



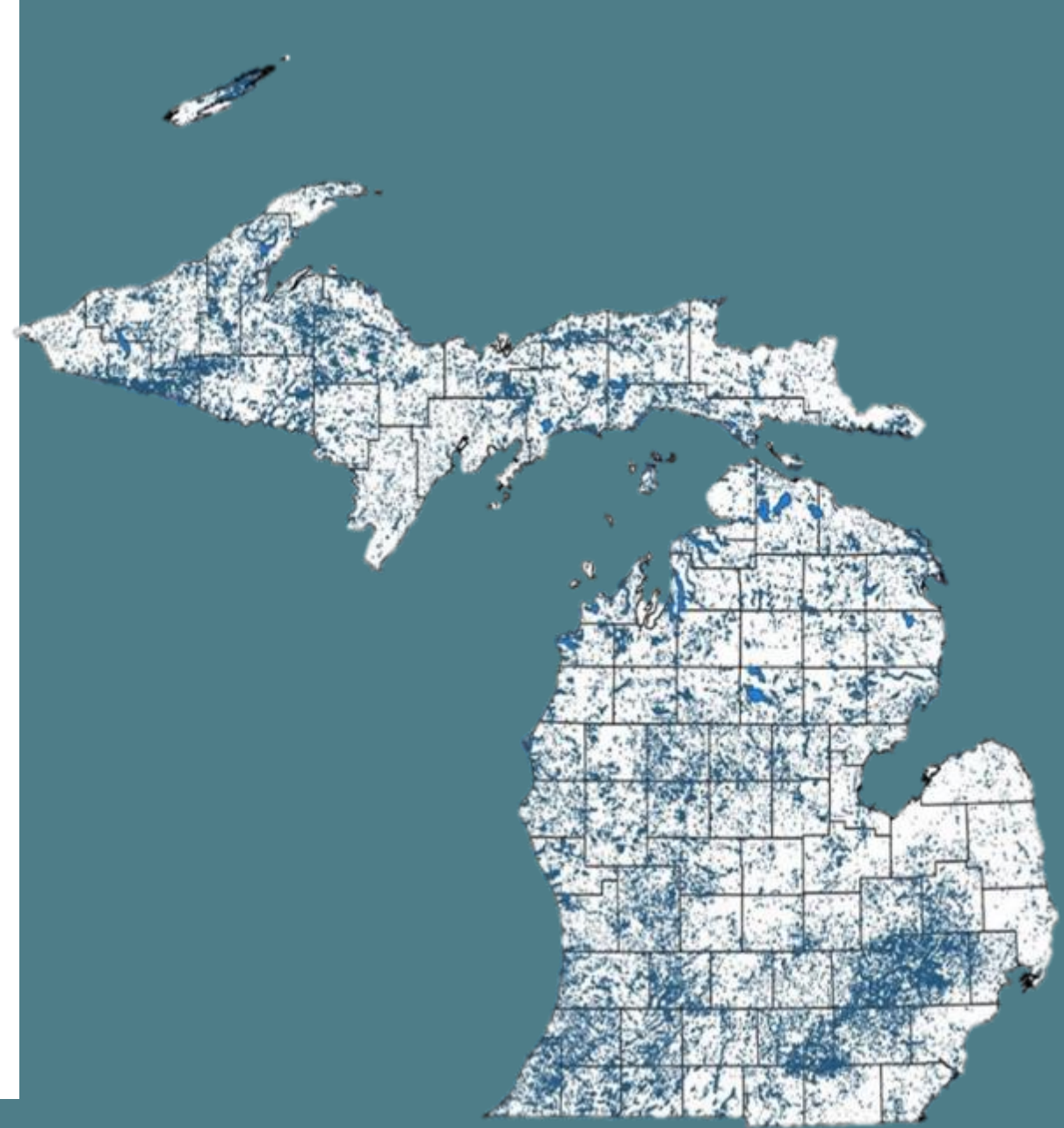
Watershed Planning for Protection

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Michigan Waters

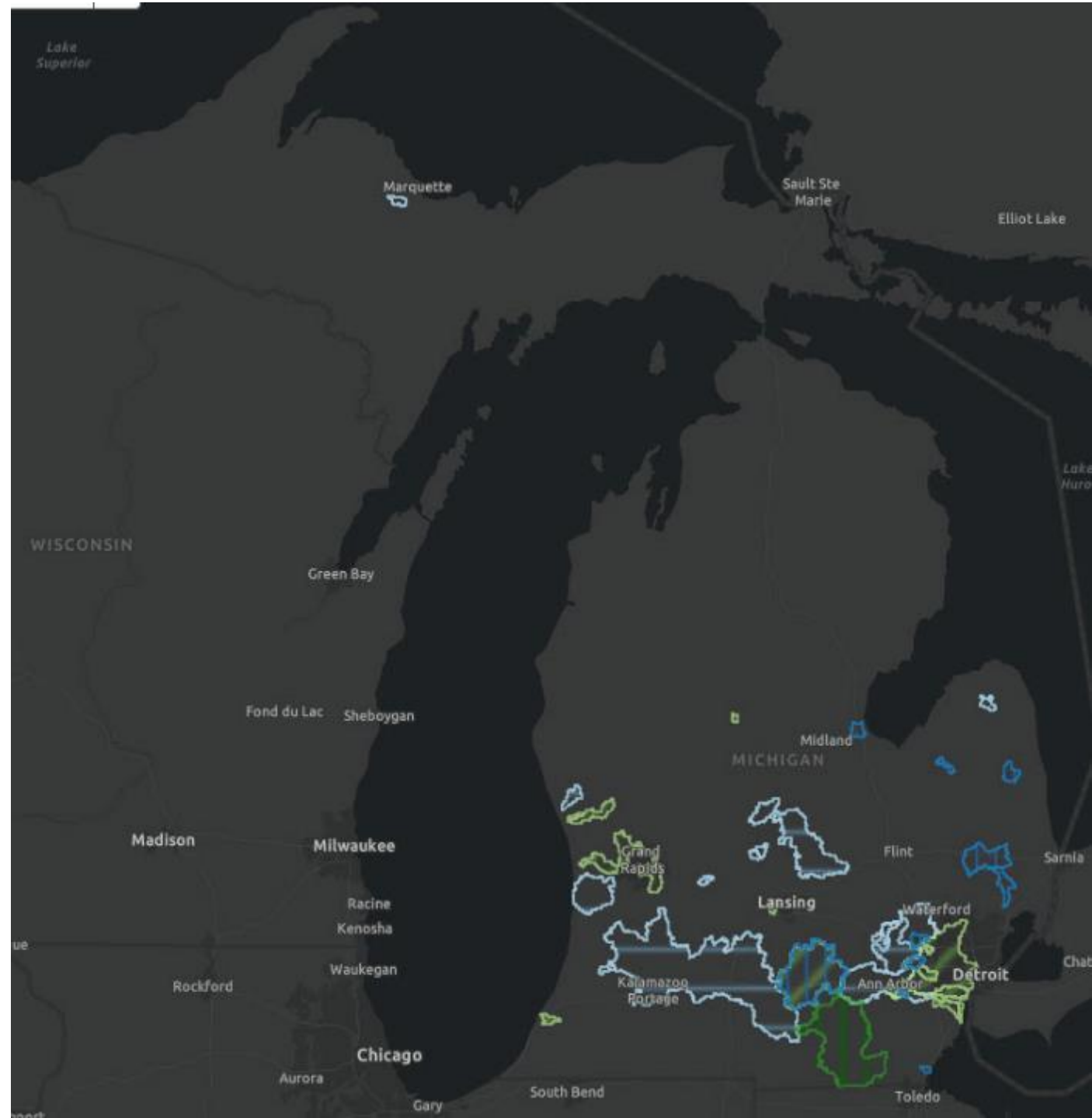
- Rivers & Streams: 76,439 miles
- Inland Lakes:
 - ❖ 46,000 (surface area greater than .1 acre)
Total area 872,109 acres.
 - ❖ 11,000 5 acres or more
- Wetlands: 6,465,109 acres current
(estimated loss 35-50% since settlement)

Impairments due to Nutrients, Sediment and Channel Modification concentrated Lower Half of Lower Peninsula



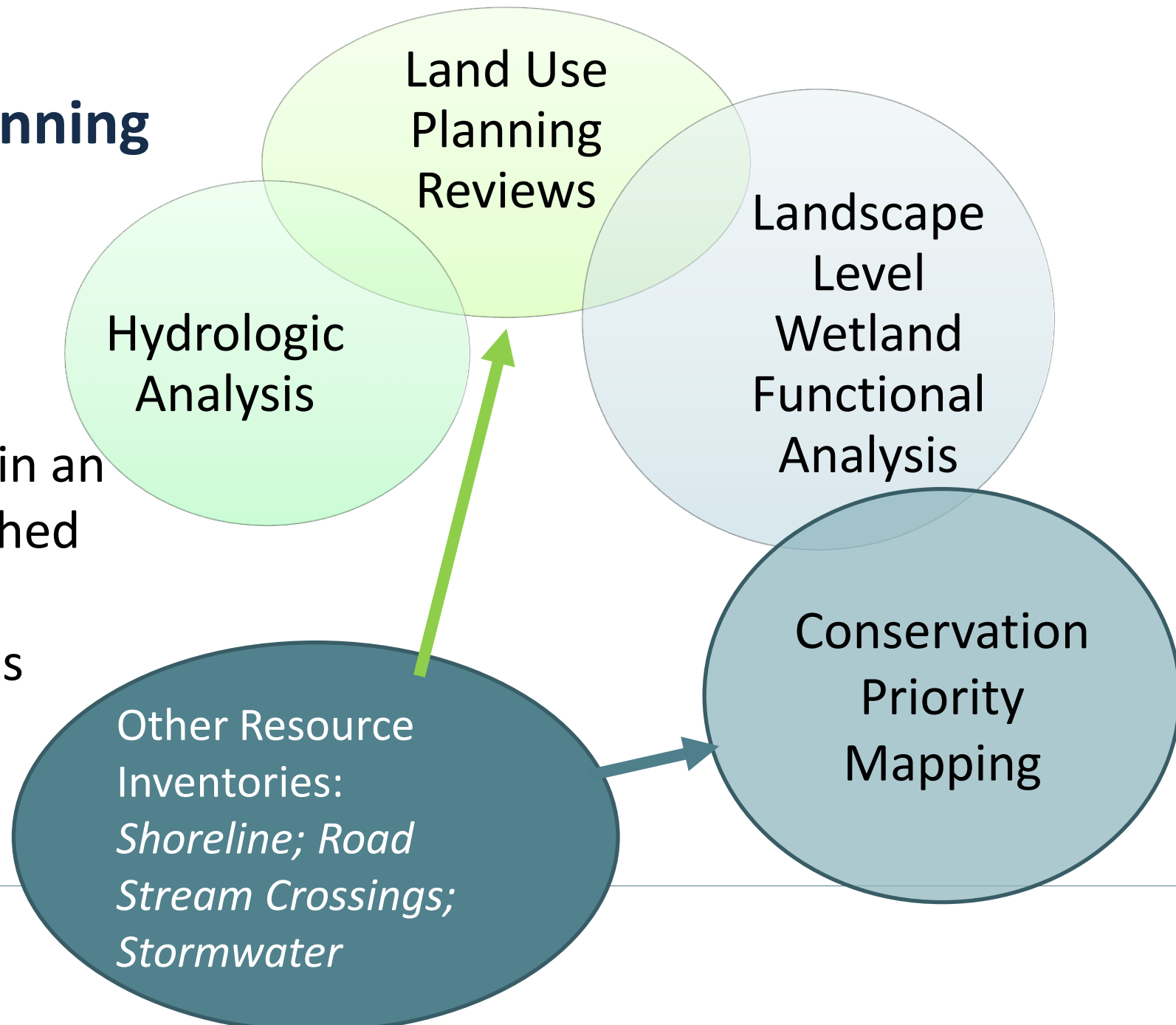
TMDLs related to Nitrates, Phosphorus and Sediment

- Multiple Reservoirs/Lakes
- Watersheds with very high loss of wetlands.
- Very intense agriculture or urbanized.



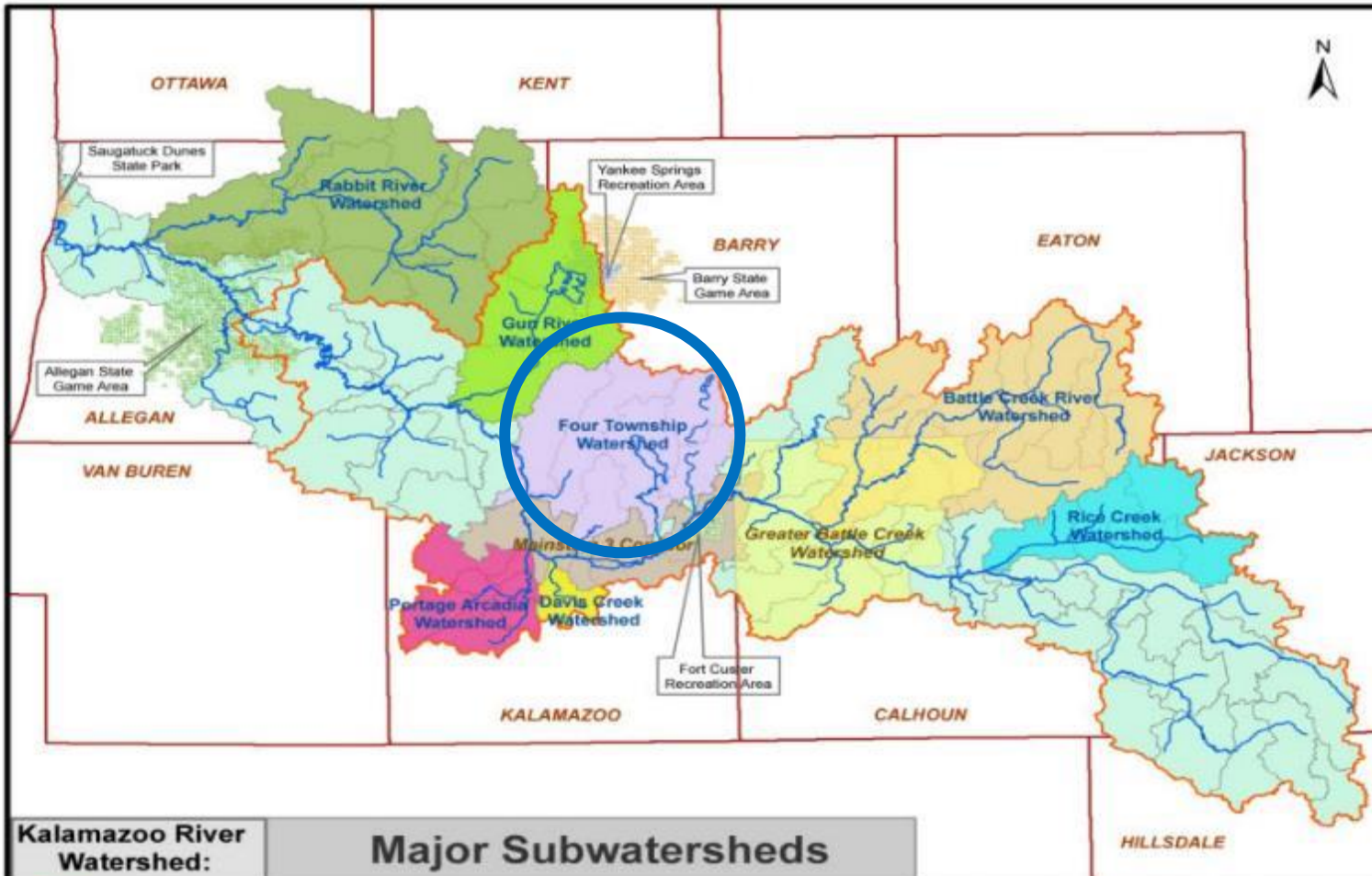
Key Tools: Protection Oriented Planning

- High Quality Areas within an Impaired/TMDL Watershed
- High Quality Watersheds



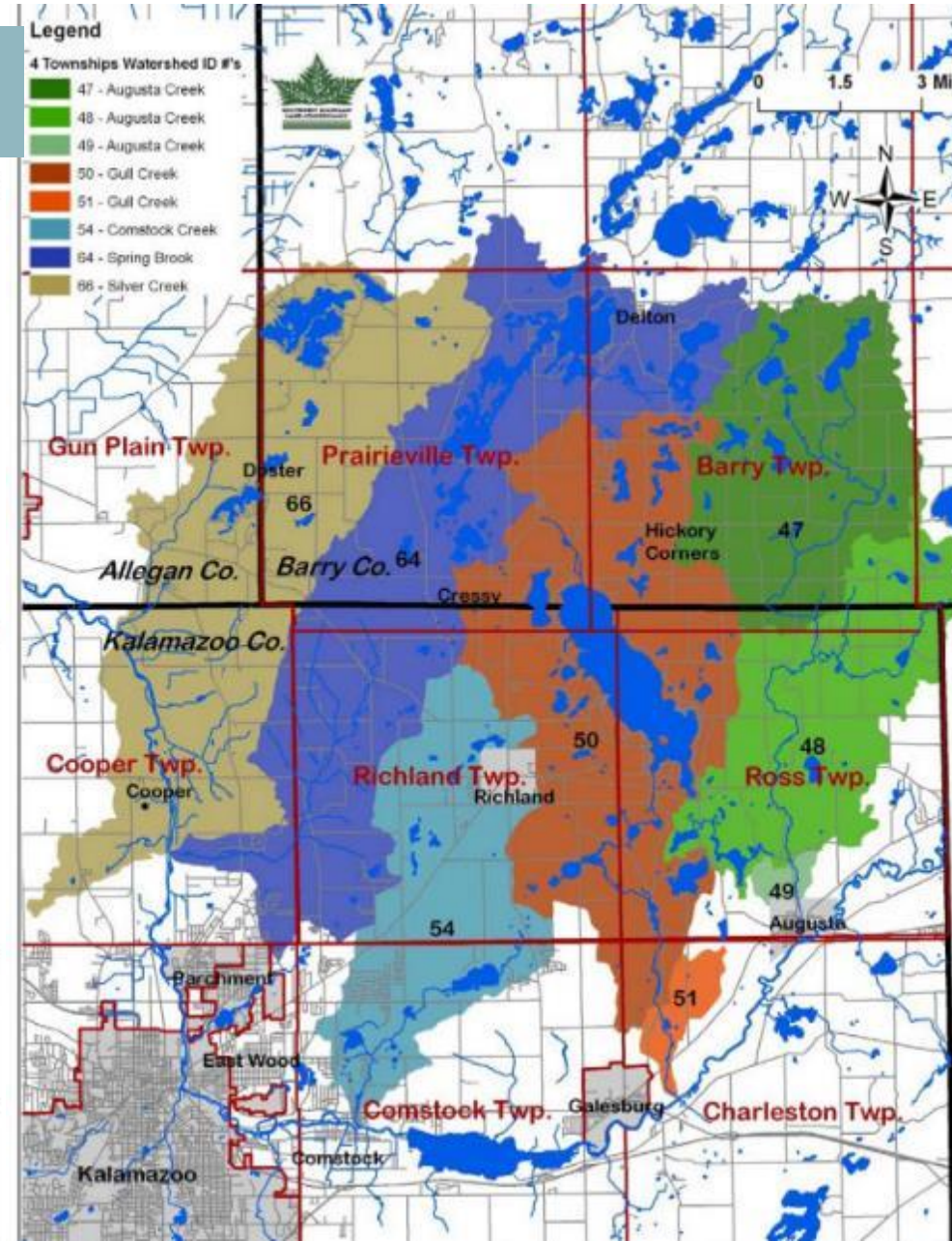
First Protection Oriented Planning Began 2000

High quality area – in a TMDL watershed
 very stable cold water trout streams, many lakes and unique wetland systems



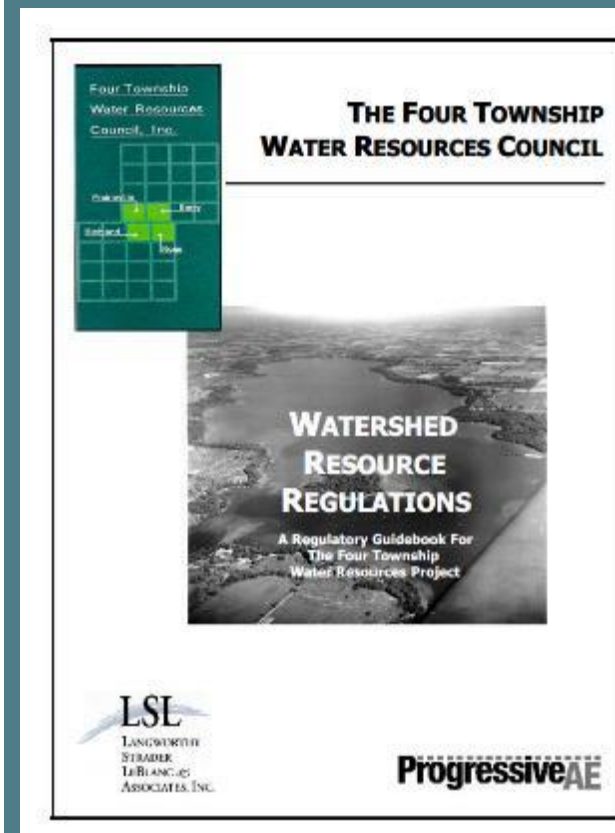
Lake Allegan TMDL boundary
 This map presents natural subbasins (name in blue), stormwater subbasins (name in brown italic), and public land management areas (balloon name).

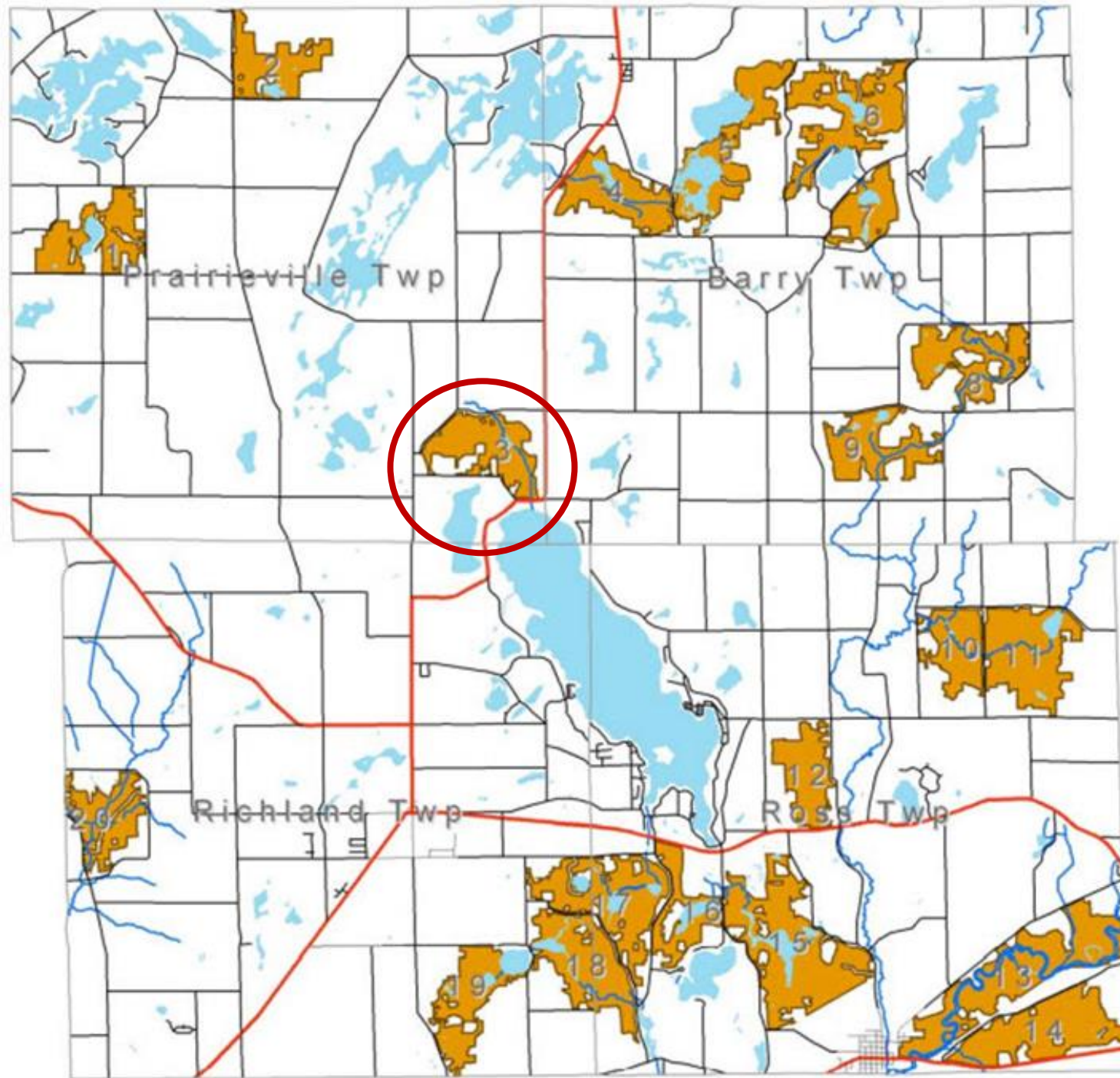
Supported by the Nonpoint Source Program, Michigan Department of Environmental Quality



Protection Related “Inventories”

Land Use Planning Analysis





“Four Townships” High Priority Potential Conservation Areas

Yellow: All areas for the watersheds
Red Circle: Prairieville Creek

Prairieville Creek Priority Conservation Area:

- Supplies 21% of Gull Lake's annual water and 60% of the total stream inflow.
- Multiple wetland systems including a rare fen
- Only coldwater fish spawning area for Gull Lake



PAW PAW RIVER WATERSHED

AREAS OF HIGH CONSERVATION POTENTIAL AND IMPACT ON WATER QUALITY

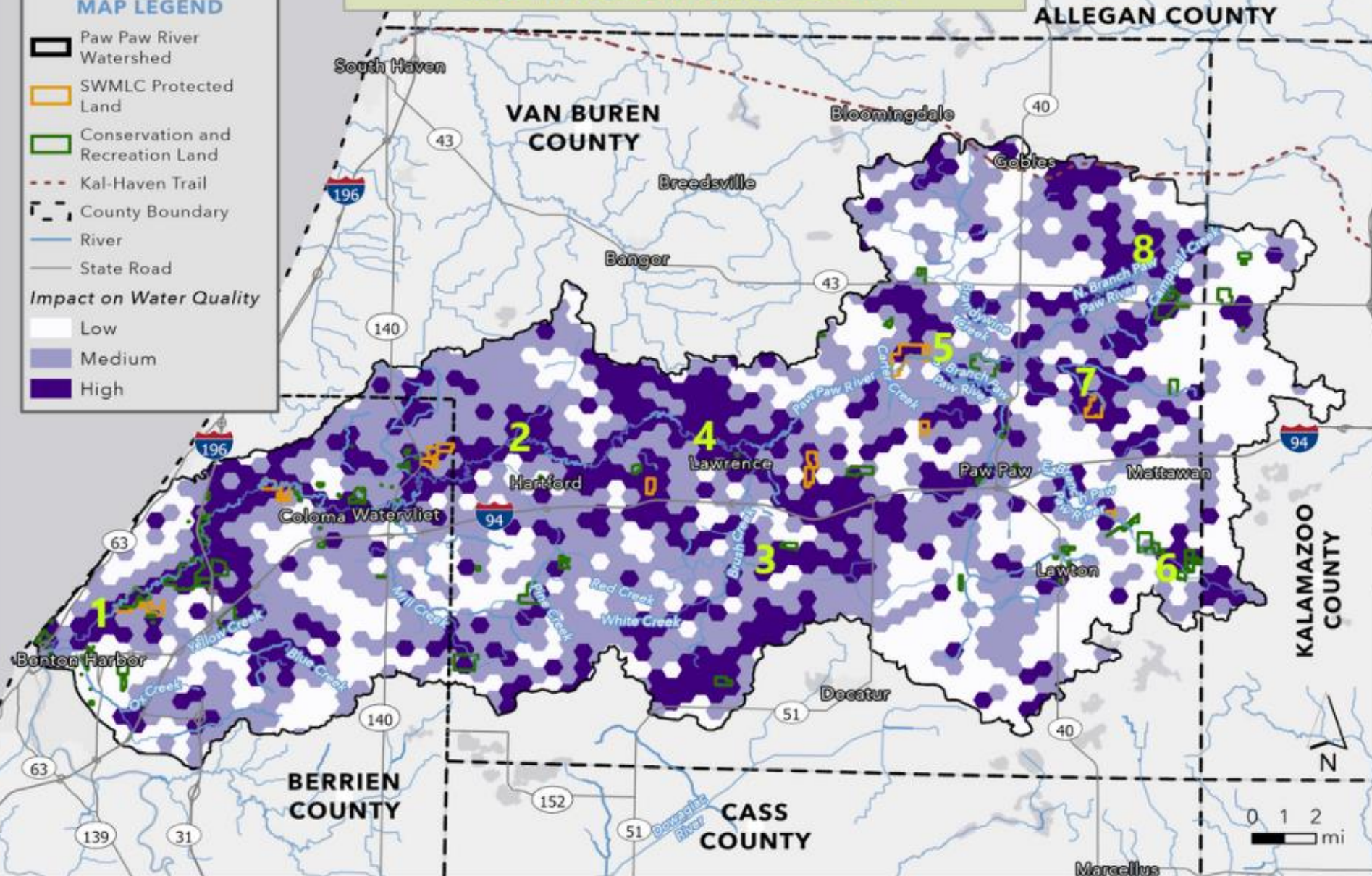


MAP LEGEND

- Paw Paw River Watershed
- SWMLC Protected Land
- Conservation and Recreation Land
- Kal-Haven Trail
- County Boundary
- River
- State Road

Impact on Water Quality

- Low
- Medium
- High



Conservation Priority Mapping Model from a water quality perspective

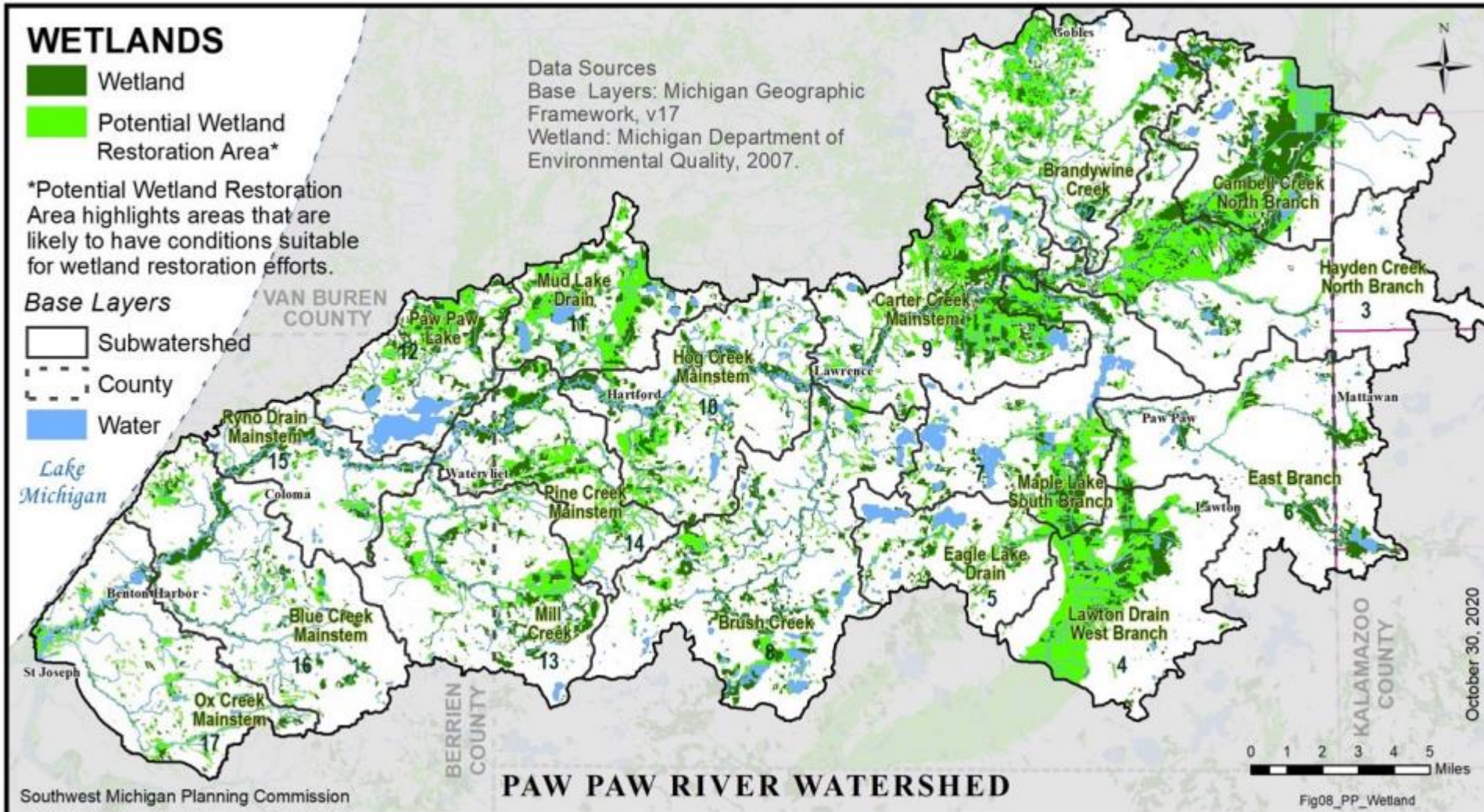
- Can be different for each watershed

Typical Primary Criteria

- Wetland percentage and size
- Parcel size
- Proximity to river or lake
- Proximity to other protected lands
- Groundwater recharge
- Forested/natural vegetation percentage

Watershed Wide Wetland Assessment

Where to protect and areas to restore



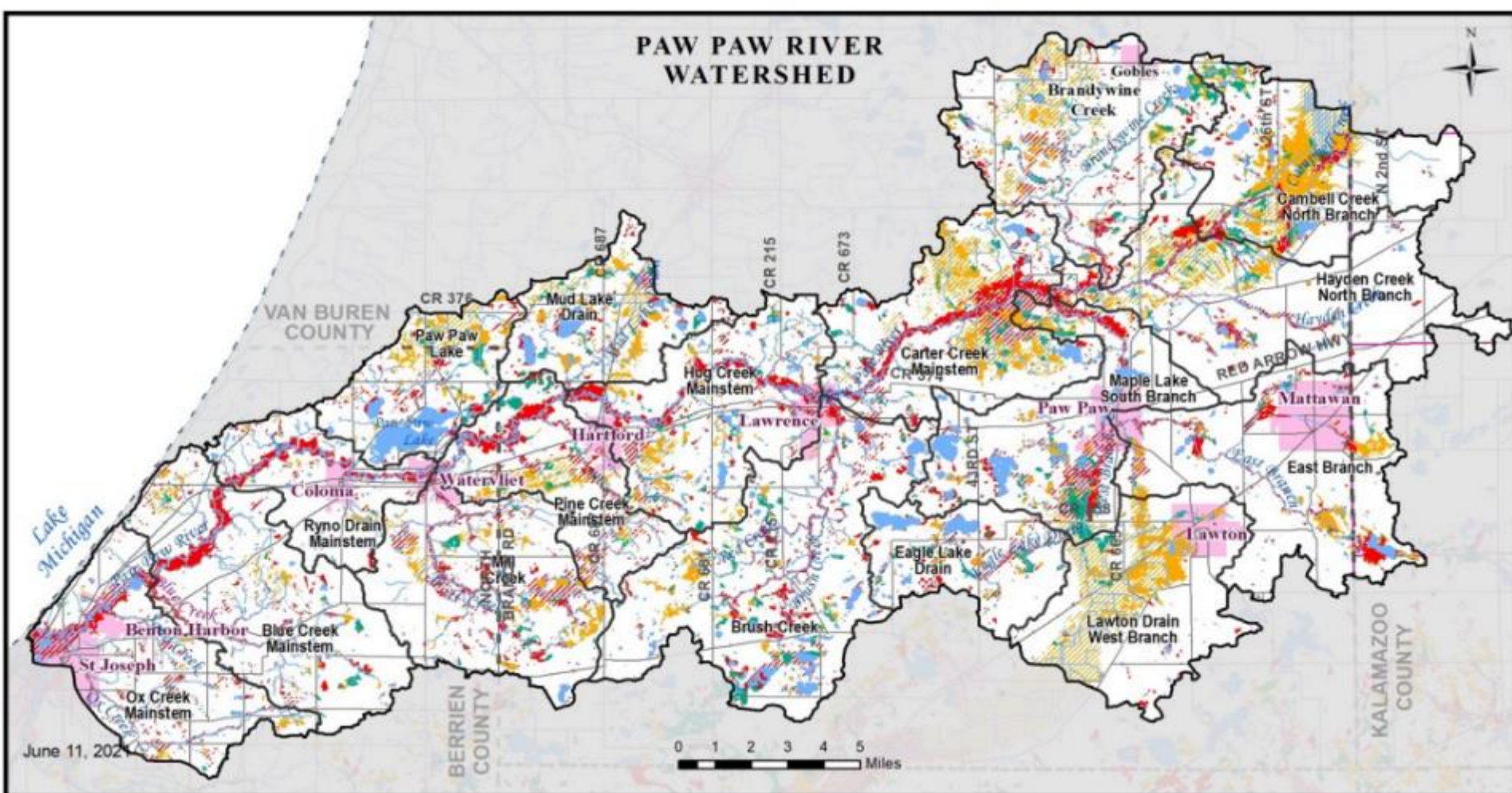
Talking/Planning Points:
 Areas with the most lost wetlands correlate with nutrient, sediment, e. coli and flashiness problems

Action: Protect what is left to prevent future problems

Landscape Level Wetland Functional Analysis

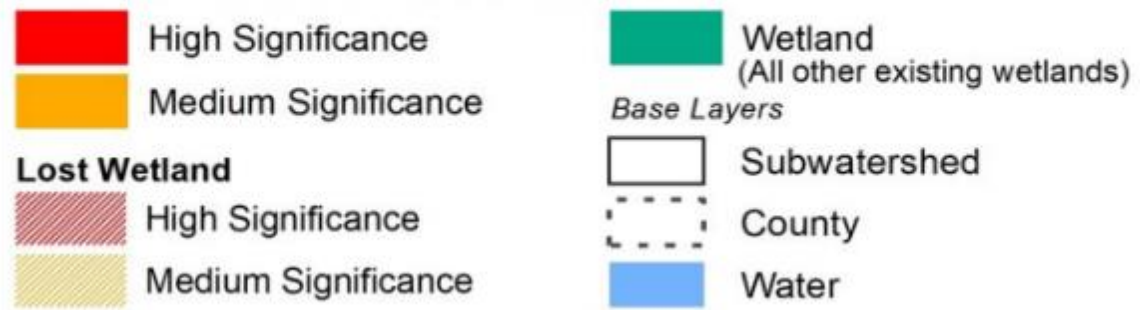
Looks at each wetland complex for specific functions

Action: *Protect these wetlands to prevent future problems*



WETLAND FUNCTION ASSESSMENT*

Sediment and Other Particulate Retention



*Wetland Functional Assessment rates wetlands according to its ability to perform specific ecological functions. This map shows existing and lost wetlands and ranks them based on how well the wetland acts as a living filter by removing nutrients and sediment from surface and ground water.

Data Sources
Base Layers: MCGI Framework, v17
Wetland: MDEQ 2007.

Lake Charlevoix Watershed



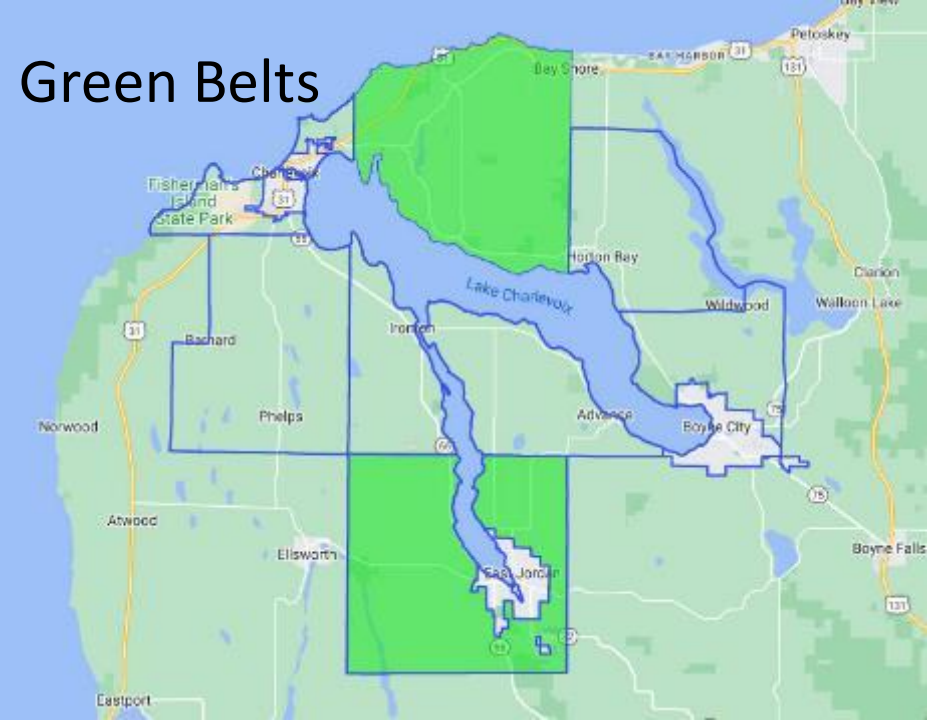
High Quality Watershed Lake Charlevoix

- Coldwater oligotrophic lake
- 3rd largest lake in Michigan
- 17,061 acres
- 60-mile perimeter
- 214,400-acre watershed
- 1,700 properties around the lake

*Significantly increasing
development threat*

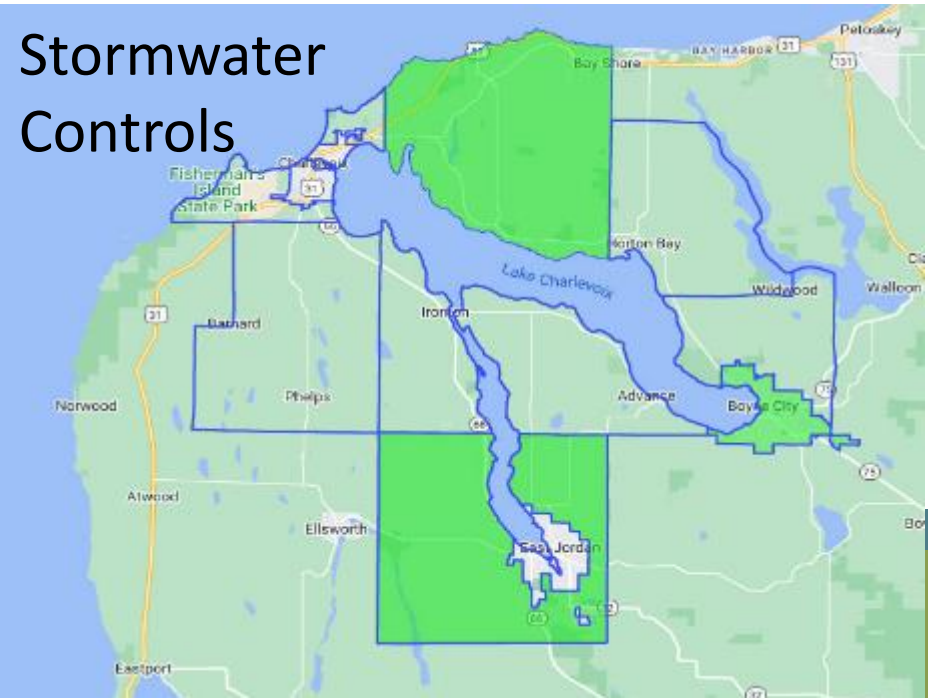
Lake Charlevoix Watershed Gaps Analysis website

Green Belts

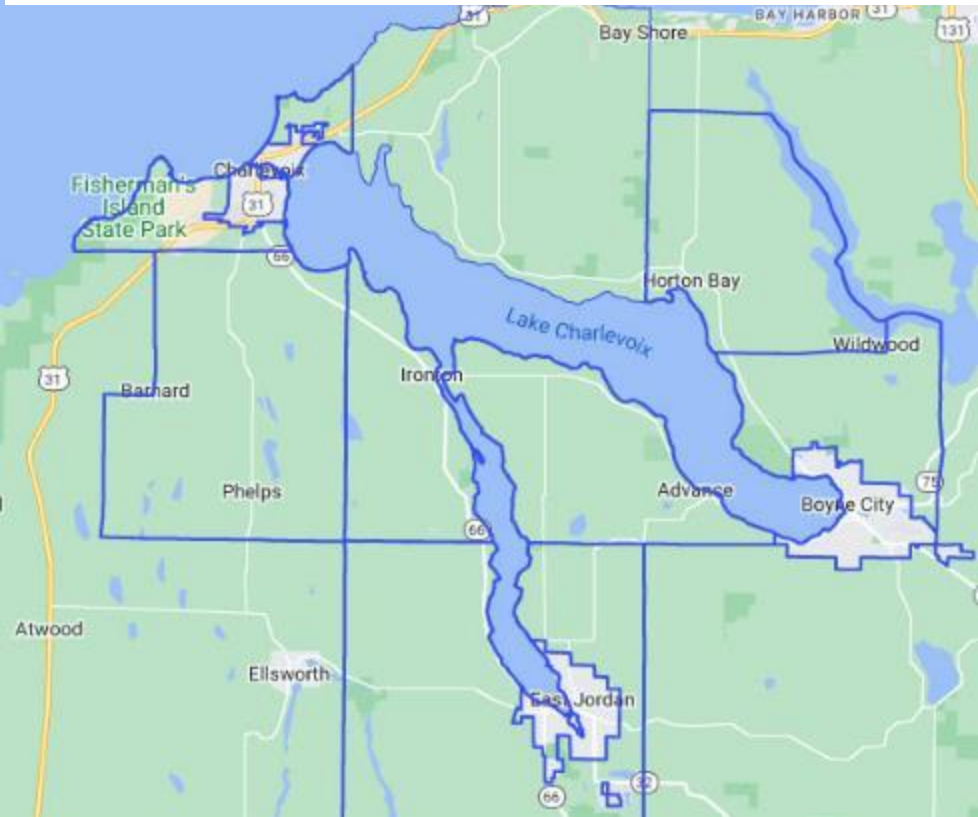


*Areas shaded in
bright green
meet or exceed
recommendations*

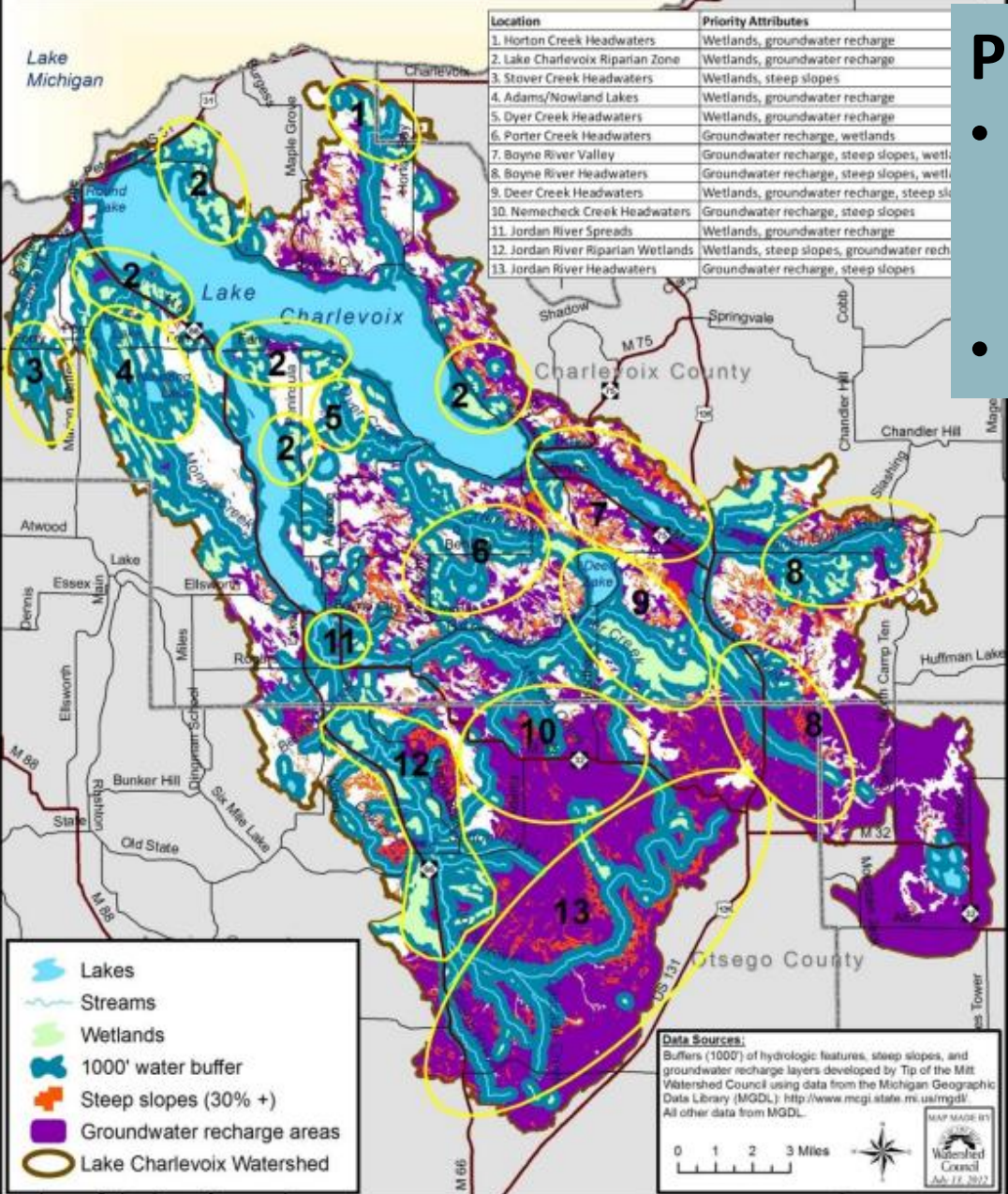
Stormwater Controls



Formal Site Plan Review



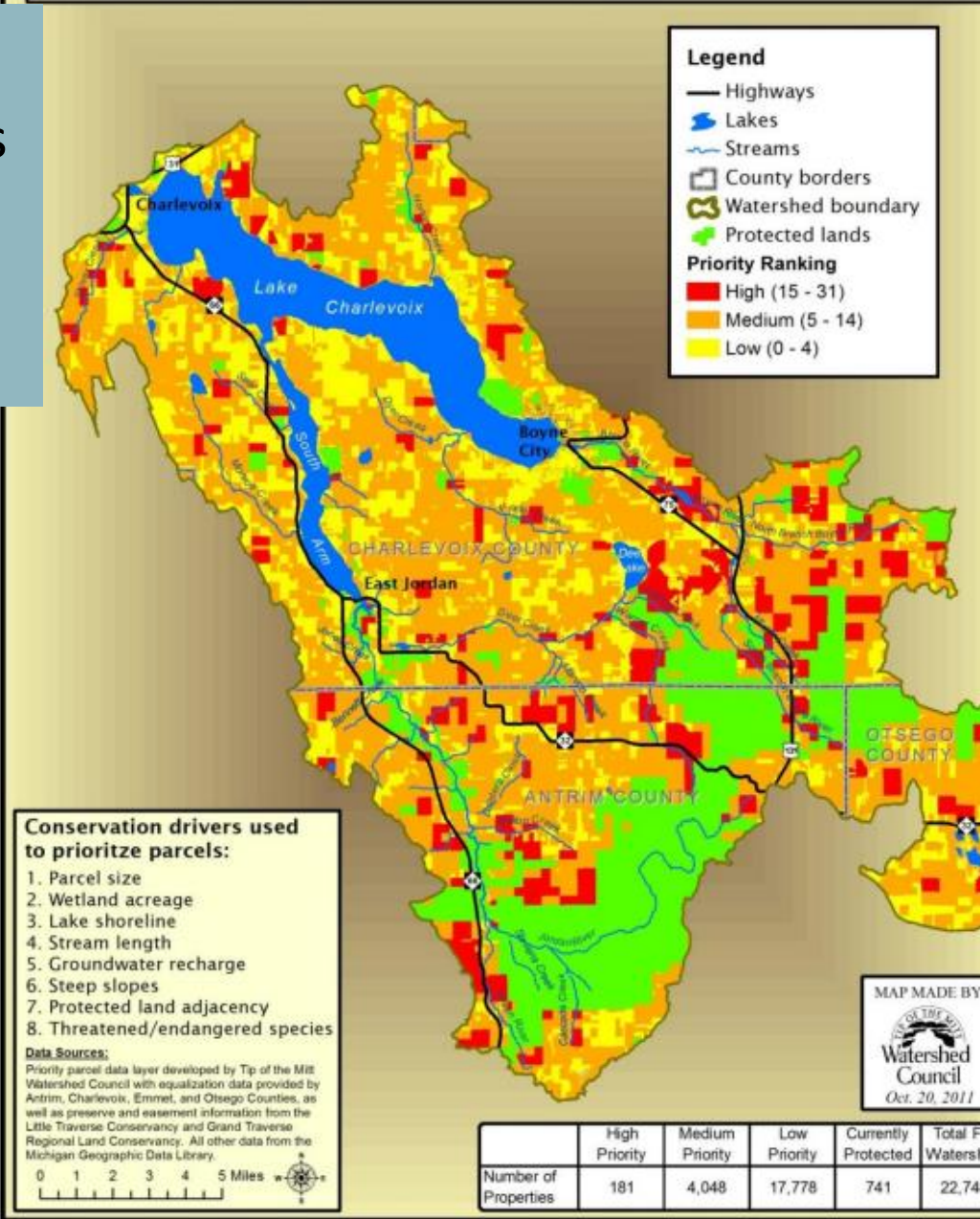
Priority Areas for Protection in the Lake Charlevoix Watershed



Protection

- Identified Areas first
- Parcels next

Priority Parcels For Permanent Land Protection Lake Charlevoix Watershed



Conservation drivers used to prioritize parcels:

1. Parcel size
2. Wetland acreage
3. Lake shoreline
4. Stream length
5. Groundwater recharge
6. Steep slopes
7. Protected land adjacency
8. Threatened/endangered species

Data Sources:
Priority parcel data layer developed by Tip of the Mitt Watershed Council with equalization data provided by Antrim, Charlevoix, Emmet, and Otsego Counties, as well as preserve and easement information from the Little Traverse Conservancy and Grand Traverse Regional Land Conservancy. All other data from the Michigan Geographic Data Library.

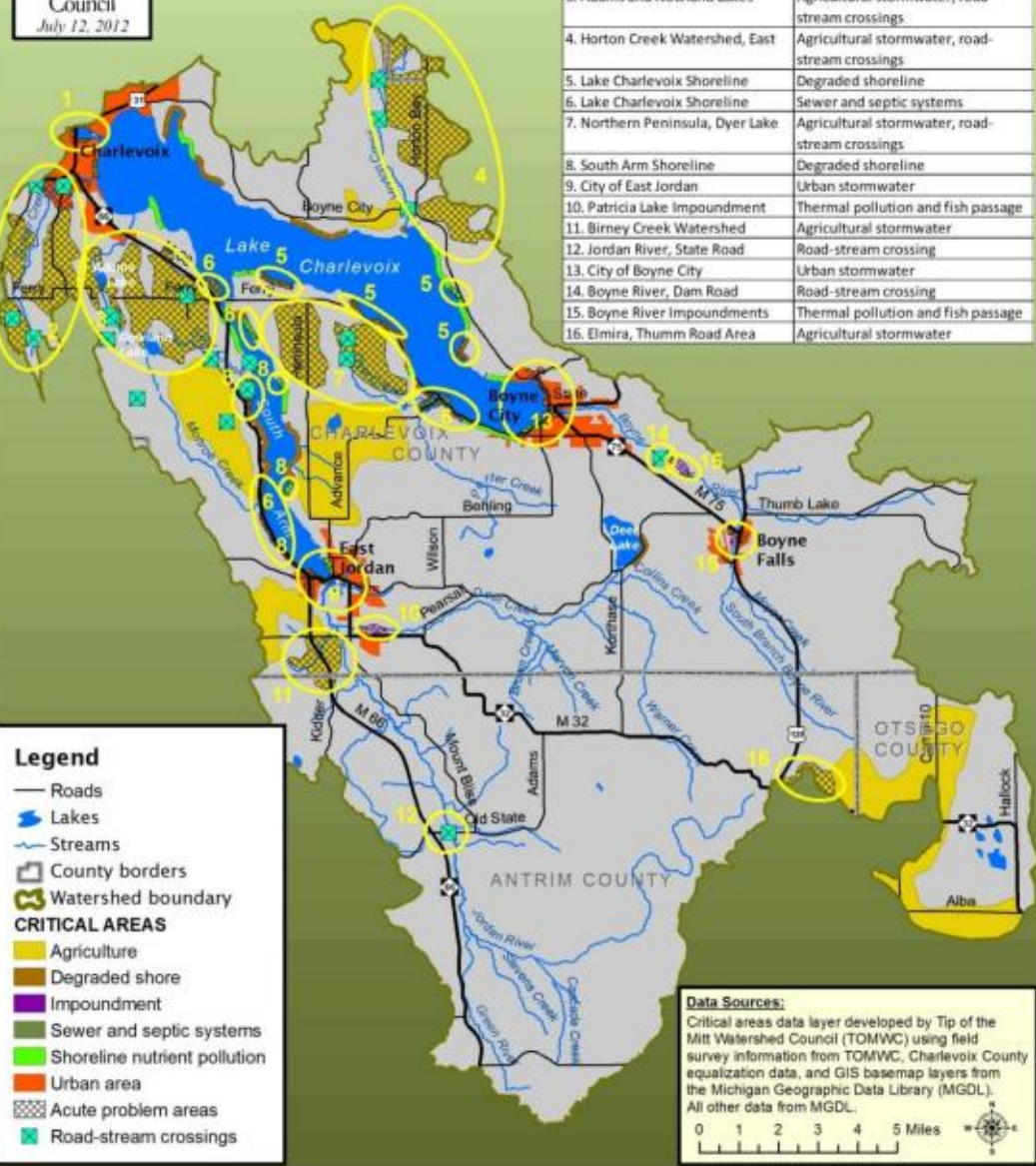


Critical Areas for Addressing Nonpoint Source Pollution Lake Charlevoix Watershed

MAP MADE BY

 July 12, 2012

| Location | Critical Concerns |
|----------------------------------|--|
| 1. City of Charlevoix | Urban stormwater |
| 2. Stover Creek Watershed | Urban and agricultural stormwater, road-stream crossings |
| 3. Adams and Nowland Lakes | Agricultural stormwater, road-stream crossings |
| 4. Horton Creek Watershed, East | Agricultural stormwater, road-stream crossings |
| 5. Lake Charlevoix Shoreline | Degraded shoreline |
| 6. Lake Charlevoix Shoreline | Sewer and septic systems |
| 7. Northern Peninsula, Dyer Lake | Agricultural stormwater, road-stream crossings |
| 8. South Arm Shoreline | Degraded shoreline |
| 9. City of East Jordan | Urban stormwater |
| 10. Patricia Lake Impoundment | Thermal pollution and fish passage |
| 11. Birney Creek Watershed | Agricultural stormwater |
| 12. Jordan River, State Road | Road-stream crossing |
| 13. City of Boyne City | Urban stormwater |
| 14. Boyne River, Dam Road | Road-stream crossing |
| 15. Boyne River Impoundments | Thermal pollution and fish passage |
| 16. Elmira, Thumm Road Area | Agricultural stormwater |

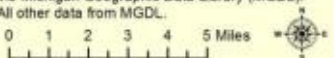


Legend

- Roads
- 🌊 Lakes
- 🌊 Streams
- ▭ County borders
- 🌿 Watershed boundary
- CRITICAL AREAS**
- 🟡 Agriculture
- 🟤 Degraded shore
- 🟣 Impoundment
- 🟢 Sewer and septic systems
- 🟩 Shoreline nutrient pollution
- 🟠 Urban area
- ▨ Acute problem areas
- 🟦 Road-stream crossings

Data Sources:
 Critical areas data layer developed by Tip of the Mitt Watershed Council (TOMWC) using field survey information from TOMWC, Charlevoix County equalization data, and GIS basemap layers from the Michigan Geographic Data Library (MGDL). All other data from MGDL.

0 1 2 3 4 5 Miles



Critical to find nonpoint source problem areas to keep waters healthy

FOCUS AREAS

- Shorelines
- Stormwater
- Road crossings
- Agriculture

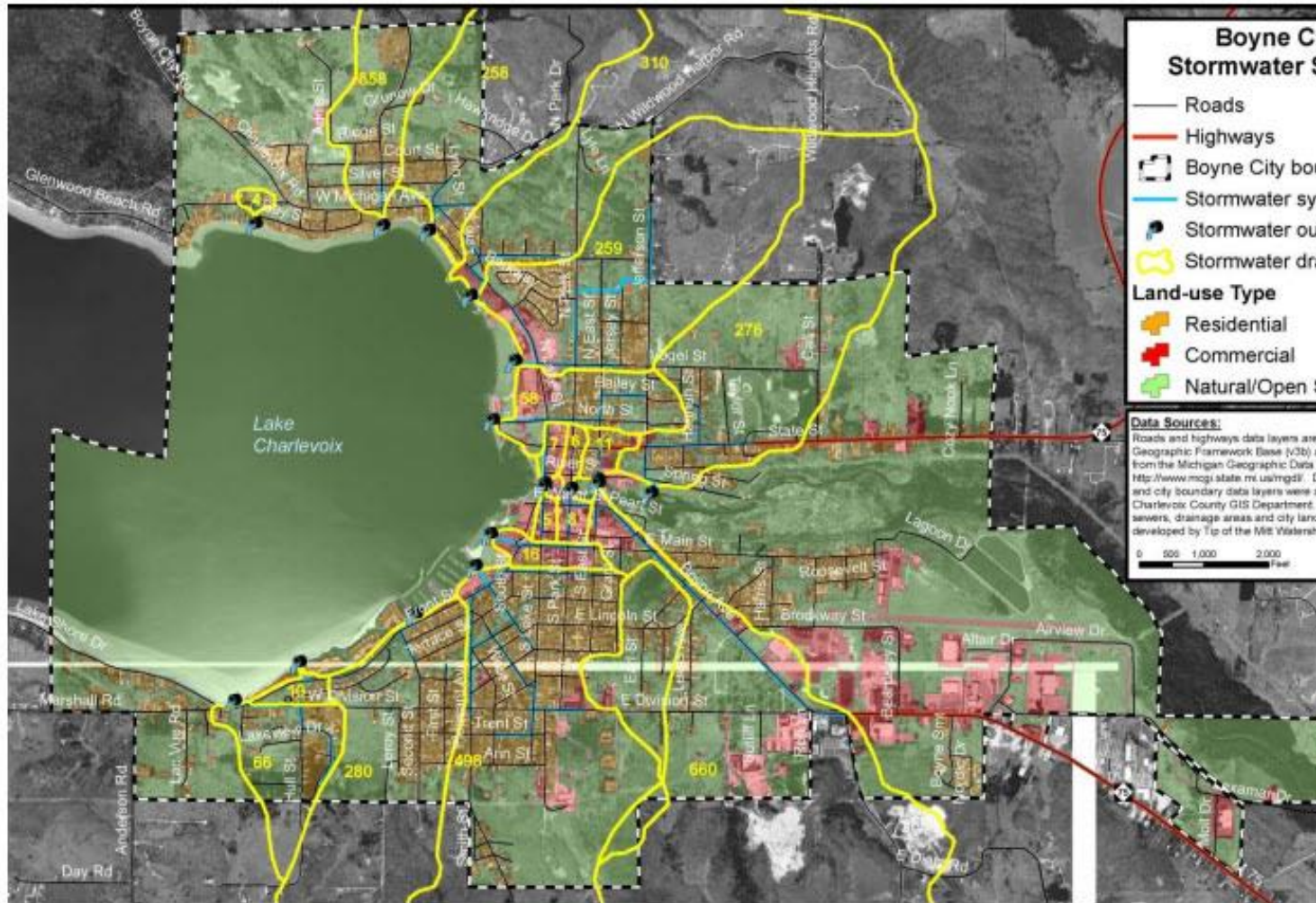


Table 21: Storm Sewer Survey Summary

| Lake Charlevoix Watershed Storm Sewer Survey | Boyne City | Charlevoix | East Jordan |
|---|------------|------------|-------------|
| Total land area (acres) of city | 2,377 | 1,280 | 1,714 |
| Total area (acres) draining into | 4,833 | 1,666 | 3,425 |
| Percent of Watershed | 2.25 | 0.78 | 1.6 |
| Land use in cities (% of acreage) | | | |
| Undeveloped | 49.6 | 29.8 | 55.5 |
| Commercial/Industrial | 12.5 | 16.4 | 11.8 |
| Residential | 36.2 | 48.4 | 29.8 |
| Water | 1.7 | 5.4 | 2.9 |
| Overall Impervious Cover | 24.0 | 31.0 | 22.0 |
| Number of storm sewer outfalls | 15 | 13 | 5 |
| Area (acres) of city draining to lake or river via storm sewers | 936 | 490 | 360 |
| Percent of city draining to lake or river via storm sewers | 39 | 39 | 21 |
| Estimated pollution contributions from storm sewers annually (lbs) | | | |
| Phosphorus | 714 | 435 | 253 |
| Sediment | 201,685 | 122,976 | 71,591 |
| Comparative Pollutant Export annually | | | |
| Aquatic Plant Growth (lbs) | 356,850 | 217,620 | 126,630 |
| Soil (Dump truck loads) | 8.5 | 5 | 3 |

Alternative Inland Lake Protection Planning *In Progress*

Goal: provide a simplified process and template for inland lake associations to use to guide where critical best management practices are needed.

Draft Criteria

- Natural Lakes larger than 20 acres
- No impairments
- No dams
- No direct connection to a Great Lake
- Watershed and Shoreland Disturbance levels low (using Midwest Glacial Lakes Conservation Planner)

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