



LOWER LITTLE ROCK CREEK WATER QUALITY & MODELING SUMMARY

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Senior Environmental Planner



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AGENDA

- Designated Uses and Impairments
- Wastewater Treatment Plant
- Water Quality Summary
- Pollutant Loading Model
- “Hot Spot” SMUs
- Impairment Reduction Targets



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WATER QUALITY IN ILLINOIS

Federal Clean Water Act requires states to assess and report 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.

If a waterbody is determined through biological and/or physical-chemical sampling to be impaired, IEPA must list potential causes and sources for impairment.



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IEPA DESIGNATED USES & IMPAIRMENTS

STREAMS

- Assessed for Aquatic Life and Aesthetic Quality.
- Little Rock Creek is Fully Supporting for both.

Designated Use	Use Attainment	Impaired?	Cause of Impairment	Source of Impairment
Little Rock Creek: IL_DTCA-01				
Aquatic Life	Fully Supporting	No	N/A	N/A
Fish Consumption	Not Assessed	-	-	-
Primary Contact Recreation	Not Assessed	-	-	-
Aesthetic Quality	Fully Supporting	No	N/A	N/A



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POINT SOURCES

Point sources are identified as any discharge that comes from a pipe or permitted outfall, such as municipal and industrial discharges.

Regulated by Illinois EPA Bureau of Water under the National Pollutant Discharge Elimination System (NPDES) program.

Separate and apart from the purposes of this watershed planning process, which is focused on non-point source pollution.

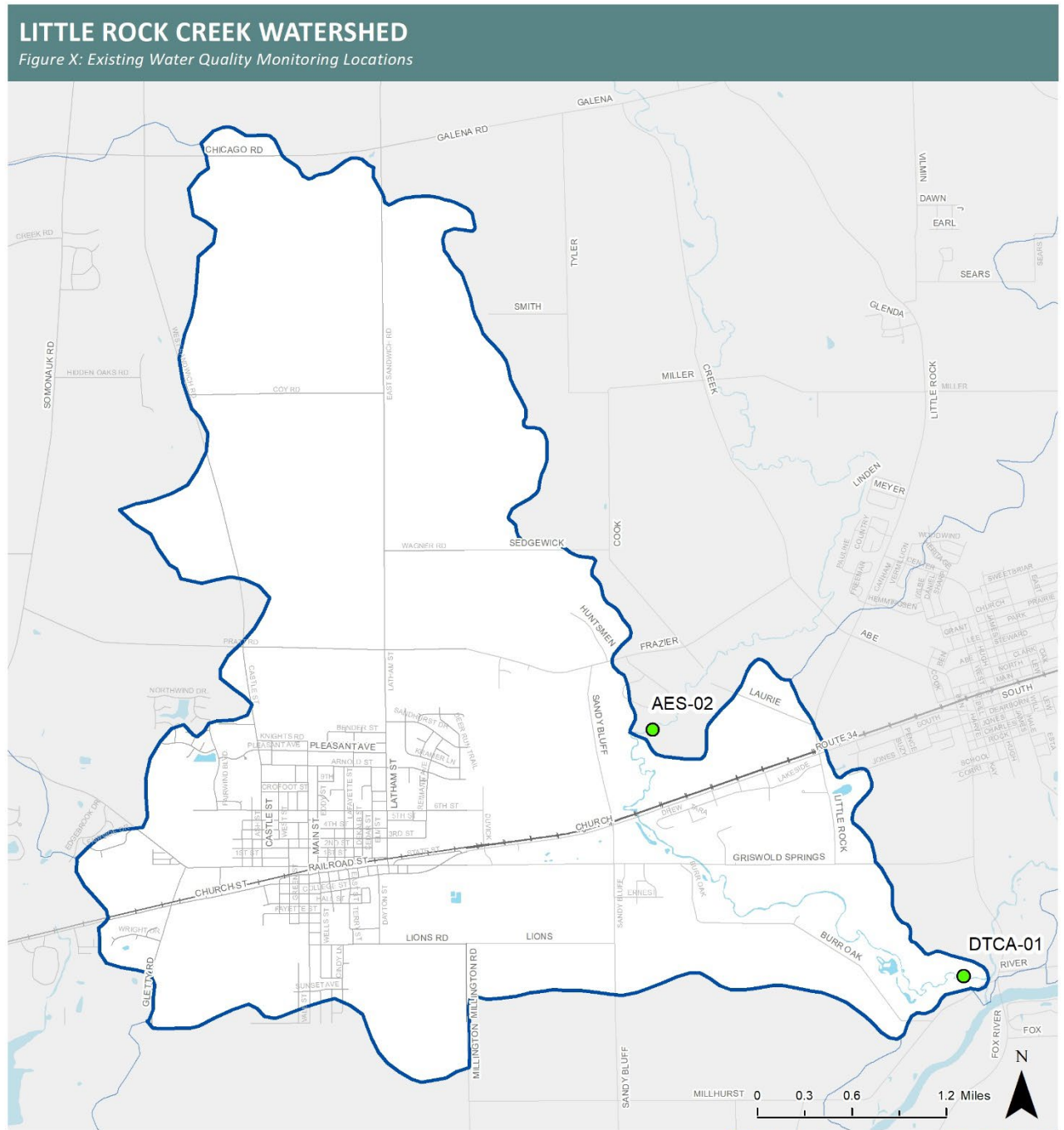
CITY OF SANDWICH STP

IL030970 NPDES permit requirements :

Parameter	Load Limits - lbs/day DAF (DMF)		Concentration Limits - mg/L	
	Monthly Ave. (lbs/day)	Daily Max. (lbs/day)	Monthly Ave. (mg/L)	Daily Max. (mg/L)
Flow: 1.5 MGD ave. & 3.75 MGD max.				
CBOD	125 (313)	250 (626)	10	20
Suspended Solids	150 (375)	300 (751)	12	24
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)			
Ammonia Nitrogen				
Apr-May/Sept-Oct	11 (28)	38 (94)	0.9	3.0
Nov-Feb	18 (44)	41 (103)	1.4	3.3
March	18 (44)	43 (106)	1.4	3.4
Total Phosphorus	Monitor only			
Total Nitrogen	Monitor only			
Dissolved Oxygen			Not less than	Daily Minimum
March-July			-	5.0
August- February	-	-	5.5	3.5

WATER QUALITY MONITORING

- Only one monitoring location in watershed
- IEPA Intensive Basin (2012) & Special Study (2017)
- Special Study included ammonia-nitrogen, inorganic nitrogen, total Kjeldahl nitrogen, total phosphorus, total suspended solids, and volatile suspended solids





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NUMERIC 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

IEPA STREAM CHEMISTRY AVERAGES, 2012-17

ID Code/ Parameter	Statistical, Numerical, or General Use Guidelines	IL_EPA_WQX-DTCA-01
Average of pH	>6.5 or <9.0*	8.2
Average of Dissolved Oxygen (mg/L)	>5.0 mg/l*	10.6
Average of TSS (mg/L)	<19 mg/l***	8.3
Average of Chloride (mg/L)	<500 mg/l*	65
Average of Phosphorus (mg/L)	<0.0725 mg/l**	0.145
Average of Ammonia (mg/L)	see TN below	0.017
Average of NO2+NO3	1.798 mg/L**	3.067
Average of Total Kjeldahl Nitrogen (mg/L)	see TN below	0.139
Average of Total Nitrogen (TN) (mg/L), calculated	<2.461 mg/l**	3.223

AES STREAM SAMPLING RESULTS

ID Code/ Parameter	Statistical, Numerical, or General Use Guidelines	DTCA-01	AES-02*
TSS (mg/L)	<19 mg/l***	1.8	1.2
Phosphorus (mg/L)	<0.0725 mg/l**	0.118	0.056
Total Nitrogen (TN) (mg/L) calculated	<2.461 mg/l**	1.60	1.74
Flow	N/A, cubic feet	17.45	7.31

-Cells highlighted in red exceed recommended statistical, numerical, or General Use guidelines, ND=not detected

* Upstream portion of LRC falls outside of the watershed; these sample results used for estimating loading outside of planning area only and not representative of Lower Little Rock Creek watershed water quality.

** Ambient Water Quality Criteria Recommendations: Rivers and Streams in Nutrient Ecoregion VI (USEPA 2000)

*** Present and Reference Concentrations and Yields of Suspended Sediment in Streams in the Great Lakes Region and Adjacent Areas (USGS 2006)



BIOLOGICAL MONITORING

Illinois River Watch conducted macroinvertebrate sampling on Little Rock Creek in 2003 and 2004:

- Received a “Fair” MBI condition score

IDNR and FRSG studies:

- 2017 report showed that fish collections resulted in an FBI score of 53 (Good).
- Between 2002 and 2017, FBI scores have remained consistent with scores in the low 50s (IDNR, 2017).
- Improved over time.



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WATER QUALITY SUMMARY

Analyzed the last 10 years of accessible water quality data from multiple sources including IEPA, Fox River Study Group, AES, IDNR, and Illinois River Watch.

Based on average results of each parameter at mouth of Little Rock Creek, the averages are:

- Phosphorus averages 0.142 mg/L vs target of 0.0725 mg/L
- Nitrogen averages 3.020 mg/L vs target of <2.461 mg/L
- TSS averages 6.5 mg/L vs target of <19 mg/L

Slight impairments for nutrients only



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POLLUTANT LOADING MODEL

- Watershed-wide pollutant loading from nonpoint sources modeled using USEPA's STEPL tool (Spreadsheet Tool to Estimate Pollutant Loads).
- Utilizes land use/land cover types, precipitation, soils information, stream data, existing BMPs, and other data.
- Estimates total loads for nitrogen, phosphorus, and total suspended solids.

POLLUTANT LOADING & WATER QUALITY

- Water quality monitoring captures all sources of pollution, both point and nonpoint
- STEPL modeling does not include point source discharges or inputs from upstream portions of Little Rock Creek
- Used permit monitoring data from WWTP to estimate their contribution to pollutant loading

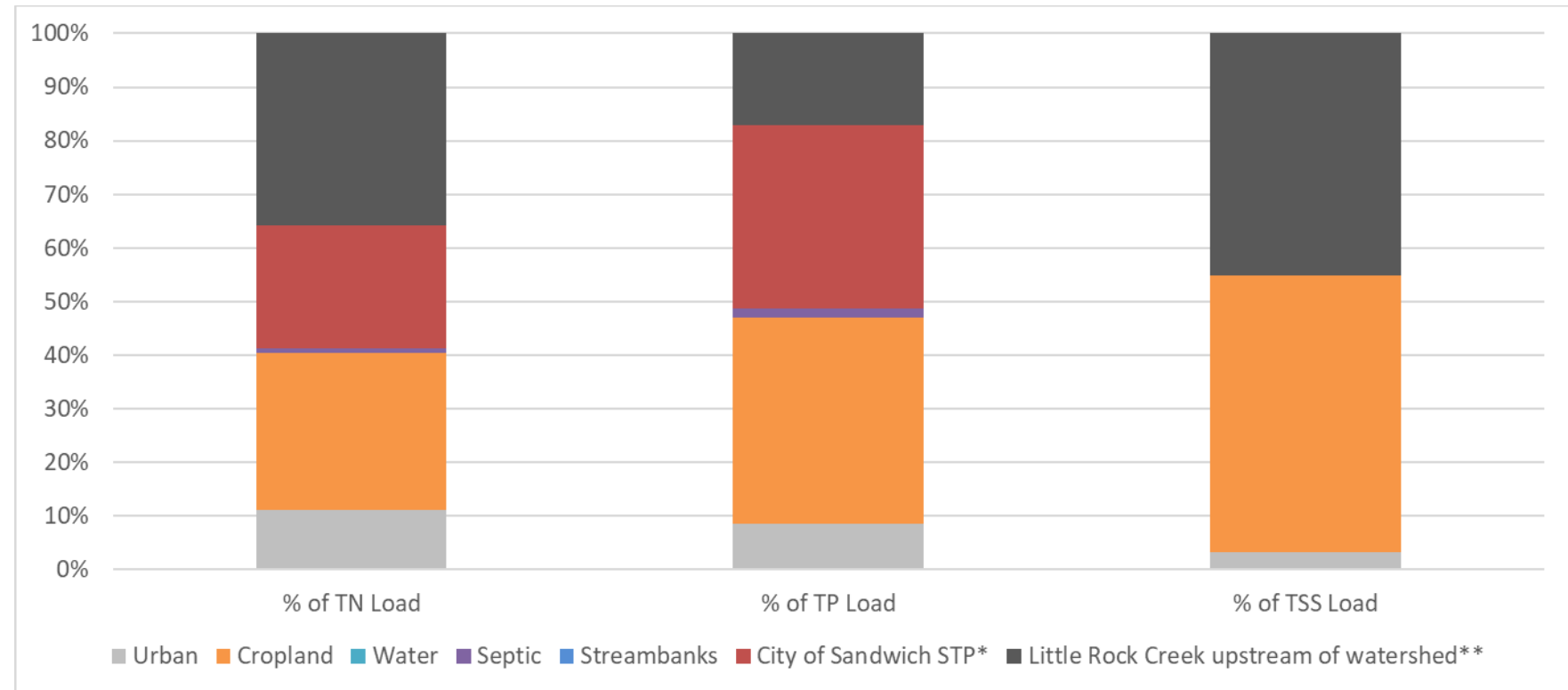
Average Flow MGD	Average Concentration (mg/l)			Annual Pollutant Load*		
	TN (mg/l)	TP (mg/l)	TSS (mg/l)	TN Load (lbs/yr)	TP Load (lbs/yr)	TSS (t/yr)
1.5	8.77	2.75	6.75	40,033	12,560	15.4

*Average daily flow (MGD) × average concentration (mg/l) × 3,042 (L-d-lb/gal-y-mg) = average annual load (lb-t/y)

POLLUTANT LOADING MODEL

STEPL Source	N Load (lbs/yr)	% of Total Load	P Load (lbs/yr)	% of Total Load	TSS (tons/yr)	% of Total Load
Urban	19,465	14%	3,057	10%	458	2%
Cropland	50,501	37%	14,004	45%	8,298	32%
Water	110	0%	42	0%	34	0%
Septic	1,728	1%	677	2%	0	0%
Streambanks	95	0%	36	0%	70	0%
City of Sandwich STP*	40,033	29%	12,560	40%	15.4	0%
Little Rock Creek upstream of watershed**	91,580	45%	7,594	20%	3,451	28%
Total	203,512	100%	37,970	100%	12,326	100%

POLLUTANT LOADING MODEL



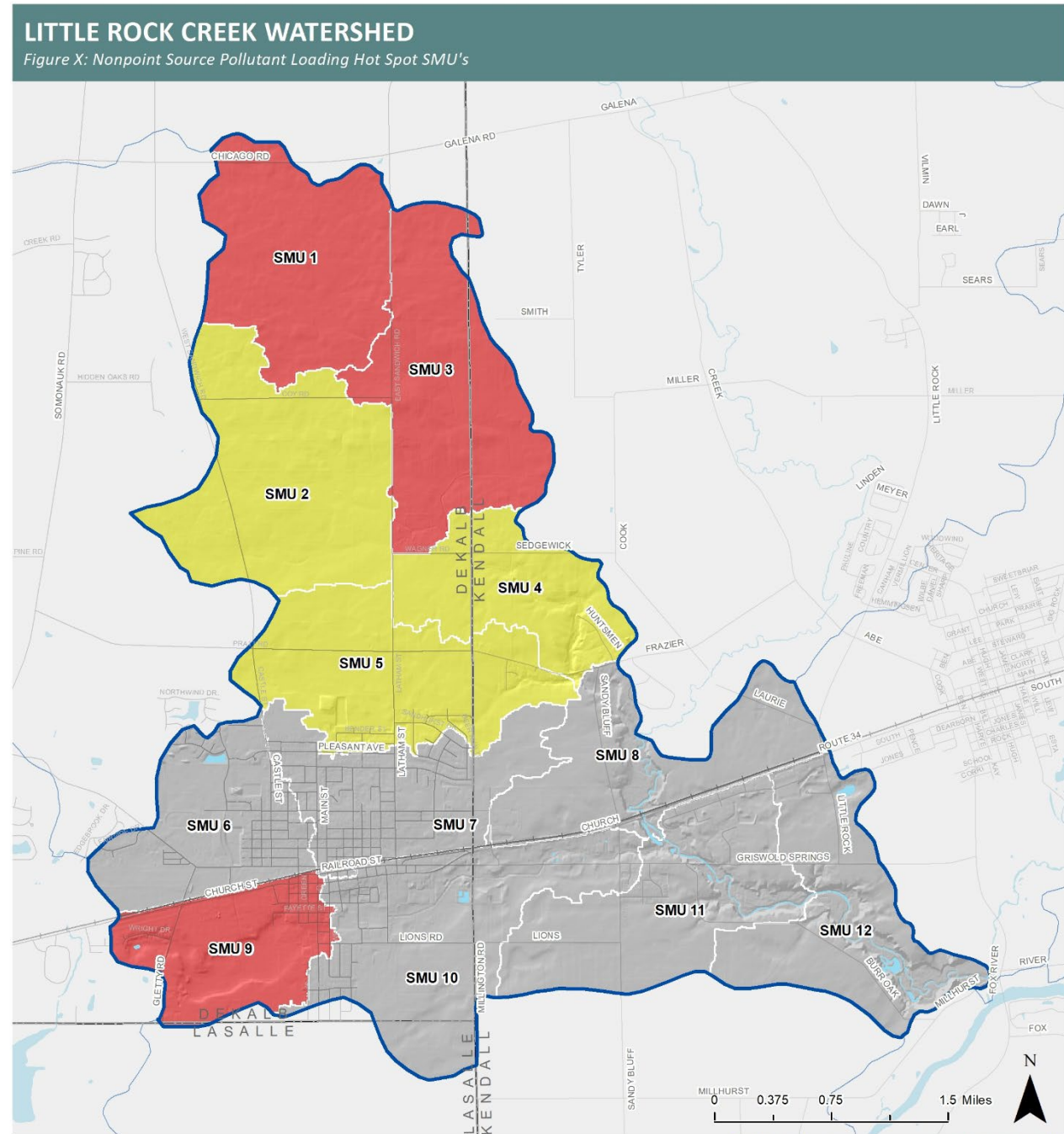
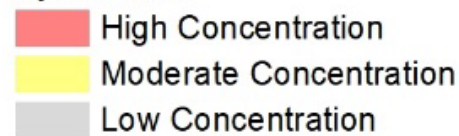
For nonpoint alone:

- 70% of nitrogen, 79% of phosphorus, and 94% of TSS comes from cropland areas.
- 27% and 17% of TN and TP and 5% of TSS come from urban lands.
- Septic systems contribute 2% of TN and 4% of TP loading.
- Streambank erosion contributes 1% of TSS loading

NONPOINT SOURCE “HOTSPOT” SMU

- SMUs 1, 3 & 9 are considered “High Concentration” Hot Spot SMUs.
- SMUs 2, 4 and 5 are “Moderate Concentration” Hot Spot SMUs.
- Loading primarily driven by agriculture & urban areas.

Nonpoint Source Pollutant Loading Hot Spot SMUs





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IMPAIRMENT REDUCTION TARGETS

Based on water quality data at outlet of watershed, results of the watershed-wide modeling, we need the following reductions from nonpoint source pollution:

- 23% reduction in phosphorus (4,095 lbs/yr)
- 7% reduction in nitrogen (4,655 lbs/yr)

These are the reduction goals we will be aiming for when recommending restoration projects.

No TSS reduction target needed because TSS levels are well below guidance criteria.



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LITTLE ROCK CREEK WATERSHED PLAN TIMELINE

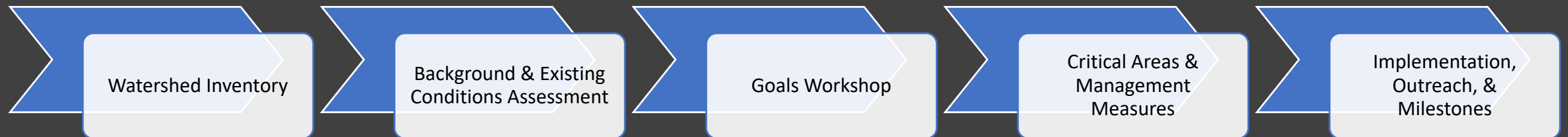
Oct 2019

Aug 2020

Jan 2021

Mar 2021

May 2021





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WATERSHED GOAL TOPICS

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

Surface Water
Quality

Flooding

Education,
Stewardship, &
Communication

Agriculture

Policy

Groundwater

Green
Infrastructure
Network & Habitat



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QUESTIONS?

Up next:

“Status of Fish and Mussels in Little Rock Creek”

Steve Pescitelli, Region II Stream Specialist with IDNR