

# Delavan Lake Watershed Implementation Plan

Funded and Sponsored By:

Town of Delavan, Walworth County, Wisconsin

## Final Report

1/30/2016

Prepared & Submitted By:

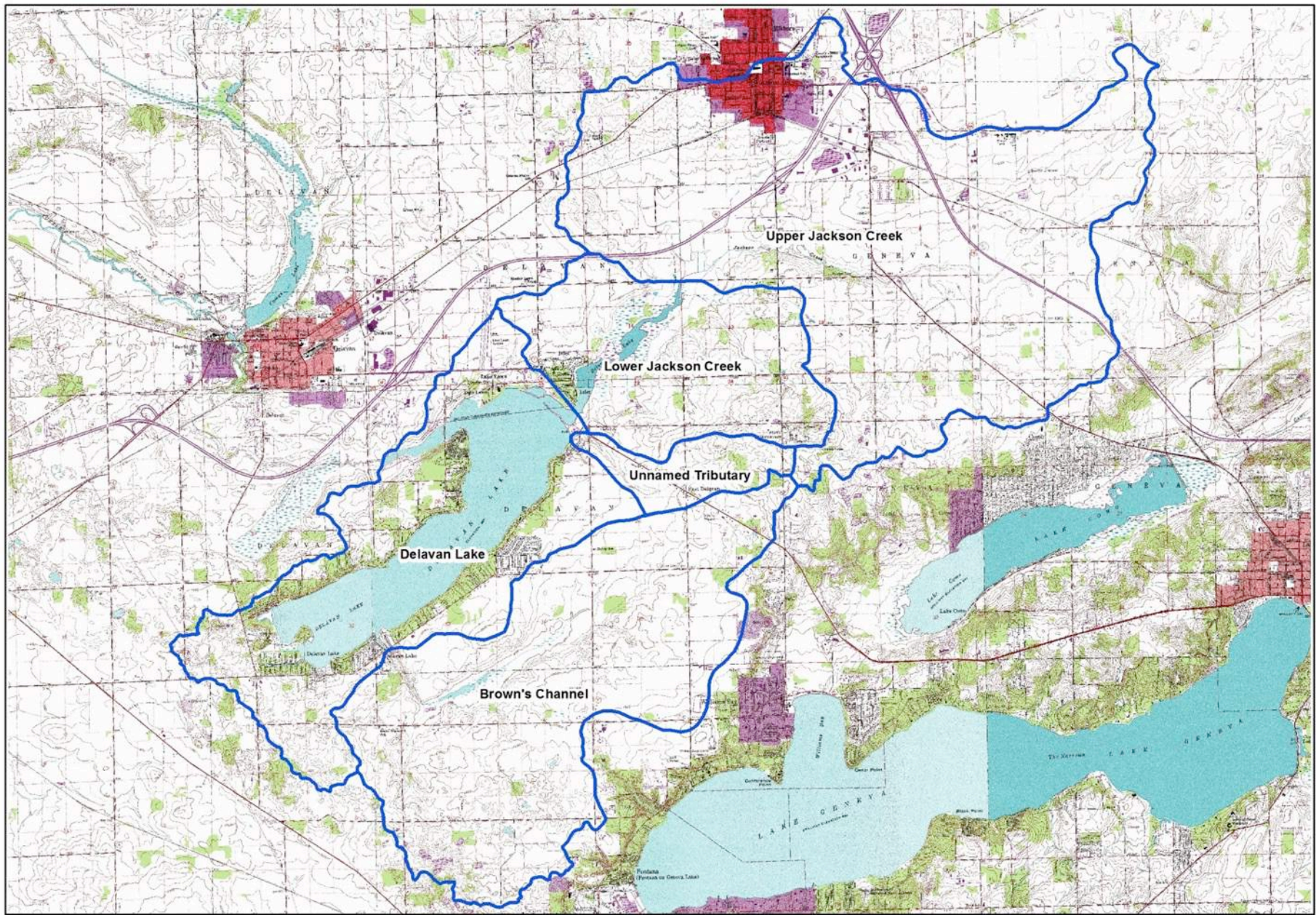
Berrini & Associates, LLC and Northwater Consulting




# Delavan Lake Watershed Implementation Plan

In an effort to preserve and protect **Delavan Lake** and its water quality, a **Watershed Implementation Plan** has been completed to identify opportunities for implementing BMPs that can reduce soil erosion and nutrient loading to Delavan Lake.





**Legend**

 Delavan Lake Watershed Boundary

**Delavan Lake Watershed**

0 0.5 1 2 3 4 Miles




# A Plan for the Future

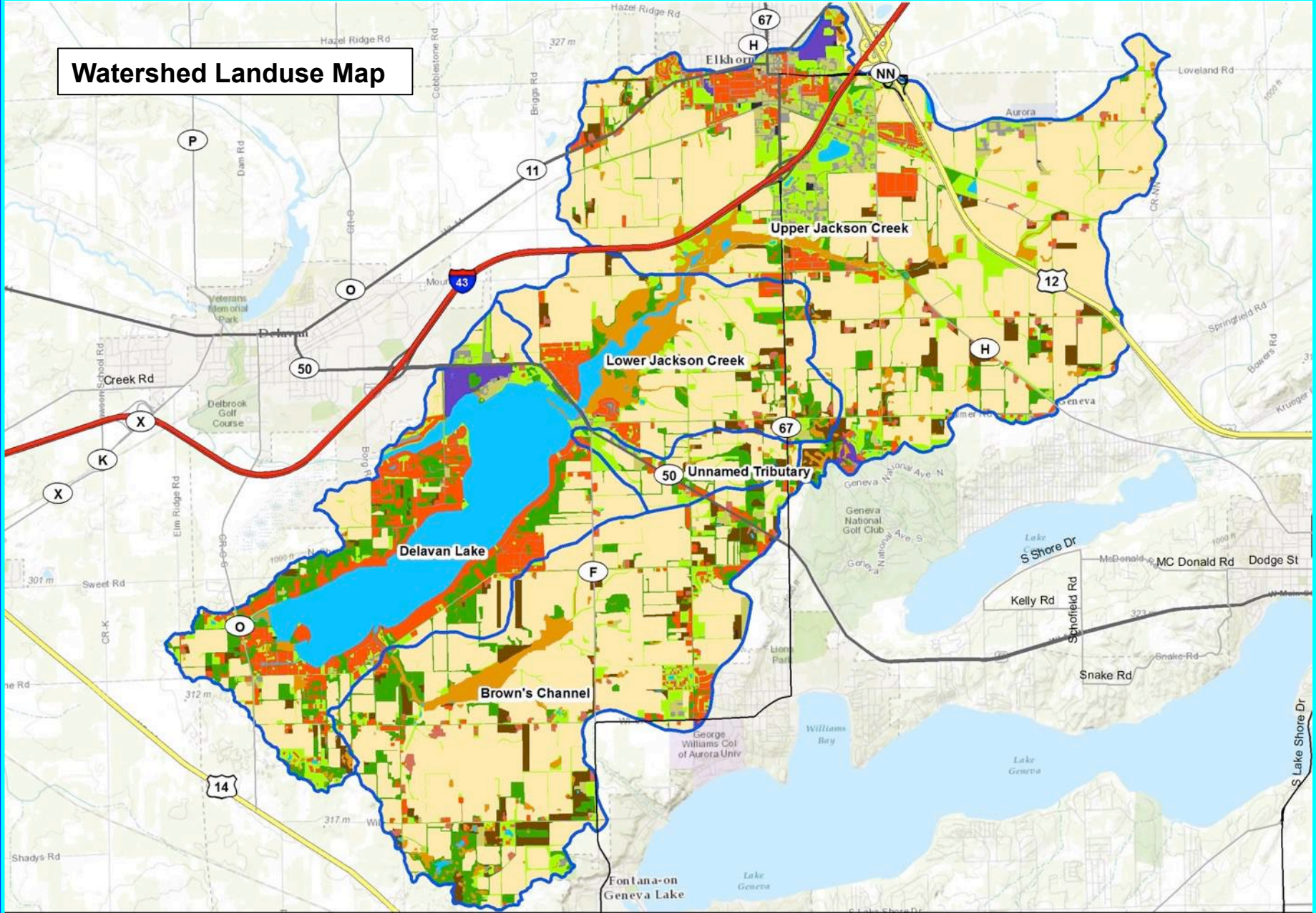
This long term Plan was developed to improve and preserve the water quality of Delavan Lake by reducing soil erosion and controlling nonpoint source (NPS) pollutant loading, while providing long-term protection.

It identifies specific sources of sediment and nutrient loading and recommends BMPs for future implementation; it identifies potential funding sources, and is consistent with USEPA and WDNR plan guidance.

# Watershed Characterization

- Geology and Soils
- Hydrologic Soil Groupings, Hydric Soils
- Topography and Slope, Climate
- Landuse & Landcover, Landuse Detention
- Watershed Hydrology,
- Environmental Corridors
- Existing, Drained or Degraded Wetlands
- Threatened or Endangered Species
- Urbanization and Growth
- Sewered Areas and Septic Systems

# Watershed Landuse Map



**Legend**

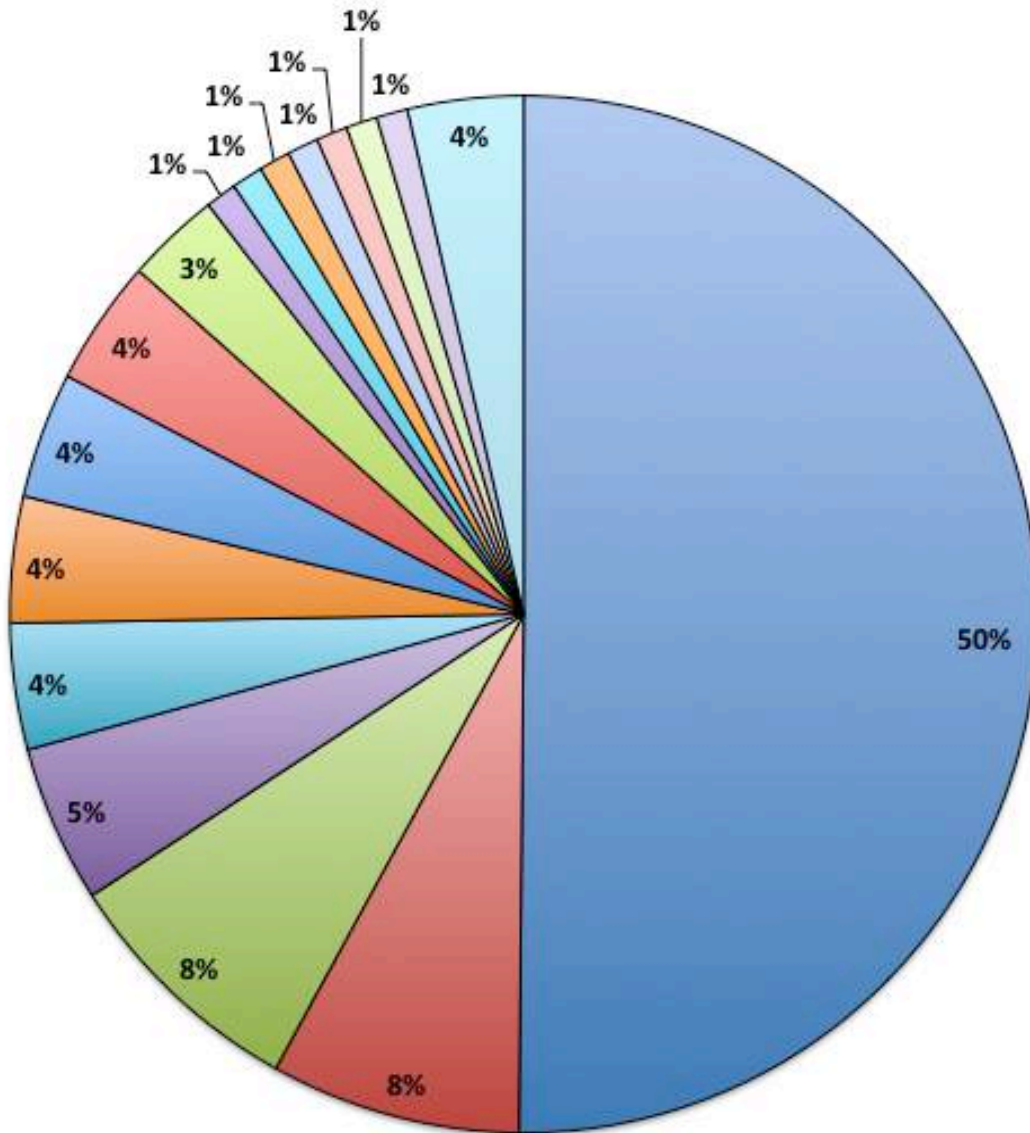
Watershed Boundary	Communication and Utilities	Recreation
<b>Landuse Type</b>	Agriculture/Crop Ground	Commercial and Institutional
Transportation/Road	Livestock/Pasture	Residential
Wetland	Farm Building	Open Water - Pond
Open Space/Grass	Forest	Open Water - Stream

## Delavan Lake Watershed Landuse



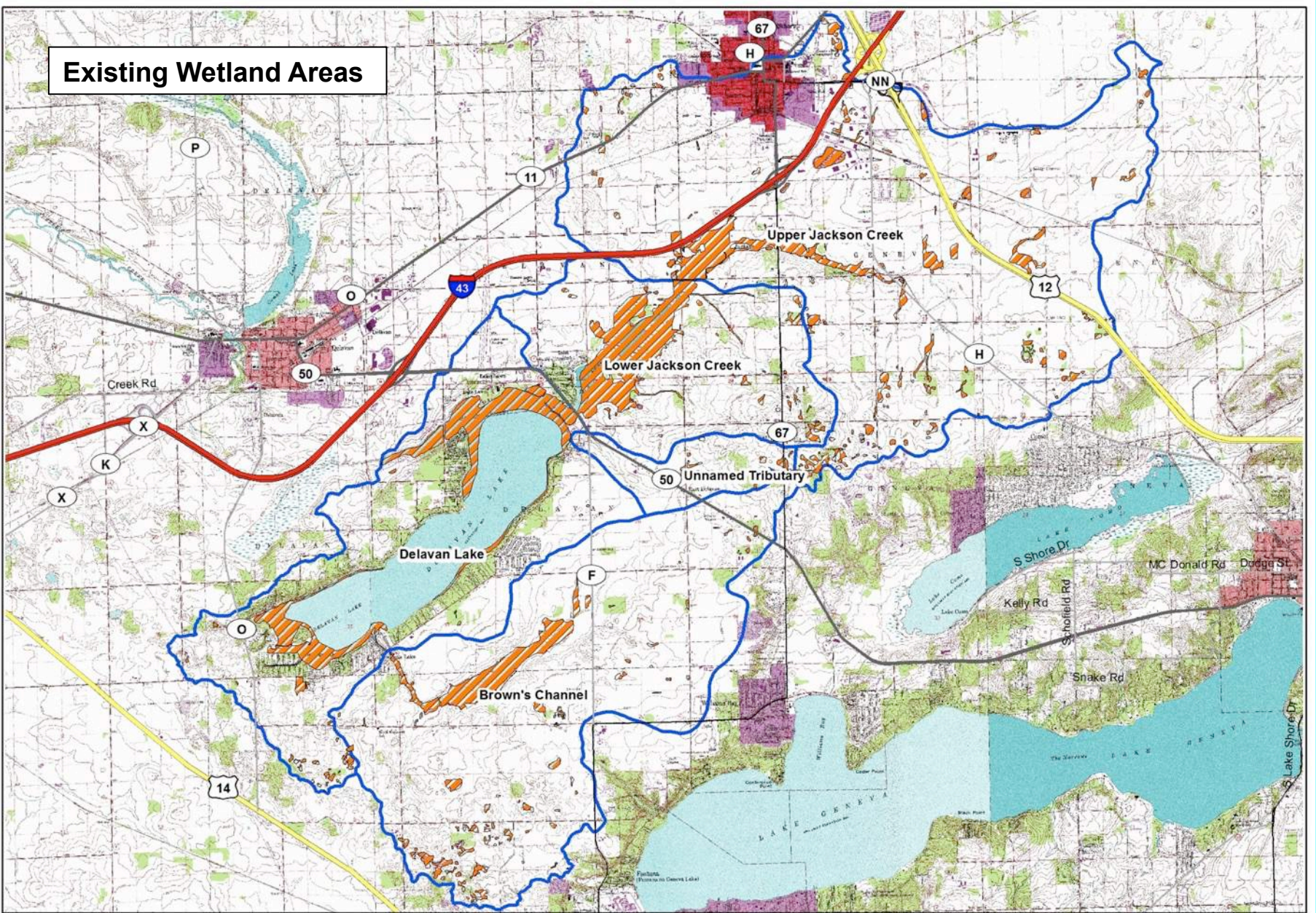
# Landuse

## Percent of Delavan Watershed



- Cropland; Row Crops
- Open Water - Pond
- Forest
- Wetland
- Rural Open Space
- Urban Open Space
- Residential Single-Family Low Density
- Pasture
- Residential Single-Family Medium Density
- Freeway
- Local Street
- Farm Building
- Orchards and Nursery
- Parking
- Recreation - Park
- Wholesaling and Storage
- Other (Miscellaneous)

# Existing Wetland Areas



## Legend

-  Wetlands
-  Watershed Boundary

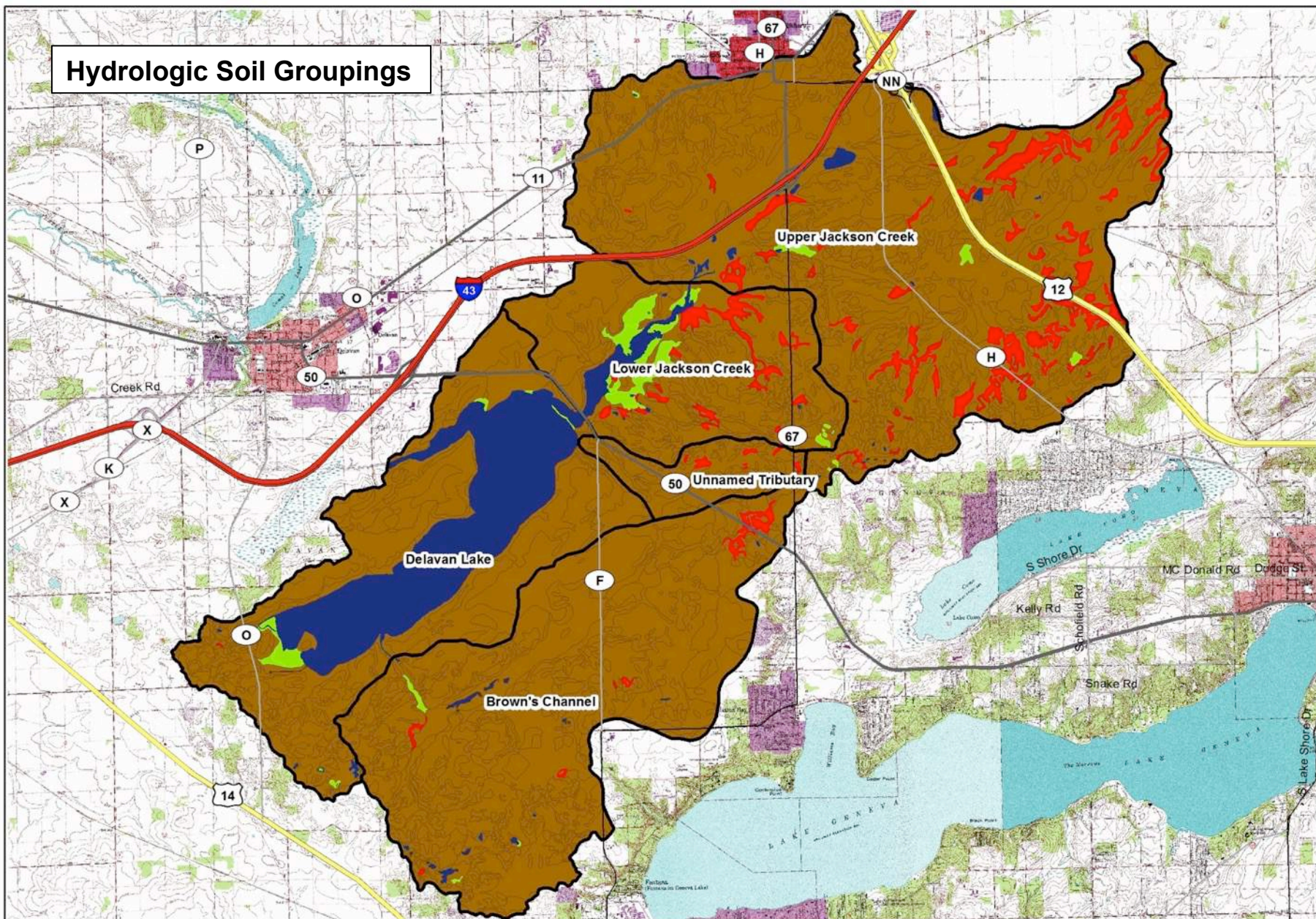
## Delavan Lake Watershed Wetlands



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# Hydrologic Soil Groupings



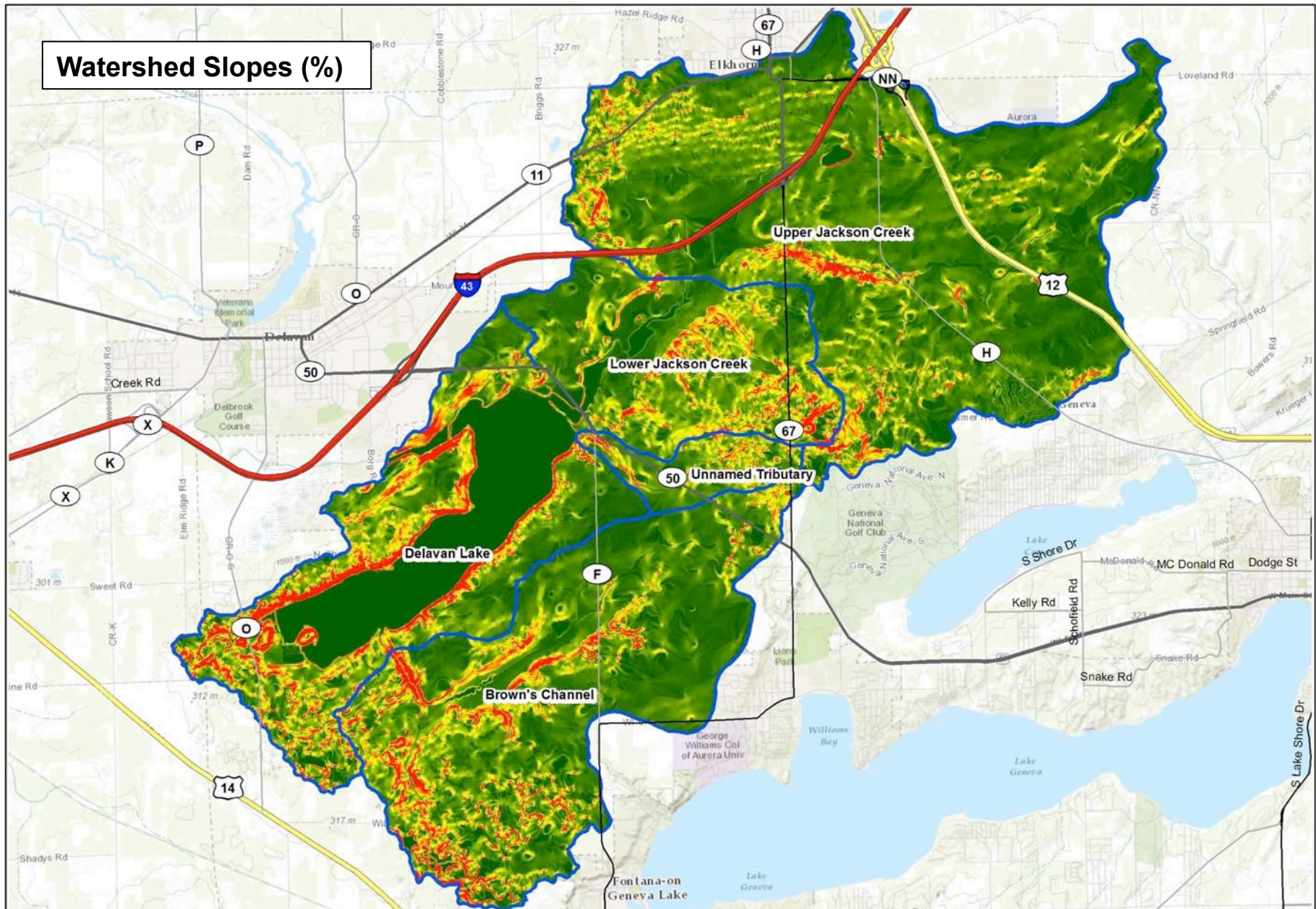
## Legend

- |   |   |
|---|---|
| Hydrologic Grouping                                       | <span style="color: red;">■</span> C - High Infiltration  |
| <span style="color: green;">■</span> A - Low Infiltration | <span style="color: blue;">■</span> Unclassified  |
| <span style="color: brown;">■</span> B                    | <span style="border: 1px solid black; display: inline-block; width: 10px; height: 10px;"></span> Watershed Boundary |

## Delavan Lake Watershed Hydrologic Soil Groupings



# Watershed Slopes (%)



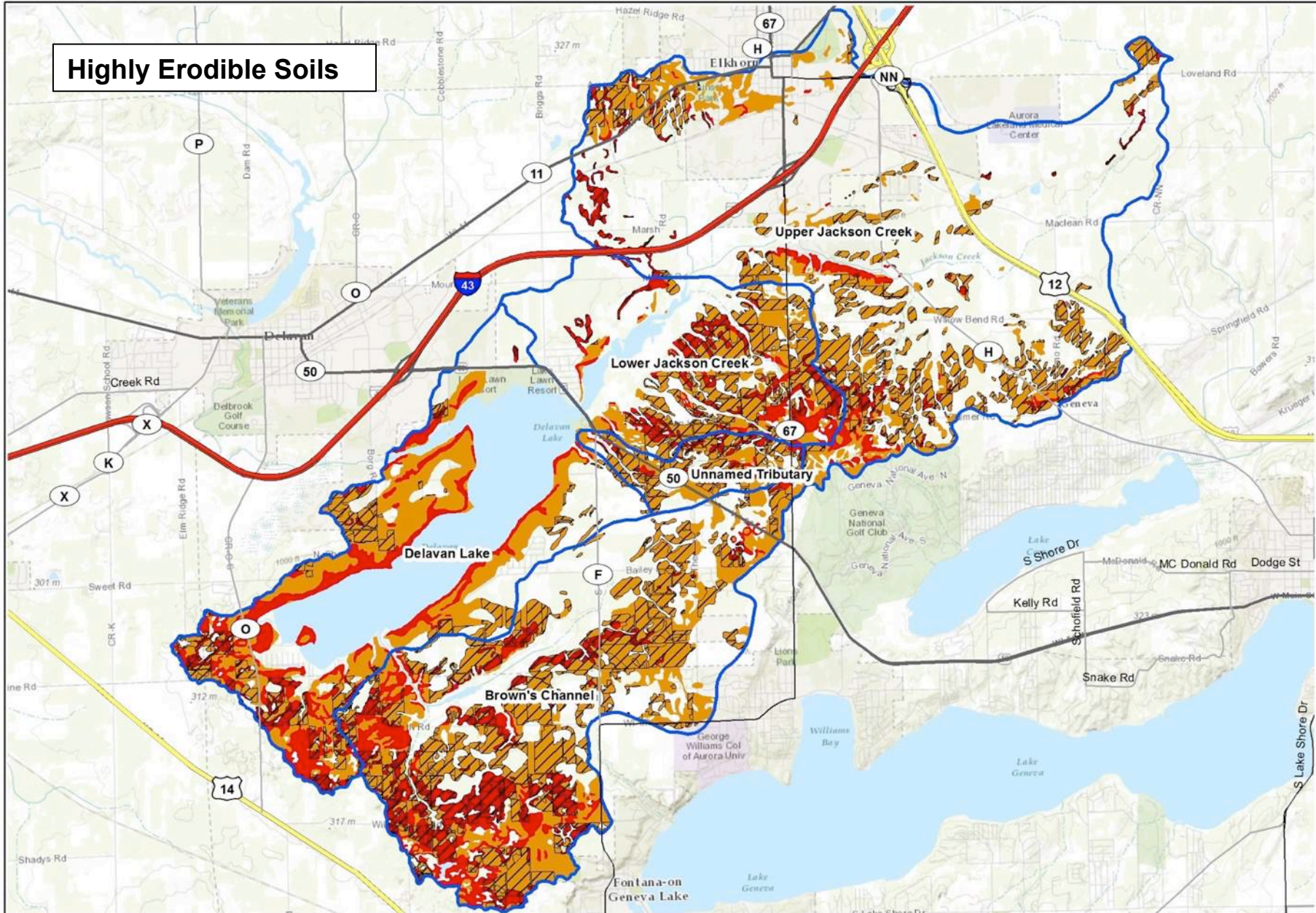
## Legend



## Delavan Lake Watershed Percent Slope



# Highly Erodible Soils



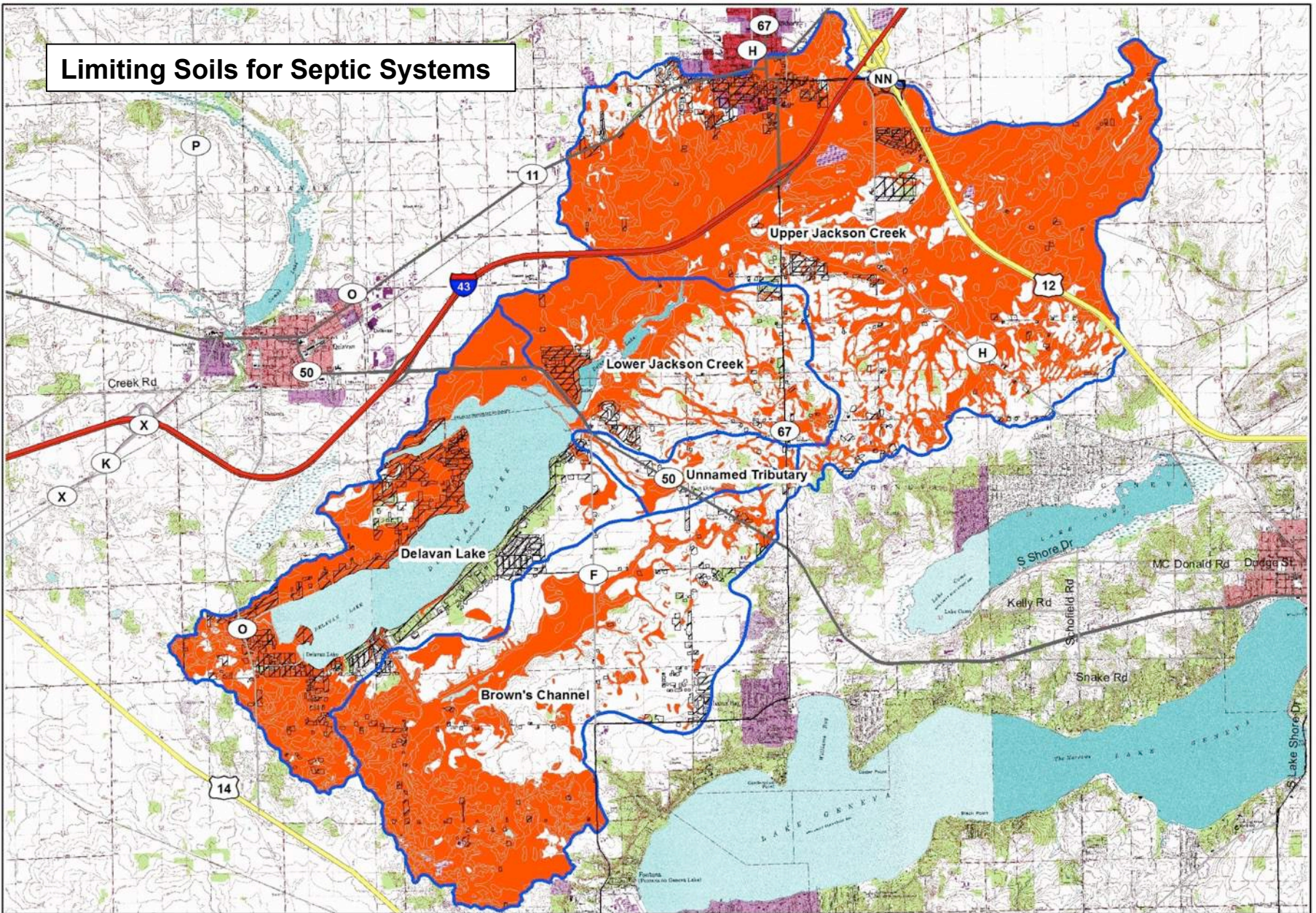
## Legend

- HEL Soils
  - HEL
  - Predominantly HEL
- Cropped HEL Soils
  - Watershed Boundary

## Delavan Lake Watershed Highly Erodible Soils



# Limiting Soils for Septic Systems



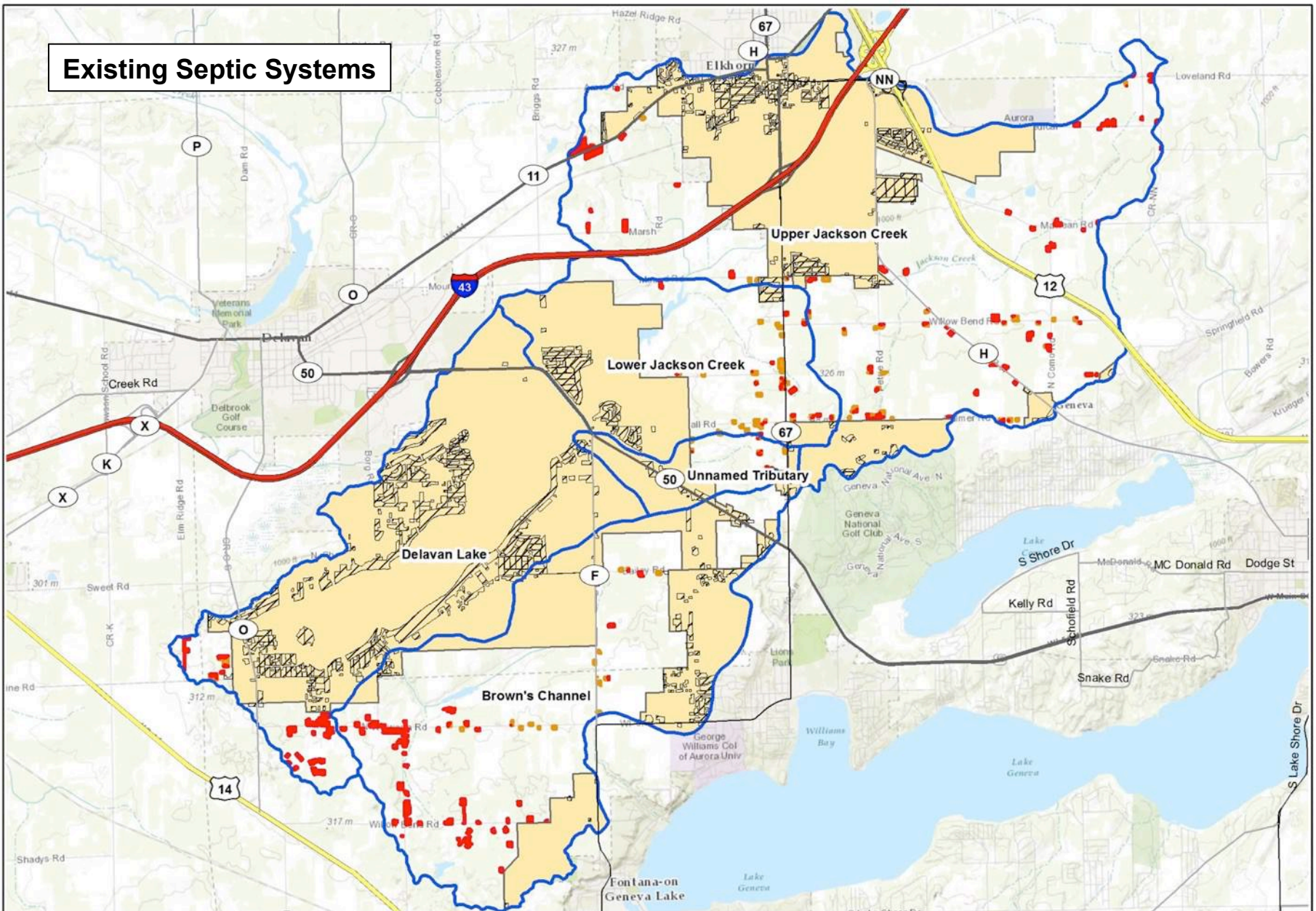
## Legend

-  Watershed Boundary
-  Septic Limiting Soils
-  Residential Areas

## Delavan Lake Watershed Limiting Soils for Septic Systems



# Existing Septic Systems



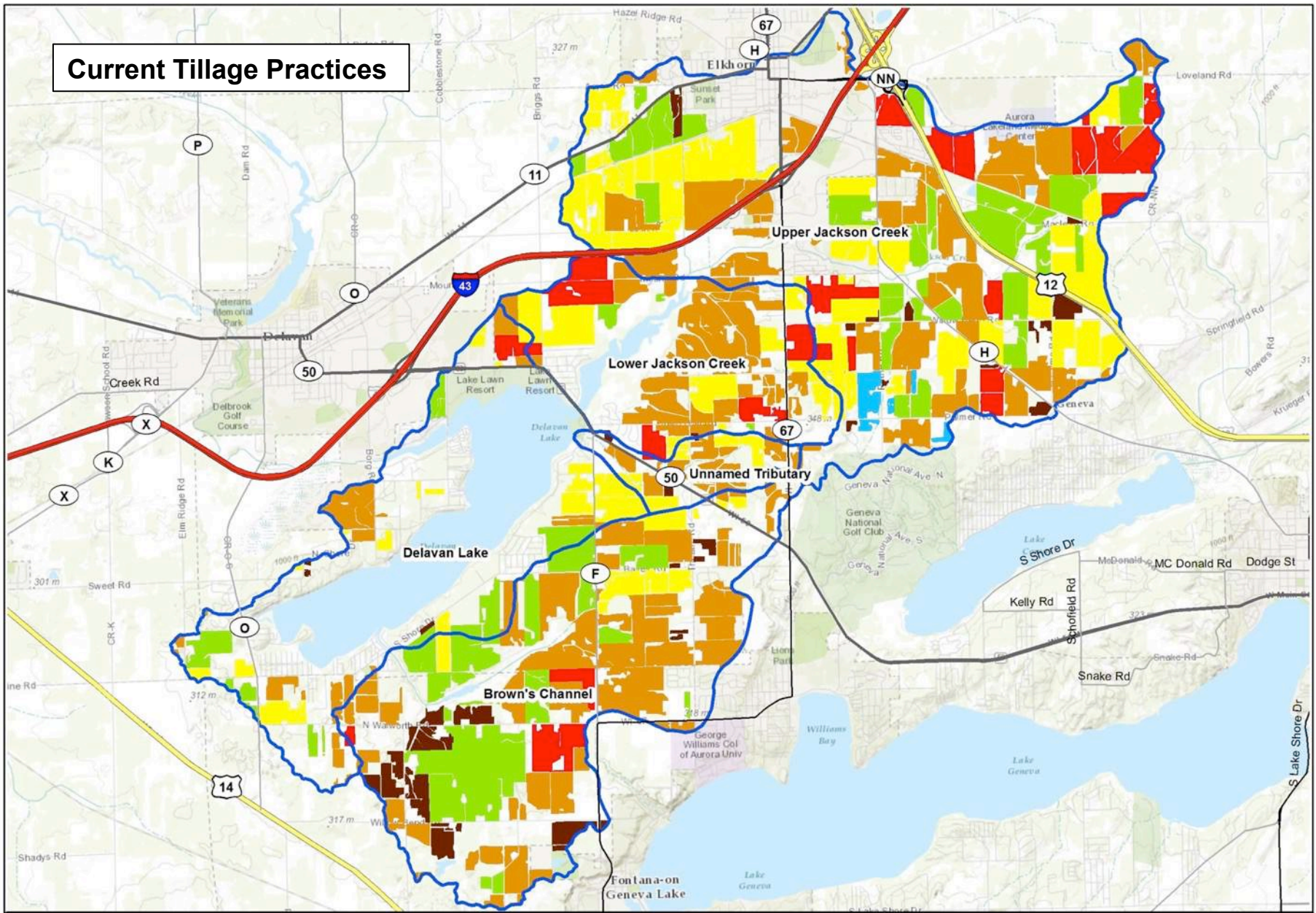
- Legend**
- Area Served by a WWTP
  - Sewered Residential Areas
  - Residential Septic on Limiting Soils
  - Residential Septic
  - Watershed Boundary

## Delavan Lake Watershed Septic Systems



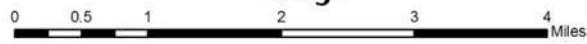
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# Current Tillage Practices

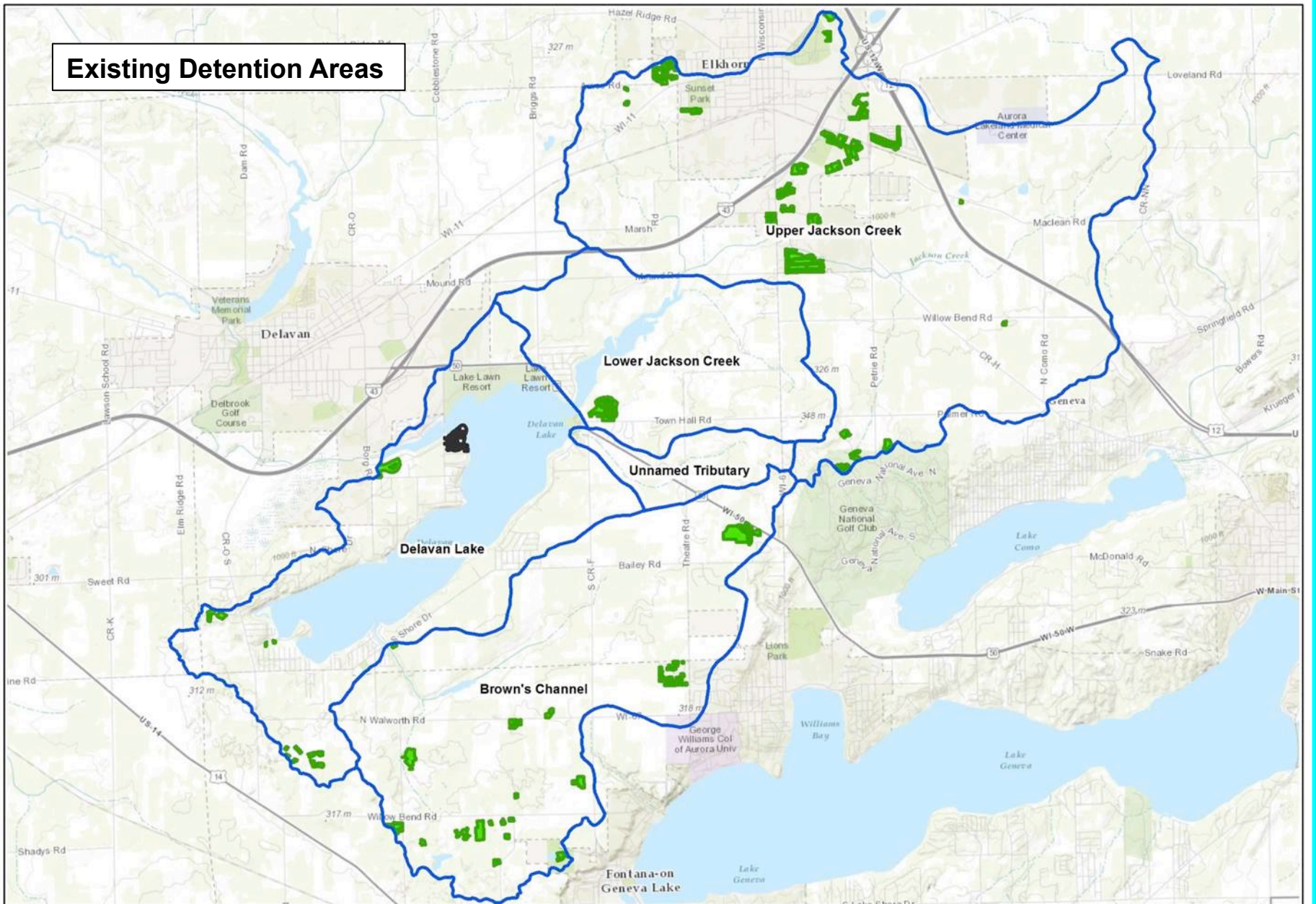


- Legend**
- Watershed Boundary
  - Mulch-Till
  - Hay
  - Spring-Till
  - No-Till
  - Conventional
  - Wheat

## Delavan Lake Watershed Tillage



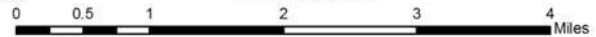
# Existing Detention Areas



## Legend

- Watershed Boundary
- Permeable Pavement
- Development with Detention

## Delavan Lake Watershed Detention



# Pollutant Load Model

Designed to:

- Quantify Current Phosphorus and Sediment Loading to Delavan Lake
- Identify Opportunity or Project Areas
- Quantify Expected Load Reductions
- Prioritize Project Locations





# Model Components and Outputs

- Model components
  - Landuse, soils, slope, distance, precipitation
  - Watershed tillage practices, existing BMPs and existing detention
  - Calibrated to historical USGS water quality data
    - Mound Road (upper Jackson Creek)
    - Highway 50 (lower Jackson Creek)
  - Outputs/Results
    - Sediment and Phosphorus Loading Estimates (Annual total and per acre loading)

# USGS Loading Estimates

## Annual Average Loadings (USGS)

(used for model calibration)

2007 through 2014 (no data in 2010, 2011 and 2012)

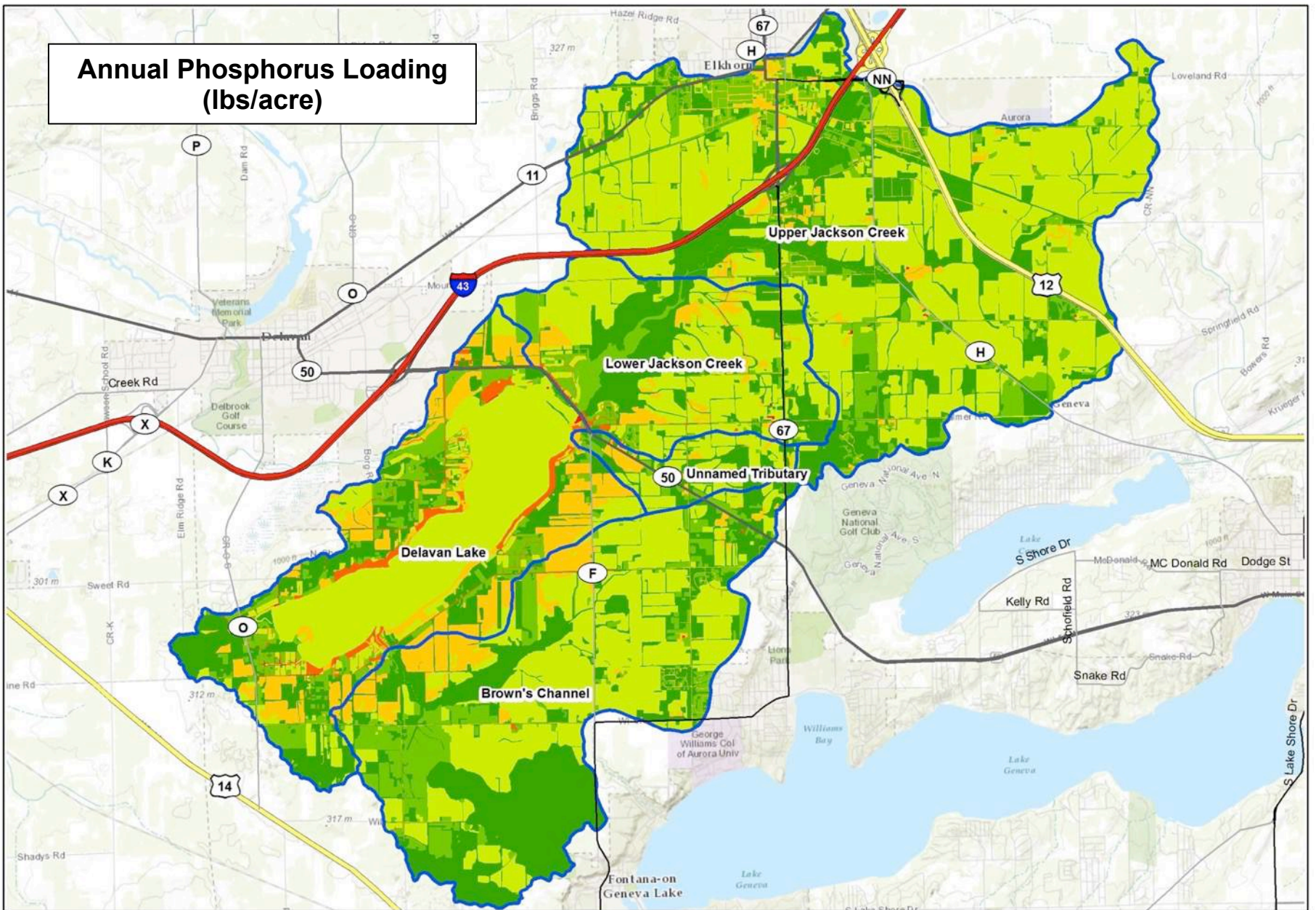
Mound Road (Upper Jackson Creek)

<u>Flow CFS</u>	<u>SS Tons</u>	<u>TP Lbs.</u>
6,176.41	1,287.95	862.84

Highway 50 (Lower Jackson Creek)

<u>Flow CFS</u>	<u>SS Tons</u>	<u>TP Lbs.</u>
8,743.31	980.66	823.33

# Annual Phosphorus Loading (lbs/acre)



**Legend**

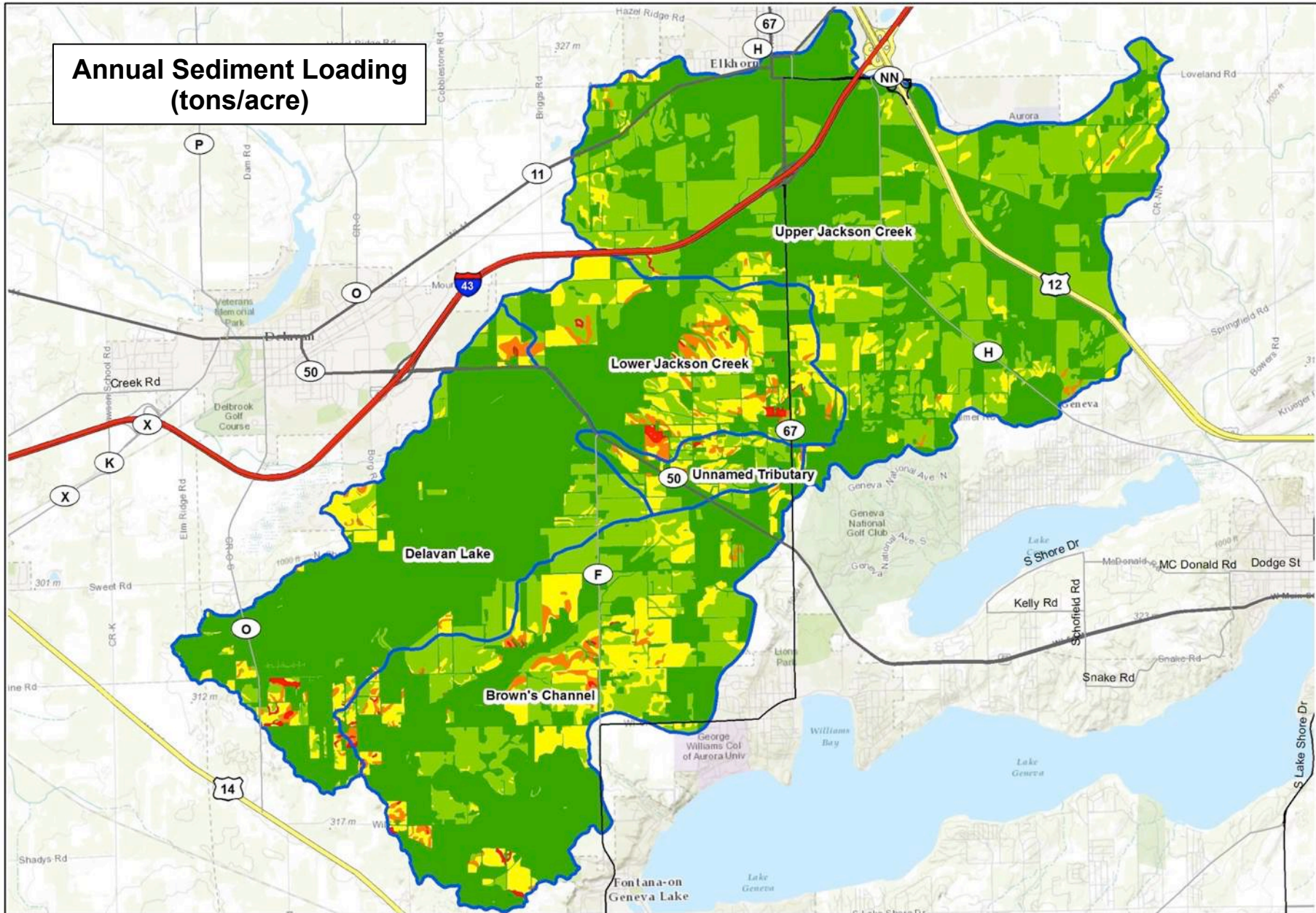
Annual Phosphorus Load (lbs/ac)	Color
0.0002 - 0.05	Green
0.05 - 0.1	Light Green
0.1 - 0.2	Yellow-Green
0.2 - 0.4	Yellow
0.4 - 0.9	Orange
0.9 - 1.9	Red
Watershed Boundary	Blue Line

**Delavan Lake Watershed  
Annual Phosphorus Loading (lbs/ac)**

0 0.5 1 2 3 4 Miles



# Annual Sediment Loading (tons/acre)



## Legend

- Watershed Boundary
- 0.000008 - 0.2
- 0.2 - 0.7
- 0.7 - 1.5
- 1.5 - 3.3
- 3.3 - 9.3



Bertel & Associates, LLC  
Watershed Assessment & Planning, LLC

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CONSULTING

# Estimated Loadings By Sub-Watershed

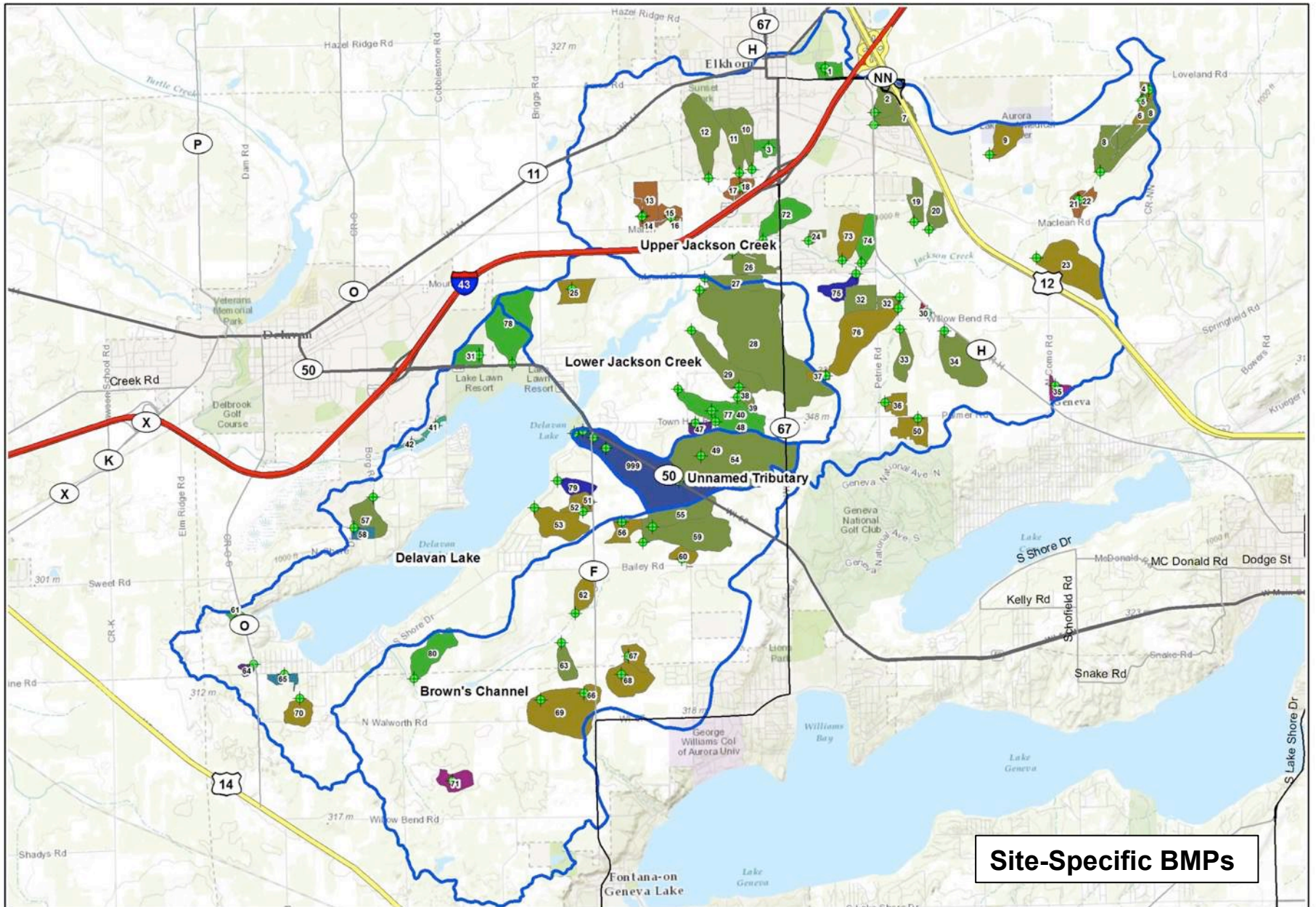
Subwatershed Name	Watershed Area (Acres)	Percent of Total	Annual Runoff (acre-feet)	Phosphorus Load (lbs/yr)	Percent of Total	Sediment Load (tons/yr)	Percent of Total
Brown's Channel	6,393	24%	3,399	697	21%	2,146	30%
Delavan Lake	5,598	21%	6,858	936	28%	975	14%
Lower Jackson Creek	3,107	12%	2,356	404	12%	1,520	21%
Unnamed Tributary	705	3%	415	90	3%	288	4%
Upper Jackson Creek	10,512	40%	7,561	1,213	36%	2,281	32%
<b>Grand Total</b>	<b>26,315</b>		<b>20,589</b>	<b>3,340</b>		<b>7,209</b>	

# Estimated Loadings by Landuse

Landuse Category	Acres	Annual Runoff (acre-feet)	Phosphorus Load (lbs/yr)	Per Acre (lbs/yr)	Sediment Load (tons/yr)	Per Acre (tons/yr)
<b>Cropland; Row Crops</b>	<b>13,351</b>	<b>8,656</b>	<b>2,090</b>	<b>0.16</b>	<b>7,016</b>	<b>0.53</b>
<b>Open Water - Pond</b>	<b>2,053</b>	<b>5,380</b>	<b>332</b>	<b>0.16</b>	<b>10</b>	<b>0.005</b>
<b>Residential Single-Family Low Density</b>	<b>1,141</b>	<b>528</b>	<b>138</b>	<b>0.12</b>	<b>27</b>	<b>0.02</b>
<b>Freeway</b>	<b>294</b>	<b>606</b>	<b>101</b>	<b>0.34</b>	<b>23</b>	<b>0.08</b>
<b>Local Street</b>	<b>267</b>	<b>553</b>	<b>94</b>	<b>0.35</b>	<b>21</b>	<b>0.08</b>
<b>Residential Single-Family Med. Density</b>	<b>707</b>	<b>481</b>	<b>92</b>	<b>0.13</b>	<b>27</b>	<b>0.04</b>
Pasture	959	383	83	0.09	9	0.01
Parking	210	330	49	0.24	11	0.05
Forest	2,053	548	46	0.02	9	0.004
Urban Open Space	1,145	453	40	0.03	3	0.003
Retail	119	152	38	0.32	9	0.07
Wholesaling and Storage	139	172	24	0.18	6	0.04
Farm Building	226	146	23	0.1	6	0.02
Golf Course	124	54	19	0.15	3	0.02
Rural Open Space	1,182	294	18	0.02	1	0.001
Arterial Road	78	129	18	0.23	4	0.05
Government and Institutional	94	117	18	0.19	4	0.05
Multi-Family Low Rise	96	97	17	0.17	5	0.06
Recreation - Park	200	68	13	0.07	1	0.005
Orchards and Nursery	220	68	13	0.06	2	0.01
Open Space - Road	73	45	10	0.13	1	0.01
Sod Farm	61	35	9	0.15	1	0.01
Wetland	1,187	942	8	0.01	0.35	0.0003
Manufacturing	52	73	8	0.15	3	0.05
Feed Area	12	11	8	0.65	1	0.05
Recreation - Cultural	67	73	7	0.11	2	0.03
Miscellaneous (see Report)	-	-	-	-	-	-
<b>Total (Annual Average)</b>	<b>26,315</b>	<b>20,590</b>	<b>3,340</b>	<b>0.13</b>	<b>7,210</b>	<b>0.27</b>

# Watershed BMPs





## Site-Specific BMPs

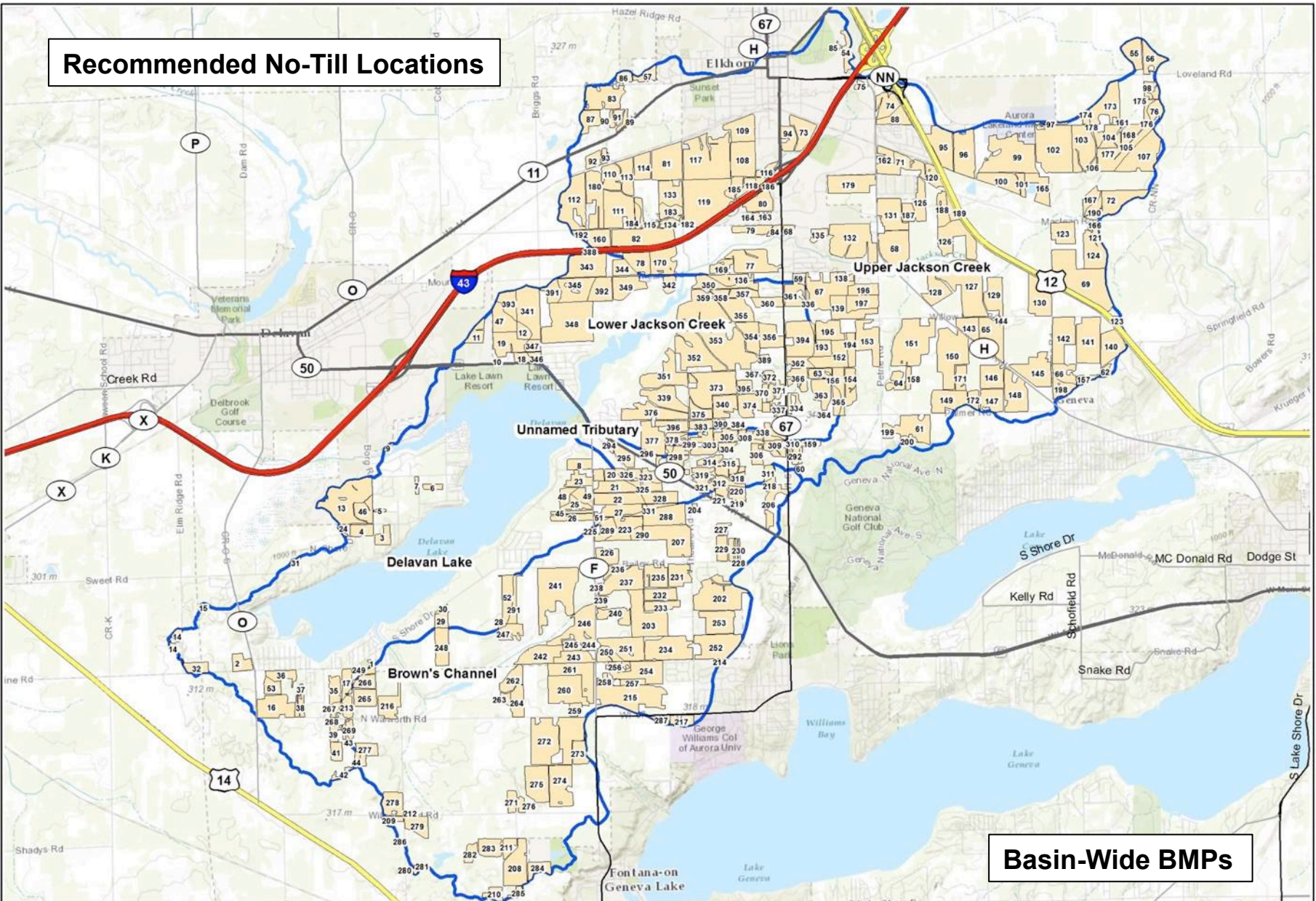
- Legend**
- BMP Location
  - Watershed Boundary
  - Rain Gardens
  - Field Border
  - Various
  - Filter Strip
  - Grade Control
  - WASCB
  - Grass Waterway
  - Wetland
  - Blind Inlet
  - Livestock Management
  - Detention

### Delavan Lake Watershed Recommended BMPs





# Recommended No-Till Locations

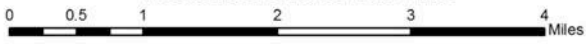


## Basin-Wide BMPs

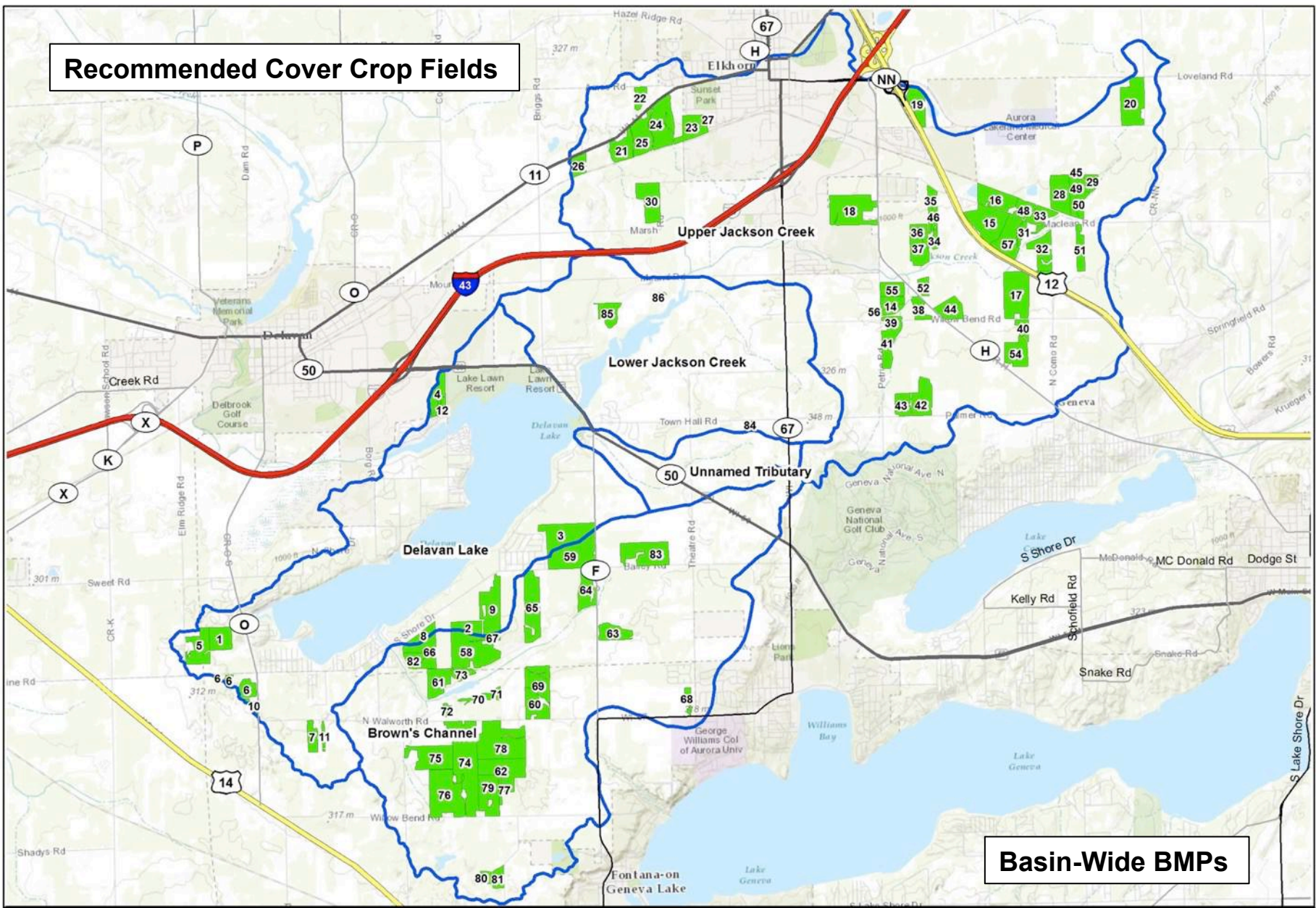
### Legend

- No Till Needed
- Watershed Boundary

### Delavan Lake Watershed Recommended No-Till



# Recommended Cover Crop Fields



## Basin-Wide BMPs

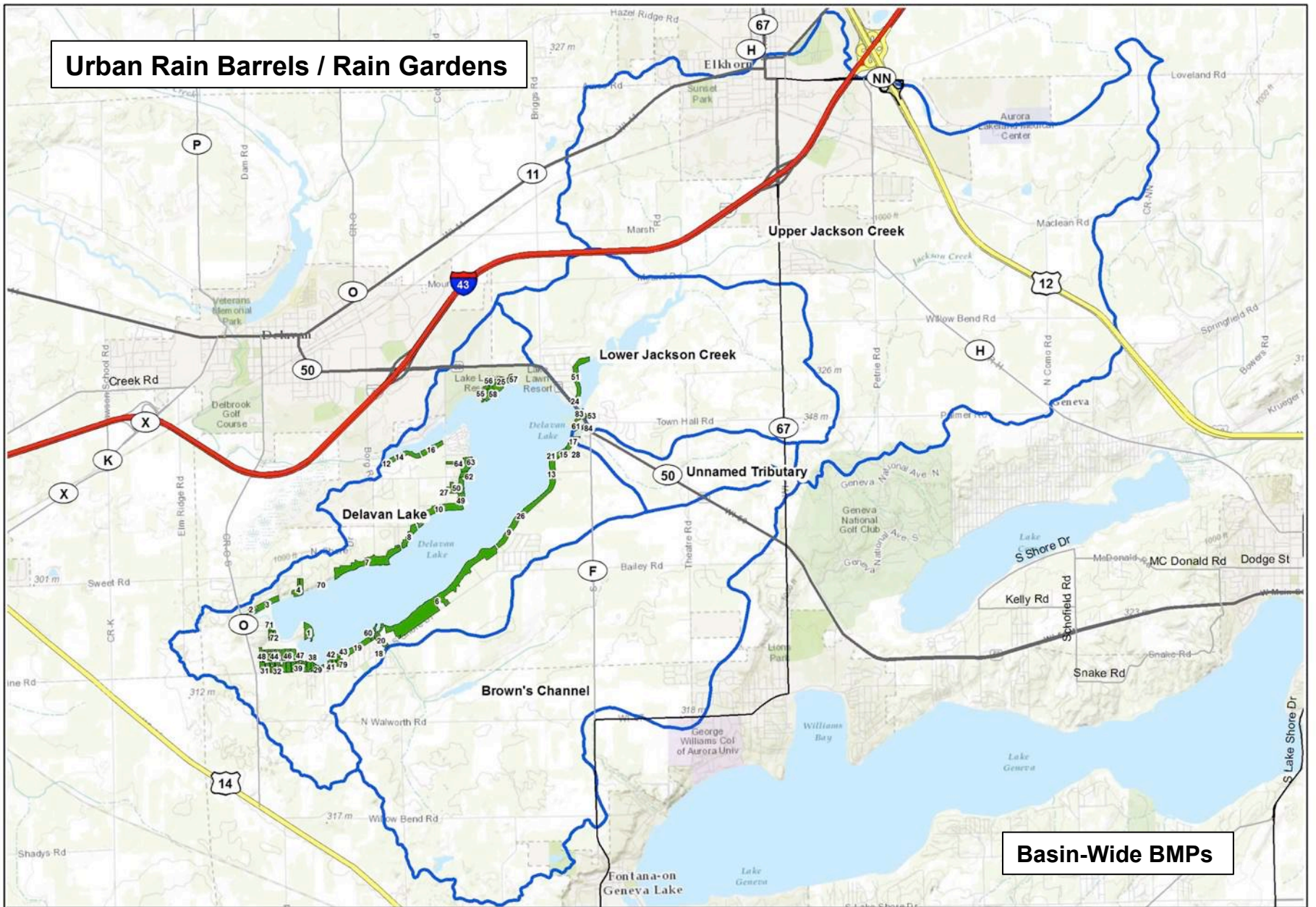
### Legend

- Watershed Boundary
- Cover Crops Needed

### Delavan Lake Watershed Cover Crop Fields



# Urban Rain Barrels / Rain Gardens



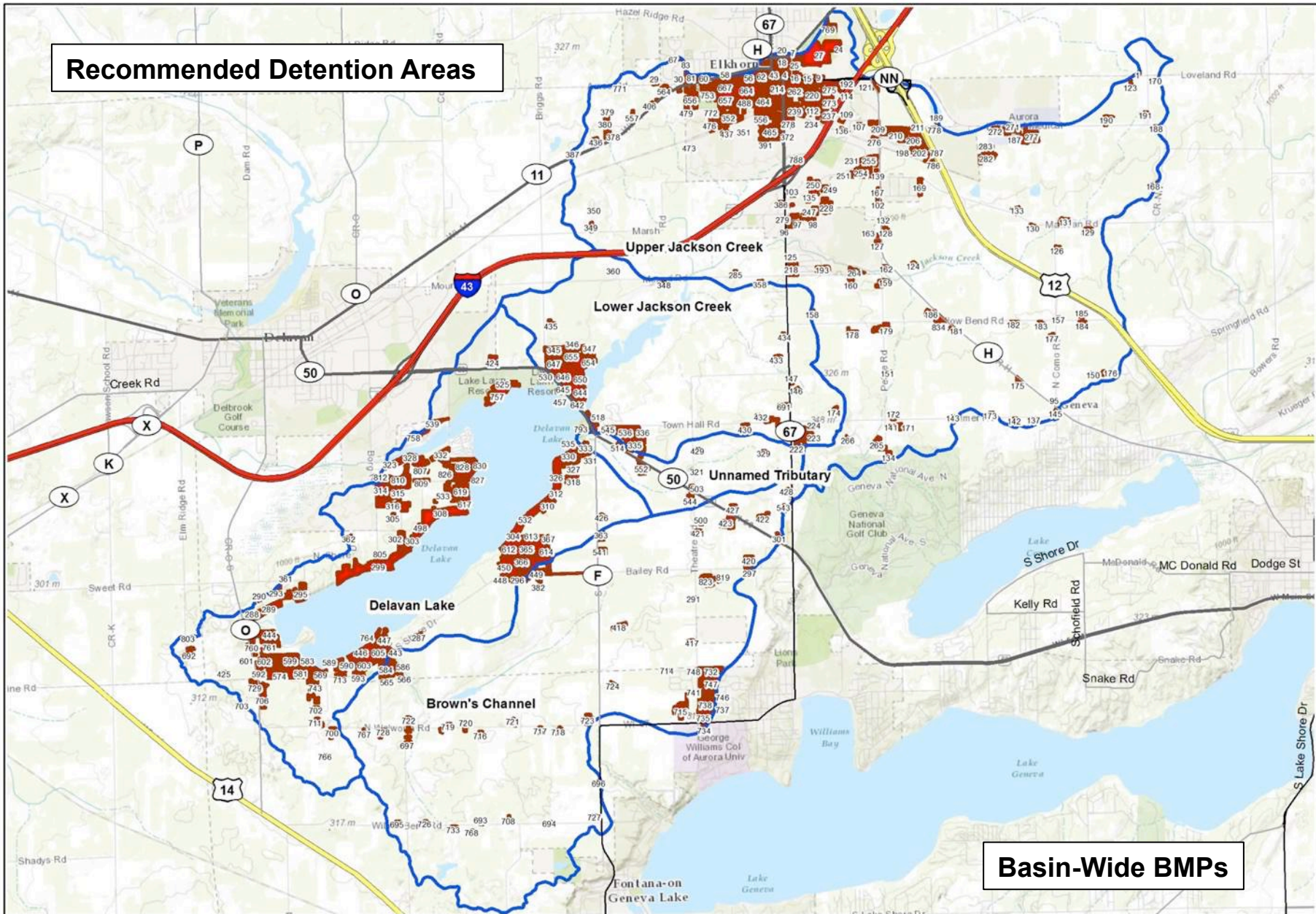
# Basin-Wide BMPs

- Legend**
- Rain Barrel & Rain Garden Needed
  - Watershed Boundary

## Delavan Lake Watershed Urban Rain Barrels & Rain Gardens



# Recommended Detention Areas

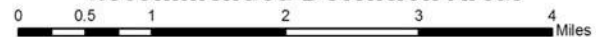


# Basin-Wide BMPs

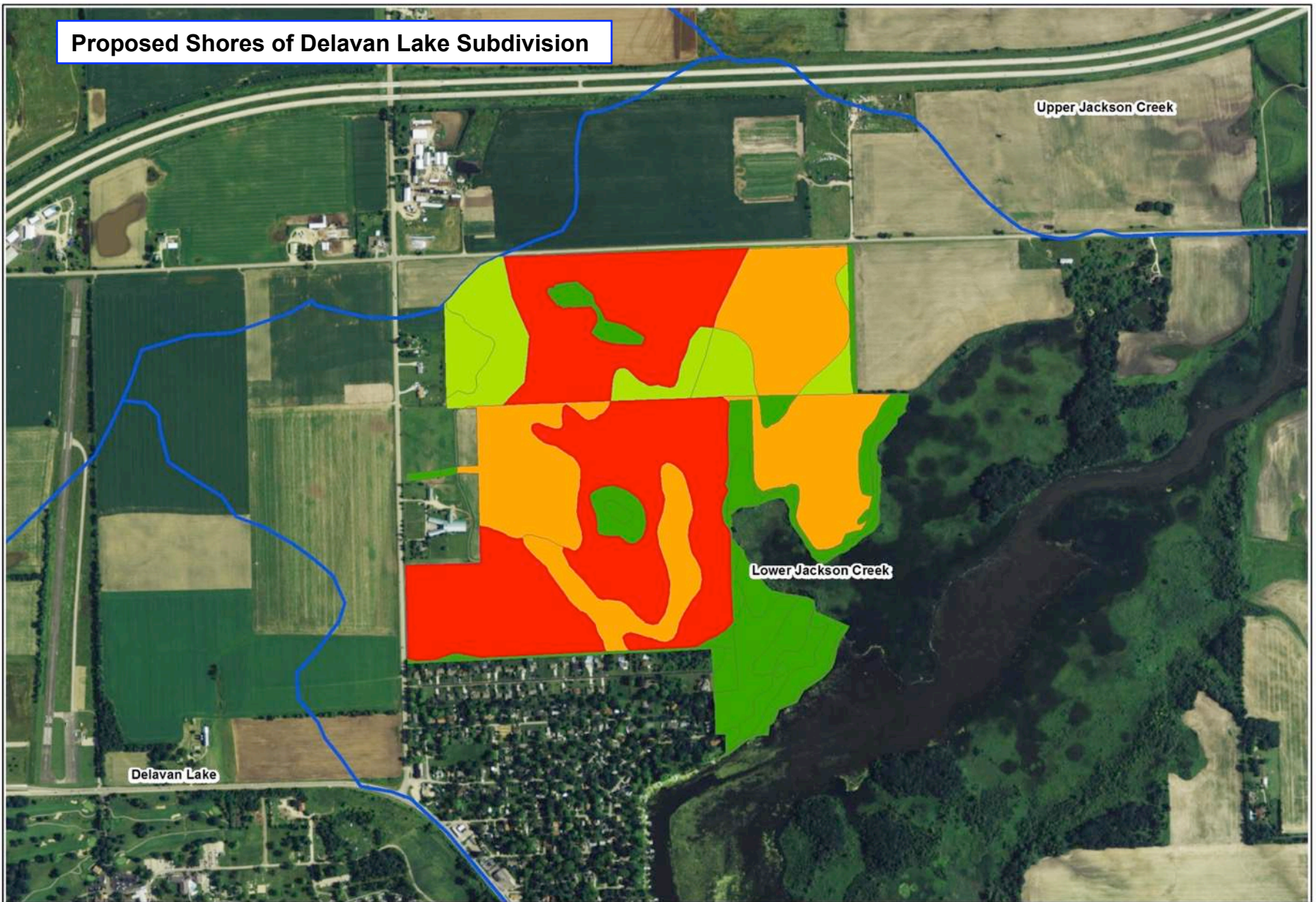
## Legend

- Watershed Boundary
- Detention Needed

## Delavan Lake Watershed Recommended Detention Areas



# Proposed Shores of Delavan Lake Subdivision



**Legend**

Phosphorus (lbs/yr)

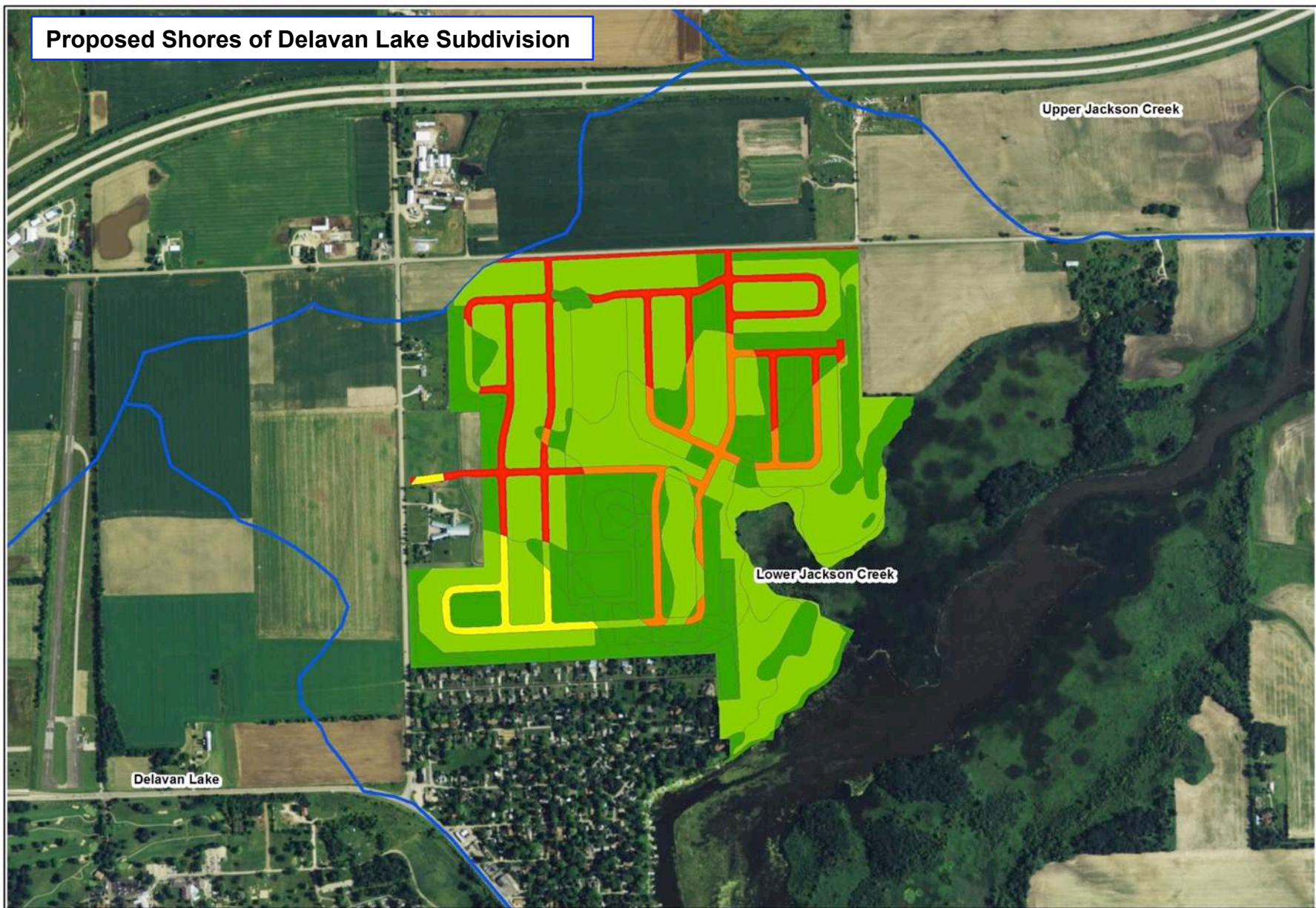
- 0 - 0.68
- 0.68 - 2.4
- 2.4 - 4.7
- 4.7 - 10.2
- Watershed Boundary

**Shodeen Development**  
**Pre-Development Phosphorus Loading (lbs/yr)**

0 0.075 0.15 0.3 0.45 0.6 Miles



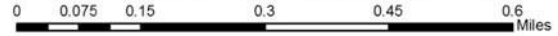
# Proposed Shores of Delavan Lake Subdivision



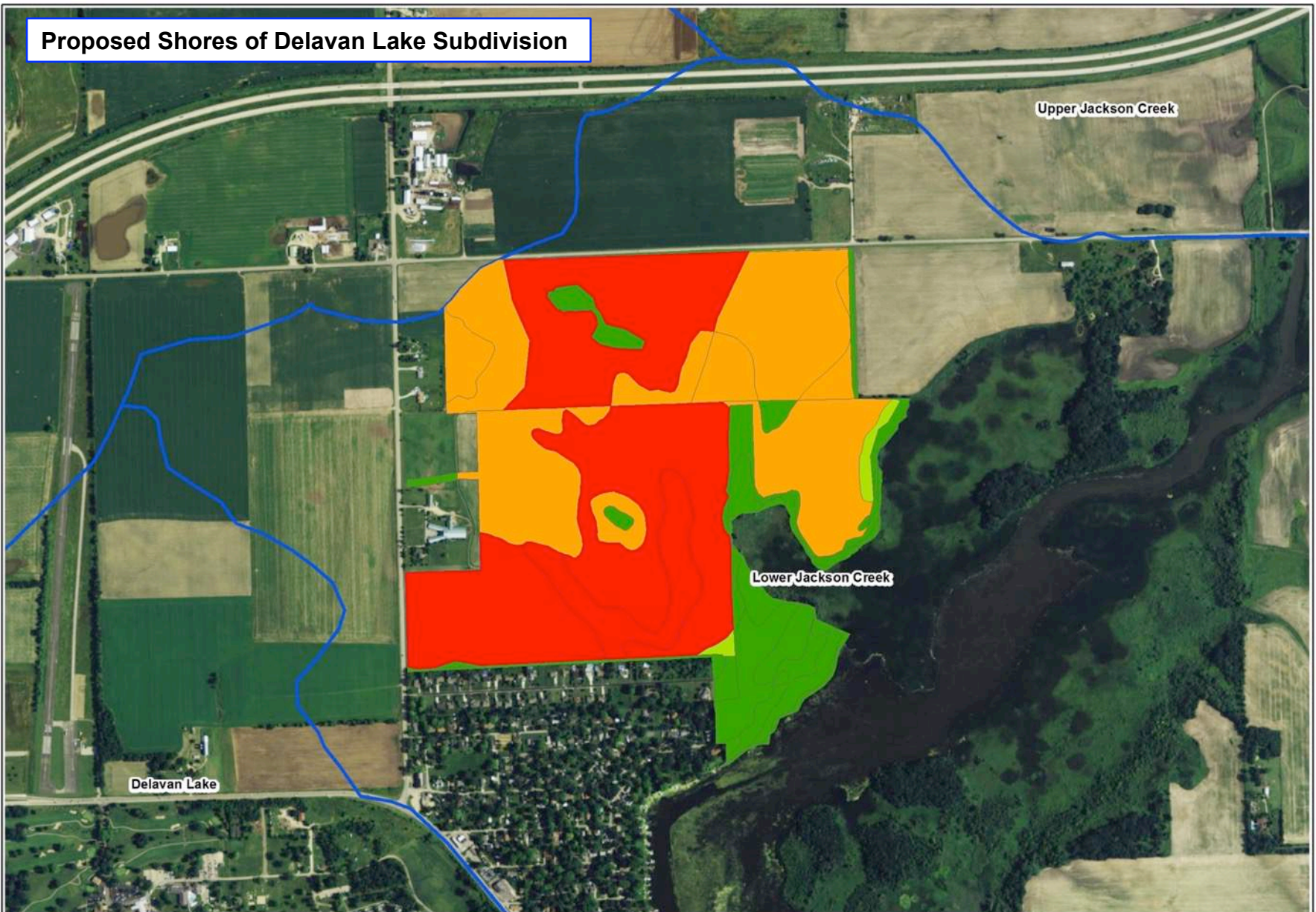
**Legend**

Phosphorus Load (lbs/yr)	0.6 - 1.3
0 - 0.2	1.3 - 2.7
0.2 - 0.6	2.7 - 4.8
	Watershed Boundary

## Shodeen Development Post-Development Phosphorus Loading (lbs/yr)



# Proposed Shores of Delavan Lake Subdivision



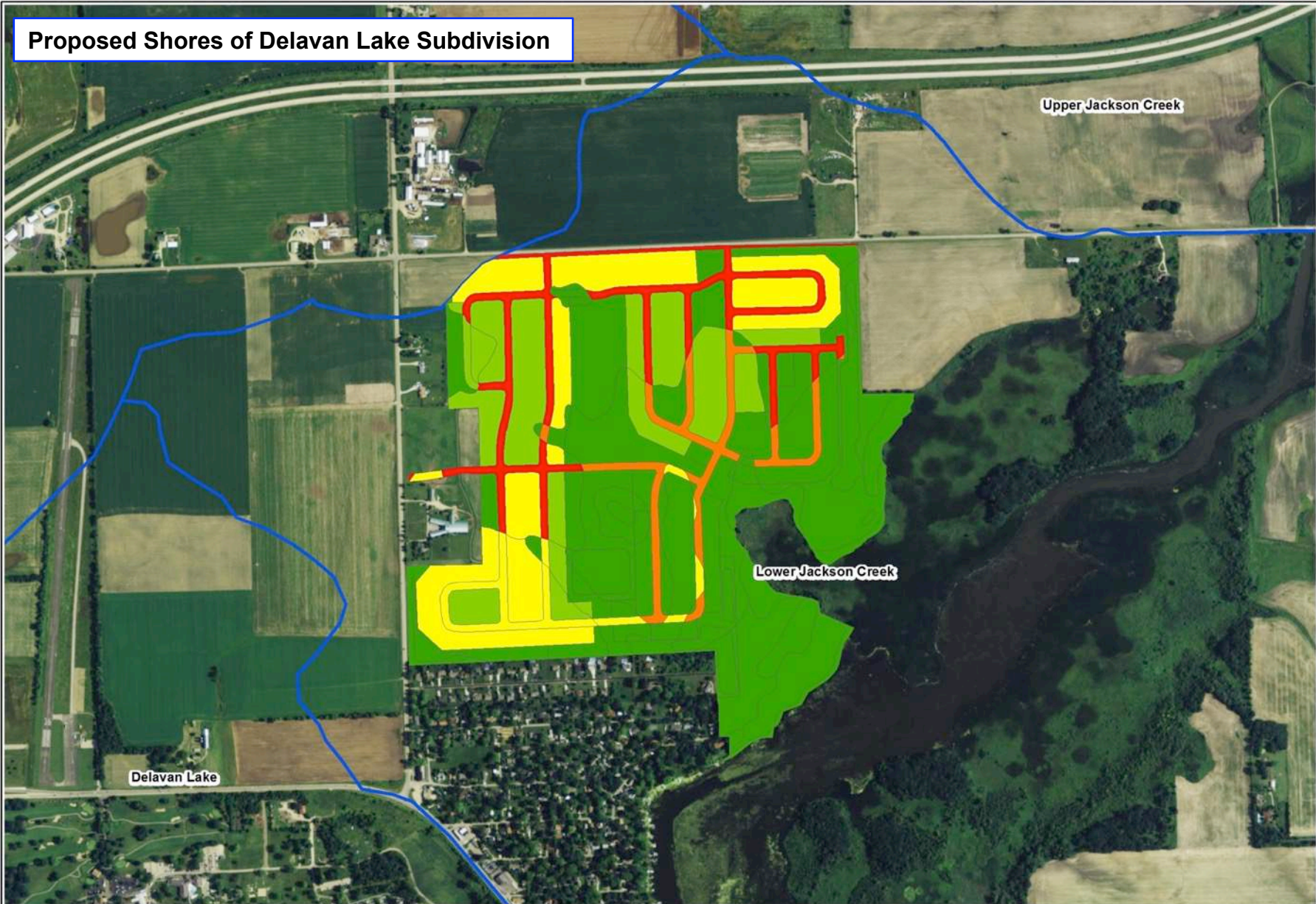
## Legend

Sediment Load (tons/yr)	1.2 - 16.3
0 - 0.2	16.3 - 31.5
0.2 - 1.2	Watershed Boundary

## Shodeen Development Pre-Development Sediment Loading (tons/yr)



# Proposed Shores of Delavan Lake Subdivision



**Legend**

Sediment Load (tons/yr)	Color	Range (tons/yr)
Light Green	Light Green	0 - 0.02
Medium Green	Medium Green	0.02 - 0.08
Orange	Orange	0.25 - 0.54
Red	Red	0.54 - 0.97
Blue Line	Blue Line	Watershed Boundary

## Shodeen Development Post-Development Sediment Loading (tons/yr)





# Shores of Delavan Lake Nutrient Loading Estimates

Current annual load:

51.5lbs phosphorus and 178.4 tons sediment

Annual Load after Development:

19.07lbs P and 3.8 tons sediment

Total Current Annual Load for Lower Jackson Creek  
404 lbs. Phosphorus; 1,520 tons Sediment

Estimated Annual Load Reduction:

32.4 lbs. Phosphorus - 63% Reduction

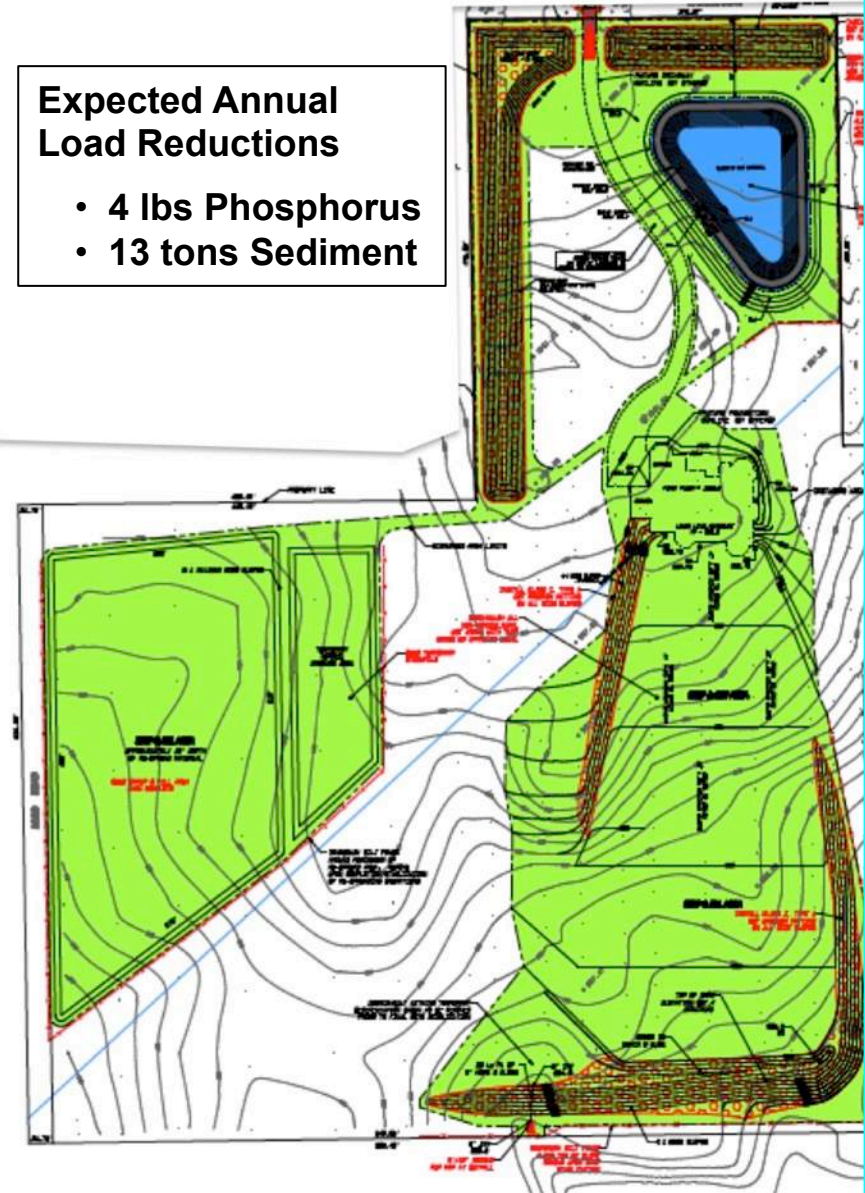
174.6 tons Sediment – 98% Reduction

# Proposed Baker Parcel Development

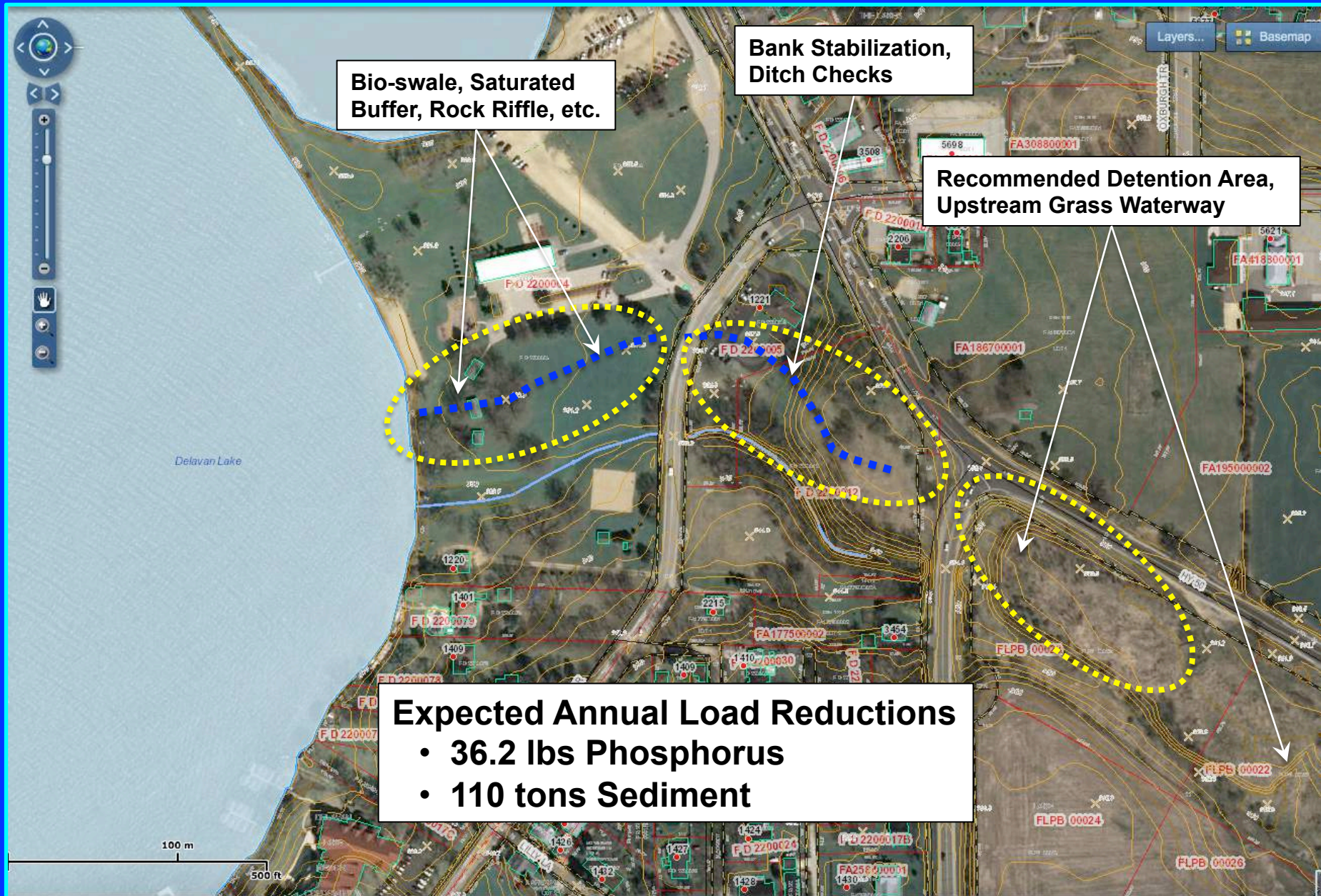


## Expected Annual Load Reductions

- 4 lbs Phosphorus
- 13 tons Sediment



# Recommended Town Park BMPs



# Estimates of Probable Cost and Relative Priority Basin-Wide BMPs

BMP Description (and relative priority)	Number of Units	Unit Cost	Estimated Cost (assume 10 Years)
1. No-Till Farming	9,886 acres	\$15/ac/yr/10 yr	\$1,482,900/10 yr.
2. Cover Crops	2,824 acres	\$45/ac/yr/10 yr	\$1,270,800/10 yr.
3. Rain Gardens, Bioswales	221 acres	\$3,500 ea/4/ac	\$773,500
4. Rain Barrels /Rock Infiltration	221 acres	\$80 ea/8 per acre	\$141,440
5. Detention	1,595 acres	Det. Pond if >5 ac.	\$3,600,000
6. Permeable Pavement	132 acres	\$100,000/acre	\$13,200,000
<b>Total Basin Wide BMP Costs</b>			<b>\$20,468,640</b>

# Estimates of Probable Cost - Site-Specific BMPs

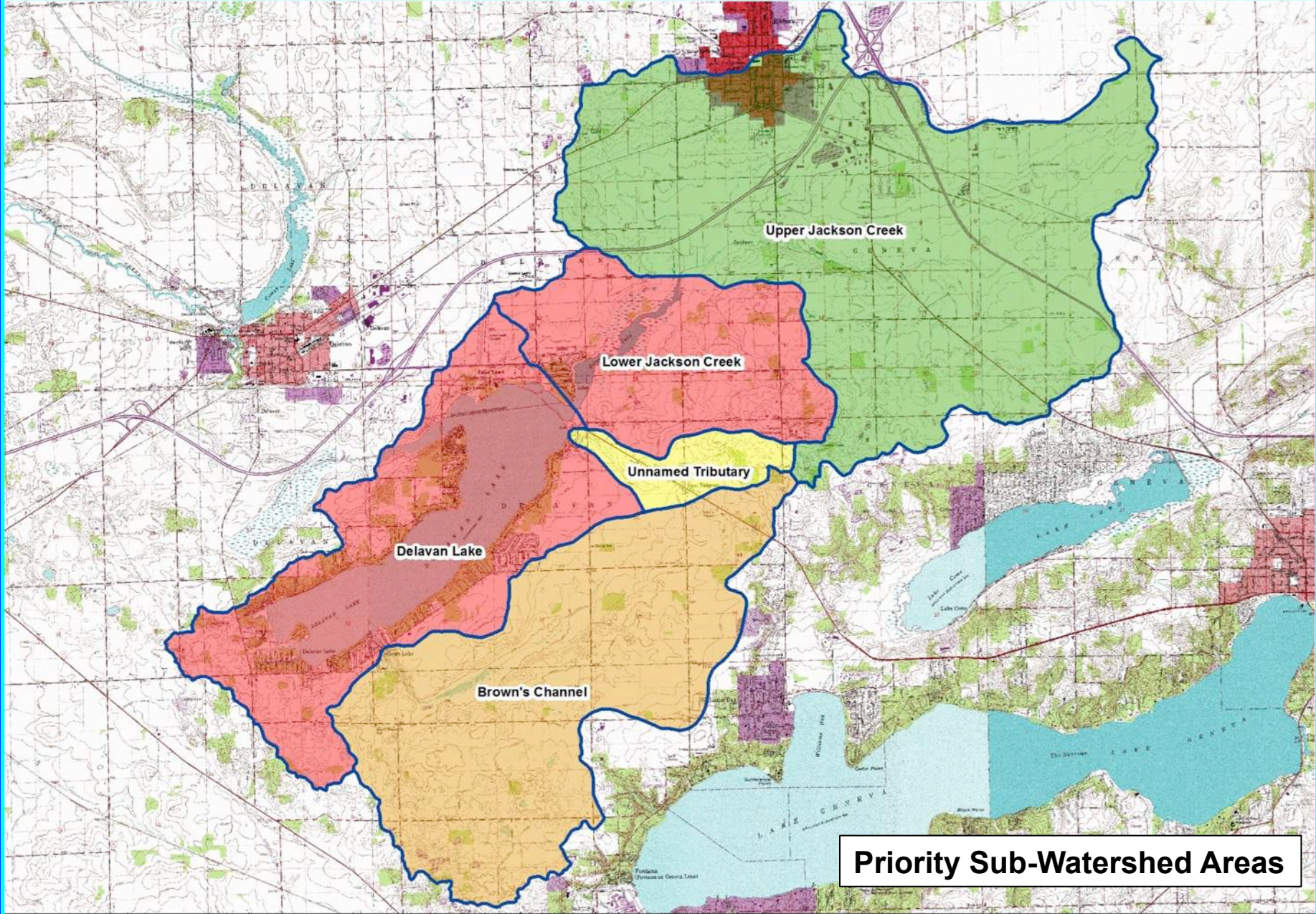
BMP Number	BMP Type	Description	Units and Quantities	Acres Treated	Phosphorus Reduction (lbs/yr)	Sediment Reduction (tons/yr)	Estimated Cost
1	Detention	Runoff Control	2 Basins, 5 Rain Gardens	28.7	1.47	0.51	\$97,500
2	Grass Waterway	Wetland	2,200 LF, 3.0 and 1.6 ac.	55.8	17.32	20.97	\$16,500
3	Detention	Runoff Control	1 Basin, 2 Rain Gardens 1 Bioswale	24.1	0.80	0.26	\$50,500
4	Wetland	0.9 ac.	1	12.3	0.70	6.07	\$4,700
5	Wetland	0.6 ac.	1	3.0	0.18	0.90	\$3,800
6	Wetland	0.5 ac.	1	14.0	0.73	3.88	\$3,500
7	Grass Waterway	2,000 LF	2.8 ac.	42.2	12.02	5.23	\$15,000
8	Grass Waterway	3,550 LF	4.9 ac.	121.5	19.06	43.44	\$26,625
9	Wetland	2.3 ac.	1	55.0	3.04	3.80	\$8,900
10	Grass Waterway	2,100 LF	2.9 ac.	60.0	10.74	13.44	\$15,750
11	Grass Waterway	2,400 LF	3.3 ac.	55.6	11.70	13.48	\$18,000
12	Grass Waterway	4,800 LF	6.6 ac.	122.8	26.13	27.01	\$36,000
13	Filter Strip	2,650 LF	3.0 ac.	50.2	3.21	2.76	\$2,100
14	Filter Strip	2,650 LF	1.8 ac.	12.3	1.00	2.58	\$1,260
15	Filter Strip	1,400 LF	1.0 ac.	18.2	1.44	2.39	\$700
16	Filter Strip	1,400 LF	1.0 ac.	4.16	0.37	0.50	\$700
17	Filter Strip	1,600 LF	1.1 ac.	16.7	1.26	2.97	\$770
18	Filter Strip	1,900 LF	1.3 ac.	12.8	0.96	2.15	\$910

# Site-Specific BMPs Prioritized by Cost & Benefit

BMP Priority	BMP Number	BMP Type	Total Estimated Cost	Phos. Reduction Cost (per lb./year for 10 years)	Sedim. Reduction Cost (per ton/year for 10 years)	Avg Phos. and Sedim. Reduction Cost (per year for 10 yrs)
1	54	Grass Waterway	\$6,000	\$34.13	\$17.78	\$25.95
2	57	Grass Waterway	\$21,000	\$41.99	\$32.80	\$37.39
3	15	Filter Strip	\$700	\$48.61	\$29.29	\$38.95
4	65	Field Border	\$1,610	\$73.18	\$6.40	\$39.79
5	25	Wetland	\$3,000	\$70.09	\$13.57	\$41.83
6	17	Filter Strip	\$770	\$61.11	\$25.93	\$43.52
7	40	Grass Waterway	\$4,500	\$53.64	\$33.43	\$43.53
8	29	Grass Waterway	\$16,500	\$56.45	\$39.47	\$47.96
9	47	WASCB	\$19,500	\$58.09	\$46.71	\$52.40
10	58	Field Border	\$1,820	\$92.39	\$14.72	\$53.56
11	19	Filter Strip	\$1,260	\$88.11	\$40.51	\$64.31
12	32	Grass Waterway	\$9,750	\$86.21	\$47.06	\$66.63
13	18	Filter Strip	\$910	\$94.79	\$42.33	\$68.56
14	22	Filter Strip	\$980	\$85.22	\$52.97	\$69.10
15	27	Grass Waterway	\$15,750	\$80.32	\$60.48	\$70.40
16	13	Filter Strip	\$2,100	\$65.42	\$76.09	\$70.75
17	21	Grass Waterway	\$12,375	\$72.12	\$72.24	\$72.18
18	67	Wetland	\$3,000	\$126.05	\$21.69	\$73.87
19	70	Wetland	\$3,500	\$132.58	\$16.53	\$74.55
20	56	Wetland	\$3,800	\$116.56	\$33.60	\$75.08






# Estimates of Probable Cost and Relative Priority Supplemental Nonpoint Source Management Measures

Relative Priority	Management Measure	Quantity	Total Cost
1	Mound Road Pond Assessment	1	\$8,000 to \$10,000
2	Mound Road Pond Maintenance (~ 8 to 10 yr. cycle)	1	\$400,000 to \$500,000
3	Brown's Chan. Sediment Removal (~8 to 10 yr. cycle)	1	\$80,000 to \$100,000
4	Brown's Chan. Stabilization (Upstream of Road)	1	\$60,000 to \$80,000
5	North Inlet Carp Removal (for 10 yrs at \$5K-\$10K/yr)	1	\$50,000 to \$100,000
6	Watershed Plan Coordinator (Part Time, ~ 10 years)	1	\$300,000 to \$400,000
7	Informational Brochure for Public Outreach	1	\$4,000 to \$6,000
8	Gully Erosion Assessment	1	\$6,000 to \$8,000
9	Brown's Chan. Wetland Pond Enhancement	1	\$50,000 to \$60,000
10	Stream Bank Stabilization	1	\$30,000 to \$40,000
11	Water Quality Monitoring (Annual, for 10 years)	1	\$250,000 to \$300,000
12	North Inlet Dredging Area Survey (every 5 years)	1	\$6,000 to \$8,000
13	Delavan Lake Shoreline Assessment	1	<u>\$6,000 to \$8,000</u>
	<b>Grand Total</b>		<b>\$1,250,000 to \$1,620,000</b>

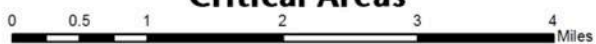


**Priority Sub-Watershed Areas**

**Legend**

 Watershed Boundary	 2
<b>Priority Area Tier</b>	 3
 1 - High Priority	 4 - Moderate Priority

**Delavan Lake Watershed  
Critical Areas**



**Born & Associates, LLC**  
  
**NORTHWATER**  
 CONSULTING





# Implementation Milestones & Timeframe

## Years 1 - 2

Timeframe	Milestone
Years 1 - 2	<ul style="list-style-type: none"><li>• Complete Mound Road Pond Assessment</li><li>• Plan and Begin Mound Road Pond Maintenance</li><li>• Plan and Begin Brown's Channel Maintenance</li><li>• Hire Part-Time Watershed Plan Coordinator</li><li>• Begin Information, Education and Outreach Efforts</li><li>• Promote Healthy Lakes Initiative and Install Rain Gardens, Buffers, etc.</li><li>• Plan and Install Town Park BMPs</li><li>• Complete Gully Erosion Assessment</li><li>• Complete Delavan Lake Shoreline Assessment</li><li>• Conduct one-on-one communication with willing Landowners.</li><li>• Complete North Inlet Channel Survey</li><li>• Plan and Conduct North Inlet Carp Removal (Annual)</li><li>• Continue with Water Quality Monitoring</li></ul>

# Implementation Milestones & Timeframe

## Years 3 - 5

### Timeframe

### Milestone

### Years 3 - 5

- Continue with Information, Education and Outreach Efforts
- Install 25% of Site Specific BMPs (Grass Waterways, Wetlands, Detention, Etc.)
- Install 25% of Basin Wide BMPs (No-Till, Cover Crops, Detention, Etc.)
- Complete Mound Road Pond Maintenance
- Complete Brown's Channel Maintenance
- Continue with Water Quality Monitoring
- Continue Healthy Lakes Initiative and Install Rain Gardens, Buffers, etc.
- Conduct North Inlet Carp Removal Efforts (Annual)
- Continue to conduct one-on-one communication with willing landowners.

# Implementation Milestones & Timeframe

## Years 6 -10

### Timeframe

### Milestone

Years 6 - 10

- Continue with Information, Education and Outreach Efforts
- Install 50% of Site Specific BMPs (Grass Waterways, Wetlands, Detention, Etc.)
- Install 50% (or more) of Basin Wide BMPs (No-Till, Cover Crops, Detention, Etc.)
- Complete Mound Road Pond Surveys and Maintenance as required
- Complete Brown's Channel Surveys and Maintenance as required
- Continue with Water Quality Monitoring
- Conduct North Inlet Carp Removal (Annual)
- Continue Healthy Lakes Initiative and Install Rain Gardens, Buffers, etc.
- Continue to conduct additional one-on-one outreach with landowners

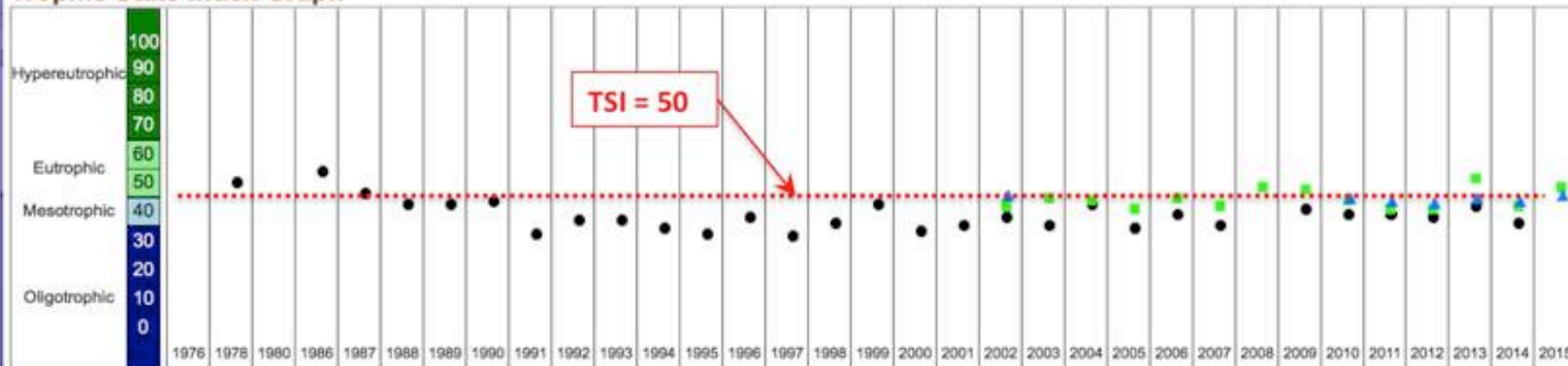
# Objectives, Responsible Parties, Technical/Financial Assistance

BMP/Objective	Responsible Party	Potential Technical Assistance and Funding Sources
<b>Basin Wide BMPs</b>		
<b>BMP:</b> Cover Crops <b>Objective:</b> Install 2,824 acres	Landowner/LURM/NRCS/ Town of Delavan	<b>Technical Assistance:</b> SWCD/NRCS/Consultants <b>Funding Mechanism:</b> WDNR/Town of Delavan/NRCS /Private funds
<b>BMP:</b> No-Till <b>Objective:</b> Convert 9,886 acres	Landowner/LURM/NRCS/ Town of Delavan	<b>Technical Assistance:</b> SWCD/NRCS/Consultants <b>Funding Mechanism:</b> WDNR/Town of Delavan/NRCS / Private funds
<b>BMP:</b> Rain Gardens/Bioswales <b>Objective:</b> Install Rain Gardens and Bioswales to reduce loadings	Landowner/LURM/DLSD/ Town of Delavan	<b>Technical Assistance:</b> NRCS/SWCD /Consultants <b>Funding Mechanism:</b> WDNR/Town of Delavan/NRCS /Private funds
<b>BMP:</b> Rain Barrels/Rock infiltration/ Shoreline Buffers/Diversions <b>Objective:</b> Promote Healthy Lakes Program & reduce nutrient delivery to lake	Landowner/LURM/DLSD/ Town of Delavan	<b>Technical Assistance:</b> SWCD/NRCS/Consultants <b>Funding Mechanism:</b> WDNR/Town of Delavan/NRCS /Private funds
<b>BMP:</b> Detention <b>Objective:</b> Install detention ponds, bioswales to reduce nutrient loads	Landowner/LURM/DLSD/ Town of Delavan	<b>Technical Assistance:</b> SWCD/NRCS/Consultants <b>Funding Mechanism:</b> WDNR/Town of Delavan/NRCS /Private funds
<b>BMP:</b> Permeable Pavement <b>Objective:</b> Installing permeable pavement to reduce urban runoff and nutrient delivery	Landowner/LURM/DLSD/ Town of Delavan	<b>Technical Assistance:</b> SWCD/NRCS/Consultants <b>Funding Mechanism:</b> WDNR/Town of Delavan/NRCS/Private funds
<b>Site-Specific BMPs</b>		
<b>BMP:</b> Grass Waterways <b>Objective:</b> Install grass waterways to prevent gully erosion & reduce nutrient delivery	Landowner/LURM/NRCS/ Town of Delavan	<b>Technical Assistance:</b> LURM/NRCS/Consultant <b>Funding Mechanism:</b> WDNR/Town of Delavan/NRCS/Private funds
<b>BMP:</b> Wetlands <b>Objective:</b> Install wetlands to trap and filter nutrients	Landowner/LURM/NRCS/ Town of Delavan	<b>Technical Assistance:</b> LURM/NRCS/Consultant <b>Funding Mechanism:</b> WDNR/Town of Delavan/NRCS/Private funds
<b>BMP:</b> Detention <b>Objective:</b> Install detention ponds, bioswales to reduce nutrient loads	Landowner/LURM/ Town of Delavan	<b>Technical Assistance:</b> LURM/NRCS/Consultant <b>Funding Mechanism:</b> WDNR/Town of Delavan/NRCS/Private funds
<b>BMP:</b> Filter Strips, Field Borders <b>Objective:</b> Install Filter Strips & Field Borders to reduce nutrient delivery	Landowner/LURM/NRCS/ Town of Delavan	<b>Technical Assistance:</b> LURM/NRCS/Consultant <b>Funding Mechanism:</b> WDNR/Town of Delavan/NRCS/Private funds

# Historical Summertime TSI

Source: WDNR

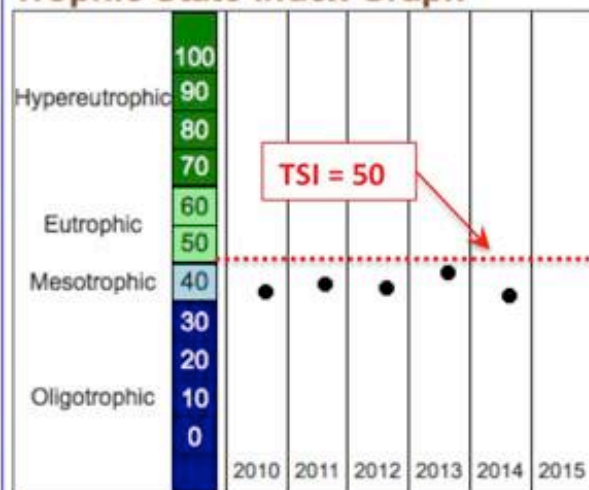
## Trophic State Index Graph



Monitoring Station: Delavan Lake - Deep Hole, Walworth County  
Past Summer (July-August) Trophic State Index (TSI) averages.

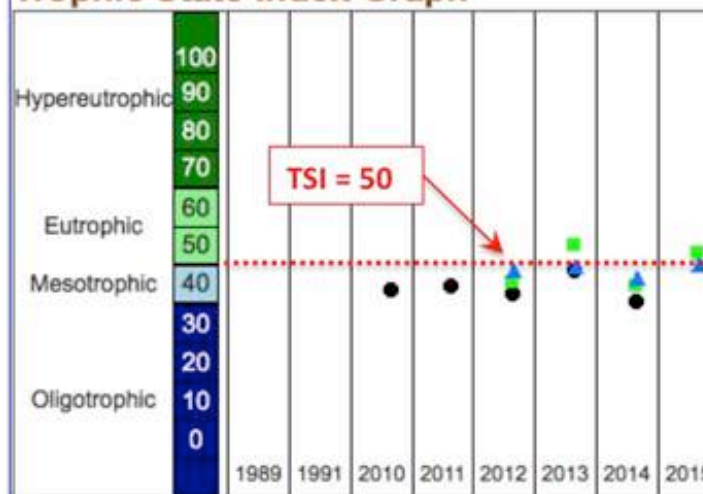
● = Secchi    ■ = Chlorophyll    ▲ = Total Phosphorus

## Trophic State Index Graph



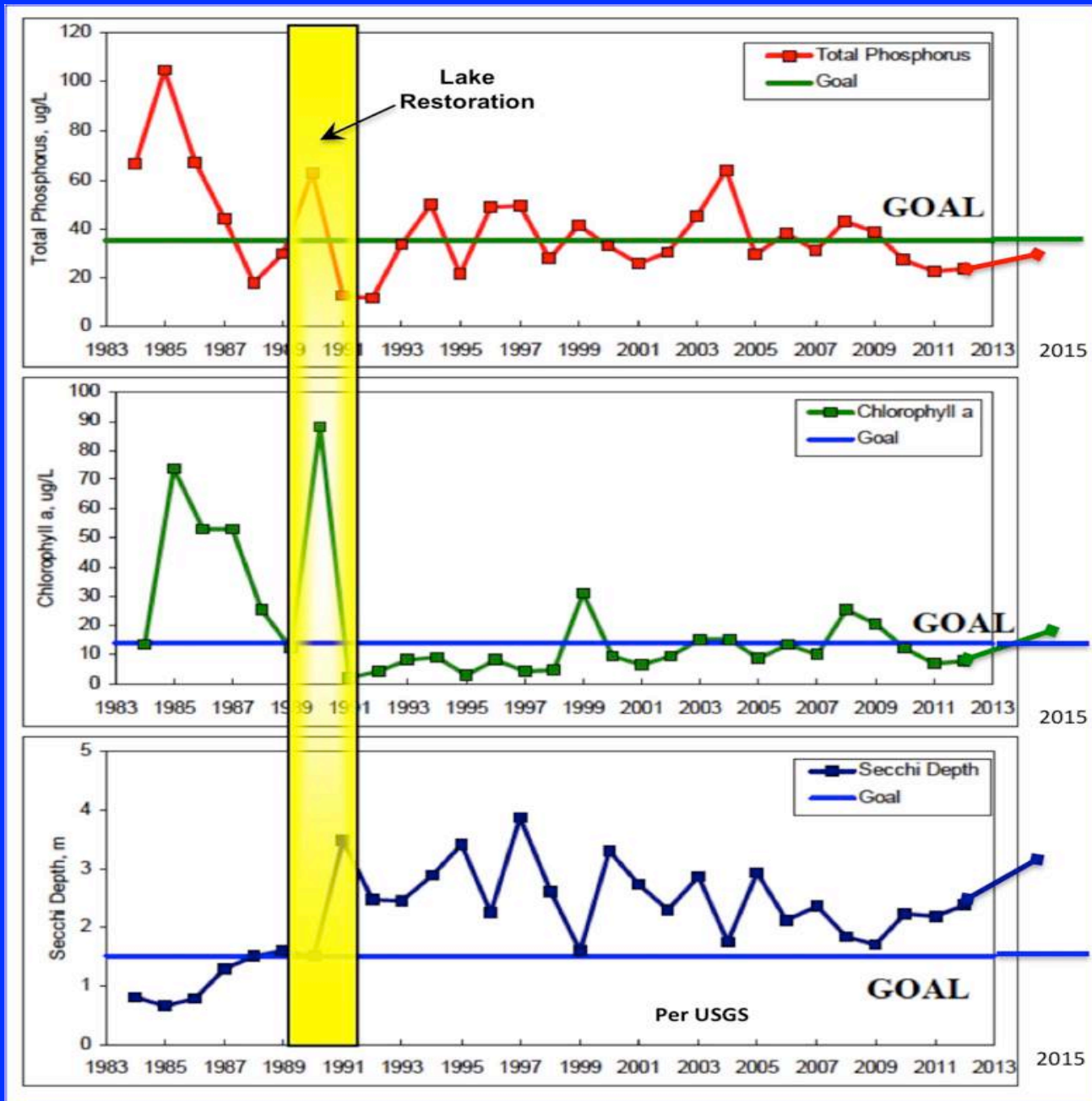
Monitoring Station: Delavan Lake - NE End

## Trophic State Index Graph

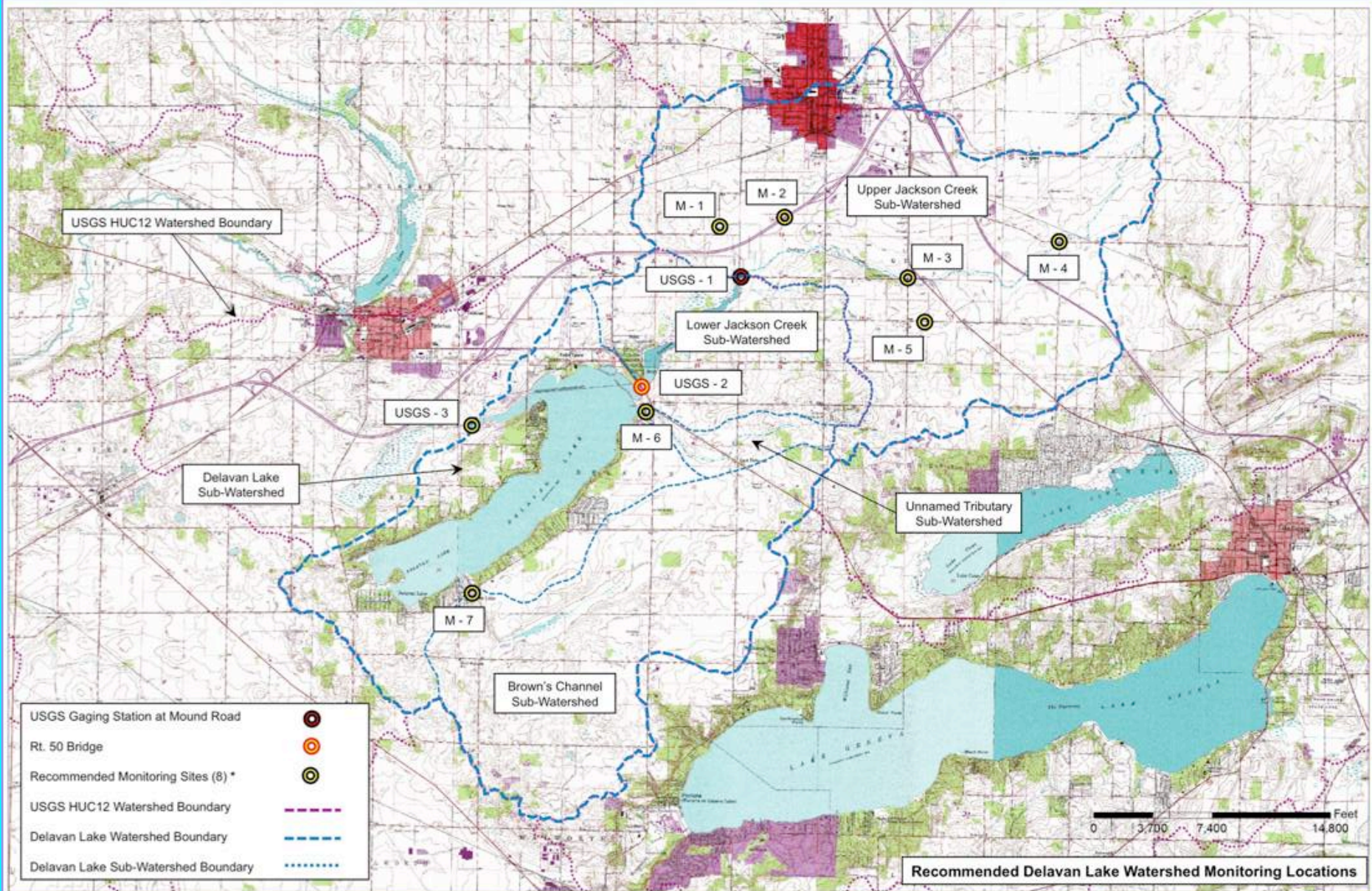


Monitoring Station: Delavan Lake - SW End of Lake

# Historical Mean Summertime Water Quality Goals



# Water Quality Monitoring



**Thank You  
Any Questions?**

