



# Central South Branch Kishwaukee River Water Quality & Pollutant Modeling

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# Watershed Characteristics Assessment

- **Designated Uses & Impairments**
- **Causes and Sources of Impairment**
- **Water Quality Summary**
- **Pollutant Loading Model**
- **“Hot Spot” SMUs**
- **Water Quality Reduction Targets**
- **Potential Goal Topics**

# Water Quality in Illinois

- **Federal Clean Water Act requires states to assess and report on water quality bi-annually.**
- **Must describe how Illinois assessed water quality and whether assessed waters meet water quality standards specific to each Designated Use of a stream or lake.**
- **Designated Uses: Aquatic Life, Fish Consumption, Primary Contact Recreation, and Aesthetic Quality**
- **If a waterbody is not meeting standard for Use it is considered impaired and IEPA must list potential causes and sources for impairment.**

# IEPA Designated Uses and Impairment (2022)

- All reaches of South Branch Kishwaukee River Reaches are Not Supporting for Fish Consumption due to Mercury and PCBs
- South Branch Kishwaukee River Reach 11 is also Not Supporting for Aquatic Life due to Algae, Dissolved Oxygen, and pH; Not Supporting for Primary Contact Recreation due to Fecal Coliform
- Deer Creek is Not Supporting for Aquatic Life due to Unknown Causes

Designated Use	Use Attainment	Impaired?	Cause of Impairment	Source of Impairment
South Branch Kishwaukee River: IL_PQC-05 (Reaches 1-6) and IL PQC-09 (Reaches 7-10)				
Aquatic Life	Fully Supporting	No	None	N/A
Fish Consumption	Not Supporting	Yes	Mercury, PCBs	Source Unknown
Primary Contact Recreation	Not Assessed	-	-	-
Aesthetic Quality	Fully Supporting	No	None	N/A
South Branch Kishwaukee River: IL_PQC-06 (Reach 11)				
Aquatic Life	Not Supporting	Yes	Algae, Dissolved Oxygen, pH	Source Unknown
Fish Consumption	Not Supporting	Yes	Mercury, PCBs	Source Unknown
Primary Contact Recreation	Not Supporting	Yes	Fecal Coliform	Source Unknown
Aesthetic Quality	Not Assessed	-	-	-
Deer Creek: IL_PQCE				
Aquatic Life	Not Supporting	Yes	Unknown	N/A
Fish Consumption	Not Assessed	-	-	-
Primary Contact Recreation	Not Assessed	-	-	-
Aesthetic Quality	Not Assessed	-	-	-
Haines Creek: IL_PQCN and Bull Run (IL_PQCD)				
Not Assessed				

# Point Sources

- Point sources are any discharge that comes from a pipe or permitted outfall
- Regulated by Illinois EPA under the National Pollutant Discharge Elimination System (NPDES) program



NPID	Facility Name	Description
IL0055182	City of Genoa-STP	STP Outfall
IL0064092	Kirkland North STP	STP Outfall
IL0023841	Walcamp Outdoor Ministries STP	STP Outfall
IL0037036	Aqua Illinois - Ellwood Greens	STP Outfall

# NPDES Permit Requirements

## City of Genoa

Parameter	LOAD LIMITS lbs/day DAF (DMF)*			CONCENTRATION LIMITS mg/L		
	Monthly Average	Weekly Average	Daily Maximum	Monthly Average	Weekly Average	Daily Maximum
CBOD <sub>5</sub>	163 (407)	260 (651)		25	40	
Suspended Solids	195 (488)	293 (732)		30	45	
pH	Shall be in the range of 6 to 9 Standard Units					
Fecal Coliform	Daily Maximum shall not exceed 400 per 100 mL (May through October)					
Chlorine Residual						0.05
Ammonia Nitrogen: March	9.8 (24)	25 (62)	28 (70)	1.5	3.8	4.3
April-October	9.8 (24)		25 (62)	1.5		3.8
November-February	26 (65)		28 (70)	4	NA	4.3
				Monthly Avg. not less than	Weekly Avg. not less than	Daily Minimum
Dissolved Oxygen March-July				NA	6.25	5.0
August-February				6	4.5	4

## Kirkland North STP

Parameter	LOAD LIMITS lbs/day DAF (DMF)*			CONCENTRATION LIMITS mg/L		
	Monthly Average	Weekly Average	Daily Maximum	Monthly Average	Weekly Average	Daily Maximum
CBOD <sub>5</sub>	65 (209)	103 (334)		25	40	
Suspended Solids	96 (309)	116 (375)		37	45	
pH	Shall be in the range of 6 to 9 Standard Units					
Fecal Coliform	Daily Maximum shall not exceed 400 per 100 mL (May through October)					
Chlorine Residual						0.05



# Nutrients and Water Quality

**Nutrients = phosphorus + nitrogen**

- **Necessary component for plant growth**
- **Detrimental to water quality and aquatic systems**
- **Can cause algal blooms, accelerated plant growth, decreasing oxygen levels, and can lead to fish kills**



# Sources of Nutrients

- **Agricultural row crop runoff**
- **Streambank erosion (nutrients bound to soils)**
- **Lawn fertilizer**
- **Failing septic systems**
- **Permitted sources**





# Sediment and Water Quality

## Total suspended solids

- Reduces light penetration and oxygen levels
- Can clog gills and reduce visual needs of fish and macroinvertebrates
- Sediments eventually settle out in streams and lakes and also carry nutrients



# Sources of Sediment

- Streambank erosion, removal of vegetation
- Construction practices, site grading, land disturbance
- Agricultural row crop runoff, soil loss
- Increased impervious surfaces

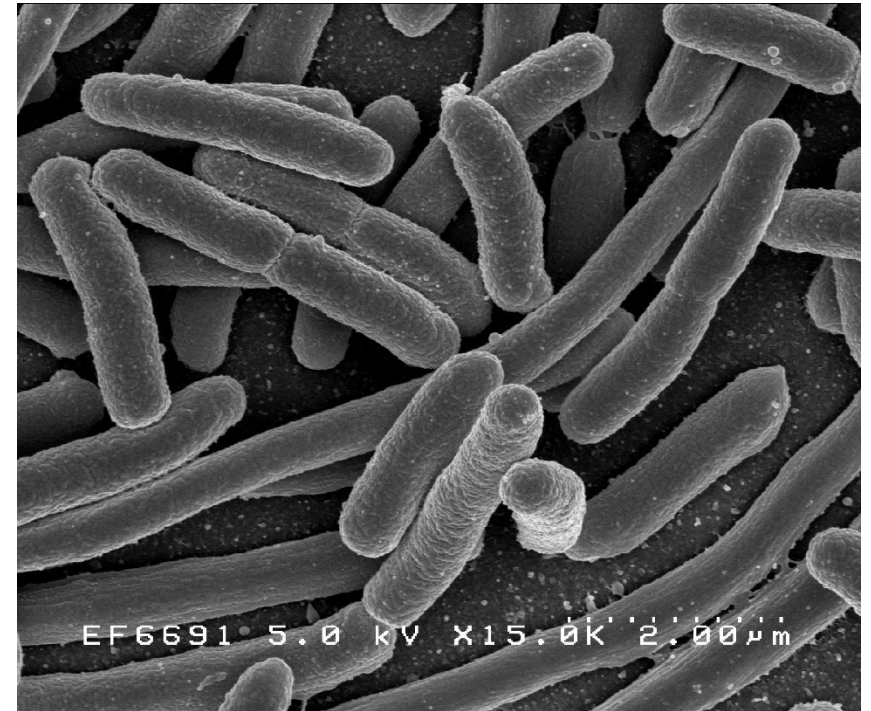




# Fecal Coliform and Water Quality

## Fecal coliform and *E. coli*

- Indication a waterbody is contaminated with pathogens
- Possible health risk during recreational contact
- Can also cause cloudy water, unpleasant odors, and increased oxygen demand



# Sources of Fecal Coliform

- **Agricultural animal or wildlife waste**
- **Agricultural manure application**
- **Failing septic systems**
- **Permitted sources (wastewater facilities)**



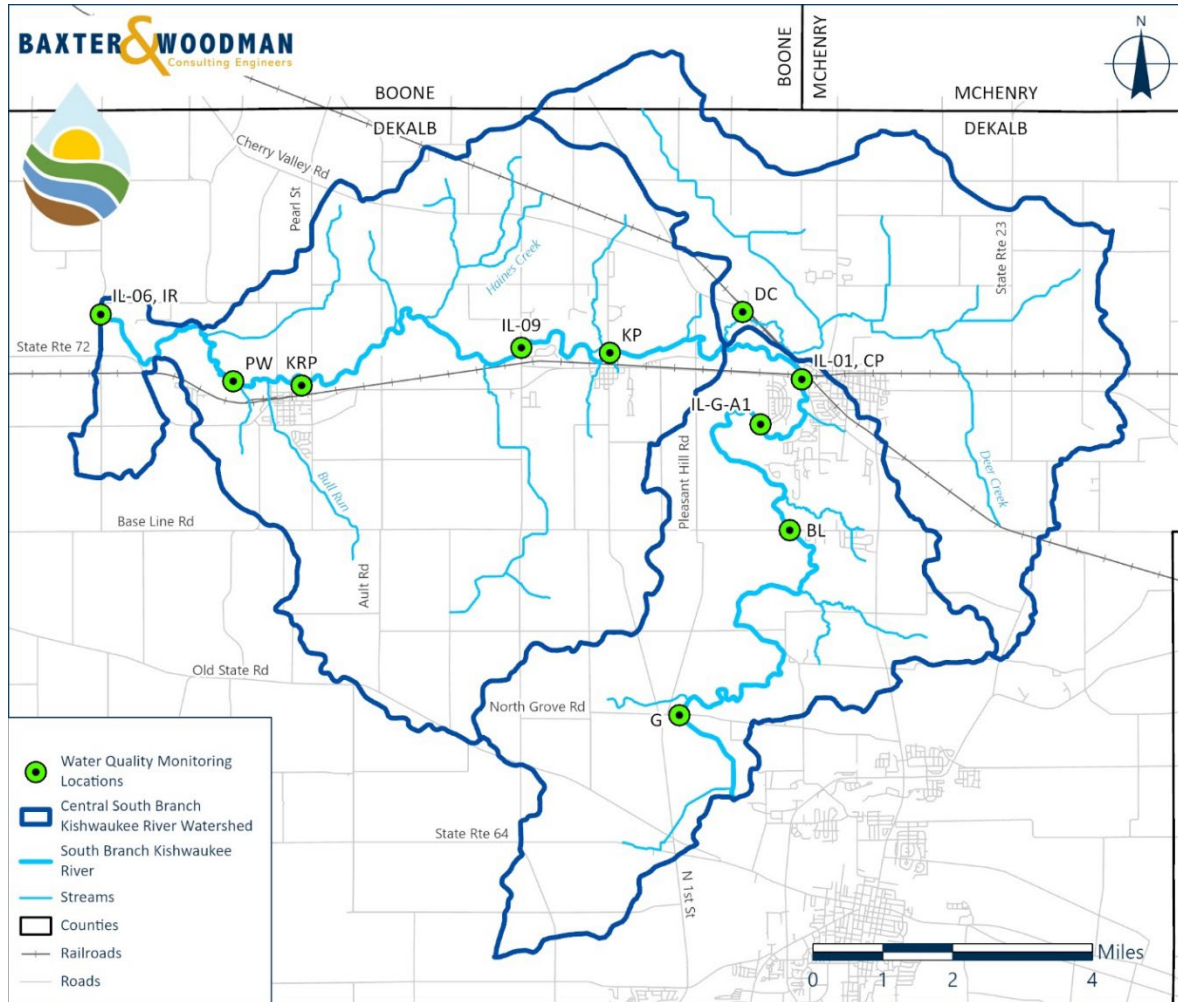


# Numeric Water Quality Standards

**In the absence of numeric standards, proposed or recommended standards from USEPA and USGS were used**

- **Phosphorus (USEPA): <0.0725 mg/L**
- **Nitrogen (USEPA): <2.461 mg/L**
- **Total suspended solids (USGS): <19 mg/L**
- **Fecal coliform or E. coli (IEPA): <235 MPN/100 mL**

# Water Quality Monitoring Locations



Site ID	Site Name	Sampling Entity	Date	Sampled Parameters
IL-G-A1	IL_EPA_WQX-PQC-G-A1; Russel Woods	Illinois EPA	2016	Intensive Basin Survey
IL-01	IL_EPA_WQX-PQC-01; David Carroll Park	Illinois EPA	2021, 2016	Intensive Basin Survey, Special Study
IL-09	IL_EPA_WQX-PQC-09; Glidden Rd	Illinois EPA	2021	Intensive Basin Survey
IL-06	IL_EPA_WQX-PQC-06; Irene Rd	Illinois EPA	2021	Intensive Basin Survey
G	N Grove Rd	NIU	2023	NIU Sampling Parameters
BL	Base Line Rd	NIU	2023	NIU Sampling Parameters
CP	David Carroll Park – Genoa WWTP	NIU	2023	NIU Sampling Parameters
DC	Deer Creek	NIU	2023	NIU Sampling Parameters
KP	Kingston Park	NIU	2023	NIU Sampling Parameters
KRP	Kishwaukee River Park	NIU	2023	NIU Sampling Parameters
PW	Potawatomi Woods	NIU	2023	NIU Sampling Parameters
IR	Irene Rd	NIU	2023	NIU Sampling Parameters



# IEPA Water Chemistry Averages (2014-2023)

ID Code/ Parameter	Statistical, Numerical, or General Use Guidelines	IL-GA-01	IL-01	IL-09	IL-06
Average of pH	>6.5 or <9.0*	8	7.9	-	-
Average of Dissolved Oxygen (mg/L)	>5.0 mg/l*	9.3	8.1	-	-
Average of TSS (mg/L)	<19 mg/l***	12	39	23	17
Average of Chloride (mg/L)	<500 mg/l*	97.1	74.5	74.1	86.2
Average of Total Phosphorus (mg/L)	<0.0725 mg/l**	0.463	0.399	0.158	0.183
Average of Ammonia (mg/L)	see TN below	ND	0.056	0.065	0.04
Average of NO2+NO3	1.798 mg/L**	4.020	5.715	4.190	3.633
Average of Total Kjeldahl Nitrogen (mg/L)	see TN below	0.600	0.883	0.515	0.340
Average of Total Nitrogen (TN) (mg/L), calculated	<2.461 mg/l**	4.620	6.654	4.770	4.013

# NIU Water Chemistry Averages (2023)

Site ID/ Parameter	Statistical, Numerical, or General Use Guidelines	G	BL	DC	KP	KRP	PW	IR
Average of pH	>6.5 or <9.0*	7.4	7.5	7.6	7.6	7.6	7.5	7.3
Average of EC (uS/cm)	<1,667 µmhos/cm	1093.0	1018.9	727.2	911.4	879.3	883.0	855.5
Average of DO (mg/L)	>5.0 mg/l*	8.0	10.6	9.7	10.9	10.0	10.0	9.1
Average of Ammonia (ppm)	<15 mg/l* (<15.017 ppm)	0.03	0.02	0.28	0.00	0.00	0.00	0.00
Average of Nitrite (NO <sub>2</sub> ) (ppm)	see NO <sub>2</sub> +NO <sub>3</sub> below	0.10	0.03	0.01	0.01	0.12	0.04	0.00
Average of Nitrate (NO <sub>3</sub> ) (ppm)	see NO <sub>2</sub> +NO <sub>3</sub> below	9.17	6.60	7.35	15.35	8.03	8.98	8.50
Average of NO <sub>2</sub> +NO <sub>3</sub> , calculated	1.798 mg/L** (1.800 ppm)	9.317	6.635	7.350	15.350	8.173	9.013	8.500
Average of Phosphate (ppm)	0.222 ppm (converted from phosphorus standard)**	0.225	0.363	0.180	0.570	0.683	0.345	0.240

Sampling Abbreviations: EC= electrical conductivity, DO= dissolved oxygen, NO<sub>2</sub>= nitrite, NO<sub>3</sub>= nitrate

# Water Quality Summary

Based on average results of each parameter at most downstream location, the nonpoint source averages are:

- Phosphorus averages **0.141 mg/L** vs a target of <0.0725 mg/L
- Nitrogen averages **3.973 mg/L** vs a target of <2.461 mg/L
- Total suspended solids averages **17 mg/L** vs a target of <19 mg/L



# Pollutant Loading Model

- **Watershed-wide pollutant loading was modeled using USEPA's PLET (Pollutant Load Estimation Tool).**
- **Model uses land use/land cover category types, precipitation, soils information, stream data, existing BMPs, and other data.**
- **Estimates total loads for nitrogen, phosphorus, and sediment.**

# Pollutant Loading & Water Quality

- Water quality monitoring captures all sources of pollution, both point and non-point, and what's coming from upstream watersheds
- PLET modeling does not include point sources or upstream sources
- Used permit monitoring data from Genoa and Kirkland, combined with NIU sampling to estimate their contribution to pollutant loading as well as upstream sources

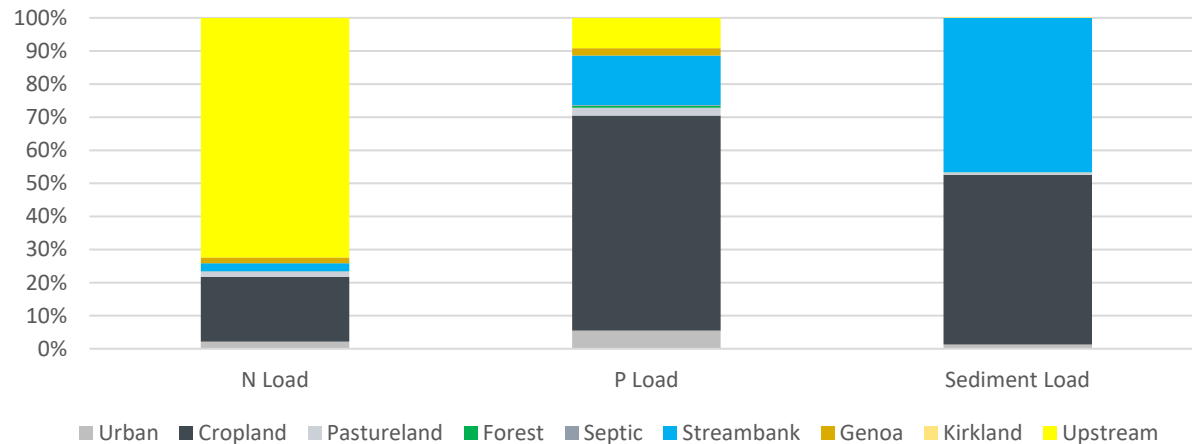
	Average Flow MGD	Average Concentration (mg/l)			Annual Pollutant Load*		
		NO2+NO3 (mg/l)	TP (mg/l)	TSS (mg/l)	NO2+NO3 (lbs/yr)	TP (lbs/yr)	TSS (t/yr)
City of Genoa	0.63	11.825	0.95	10.4	22,662	1,821	10
Kirkland North	0.2	NA	NA	10.56	NA	NA	3
Upstream watersheds	33.6	9.27	0.073	NA	947,498	7,461	NA

# Pollutant Loading Model

STEPL Source	N Load (lbs/yr)	% of Total Load	P Load (lbs/yr)	% of Total Load	Sediment (tons/yr)	% of Total Load
Urban	28,171	2%	4,492	6%	658	1%
Cropland	255,964	20%	53,084	65%	25,626	51%
Pastureland	21,127	2%	1,942	2%	361	1%
Forest	1,075	0%	525	1%	34	0%
Septic	392	0%	153	0%	0	0%
Streambank	31,708	2%	12,208	15%	23,271	47%
City of Genoa*	22,662	2%	1,821	2%	10	0%
Kirkland North STP*	ND	0%	ND	0%	3	0%
Upstream Watersheds*	947,498	72%	7,461	9%	ND	0%
<b>Total</b>	<b>1,308,596</b>	<b>100%</b>	<b>81,687</b>	<b>100%</b>	<b>49,962</b>	<b>100%</b>

**Excluding wastewater and upstream sources:**

- **20% of nitrogen, 65% of phosphorus, and 51% of sediment comes from Cropland areas**
- **Streambanks contribute 15% of phosphorus and 47% of sediment load**
- **2% and 6% of TN and TP and 1% of TSS come from urban land uses**







# Watershed Impairment Reduction Targets

**Based on water quality data near outlet of the watershed and the results of the PLET modeling, we need the following reductions from nonpoint source pollution:**

- **43% reduction in phosphorus (31,351 lbs/yr)**
- **10% reduction in nitrogen (33,505 lbs/yr)**
- **No sediment reduction needed**

**These are the reduction goals that we will be aiming for when recommending restoration projects throughout the watershed.**

# Watershed Goal Topics

Goals are general actions, or better yet, an outcome towards which we strive.

- **Surface water quality**
- **Agriculture**
- **Green Infrastructure Network & Habitat**
- **Education, Stewardship & Communication**
- **Groundwater**
- **Flooding?**



# Goal Workshop Agenda

## Watershed Goals & Prioritization

- Review Watershed Conditions (briefly)
- Places of the Heart/Flood problem area mapping
- Introduce Goal Topics
- Prioritize Watershed Goal Topics
- World Café Exercise

# Watershed Planning Schedule

## Upcoming Meetings:

- **April 18<sup>th</sup>, 6pm – Watershed Goals Workshop**
- **June – Bus Tour**
- **August – Critical Areas and Action Plan**
- **October – Implementation and Outreach Plan**



Questions?

