



Citywide Stormwater Management Plan

July 26, 2022



Lower Fox River Basin TMDL

Total Maximum Daily Load and Watershed Management Plan for Total Phosphorus and Total Suspended Solids in the Lower Fox River Basin and Lower Green Bay

Brown, Calumet, Outagamie, and Winnebago Counties, Wisconsin

March 2012

Prepared for:

Wisconsin Department of Natural Resources



Oneida Tribe of Indians of Wisconsin



U.S. Environmental Protection Agency



Prepared by:
CADMUS
CONSULTANTS, INC.

Upper Fox and Wolf River Basins TMDL

Total Maximum Daily Loads for Total Phosphorus and Total Suspended Solids Upper Fox and Wolf Basins

Final U.S. EPA approved Report



02/27/2020

Including Forest, Langlade, Menominee, Shawano, Outagamie, Waushara, Winnebago, Wauchara, Calumet, Fond Du Lac, Green Lake, Marquette, Columbia, Adams, Dodge, and Portage Counties, Wisconsin

Prepared For:
U.S. Environmental Protection Agency
Region 5
77W Jackson Blvd.
Chicago, IL 60604



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PO Box 7921
Madison, WI 53707-7921



Prepared By: **The Cadmus Group LLC**
Finalized by the WI Department of Natural Resources

A TMDL sets “acceptable pollution loads” for each watershed

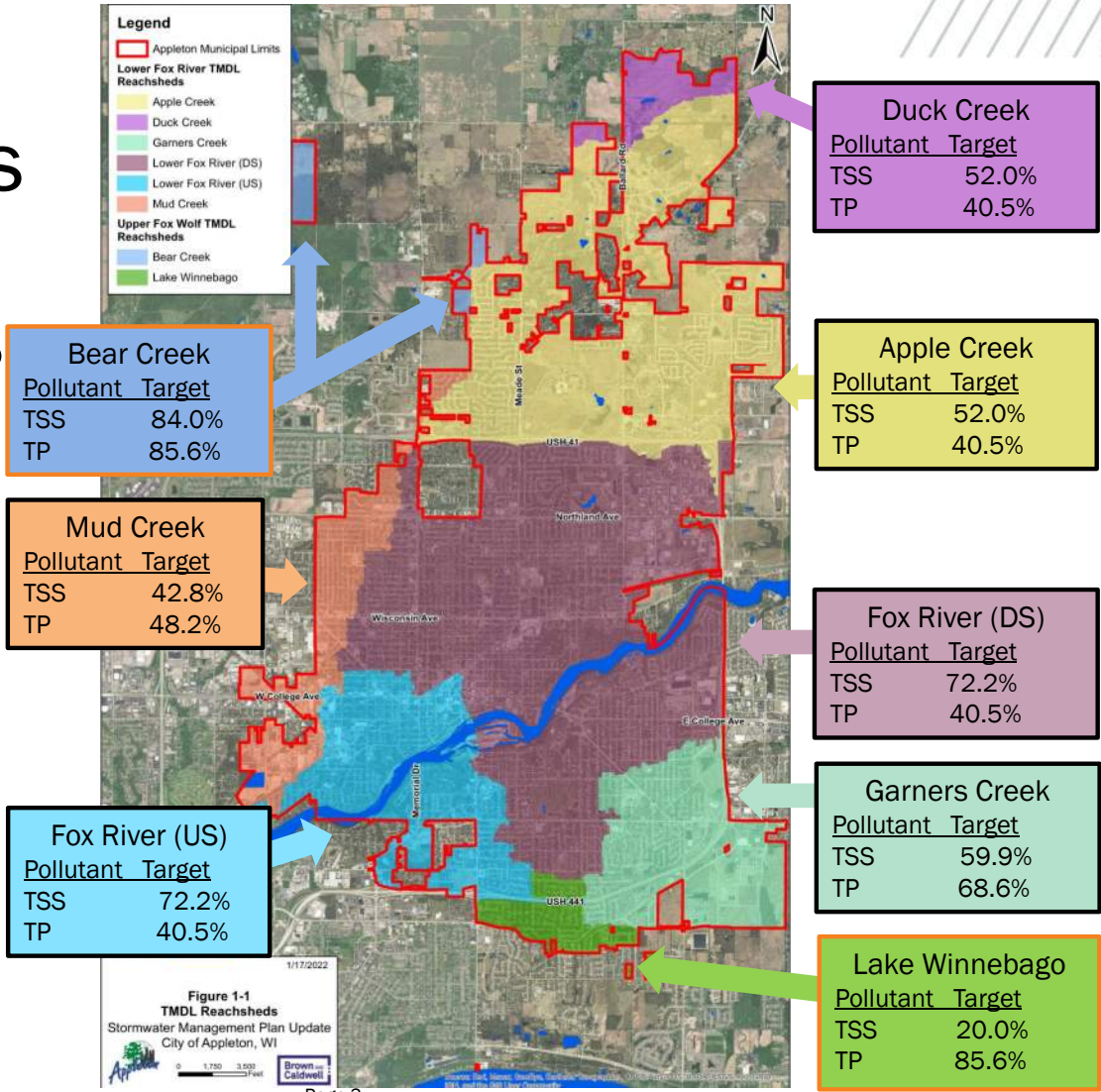
TMDL Reachsheds and Target Reductions

Update to 2014 Plan

Lower Fox River

- Duck Creek
- Apple Creek
- Mud Creek
- Fox River (US)
- Fox River (DS)
- Garners Creek

13,707 acres



NEW for 2022 Plan

Upper Fox-Wolf River

- Bear Creek
- Lake Winnebago

565 acres

Figure 1-1
TMDL Reachsheds
Stormwater Management Plan Update
City of Appleton, WI
1/17/2022
Brown and Caldwell



Stormwater Pollution Control “Tool Box”

“Proven Practices” with WDNR Standards



Street Cleaning



Grass Swales



Wet Detention



HSD's (Catch Basins)



Bioretention



Water Quality Trading /
Adaptive Management

Stormwater Pollution Control “Tool Box”

“Newer/Emerging Practices” with WDNR Standards



Porous Pavement



Proprietary Filters



Leaf Management

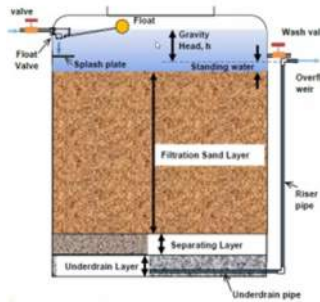
Table 2.
Total Suspended Solids (TSS) and Total Phosphorus (TP) Load Reduction Requirements

<u>Watershed</u>	<u>New Development, Redevelopment 5 acres or larger and Infill</u>		<u>Redevelopment less than 5 acres and Transportation Facility Redevelopment</u>	
	<u>TSS</u>	<u>TP</u>	<u>TSS</u>	<u>TP</u>
<u>Apple Creek</u>	<u>80.0%</u>	<u>40.5%</u>	<u>52.0%</u>	<u>40.5%</u>
<u>Duck Creek</u>	<u>80.0%</u>	<u>40.5%</u>	<u>52.0%</u>	<u>40.5%</u>
<u>Mud Creek</u>	<u>80.0%</u>	<u>48.2%</u>	<u>42.8%</u>	<u>48.2%</u>
<u>Garners Creek</u>	<u>80.0%</u>	<u>68.6%</u>	<u>59.9%</u>	<u>68.6%</u>
<u>Fox River</u>	<u>80.0%</u>	<u>40.5%</u>	<u>72.2%</u>	<u>40.5%</u>
<u>Bear Creek</u>	<u>84.0%</u>	<u>85.6%</u>	<u>84.0%</u>	<u>85.6%</u>
<u>Lake Winnebago</u>	<u>80.0%</u>	<u>85.6%</u>	<u>40.0%</u>	<u>85.6%</u>

Ordinance Changes

Stormwater Pollution Control “Tool Box”

Practices With No Current WDNR Standards



Sand Filter With Additives (e.g. Iron/Slag)



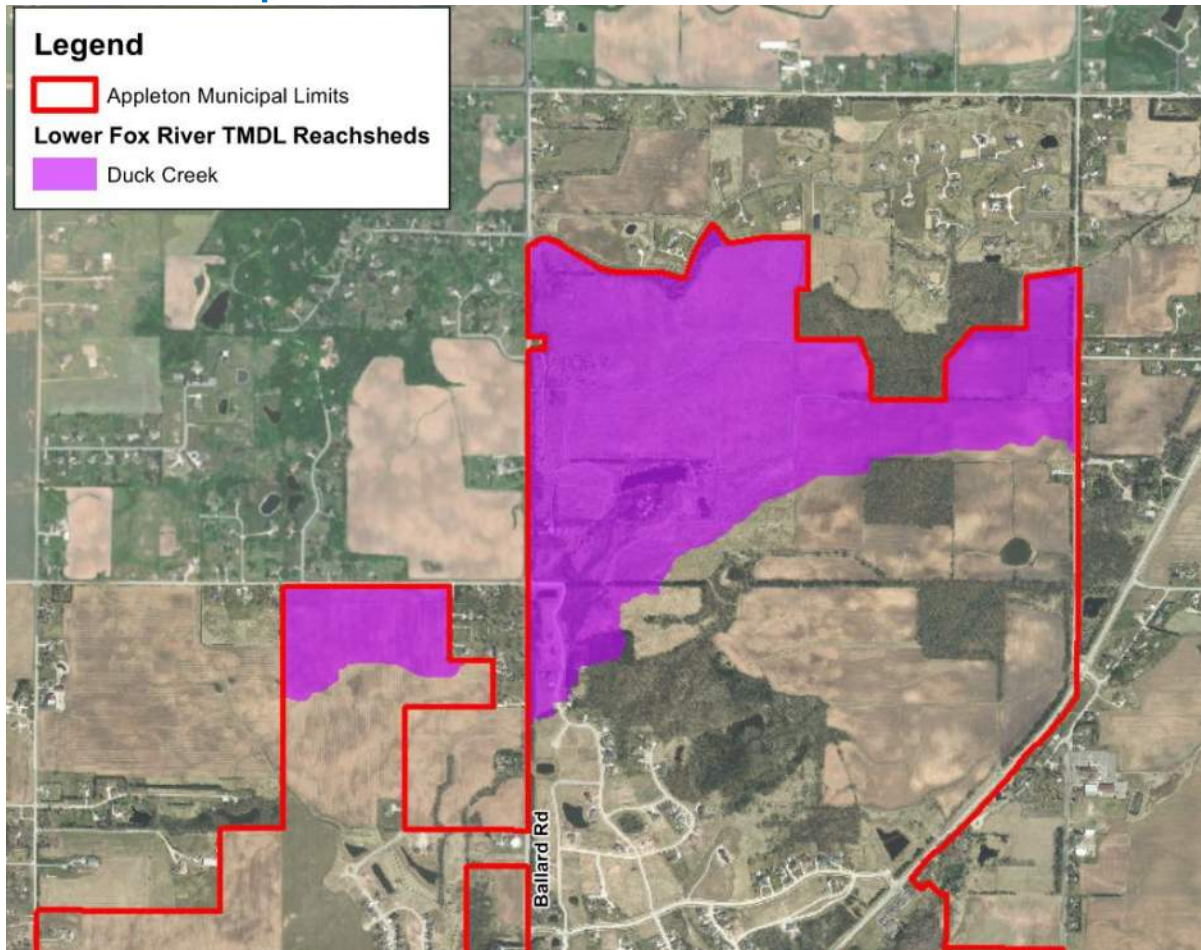
Enhanced Wet Detention (Coagulant Addition)

Common Citywide Implementation Plan Elements

Citywide Plan Elements	Implementation Year(s)	Cost
Post-Construction Ordinance Implementation	2022	\$0
Complete Regional WinSLAMM Models	2022	\$63,000
SWU Multi-family Billing System Updates	2026	\$100,000
Complete Leaf Management Program Implementation (Capital costs and CEA Payments)	2022-2026	\$2,200,000
Municipal Services Building Expansion (Ph 1)	2026	\$2,000,000
SWU Commercial/Industrial Billing System Updates	2028	\$100,000
Conduct Detailed Leaf Collection Analysis	2028	\$35,000
Expand Street Cleaning to all High Efficiency Equipment	2030	\$810,000
Municipal Services Building Expansion (Ph 2)	2031	\$2,300,000
Citywide Plan Update	2031	\$200,000
Total		\$7,808,000

Duck Creek

- In Compliance



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Individual Implementation Plan Elements

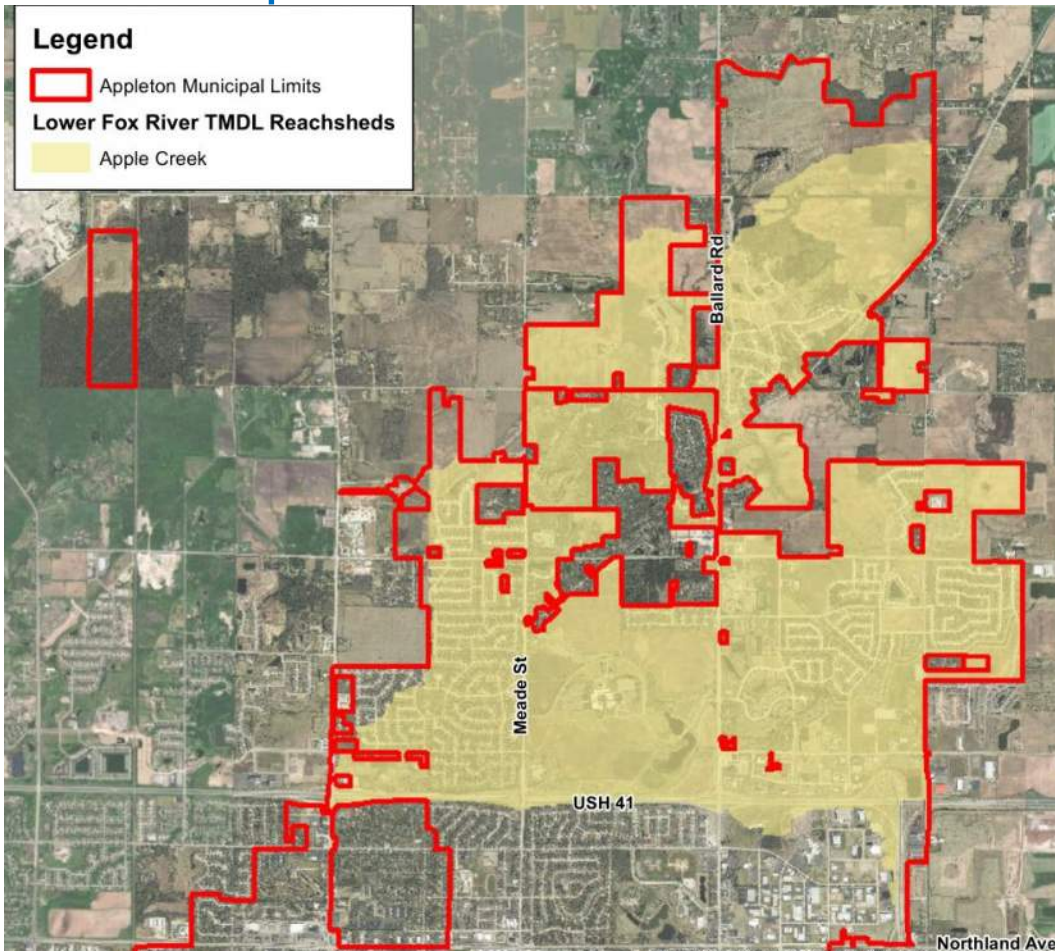
1. None

Plan Element	TSS (tons/yr)	TP (lbs/yr)	Capital Cost
1	N/A	N/A	\$0
Total	N/A	N/A	\$0

Duck Creek			
Pollutant	Target	Existing	Future
TSS	52.0%	73.7%	74.4%
TP	40.5%	48.5%	48.9%



Apple Creek - In Compliance



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Individual Implementation Plan Elements

1. None

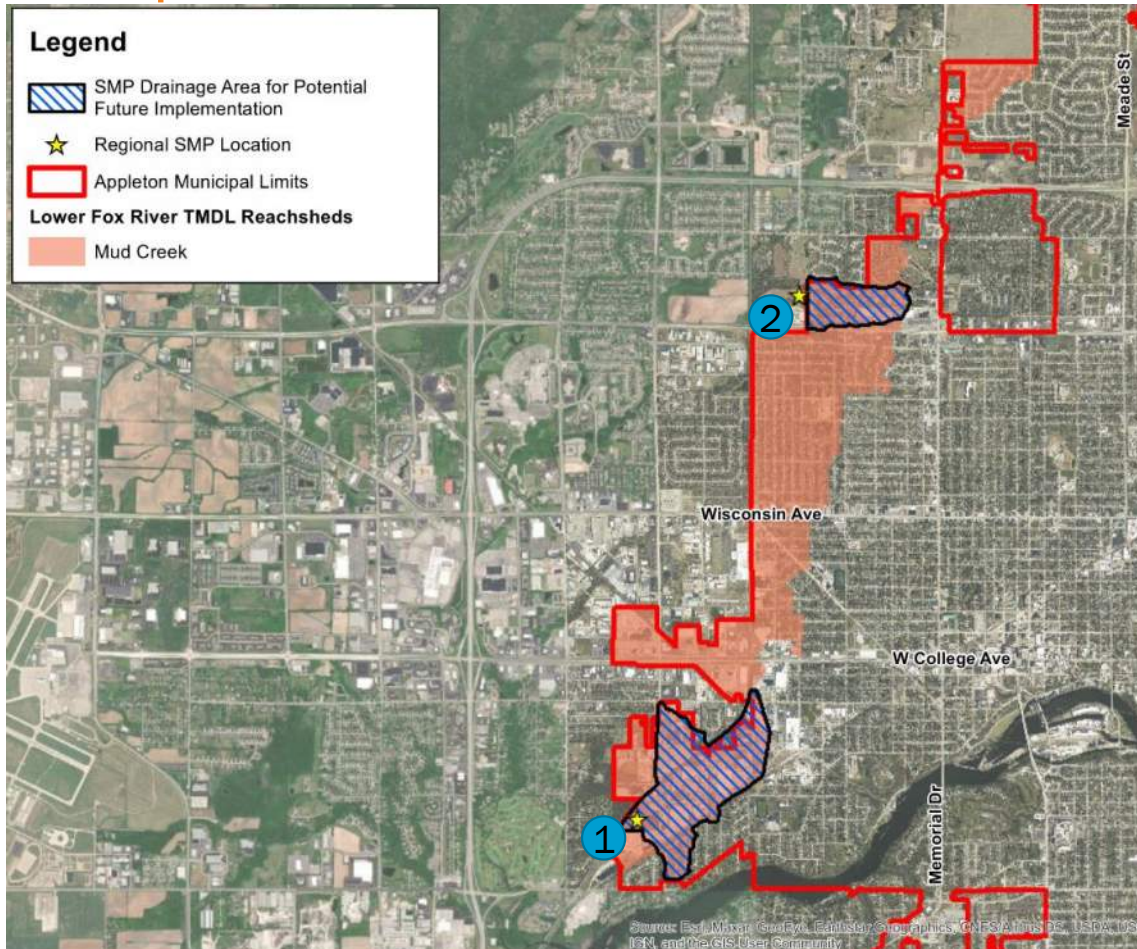
Plan Element	TSS (tons/yr)	TP (lbs/yr)	Capital Cost
1	N/A	N/A	\$0
Total	N/A	N/A	\$0

Apple Creek			
Pollutant	Target	Existing	Future
TSS	52.0%	69.7%	53.6%
TP	40.5%	48.3%	41.2%



Mud Creek

- Requires Additional TSS and TP Control



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Individual Implementation Plan Elements

1. RGL Warehouse Pond (2023-2027)
2. Hillock Court Pond (2034-2038)
3. 7 HSDs (various years – not shown on figure)

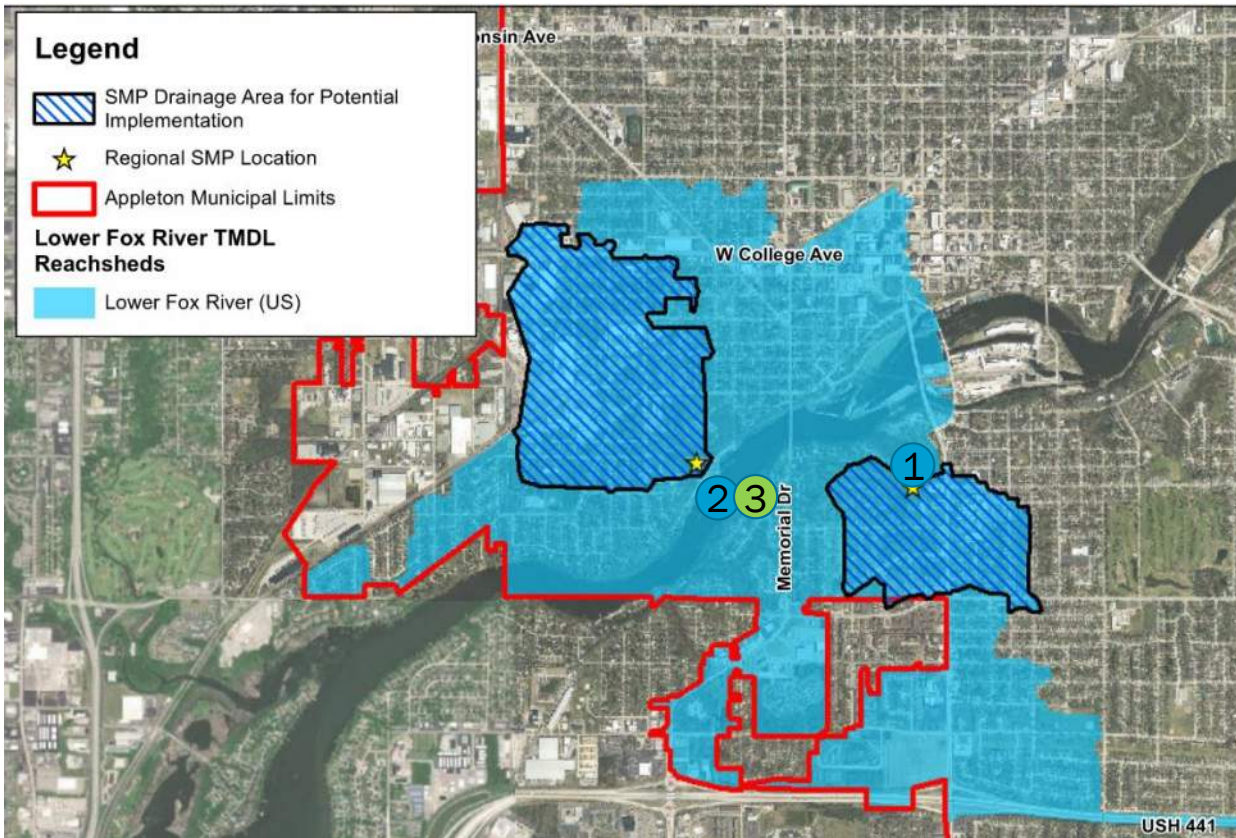
Plan Element	TSS (tons/yr)	TP (lbs/yr)	Capital Cost
1	46	129.7	\$8,060,790
2	7.5	36.5	\$5,425,891
3	0.7	1.1	\$175,000
Total	54.2	167.3	\$13,661,681

Mud Creek			
Pollutant	Target	Existing	Future
TSS	42.8%	28.6%	48.1%
TP	48.2%	20.8%	48.5%



Lower Fox River (Upstream)

- Requires Additional TSS and TP Control



Individual Implementation Plan Elements

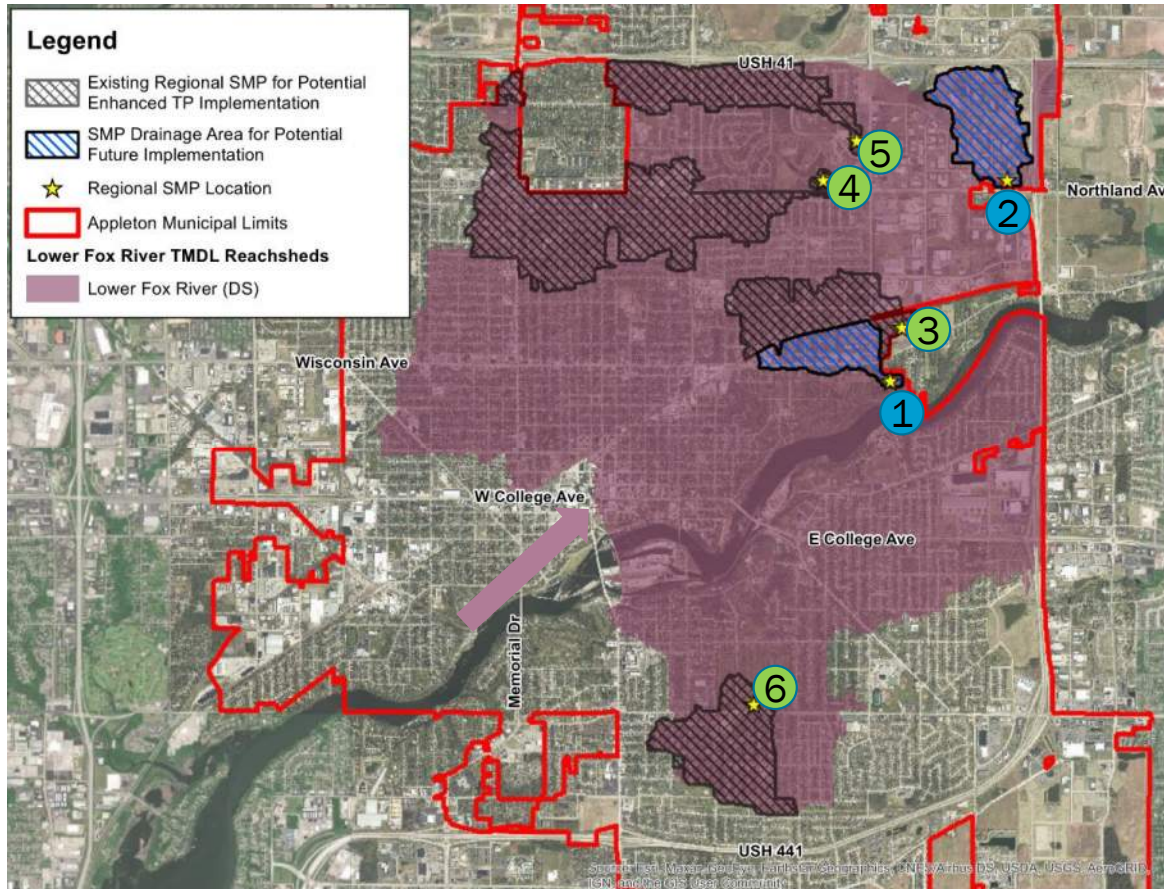
1. Riverview Gardens Pond (2029-2033)
2. Pierce Park Pond (2039-2043)
3. Pierce Park Enhanced TP (2064-2068)
4. 20 HSDs (various years)

Plan Element	TSS (tons/yr)	TP (lbs/yr)	Capital Cost
1	13.4	65.5	\$1,172,371
2	24.2	93.5	\$2,396,381
3	24.2	146	\$3,457,883
4	1.4	3.8	\$500,000
Total	63.2	308.8	\$7,526,635

Lower Fox River (US)			
Pollutant	Target	Existing	Future
TSS	72.2%	25.3%	73.3%
TP	40.5%	15.4%	41.7%

Lower Fox River (Downstream)

- Requires Additional TSS and TP Control



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Individual Implementation Plan Elements

1. Wisconsin Avenue Pond (2044-2048)
2. Winslow Avenue Pond (2049-2053)
3. Leona Street Pond Enhanced TP (2059-2063)
4. MPPS Pond Enhanced TP (2069-2073)
5. MPPNE Pond Enhanced TP (2074-2078)
6. Reid GCS Pond Enhanced TP (2079-2083)
7. 57 HSDs (various years)

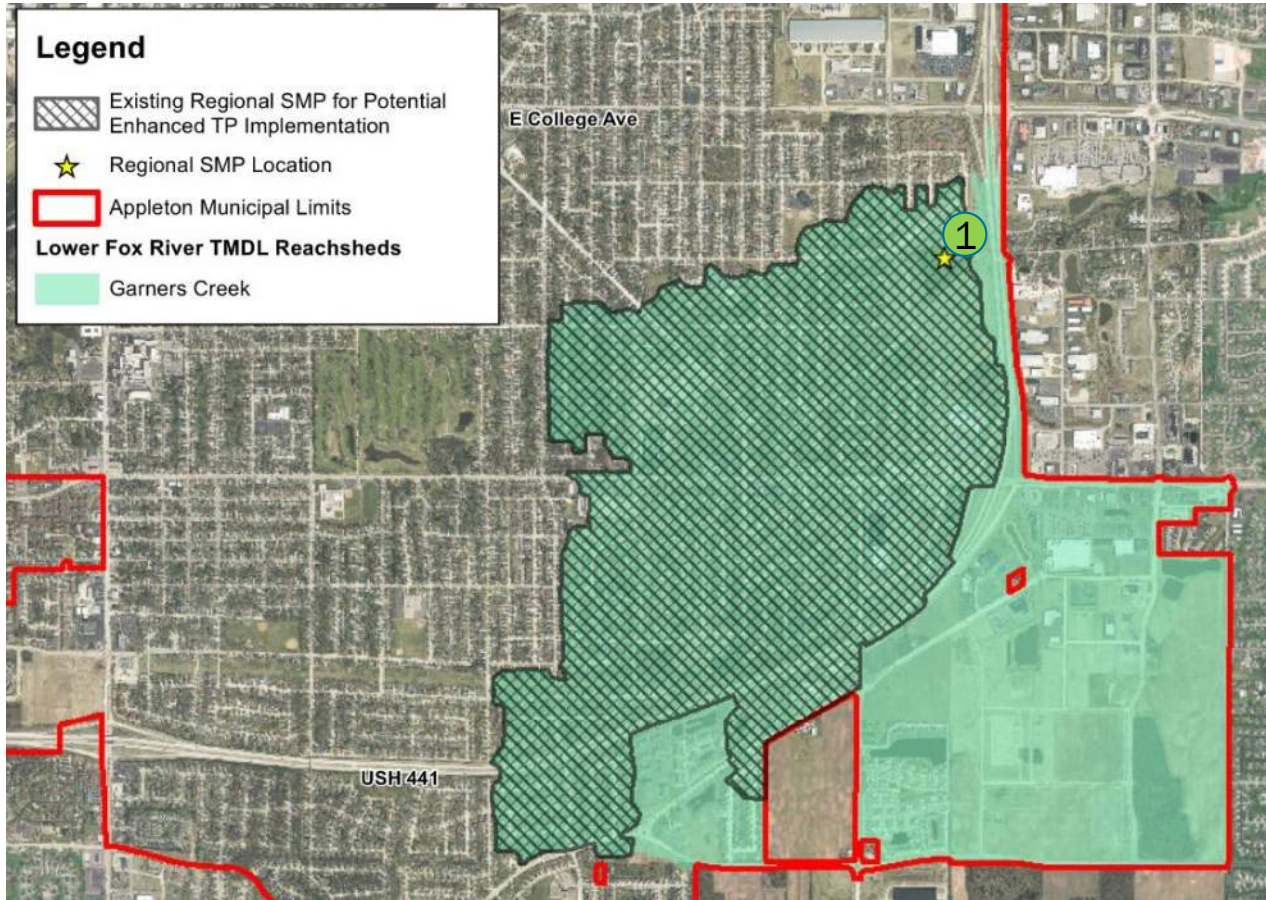
Plan Element	TSS (tons/yr)	TP (lbs/yr)	Capital Cost
1	13.6	56.7	\$4,626,484
2	25.0	75.3	\$6,164,580
3	2.8	44.0	\$2,982,447
4	10.5	154.0	\$4,008,291
5	3.2	58.0	\$4,646,473
6	1.7	52.0	\$5,387,056
7	8.4	16.5	\$1,425,000
Total	65.2	456.5	\$29,240,330

Lower Fox River (DS)			
Pollutant	Target	Existing	Future
TSS	72.2%	36.0%	77.8%
TP	40.5%	23.5%	46.3%



Garners Creek

- Meets TSS, Requires Additional TP Control



Individual Implementation Plan Elements

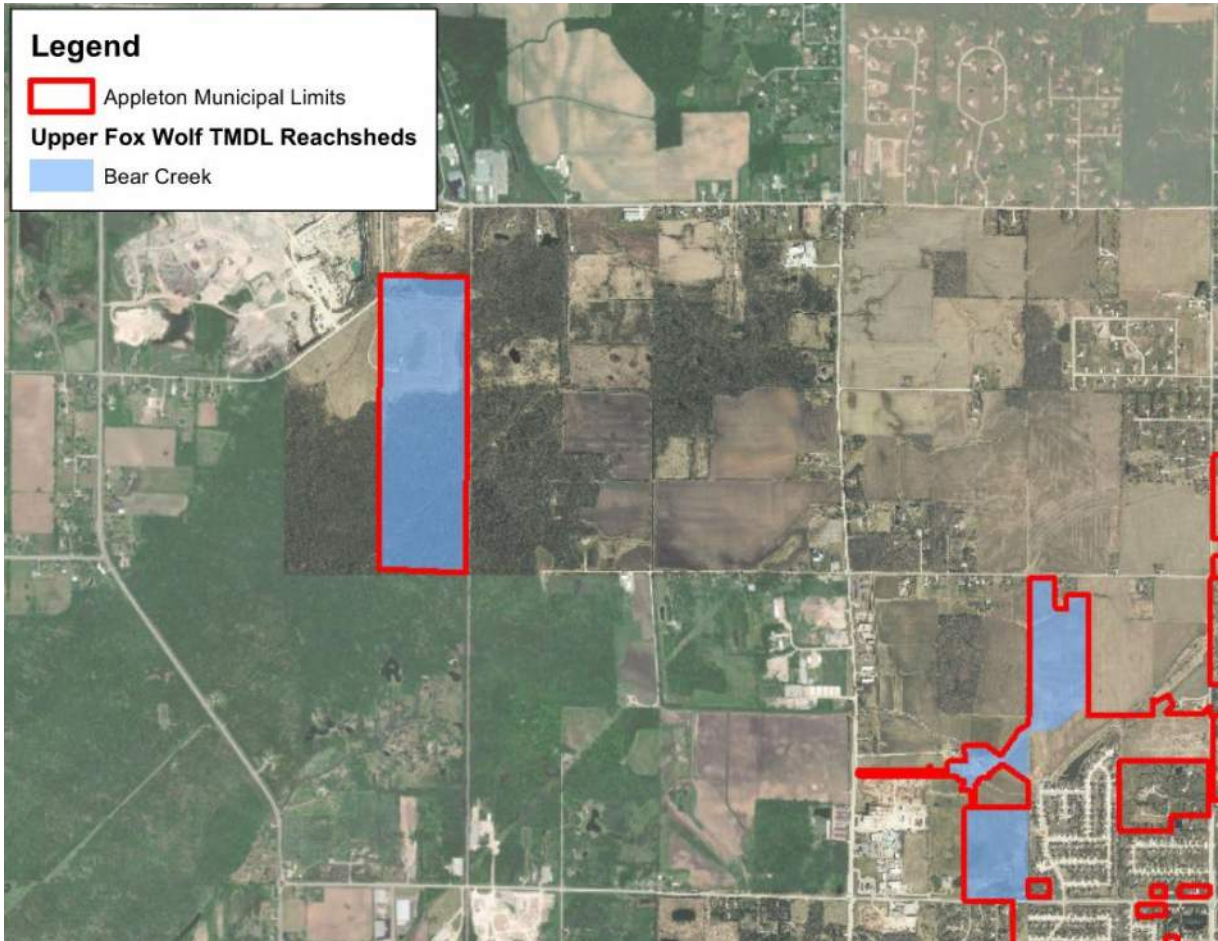
1. Kensington Pond Enhanced TP (2054-2058)
2. Purchase Floc Dredge Equipment (2059)

Plan Element	TSS (tons/yr)	TP (lbs/yr)	Capital Cost
1	11	181	\$2,572,840
2	N/A	N/A	\$703,500
Total	11	181	\$3,276,340

Garners Creek			
Pollutant	Target	Existing	Future
TSS	59.9%	75.9%	61.9%
TP	68.6%	56.0%	69.0%

Bear Creek (New Planning Area)

- Requires Additional TSS and TP Control



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Individual Implementation Plan Elements

- None Currently Identified
- New Planning Area in Upper Fox-Wolf TMDL
- Potential TSS and TP reductions possible for swales/filter strips at old City landfill area – will evaluate at next plan update
- Will move toward compliance as area develops
- Achieving 85.6% TP Reduction Target is limited by available/cost-effective technology

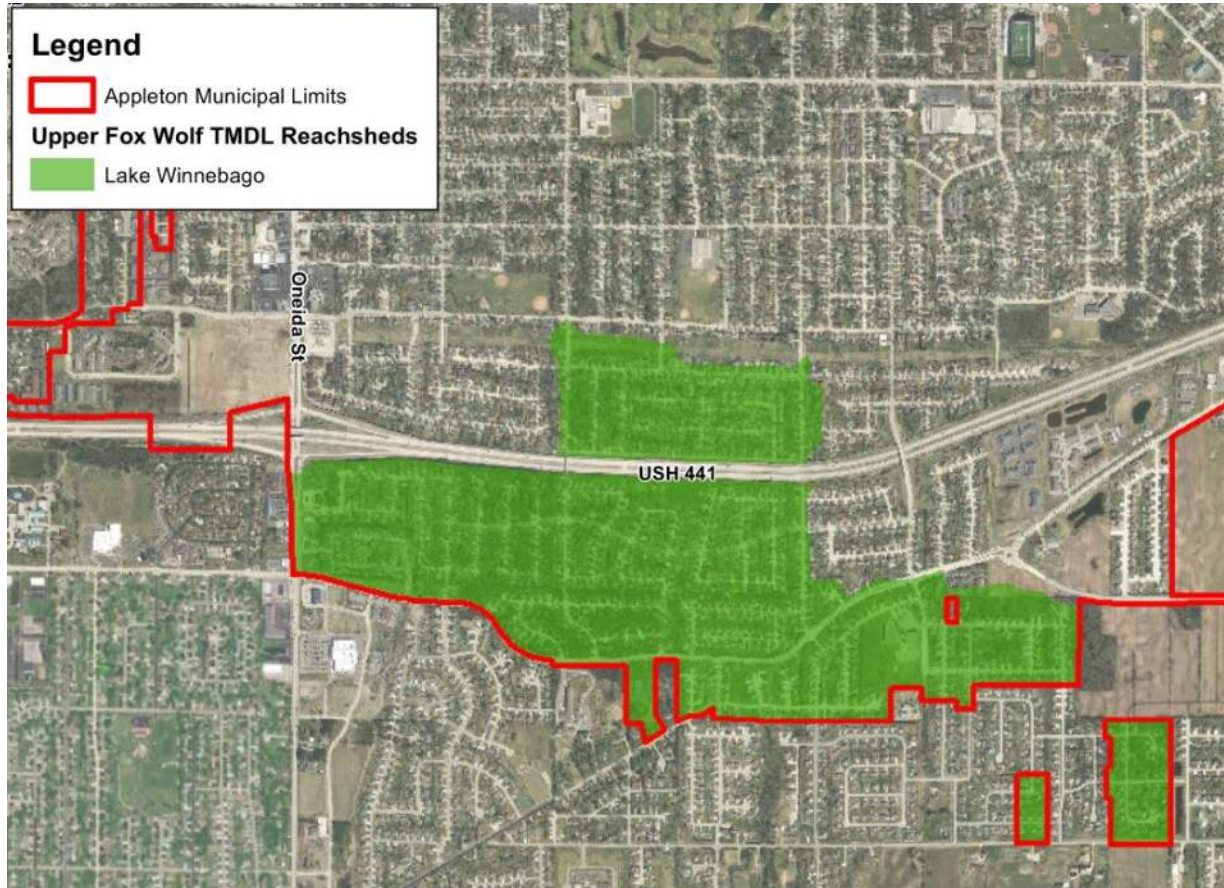
Plan Element	TSS (tons/yr)	TP (lbs/yr)	Capital Cost
N/A	N/A	N/A	\$0
Total			\$0

Bear Creek			
Pollutant	Target	Existing	Future
TSS	84.0%	25.8%	25.8%
TP	85.6%	11.4%	11.4%



Lake Winnebago (New Planning Area)

- Meets TSS, Requires Additional TP Control



Individual Implementation Plan Elements

- 11 HSDs (various years)
 - New Planning Area in Upper Fox-Wolf TMDL
 - Achieving 85.6% TP Reduction Target is limited by cost-effective technology

Plan Element	TSS (tons/yr)	TP (lbs/yr)	Capital Cost
1	0.5	2.5	\$275,000
Total			\$275,000

Lake Winnebago			
Pollutant	Target	Existing	Future
TSS	20.0%	22.4%	22.1%
TP	85.6%	15.3%	23.1%

Internal Trading

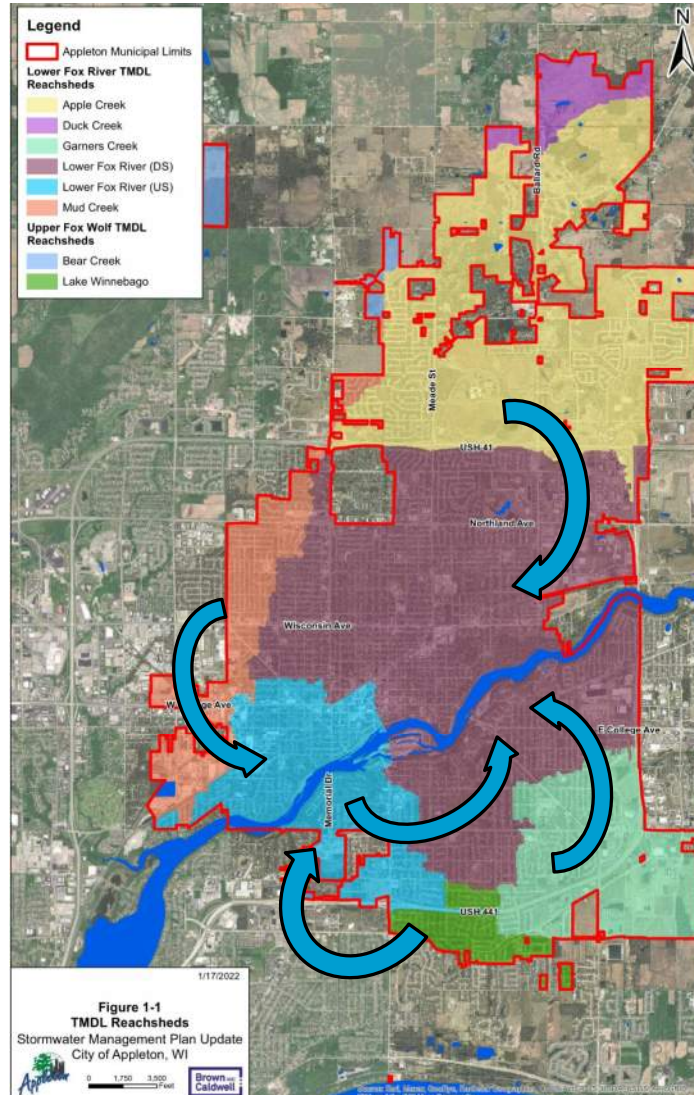
Reachsheds with Existing (or Future) TSS and/or TP in Excess of TMDL Targets Can be Applied (Traded) to Downstream Reachsheds

Lower Fox River (US)

Pollutant	Target	Existing	w/o Trading	w/ Trading
TSS	72.2%	25.3%	68.5%	73.3%
TP	40.5%	15.4%	46.5%	41.7%

Lower Fox River (DS)

Pollutant	Target	Existing	w/o Trading	w/ Trading
TSS	72.2%	36.0%	57.7%	77.8%
TP	40.5%	23.5%	40.1%	46.3%



2014 vs 2020 Results Comparison



TMDL Reached Targets and Reductions vs 2014 and 2020 Study Results								
Reached	Total Suspended Solids				Total Phosphorus			
	TMDL Target TSS Load Reduction %	2014 With Controls TSS Reduction %	2020 With Controls TSS Reduction %	2020 Plan Future Conditions TSS Reduction %	TMDL Target TP Load Reduction %	2014 With Controls TP Reduction %	2020 With Controls TP Reduction %	2020 Plan Future Conditions TP Reduction %
Lower Fox River TMDL								
Apple Creek	52.0%	79.6%	69.7%	53.6%	40.5%	59.6%	48.3%	41.2%
Duck Creek	52.0%	69.2%	73.7%	74.4%	40.5%	43.8%	48.5%	48.9%
Garners Creek	59.9%	78.0%	75.9%	61.9%	68.6%	58.7%	56.0%	69.0%
Lower Fox River Mainstem (DS)	72.2%	29.3%	36.0%	77.8%	40.5%	20.3%	23.5%	46.3%
Lower Fox River Mainstem (US)	72.2%	17.8%	25.3%	73.3%	40.5%	11.4%	15.4%	41.7%
Mud Creek	42.8%	21.3%	28.6%	48.1%	48.2%	13.8%	20.8%	48.5%
Upper Fox-Wolf TMDL								
Bear Creek	84.0%	32.3%	25.8%	25.8%	85.6%	26.8%	11.4%	11.4%
Lake Winnebago	20.0%		22.4%	22.1%	85.6%		15.3%	23.1%



