Illinois EPA Stage 1 TMDLs Virtual Public Meeting

June 30, 2021

CDM Smith

Illinois Environmental Protection Agency

Agenda

- TMDL Overview – What is a TMDL?
- Illinois EPA TMDL Stages
- TMDL Watersheds and Impairments
- Watershed Description
- Water Quality Data
- Potential Pollutant Sources: Point Sources/Non-Point Sources
- Future TMDL Stages
- Next Steps

Total Maximum Daily Load (TMDL)

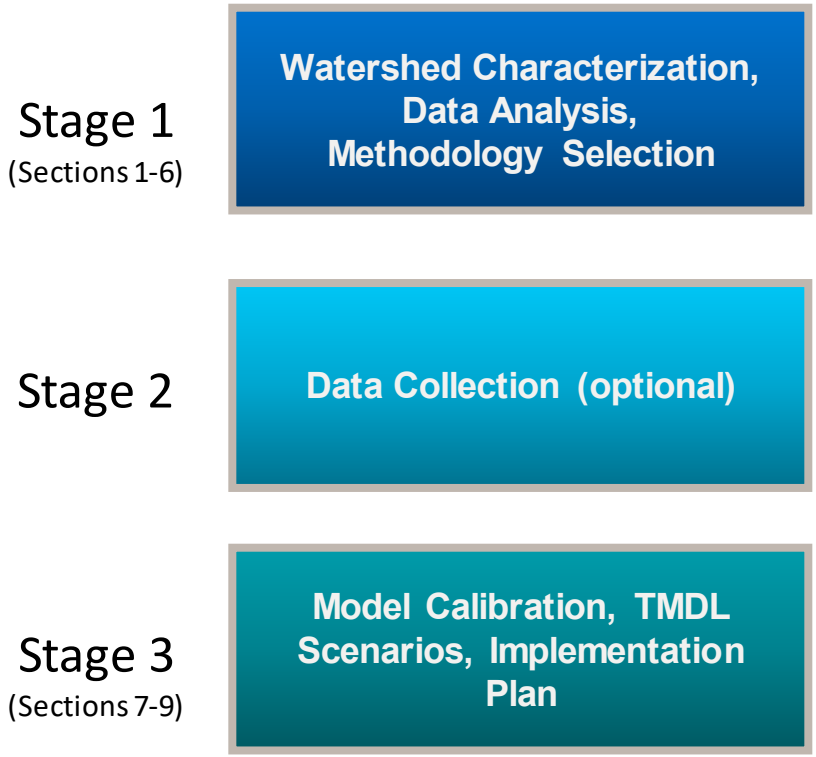
- TMDL - calculation of the amount of a pollutant waterbodies can receive and still meet water quality standards
- TMDLs are developed for impaired waterbodies (303d list)
  - Waters that do not meet designated uses
    - Fish & aquatic life, public health, recreation
  - Waters that do not meet water quality criteria
    - Numeric and narrative standards

TMDL Calculation

$$\mathbf{TMDL = LC = \sum WLA + \sum LA + MOS + RC}$$

- **LC** (Loading Capacity) – the maximum amount of pollution loading a water body can receive without violating water quality standards
- **WLA** (Waste Load Allocation) – the portion of the TMDL allocated to existing or future ***point sources***
- **LA** (Load Allocation) – the portion of the TMDL allocated to existing or future ***nonpoint sources*** and ***natural background load***
- **MOS** (Margin of Safety) – an accounting of uncertainty about the relationship between pollutant loads and receiving water quality
- **RC** (Reserve Capacity) – portion of the load explicitly set aside to account for growth in the watershed

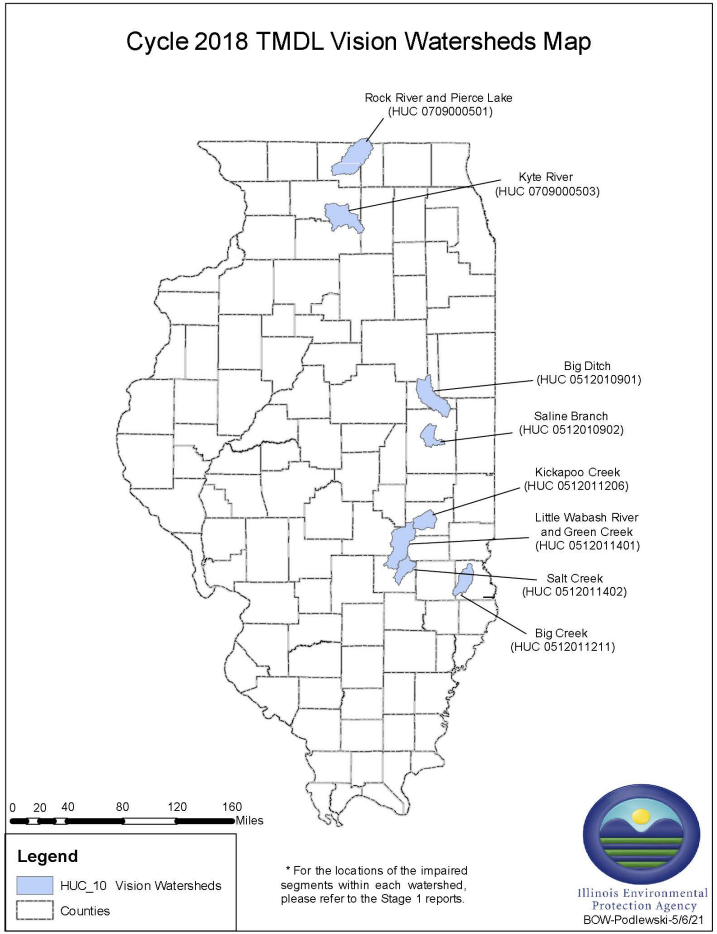
Illinois EPA TMDL Stages



2018 TMDL Watersheds

- Big Creek
- Big Ditch
- Kickapoo Creek
- Kyte River
- Little Wabash River and Green Creek
- Rock River and Pierce Lake
- Saline Branch
- Salt Creek (II)

https://www2.illinois.gov/epa/topics/water-quality/watershed-management/tmdls/Pages/reports.aspx


Cycle 2018 TMDL Vision Watersheds Map
Rock River and Pierce Lake
(HUC 0709000501)
Kyte River
(HUC 0709000503)
Big Ditch
(HUC 0512010901)
Saline Branch
(HUC 0512010902)
Kickapoo Creek
(HUC 0512011206)
Little Wabash River
and Green Creek
(HUC 0512011401)
Salt Creek
(HUC 0512011402)
Big Creek
(HUC 0512011211)
0 20 40 80 120 160
Miles
Legend
HUC_10 Vision Watersheds
Counties
* For the locations of the impaired segments within each watershed, please refer to the Stage 1 reports.
Illinois Environmental Protection Agency
BOW-Podlewski-5/6/21

Big Creek Watershed

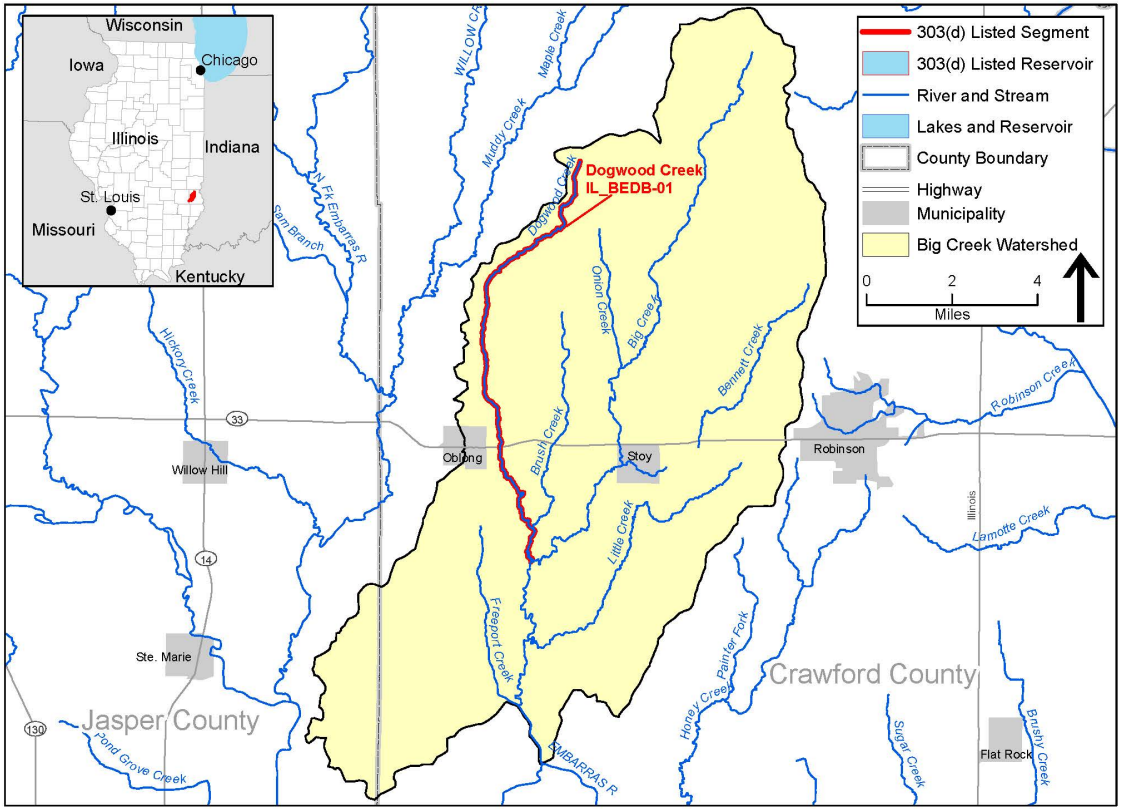


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Figure 1-1: Big Creek Watershed, HUC 0512011211

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Big Creek Watershed Impairments

Segment ID	Segment Name	Potential Causes of Impairment	Designated Use	Potential Sources (as identified by the 2018 303(d) list)
BEDB-01	Dogwood Creek	**Dissolved Oxygen**	Aquatic Life	Crop Production, Source Unknown
		Manganese	Aquatic Life	Natural Sources
		Phosphorus (Total)	Aquatic Life	Crop Production, Natural Sources

Big Ditch Watershed

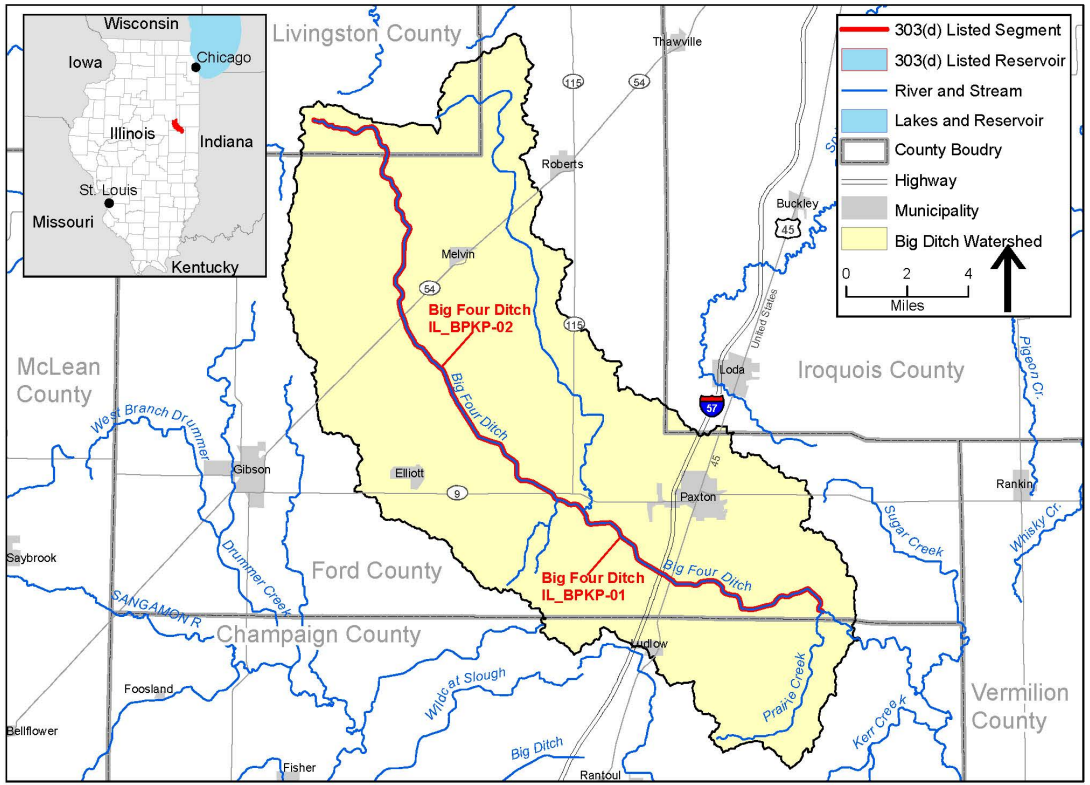

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Figure 1-1: Big Ditch Watershed
HUC 0512010901

Big Ditch Watershed Impairments

Segment ID	Segment Name	Potential Causes of Impairment	Designated Use	Potential Sources (as identified by the 2018 303(d) list)
BPKP-01	Big Four Ditch	Dissolved Oxygen	Aquatic Life	Source Unknown
BPKP-02	Big Four Ditch	Dissolved Oxygen	Aquatic Life	Source Unknown

Kickapoo Creek Watershed

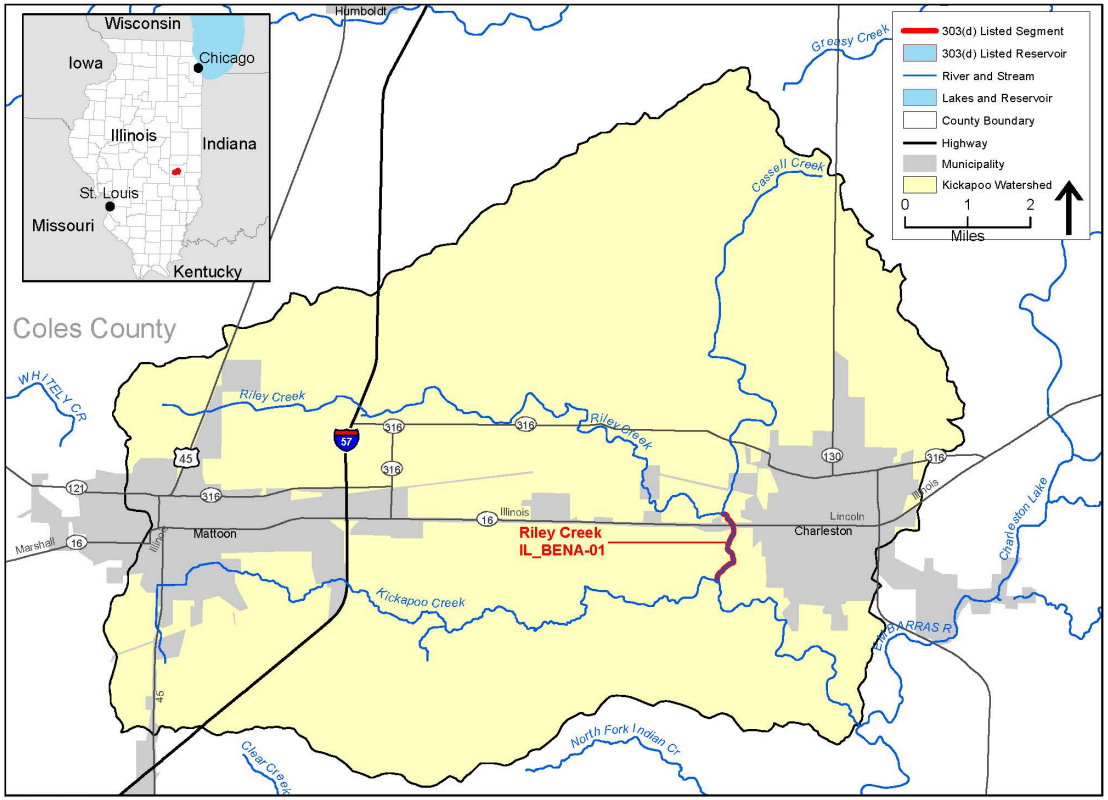

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Figure 1-1: Kickapoo Creek Watershed
HUC 0512011206

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Kickapoo Creek Watershed Impairments

Segment ID	Segment Name	Potential Causes of Impairment	Designated Use	Potential Sources (as identified by the 2018 303(d) list)
BENA-01	Riley Creek	Dissolved Oxygen	Aquatic Life	Industrial Point Source Discharge, Municipal Point Source Discharge, Crop Production (Crop Land or Dry Land), Agriculture, Urban Runoff/Storm Sewers

Kyte River Watershed

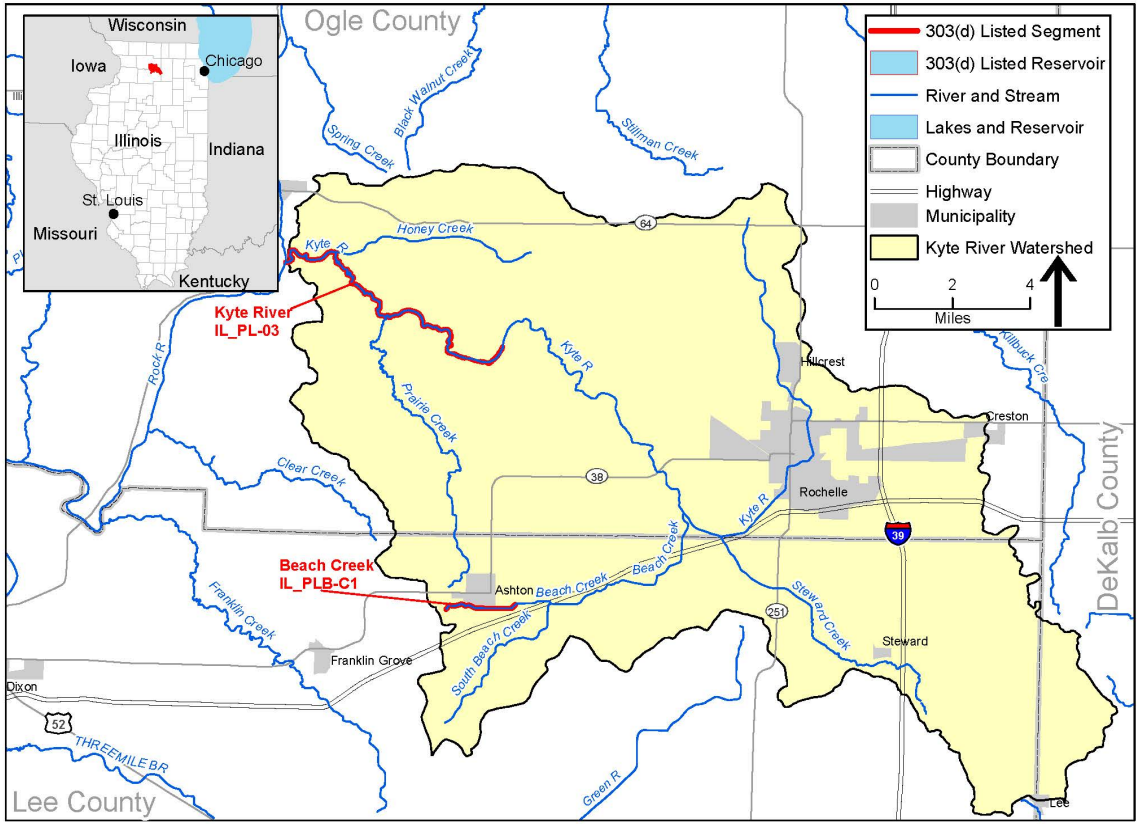

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Figure 1-1: Kyte River Watershed, HUC 0709000503

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Kyte River Watershed Impairments

Segment ID	Segment Name	Potential Causes of Impairment	Use Description	Potential Sources (as identified by the 2018 303(d) list)
PL-03	Kyte River	**Fecal Coliform**	Primary Contact Recreation	Agriculture
PLB-C1	Beach Creek	**Dissolved Oxygen**	Aquatic Life	Municipal point source discharges
		Phosphorus (Total)	Aquatic Life	Municipal point source discharges

Little Wabash River/Green Creek Watershed

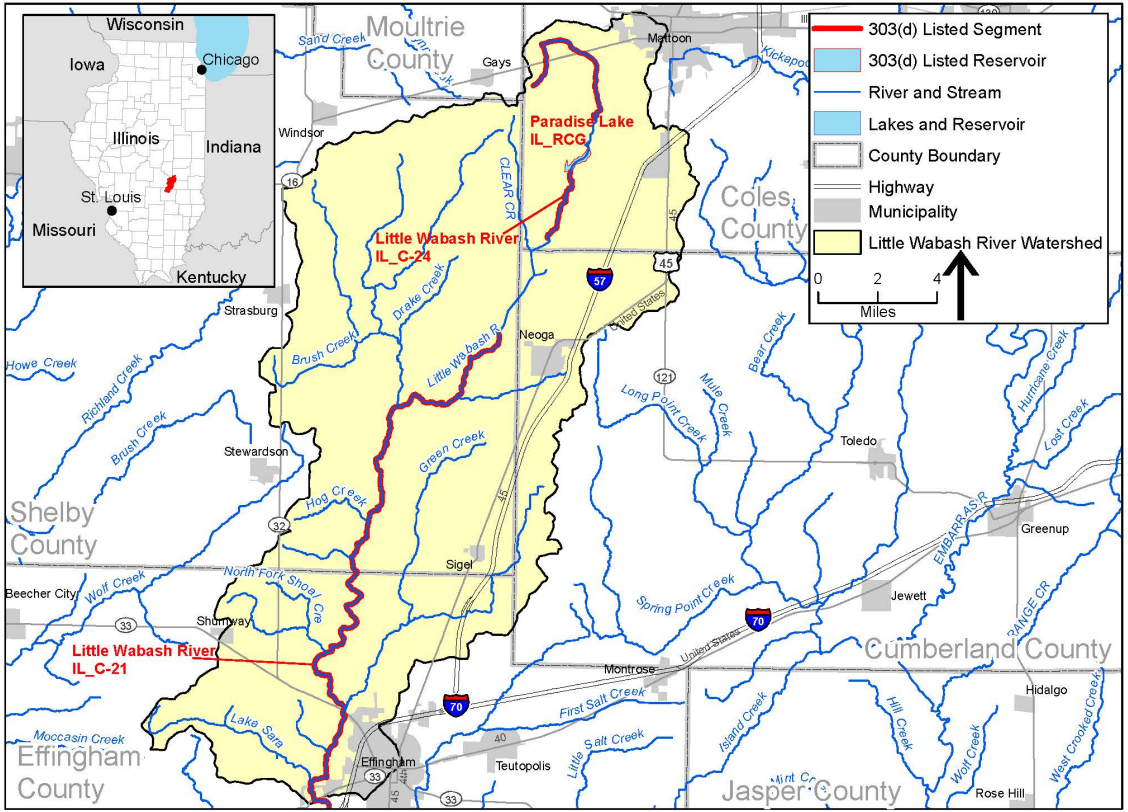

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Figure 1-1: Little Wabash River/Green Creek Watershed
HUC 0512011401

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Little Wabash River/Green Creek Watershed Impairments

Segment ID	Segment Name	Potential Causes of Impairment	Designated Use	Potential Sources (as identified by the 2018 303(d) list)
C-21	Little Wabash River	Dissolved Oxygen	Aquatic Life	Dam or Impoundment
C-24	Little Wabash River	Dissolved Oxygen	Aquatic Life	Upstream Impoundment, Crop Production (Crop Land or Dry Land), Agriculture
RCG	Paradise (Coles)	Dissolved Oxygen	Aquatic Life	Sources Unknown

Rock River/Pierce Lake Watershed

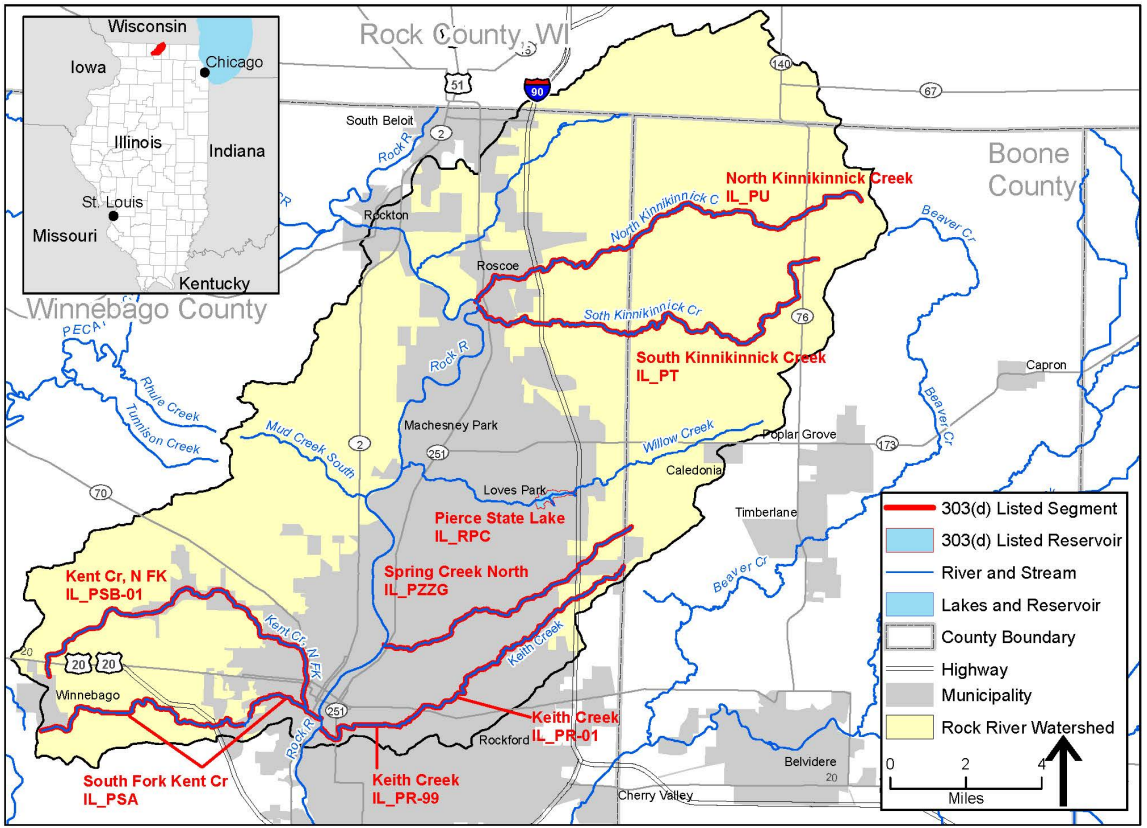

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Figure 1-1: Rock River/Pierce Lake Watershed
HUC 0709000501

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Rock River/Pierce Lake Watershed Impairments

Segment ID	Segment Name	Potential Causes of Impairment	Impaired Use	Potential Sources (as identified by the 2018 303(d) list)
PR-01	Keith Creek	**Fecal Coliform**	Primary Contact Recreation	Urban Runoff/Storm Sewers
PR-99	Keith Creek	**Fecal Coliform**	Primary Contact Recreation	Urban Runoff/Storm Sewers
		Arsenic	Aquatic Life	Channelization, Urban Runoff/Storm Sewers, Contaminated Sediments
		pH	Aquatic Life	Channelization, Urban Runoff/Storm Sewers
		Zinc	Aquatic Life	Channelization, Urban Runoff/Storm Sewers, Contaminated Sediments
PSB-01	North Fork Kent Creek	**Fecal Coliform**	Primary Contact Recreation	Source Unknown
PSA	South Fork Kent Creek	**Fecal Coliform**	Primary Contact Recreation	Source Unknown
PU	North Kinnikinnick Creek	**Fecal Coliform**	Primary Contact Recreation	Source Unknown
PT	South Kinnikinnick Creek	**Fecal Coliform**	Primary Contact Recreation	Source Unknown
PZZG	Spring Creek - North	**Fecal Coliform**	Primary Contact Recreation	Source Unknown
RPC	Pierce Lake	**Phosphorus (Total)**	Aesthetic Quality	Internal nutrient recycling, On-site treatment systems, Waterfowl, Crop production (crop land or dry land), Runoff from Forest/Grassland/Parkland

Saline Branch Watershed

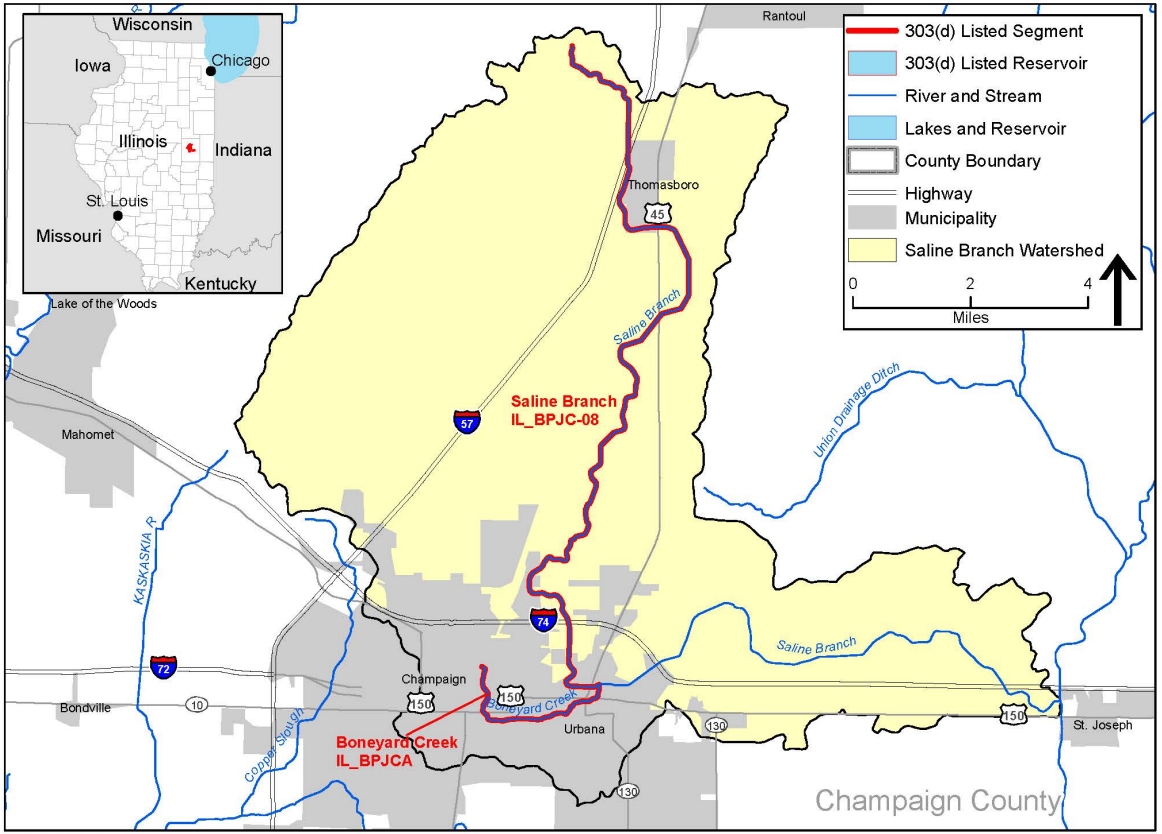

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Figure 1-1: Saline Branch Watershed, HUC 0512010902

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Saline Branch Watershed Impairments

Segment ID	Segment Name	Water Body Size	Potential Causes of Impairment	Designated Use	Potential Sources (as identified by the 2018 303(d) list)
BPJC-08	Saline Branch Drainage Ditch	14.11 miles	**pH**	Aquatic Life	Source Unknown
BPJCA	Boneyard Creek	3.28 miles	**Dissolved Oxygen**	Aquatic Life	Urban Runoff/Storm Sewers
			Copper	Aquatic Life	Urban Runoff/Storm Sewers
			Phosphorous (Total)	Aquatic Life	Urban Runoff/Storm Sewers

Salt Creek Watershed (II)

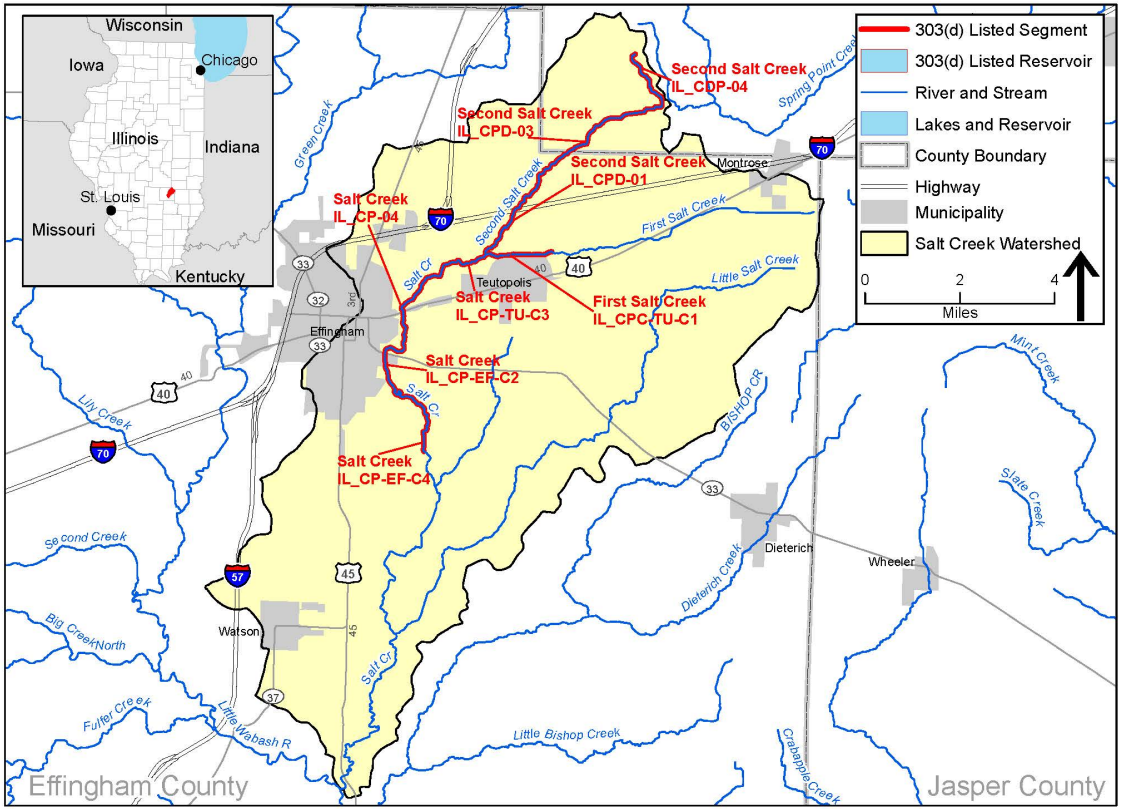

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Figure 1-1: Salt Creek Watershed
HUC 0512011402

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Salt Creek Watershed (II) Impairments

Segment ID	Segment Name	Potential Causes of Impairment	Designated Use	Potential Sources (as identified by the 2018 303(d) list)
CPD-01	Second Salt Creek	**Manganese**	Aquatic Life	Source Unknown, Natural Sources
		Phosphorus (Total)	Aquatic Life	Animal Feeding Operations, Livestock
CPD-03	Second Salt Creek	*Phosphorus (Total)*	Aquatic Life	Animal Feeding Operations, Crop Production
CPD-04	Second Salt Creek	*Phosphorus (Total)*	Aquatic Life	Animal Feeding Operations, Crop Production
CPC-TU-C1	First Salt Creek	*Phosphorus (Total)*	Aquatic Life	Municipal Point Source Discharges, Crop Production
CP-04	Salt Creek	*Phosphorus (Total)*	Aquatic Life	Crop Production, Agriculture
CP-EF-C2	Salt Creek	*Phosphorus (Total)*	Aquatic Life	Municipal Point Source Discharges, Crop Production, Urban Runoff/Storm Sewers
CP-EF-C4	Salt Creek	*Phosphorus (Total)*	Aquatic Life	Municipal Point Source Discharges, Crop Production, Urban Runoff/Storm Sewers
CP-TU-C3	Salt Creek	*Phosphorus (Total)*	Aquatic Life	Municipal Point Source Discharges, Crop Production

STAGE 1: Watershed Description Components

- Elevation – National Elevation Dataset
- Land use – USDA National Agriculture Statistics Service Cropland Data Layer
- Soil – NRCS Soil Survey Geographic database (SSURGO)
- Population – US Census
- Climate, Evaporation, Streamflow – National Climatic Data Center, Illinois State Water Survey, USGS

STAGE 1: Watershed Description Components

- Streamflow – USGS Daily Data for Gages within watershed
  - Gage data not available for every impaired water body
  - Gage data often not available within TMDL watershed
  - Area-Ratio estimates used to develop TMDLs

$$Q_{gaged}\left(\frac{Area_{ungaged}}{Area_{gaged}}\right) = Q_{ungaged}$$

where Q_{gaged} = Streamflow of the gaged basin
$Q_{ungaged}$ = Streamflow of the ungaged basin
$Area_{gaged}$ = Area of the gaged basin
$Area_{ungaged}$ = Area of the ungaged basin

STAGE 1: Water Quality Data

Illinois EPA Data

- Hundreds of sampling stations in IL
  - Varied period of record and sample frequency

Water Quality Data Summaries

- Data counts
- Summary statistics
- Number of exceedances
- Trends over time
  - Data plots & graphs

Recommend data collection in Stage2

- As needed for:
  - Impairment verification
  - TMDL calculations
  - Model development

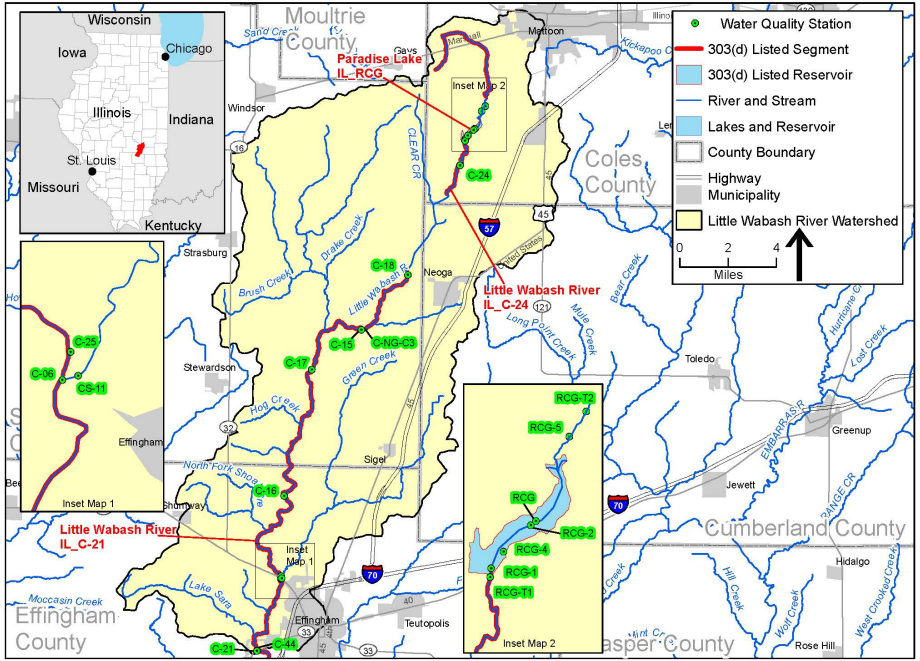

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Figure 5-1: Little Wabash River/Green Creek Watershed Water Quality Stations

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STAGE 1: Water Quality Data

Facility Related Stream Surveys (FRSS)

- Also conducted by Illinois EPA
- Associated with WWTPs
  - Multiple locations on a stream sampled at same time
  - Useful for modeling

USEPA STORET System

- Online environmental database
- Multiple agencies submit data
  - Varying formats, data quality, information
- Available at: http://www.epa.gov/storet/
  - Query by watershed HUC, Station ID, Geography, etc.

USGS – National Water Information System (NWIS)

- Sometimes additional data not included in STORET
- http://nwis.waterdata.usgs.gov/usa/nwis/qwdata
  - Query by watershed HUC, Station ID, Geography, etc.

Public Meetings/Public Input

- Municipalities/POTW
- Watershed groups
- Non-profit groups, NGOs
- Universities
- Other special studies

STAGE 1: Potential Sources of Pollutants

Point Sources

- Permitted Discharges (NPDES)
  - Individual Discharge Permits
  - Municipal Stormwater Permits (MS4s)
  - CAFOs
- Approximately 2,500 Permits in Illinois
  - Searchable from USEPA online at PCS-ICIS: http://www.epa.gov/enviro/pcs-icis-search
- Required to monitor for certain parameters
  - Discharge Monitoring Reports (DMRs) online
  - Available from USEPA at http://cfpub.epa.gov/dmr/

STAGE 1: Potential Sources of Pollutants

Non-Point Sources

- Non-permitted sources
- Overland runoff containing pollutants
- Loads are often land use driven
  - Urban (non MS4)/Forest/Agriculture Categories
  - Cropping Practices
  - Animal Operations
  - Septic Systems

STAGE 1: Potential Sources of Pollutants

Non-Point Sources

- Cropping/Tilling Practices
  - Conventional, Reduced-till, Mulch-till, No-till
  - tillage practices affect soil loss, tiling can increase nutrient loss from fields and can cause more intense runoff
- Animal Operations
  - Livestock populations in watershed can contribute nutrients and soil loss
- Septic Systems
  - Common in rural areas
  - Failing systems can contribute bacteria and nutrients into groundwater and flow to waterbodies
- Internal Loading in Lakes
  - Nutrients and Metals can leach from lake sediments under anoxic conditions

STAGE 1: Methodology Recommendation for Stage 3

- Additional Data Collection (Stage 2)
- Modeling: Load Duration Curves, BATHTUB/SLAM, QUAL2k
- Spreadsheet Analysis
- Recommendation for delisting segment/impairment

STAGE 2: Data Collection

- As-needed
- Performed by Illinois EPA staff
- Fill data gaps
  - Confirm impairment or delisting
  - Support Stage 3 modeling
    - Limited data
    - Old data
    - Additional parameters needed for model

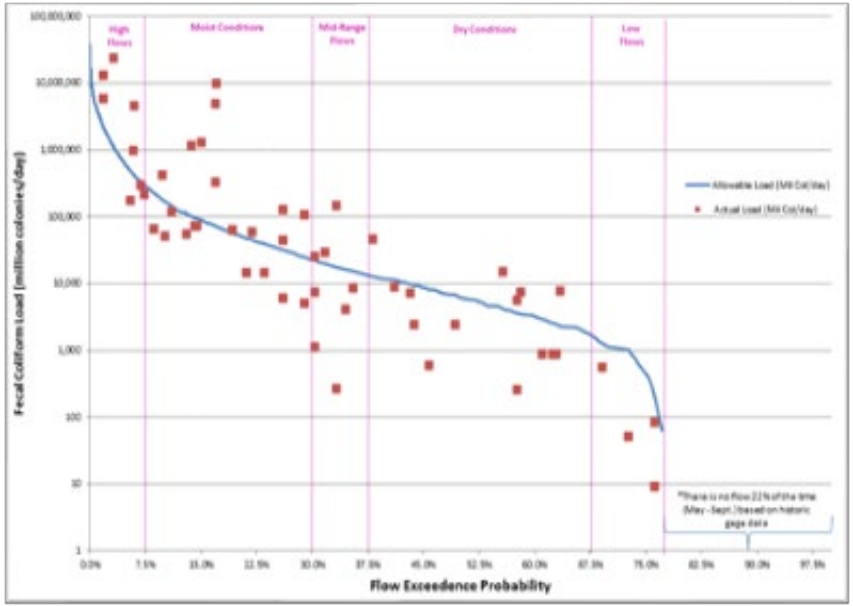
STAGE 3: Common Methodology for TMDL Development

- Load Duration Curves
- BATHTUB/SLAM
- QUAL2k
- Spreadsheet Analysis
- Recommendation for delisting segment/impairment

STAGE 3: Common Methodology for TMDL Development

Load Duration Curve modeling for stream impairments:

- Metals/Nutrients
- TSS
- Fecal coliform
- Chloride
- Approach uses stream flow and pollutant concentration data to estimate the allowable loads for a waterbody
- MS Excel-based calculations



STAGE 3: Common Methodology for TMDL Development

QUAL2K modeling for dissolved oxygen stream impairments:

- USEPA supported model that simulates DO dynamics in streams
- Steady state
- Numerous input variables
- Nutrients, CBOD, re-aeration, SOD, phytoplankton, et al.
- Can also be used for other parameters such as pH
- http://epa.gov/athens/wwqtsc/html/qual2k.html

STAGE 3: Common Methodology for TMDL Development

SLAM modeling for **Total Phosphorus** impairment

- Modeling approach adapted from the USEPA BATHTUB model
- Steady State water and nutrient balance calculations
- Uses Spatially Segmented networks
- Nutrient loading estimated using Event Mean Concentrations, precipitation, and flow estimates

STAGE 3: Common Methodology for TMDL Development

Recommendation for Delisting of segments/parameters no longer showing impairment

- Changes to water quality standards
- No impairment in recent data
  - Typically verified with additional sampling

STAGE 3: Implementation Plan

- Identifies Best Management Practices (BMPs) to help meet water quality criteria
- Addresses USEPA nine minimum elements of a watershed plan
- Provides general watershed-wide implementation strategies
  - Input from public on site-specific practices and plans are welcomed/encouraged for inclusion in final plan

Next Steps

- Public Review - 30-day comment period
- Review/Respond/Incorporate into Final Stage 1 Report
- Stage 2 Data Collection (as needed)
- Stage 3 Modeling, TMDL Scenarios, Implementation Plan
- Draft Stage 3 Reports (includes Sections 1-6 of Stage 1 TMDL)
- Public Meetings/Comment Period
- Final TMDL Reports/USEPA Approval

Questions

Abel Haile
Abel.Haile@illinois.gov
Illinois Environmental Protection Agency

Becky Dunavant
dunavantra@cdmsmith.com

Brian Bennett
bennettbj@cdmsmith.com

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