. Section 4 of the report explains how each segment was assessed. Appendix A contains specific information for each of the eleven segments. Each segment has a section in that report identified as "Fecal Coliform Data Assessment" that lists the data quantity, number of times the data samples exceeded the 200cfu/100ml and the 400cfu/100ml standards. It also contains a time series plot that shows each data sample. This comment was made on the Stage 1 Report, which does not include point and nonpoint source analysis. The Stage 3 Report contains allocations and the Implementation Plan that will be developed in the next several months will have source analysis. Since we do have ambient water quality stations on each of these segments, there were years of data for each.

2. On page 27, it appears that the target load will be set, after adjusting for flow, to the target concentration for fecal coliforms 200cfu/100ml. If this is correct, this target load seems to assume immediate (within 24 hours) die-off of fecal coliform and all associated pathogens. Please provide clarification, and if this assumption is correct, provide justification.

   Response
   The target load does not assume die-off or regrowth. We do not dispute that either occurs, but we intended to treat the parameter conservatively. Regardless, if there is die-off or regrowth, the in-stream fecal coliform concentration must not exceed the 200 cfu/100ml when sampled.

3. Fecal coliform concentrations should be expressed consistently throughout the document, using cfu/100ml, with "cfu" explained at its first use.

   Response
   Cfu stands for colony forming units. It will be stated in the report.

NPDES Permitted Dischargers

4. Presumably, good data on fecal coliform loading should be available from point source dischargers operating under NPDES permits. The report should discuss absolute and relative loads from these dischargers. While firm data are not available on loads from many nonpoint sources, the report should try to estimate loads, at least on a relative basis, for all potential nonpoint sources and discuss whether such back-of-the-envelope estimates are sufficient to develop the TMDL. If they are not, the report should discuss what data will be necessary, and how these data will be obtained.

   Response
   NPDES discharge information and loads for each individual segment are in Appendix A.

Load allocation and Wasteload allocation from nonpoint sources and point sources, respectively, are estimated in the Stage 3 Report. The implementation plan will discuss in more details the loads from point and nonpoint sources as they relate to flow.

5. What is Illinois EPA going to do about NPDES facilities that are not compliant with their effluent standard? Subdivisions such as Deer Ridge, Mallard Point, Mallingham, Sherwood, and Old Town Timber have a mixed record of compliance and noncompliance with their fecal coliform and other permit limits. Whereas 400 cfu/100ml is the maximum allowable: monthly DMRs reporting 40,000 cfu/100ml have not been uncommon. All of these subdivisions have been noncompliant part of the time, over the years of their first permits. No engineering improvements have been made to improve the fecal coliform compliance though several have talked about it. Most chronic violations of the NPDES permit limits do not even result in a Violation Notice.

   Response
   The Illinois EPA will pursue any necessary enforcement action for NPDES permittees experiencing chronic fecal coliform effluent limit exceedences. The compliance/enforcement process detailed in Section 31 of the Illinois Environmental Protection Act, that includes the issuance of Violation Notices and the establishment of compliance commitment agreements, will be followed. Permittees that do not submit an acceptable compliance commitment and/or fail to achieve compliance will be considered for further formal enforcement.

6. The fact that a young man almost died of an E. Coli 0157:H7 infection, who was exposed to the waters of a pond in Deer Ridge, which we learned was commonly discharging fecal coliform at the rate of 40,000 cfu/100ml on the official Discharge Monitoring Reports when he was exposed, has inspired examination of rural subdivision sewer systems. We understand when IDPH and Illinois EPA were contacted about this exposure it was denied that there was any sewer contamination of the pond. If the illegal sewer discharge into the pond had been acknowledged at the same time, tests could have been done to confirm whether the NPDES discharge was the source of contamination. Today, that same pond's NPDES discharges are noncompliant part of the time for fecal coliform plus it appears to have IDPH discharges into the pond in excess of IDPH regulations. Illinois EPA is currently preparing to reissue the NPDES 5 year sewer permit.

   Response
   Non-compliant wastewater systems are and have been the subject of enforcement actions by this Agency. IDPH, the Illinois EPA and local public health departments are currently working on a strategy that will bring problematic surface discharging septic systems into compliance. This TMDL will account for those actions in the implementation plan. The TMDL is not intended to substitute for ongoing or future enforcement necessary to achieve the water quality standard.

7. We recommend that the policy be reviewed which allows surface discharging waste water permits to be issued in ever increasing numbers in spite of the fact that Illinois EPA readily admits that they do not have the resources to enforce the permits they issue, and the fact that the permits they do issue for rural subdivisions are not complying with the fecal coliform permit limits.

   Response
   This issue is now under investigation- see our response to comment 6.

CSOs

8. Do the NPDES facilities monitor combined sewer overflows (CSOs)?

   Response
   Most CSOs or wet weather flow treatment facilities (WWFTF) are required by their permit to submit monthly information on the maximum bacteria count and on flow. There are CSOs that are exempt from these regulations. Bloomington/Normal WWTP is the only facility in this watershed that is exempt from the CSO regulations and does not have to monitor for fecal coliform bacteria based on a decision from the Illinois Pollution Control Board in 1984.

9. Do you see patterns in the water quality duration curves that show segments having problems with CSOs?

   Response
   Water quality duration curves consider the flow at the time of the data sample. If a CSO is a problem for a stream segment, one would expect to see those exceedences in high to high/medium stream flows since storm events are the cause of CSOs. Duration curves for each segment are included in Appendix A and source analysis will be discussed in the Implementation Plan.

10. Bloomington/Normal Water Reclamation District is in the process of eliminating CSOs over the next three years.

    Response
    Thank you. That will be noted in the Implementation Plan.

11. The City of Bloomington periodically has CSOs which tremendously increase fecal coliform in Sugar Creek. What are Bloomington's plans to control combined sewer overflows?

    Response
    As discussed in the comment above, Bloomington/Normal WRD is planning to eliminate its CSOs over the next three years.

Septic Systems

12. The abundance and locations of private sewage treatment systems, including conventional septic systems and surface-discharging systems should be in the report. County health departments and perhaps the Illinois Department of Public Health should have some readily-accessible information about these systems. Any local information at all, even if well short of a thorough census, would provide useful information for this TMDL effort.

    Response
    Several county health departments were contacted. Most keep track of complaints and new systems, and issue permits for renovations. They do not have estimates of failing septic systems for their respective county.

13. How did you come up with loads from septic systems? Do you know if any are making surface water contributions?

    Response

Failing septic systems are considered both a nonpoint and a point source. Septic systems can fail and discharge directly into the river or indirectly by tile drains or precipitation runoff. Specific failing septic system numbers are not available, but estimates were based on statistics from *A Summary of the Status of Onsite Wastewater Treatment Systems in the United States during 1998*, by the National Small Flows Clearinghouse. According to this report, nineteen percent of households per county have failing septic systems and nineteen percent of those discharge to ground and/or surface water. Both load and wasteload allocations have septic system failures as part of their calculations.

14. Is there enough data to come up with an effective implementation plan that addresses septic problems?

Response
Load duration curves were done for each segment in the TMDL. Duration curves consider the flow at the time of the fecal coliform sample. One can assume that point source contributions of septic failures would happen in low flow because the flow from leaking or surface discharging septic systems would, under those flow conditions, constitute the majority of the flow in the stream, while nonpoint contributions (e.g., runoff from CAFOs) would happen only during and after rain events. Each segment will be discussed in the Implementation Plan.

15. Unsewered communities should be addressed in the TMDL. There are communities like the Village of Downs with no central sewer, and septic systems can vary from new and functional to many old, failing poorly designed systems. The worst are homes close to the creek, which discharge septic tank effluent straight to a tile to the creek. What are the plans for these communities to stop illegally discharging sewage to the surface and the creek?

Response
As discussed in the three questions above, septic systems are addressed in the TMDL. We will address possible solutions to septic issues in the implementation plan. The Village of Downs has applied for Illinois EPA grant and loan assistance and submitted a Facility Plan to build a sewage collection and transmission to Bloomington-Normal WRD. Illinois EPA requested additions be made to the plan and is expecting a resubmittal soon.

16. McLean County is somewhat unique in that is has, through zoning, restricted home building to secondary farm land and forested areas which commonly have less porous soils. About 1500 individual home gravity sand filters have been allowed with surface discharge in the county. Only a small percentage of the homeowners disinfect their surface discharge as required by IDPH regulations, resulting in hundreds of homes discharging undisinfected effluent with its fecal coliform and associated human pathogens into their residential areas and the small streams that originate in McLean County- all part of the waters of Illinois and the Sangamon watershed. Williamson Farm Drainage sells the disinfecting chlorine tablets for surface discharging systems. They sell very few for any subdivision except Deer Ridge. McLean County Environmental Health does have a handle on the numbers of surface discharging systems and failing septic systems in the county. Educating residents on how to maintain their septic systems has been sparse.

Response
Illinois EPA will contact McLean County Health Department for any information available. As for educating the public on septic systems, we will continue to investigate possible actions in the implementation plan.

Other Sources

17. Bloomington Water Reclamation District would like to make a correction to the report. We do not aerobically treat our sewage sludge.

    Response
    Thank you. It will be changed in the final report.

18. On page 22, the report states that data on Concentrated Animal Feeding Operations (CAFOs) are unavailable. It should be possible to determine if there are any permitted operations from your NPDES permitting division. County extension offices may have some information about operations smaller than those requiring permits. Local watershed groups may also have some local information. At the public meeting on the report in Springfield on July 6, one of the attendees confirmed that there are CAFOs in the watershed. It seems probable that CAFOs and other potential sources (manure applications to land and more locally-targeted wildlife population data) may be obtainable at a reasonable level of staff effort.

    Response
    We are not aware of any inventories for CAFOs in Illinois on a watershed basis. Until the ruling on CAFOs is addressed by USEPA as discussed on page 22 in the Report, reliable CAFO information is not available. Manure application information is currently not available either. As for wildlife, one individual at the second public meeting had said that he had wildlife populations, but no data were provided to IEPA for Report 3. We can update our wildlife populations and include that in the Implementation Plan if it is available to IEPA.

19. While the locations of many of the potential fecal coliform sources are plotted on maps, would it be useful to tabulate what /how many sources are in or immediately upstream of impaired watersheds?

    Response
    In Appendix A, maps are provided for each individual segment that shows the NPDES permits and CSOs in their watershed. There is no spatial information on CAFOs or manure applications by farmers.

Exemptions

20. If the NPDES facilities have exemptions, why is the stream segment considered for primary contact use?

    Response
    A portion of the river is considered exempt from primary contact use, but it may not be the entire river segment. There may also be downstream segments that are not exempt.

21. The report should explain what the “exemptions” mentioned in Tables 13 and 14 are from. Many facilities in this watershed are currently operating under such exemptions.

    Response
    Page 13 of the TMDL Report states that some of the stream segments are exempt from the fecal coliform bacteria water quality standard and thus primary contact (swimming) use does not apply in these portions. The standards established by the Pollution Control Board allow that waters unsuitable for primary contact activities, and unutilized for public and food processing water supply, are exempt from the bacteria standards. NPDES dischargers that affect these waters may be eligible for a disinfection exemption. These dischargers do not disinfect or monitor for fecal coliform bacteria in their effluent. Before a disinfection exemption is granted, the discharger must demonstrate to the Illinois EPA that it

will not cause downstream waters to exceed applicable fecal coliform standards. IEPA models the die-off of fecal coliform from the discharge using a first-order die-off equation that predicts levels of fecal coliform at points downstream from the source. Preferable fecal coliform concentrations (facility data) used in the equation are an average over at least three months, but a minimum of four samples in 30 days is acceptable.

22. What about the NPDES facilities that do not monitor for fecal coliform bacteria in their discharge?

    Response
    These facilities have an exemption as discussed above.

23. The facilities are exempt from monitoring, but do they chlorinate/dechlorinate their effluent?

    Response
    Most facilities that have been granted a disinfection do not disinfect (chlorinate) their effluent when they are not required. However, a few facilities chlorinate/ dechlorinate their effluent for operational control of filters.

24. Will revocation of these exemptions be on the table as a load reduction implementation measure? What about reexamining the exemptions when the permit is up for renewal?

    Response
    Review of each discharge and the continuation or discontinuation of the exemption will be dependent on the water quality data available for each segment. To the extent that the duration curve method and any additional monitoring conducted as a result of the implementation plan can identify specific sources, the exemptions will be reviewed in this context. Adaptive management will also be employed so that readily identifiable sources and cost effective remedies may be developed.

25. Bloomington-Normal Water Reclamation District does not currently disinfect the effluent from their main treatment plant in spite of the recent residential areas and recreational areas developing closely downstream. What are Bloomington's plans to disinfect its main treatment plant effluent?

    Response
    An exemption for disinfecting may be granted if part of the stream that is downstream of the wastewater treatment plant discharge is not used for primary contact (swimming). If the agency is aware that this has changed, it will have to review the exemption status when the permit is reissued.

26. We recommend review of the Illinois EPA policy of not requiring seasonal disinfection unless primary contact (swimming) is reported in the application of public hearing process. The fecal coliform/ seasonal disinfection standard set by the IPCB in 1988 does not require reported primary contact activity to establish "protected waters". It only requires the waters have the physical characteristics to support primary contact or that the waters flow through or adjacent to parks or residential areas.

    Response
    Because residential neighborhoods in rural landscapes have become more common, the Agency will reevaluate all year-round disinfection exemptions as their NPDES permit comes up for renewal. Revocation of the year-round disinfection exemptions will be considered when there is evidence that the year-round disinfection exemption is impacting an area that supports primary contact and/or the land adjacent to the "unprotected reach" is developed for residential use.

27. Effluent that requires warning signs and fences and is too contaminated to water the lawn should be disinfected before discharge to the neighborhood. Regulations require posting of warning signs and

erections of fences to protect residents from the effluent. Regulations do not allow the effluent to be used to water lawns because residents may come into contact with the effluent. But half of the year the effluent will flow through the neighborhood without any disinfection- available to the neighborhood kids and pets to play in.

Response
The question of continuing existing disinfection exemptions for those dischargers to streams that have undergone a fundamental change in use, as described in this comment and in comment 28, will be addressed as permits are renewed.

28. We recommend that any surface wastewater discharge should be disinfected year-round when it is around homes or parks. Swimming may occur May through October but kids play in creeks by their homes over a longer period. April 2005 was often 70 degrees and children were in the waters around their residential areas playing. But due to current Illinois EPA interpretation of Illinois Pollution Control Board policy the surface discharges in residential areas were not disinfected in April because even at 70 degrees April is classified as a "winter month". Illinois Department of Public Health requires year-round disinfection of their smaller systems which discharge in residential areas. Illinois EPA should do the same.

Response
The current bacteria standard, and its application to specific seasonal period, was based on long-term climate conditions. We recognize that instances of warm weather can occur at any time. However, these few extremes have been evaluated by the Pollution Control Board in adopting this standard and placed in balance against the cost and risks of year round disinfection.

Implementation Plan

29. When it comes to point and nonpoint sources, where will the funding come from to fix the problems?

Response
Funding for improvements to NPDES facilities will be dependent on the communities and or the state revolving load program. There are a number of different ways to deal with nonpoint sources. There are state funding programs such as Conservation 2000 and the Illinois EPA 319 Program, which can be used to establish BMPs (Best Management Practices) such as filter strips or livestock fencing/alternative watering access. Other problems such as septic failures will require investigations, surveys and the cooperation of individual landowners. These activities may also be eligible for funds under Section 319. These and other programs will be discussed in more detail in the implementation plan.

30. Are you envisioning the implementation plan will include additional data collection? We are concerned about getting an effective implementation plan.

Response
All the segments in the TMDL have ambient water quality stations that collect surface water samples on a six-week sampling frequency. The implementation plan will discuss possible choices for local stakeholders to be effective in lowering fecal coliform in the streams. This may include more frequent or targeted monitoring by stakeholders. Illinois EPA will hold another public meeting this winter to discuss the implementation plan.

31. The TMDL Development section is lacking in details to convince the reader that future analyses will result in an effective and defensible TMDL. One of the major benefits of the duration curve method as

described in the Cleland article is that it can be used to target pollution control efforts to particular flow regimes and types of sources (point vs. nonpoint sources). The report should discuss specifically how flows and sources will be targeted in the impaired watersheds, given the available data. Are the types of sources in the watersheds even amenable to targeting by flows? Another important aspect of the Duration Curve method described by Cleland is the use of adaptive management. The report should discuss whether and how adaptive management will be incorporated into TMDL implementation. How will reduced loads be maintained in the watersheds in the face of projected future land use change? The report should discuss what mechanisms will be considered to implement reductions in loadings from nonpoint sources. While no load assessment has been provided, it seems likely that such reductions will be needed.

Response
Allocation and Reductions are in Stage 3 Report. Source analysis and implementation will be discussed in the Implementation Plan.

32. The discussion of the duration curve methodology was difficult to follow. While the appendix containing the Cleland article was helpful, the text of the Stage 1 Report should be able to stand alone. On the bottom of page 27, it might be helpful to add an equation to clarify the text description of calculation of load duration curves. Also throughout the description of the duration curve methodology, the term "exceedences" is used to refer both to flow rates and fecal coliform concentrations. Sometimes it is unclear which parameter is being referred to.

Response
The implementation plan will contain more information on the duration curves. Appendix A contains all the separate load and wasteload allocation calculations. All data in the duration curve are linked to the flow at the time the sample occurred. This way flow at the time of each exceedence of the fecal coliform bacteria standard can be looked at and analyzed. We can see at which flow periods most standard exceedences occur and what sources should be considered at those flow periods.

Public Participation

33. We understand that Stages 2 and 3 of the Regional Fecal Coliform TMDL development are scheduled to proceed without further public review and comment. The Stage 1 report lacks significant information on data availability, sufficiency, and model development. Given these omissions, we are concerned that only allowing public comment after development of a draft final product with preclude any meaningful input by the public. We encourage you to reconsider the approach of combining Stages 2 and 3.

Response
The first public meeting covered Stage 1 of the TMDL process. Stage 1 is intended to address the watershed characterization and water quality analysis. The Salt Creek of Sangamon and Lower Sangamon River TMDL Stage 1 Report discussed the listed water bodies, watershed description, water quality standards and guidelines, a description of the impairment, assessment of sources and the rationale for the model for TMDL development (duration curves). Stage 2 is an optional stage for additional monitoring. The Stage 3 Report provides the results of the duration curves analysis, wasteload/load allocations and reductions. An additional Implementation Stage has been added to the TMDL process. At the Stage 1 meeting, the public was informed or our determination that Stage 2 was not needed for this TMDL, and that the Stage 3 meeting would be held the next month. At Stage 3 meeting, the public was informed the Implementation Meeting will be held December 2005 or January 2006.

34. The publicity for the meetings for the Stage 1 Report was inadequate, resulting in minimal attendance and public involvement. All future meetings associated with development of the Regional Fecal Coliform TMDL should be preceded by ample public outreach efforts, increasing the likelihood that the process will be well received by the public and that voluntary processes involved in TMDL implementation will be successful.

    Response
    For the first public meeting, Illinois EPA sent out public notices to five newspapers in the watershed; the State journal Register in Springfield, the Breese Courier in Taylorville, The Courier in Lincoln, The Pantagraph in Bloomington/Normal and the Daily Journal in Clinton. Over 200 public notices were also sent out to organizations/individuals such as the Farm Bureau, Soil and Water Conservation Districts, Extension offices, Congressional representatives and county/city/village officials. The public notice stated the date and location of the two meetings, the intent of the meetings, locations of the Draft Stage 1 Report and the meeting closure date. The Report is available online at the Agency's TMDL website and hard copies were mailed to the Lincoln College Library, the Springfield Lincoln Library, the Bloomington Public Library, the Clinton Warner Library and the Taylorville Public Library. Unfortunately, a few people who have been on the list for every TMDL public notice did get left out of the first meeting only. Our normal mailing list was mistakenly not used. For the second meeting, about 70 people were added to the list including representatives of environmental groups, county health departments and NPDES dischargers in the entire watershed with fecal coliform limits in their effluent.

35. It would be very helpful to members of the public for the report to contain a brief description of what the Stage 1 Report is intended to achieve, what the other stages of the TMDL development will be, a rough overall schedule for TMDL development, and when there will be opportunities for public comment.

    Response
    TMDLs are done on waters that are listed in the Illinois Section 303(d) List of impaired waters. Please refer to this document for TMDL stage descriptions. Go to the TMDL website at http://www.epa.state.il.us/water/tmdl/ and click on "303(d) List". Page 18 describes what is in each stage of TMDL development. Page 22 contains information on the public participation process with TMDLs. Public meetings take place near the conclusion each stage.