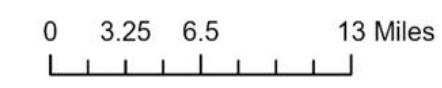
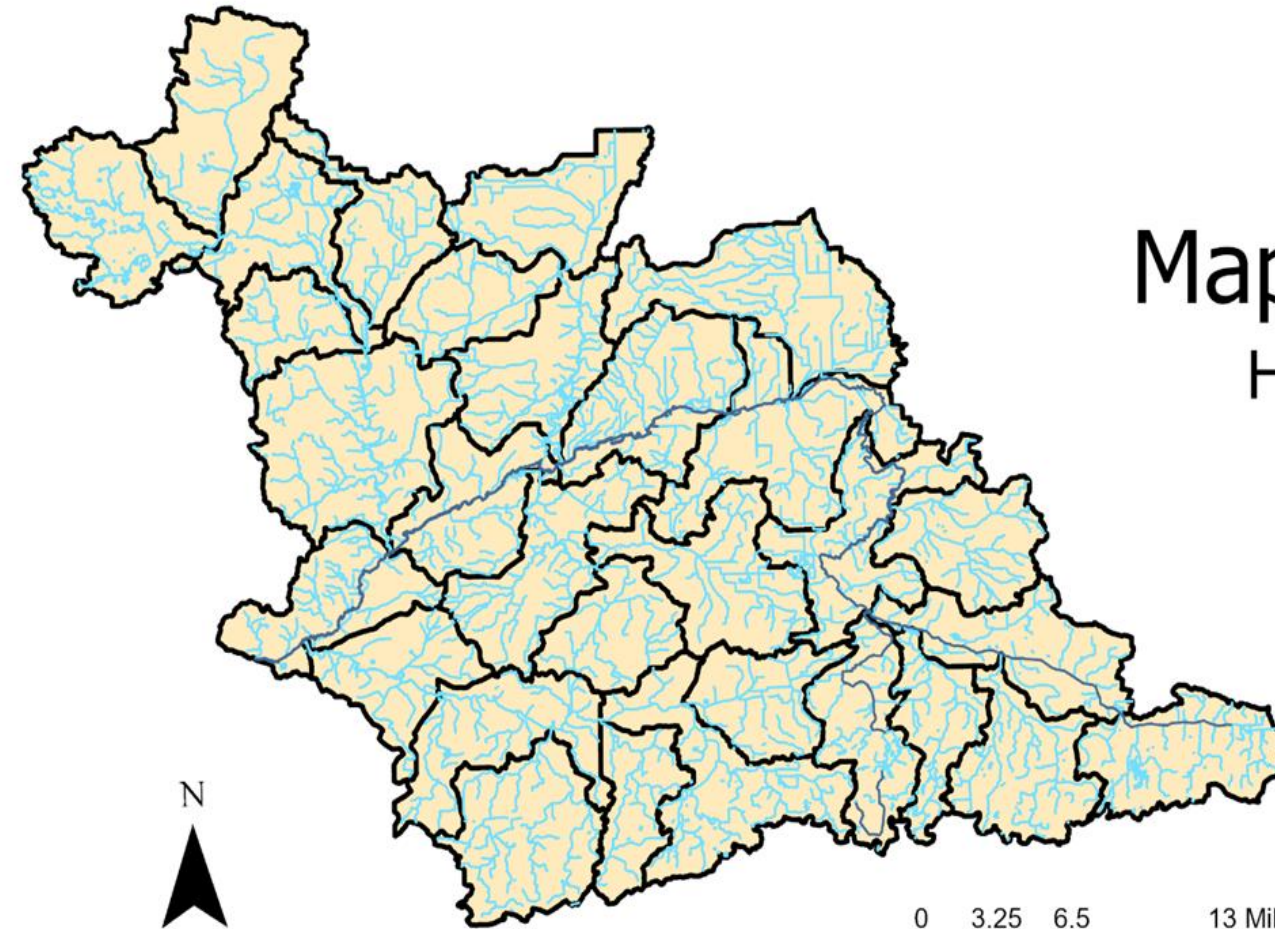


Nine Element Watershed Plan: A Blueprint for Watershed Restoration and Protection of the Maple Watershed 04050005



Maple Watershed
HUC 8 and HUC 12



Introduction

3 Zones of Watershed:

Major Watershed Challenges

North:

- Characterized by numerous lakes

Central:

- Home of Maple River

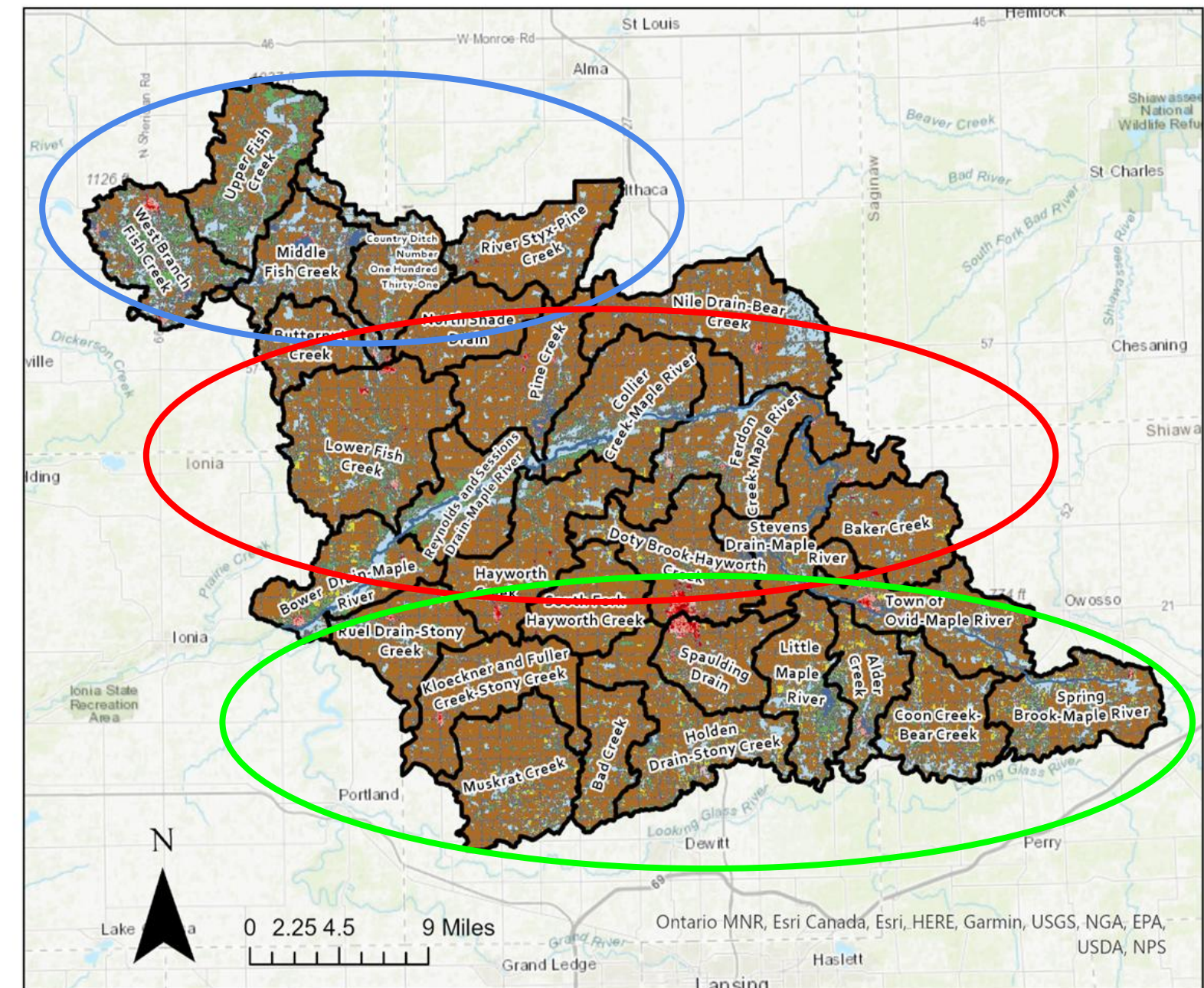
South:

- Primarily where streams converge and drain

➤ Agriculture

➤ Road-stream crossings

➤ Low Forested Riparian Buffers



Legend



Spatial Reference

Name: NAD 1983 Michigan GeoRef Meters
 PCS: NAD 1983 Michigan GeoRef Meters
 GCS: GCS North American 1983
 Datum: North American 1983



Overview of the Nine Elements

1. Identify pollution sources.
2. Estimate pollutant load reductions.
3. Describe management measures.
4. Estimate financial needs.
5. Develop outreach and education strategies.
6. Develop an implementation schedule.
7. Describe measurable milestones.
8. Develop criteria to measure progress.
9. Create a monitoring plan.



Pollution Sources

HUC 12s with the :



1.

1a. Highest Erosion (Highest slope)

1b. Highest Population density

1c. Least forested riparian buffer

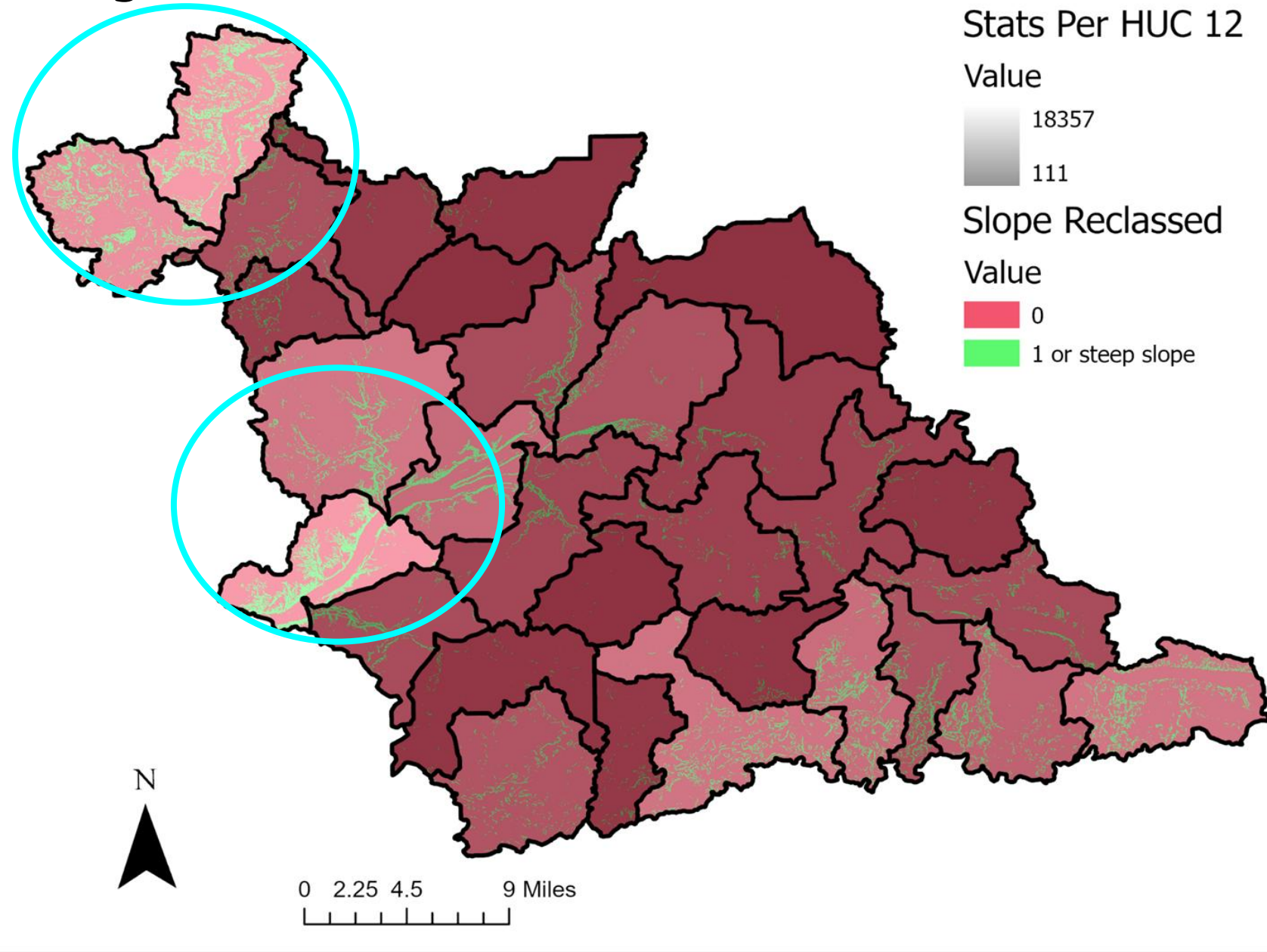
1d. Most Agriculture

1e. Most road-stream crossings

1f. Stream segments on the 303(d) list

Highest Erosion Per HUC12

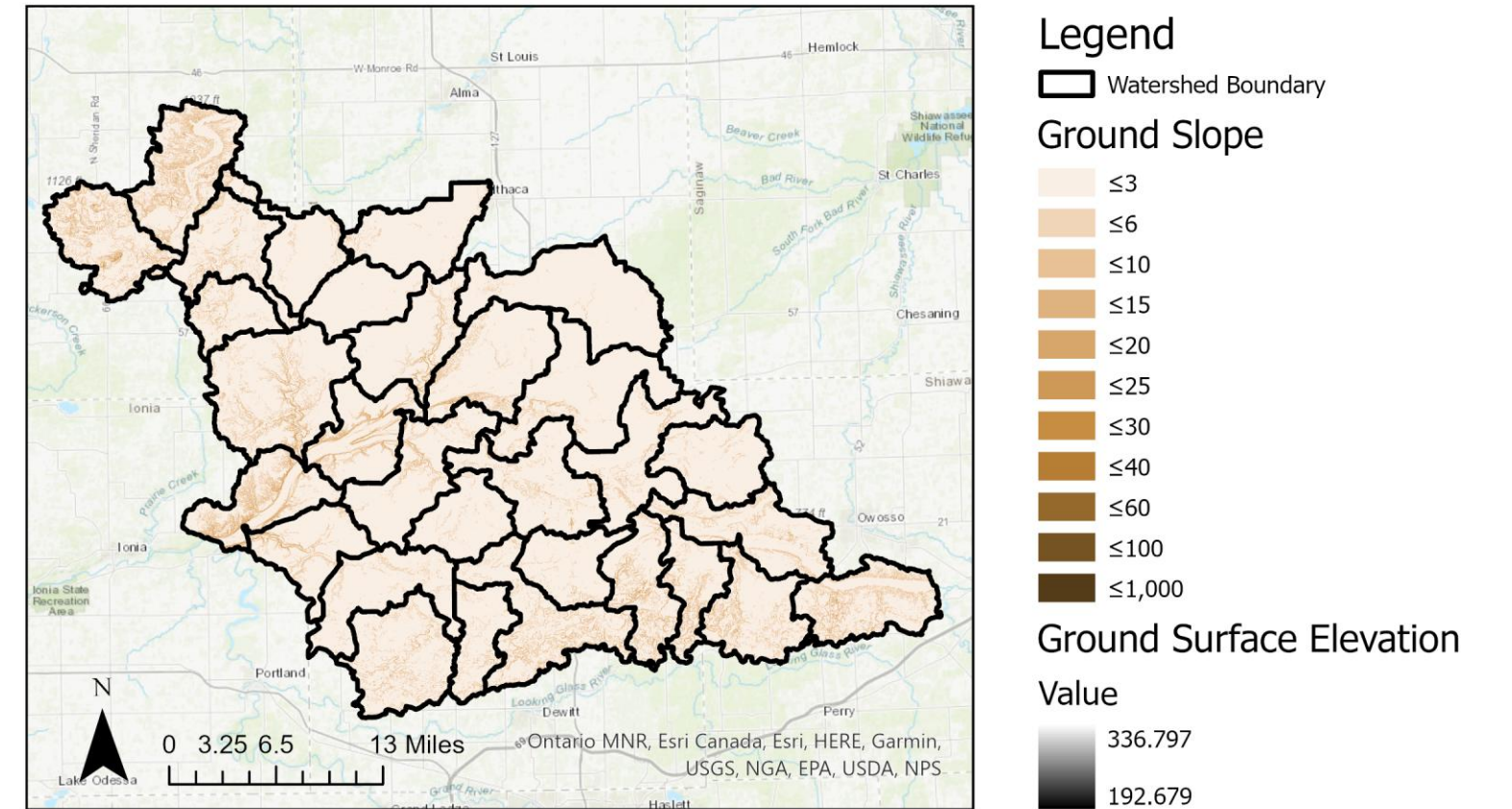
Highest Erosion Per HUC12



1a.

Slope and Reclassified Slope Per HUC 12

Credits: R Demond, December 2024



Legend

Watershed Boundary

Zonal Statistics Per HUC 12

Value

- 18357
- 111

Slope Reclassed

Value (1 = >5%)

- 0
- 1

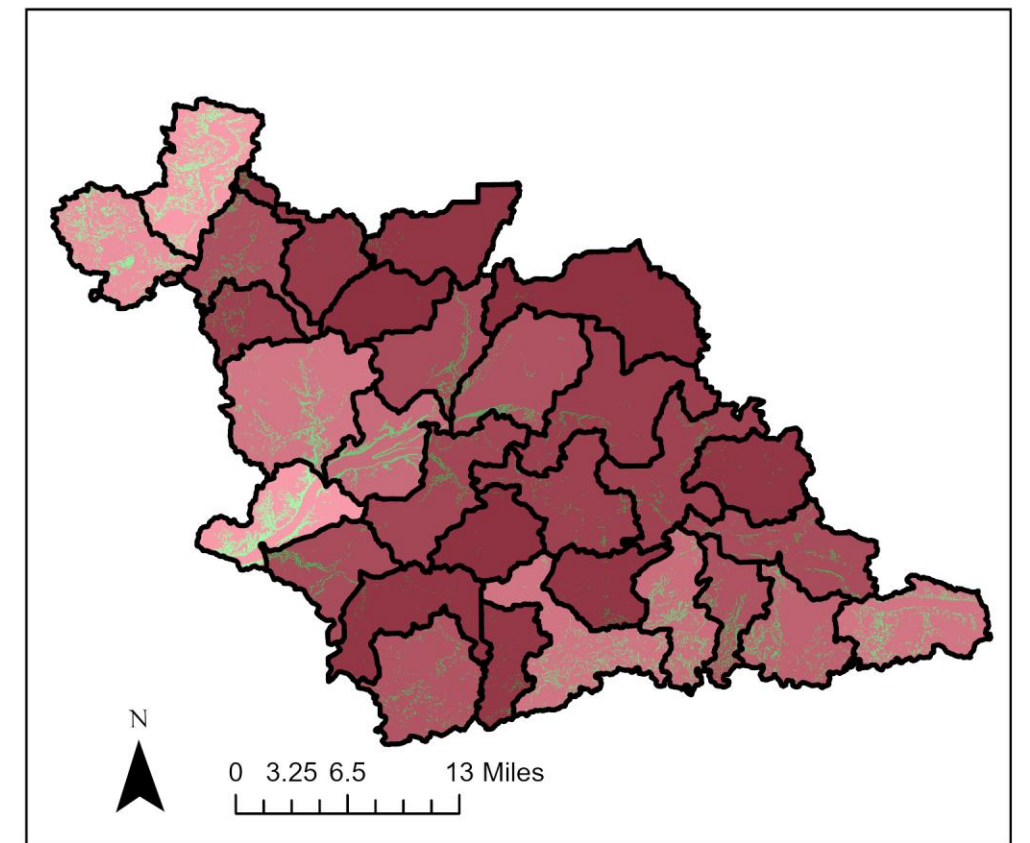
Ground Surface Elevation

Value

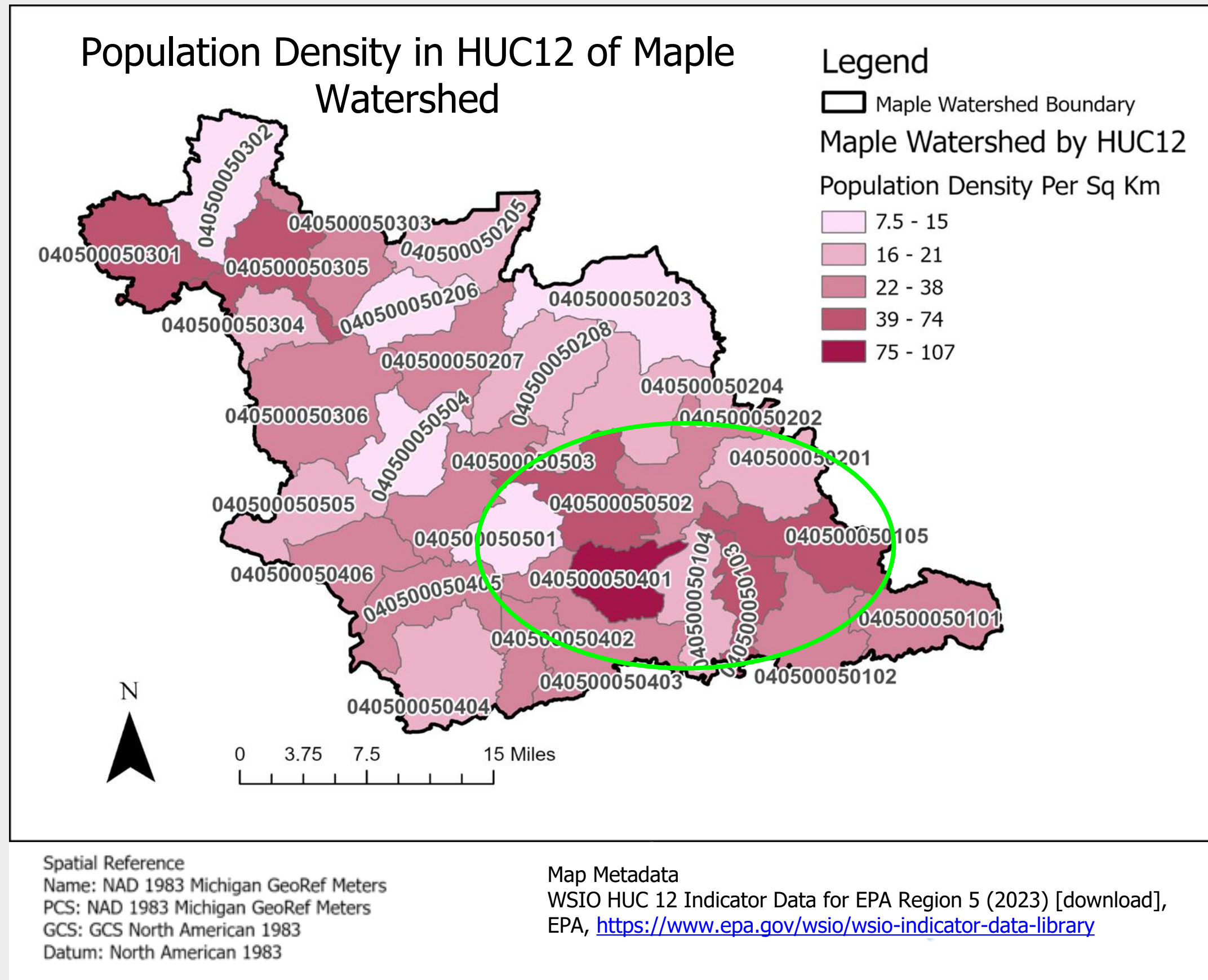
- 336.797
- 192.679

Spatial Reference
 Name: NAD 1983 Michigan GeoRef Meters
 PCS: NAD 1983 Michigan GeoRef Meters
 GCS: GCS North American 1983
 Datum: North American 1983

Map Metadata
 WSIO Geodatabase with Hydrologic Unit (HUC12) polygons (2024) [download], EPA,
<https://www.epa.gov/wsio/wsio-indicator-data-library>



Population Density in HUC12 of Maple Watershed

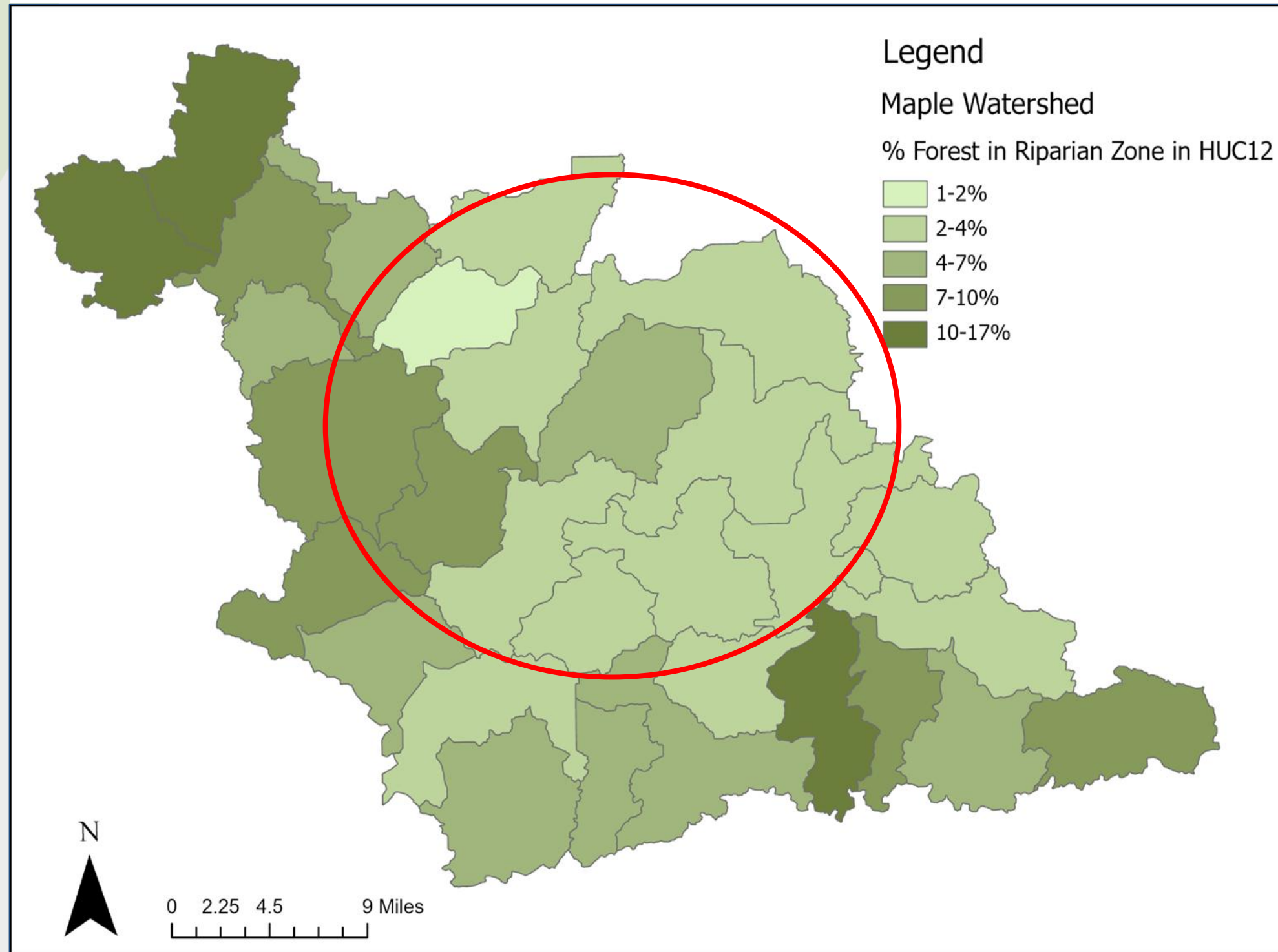


1b.

Least Forested Riparian Buffer in HUC12

1c.

Least Forested Riparian Buffer in HUC12

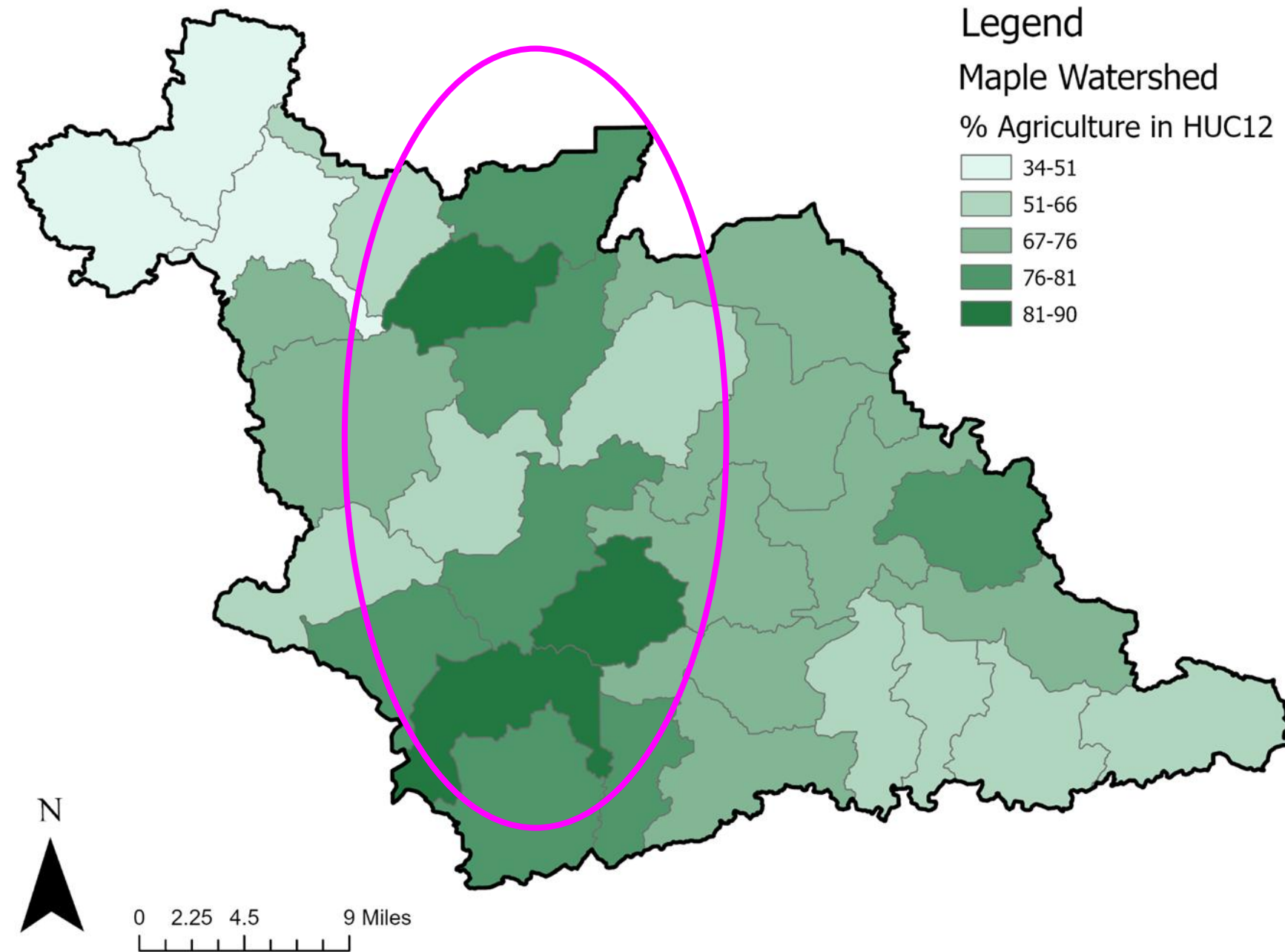


Spatial Reference
Name: NAD 1983 Michigan GeoRef Meters
PCS: NAD 1983 Michigan GeoRef Meters
GCS: GCS North American 1983
Datum: North American 1983

Map Metadata
WSIO HUC 12 Indicator Data for EPA Region 5 (2023) [download], EPA,
<https://www.epa.gov/wsio/wsio-indicator-data-library>

Most Agriculture Per HUC12

Agriculture Per HUC12 of Maple Watershed



Spatial Reference
Name: NAD 1983 Michigan GeoRef Meters
PCS: NAD 1983 Michigan GeoRef Meters
GCS: GCS North American 1983
Datum: North American 1983

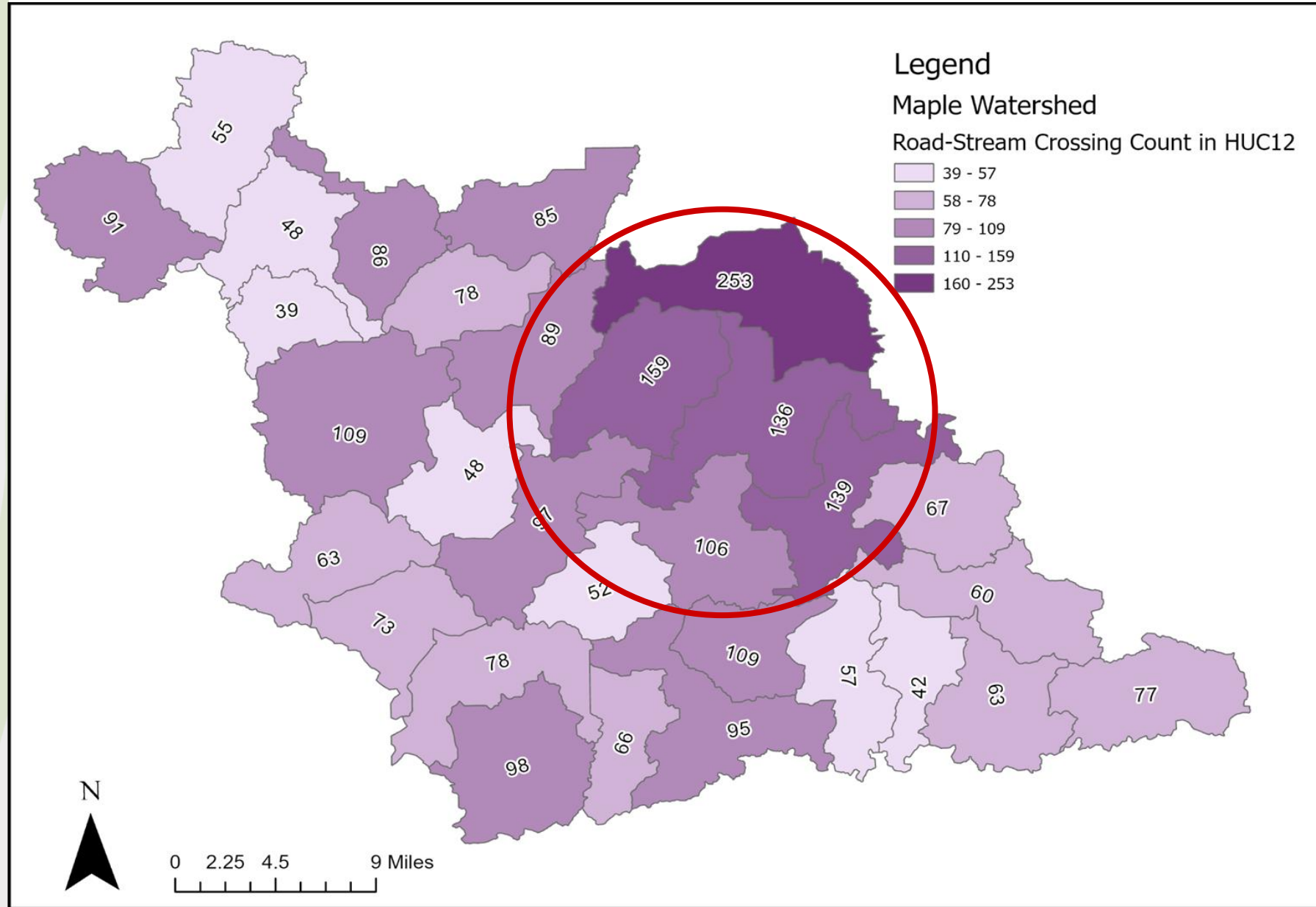
Map Metadata
WSIO HUC 12 Indicator Data for EPA Region 5 (2023) [download], EPA,
<https://www.epa.gov/wsio/wsio-indicator-data-library>

1d.

Most Road Stream Crossings

Road-Stream Crossings Per HUC12

1e.

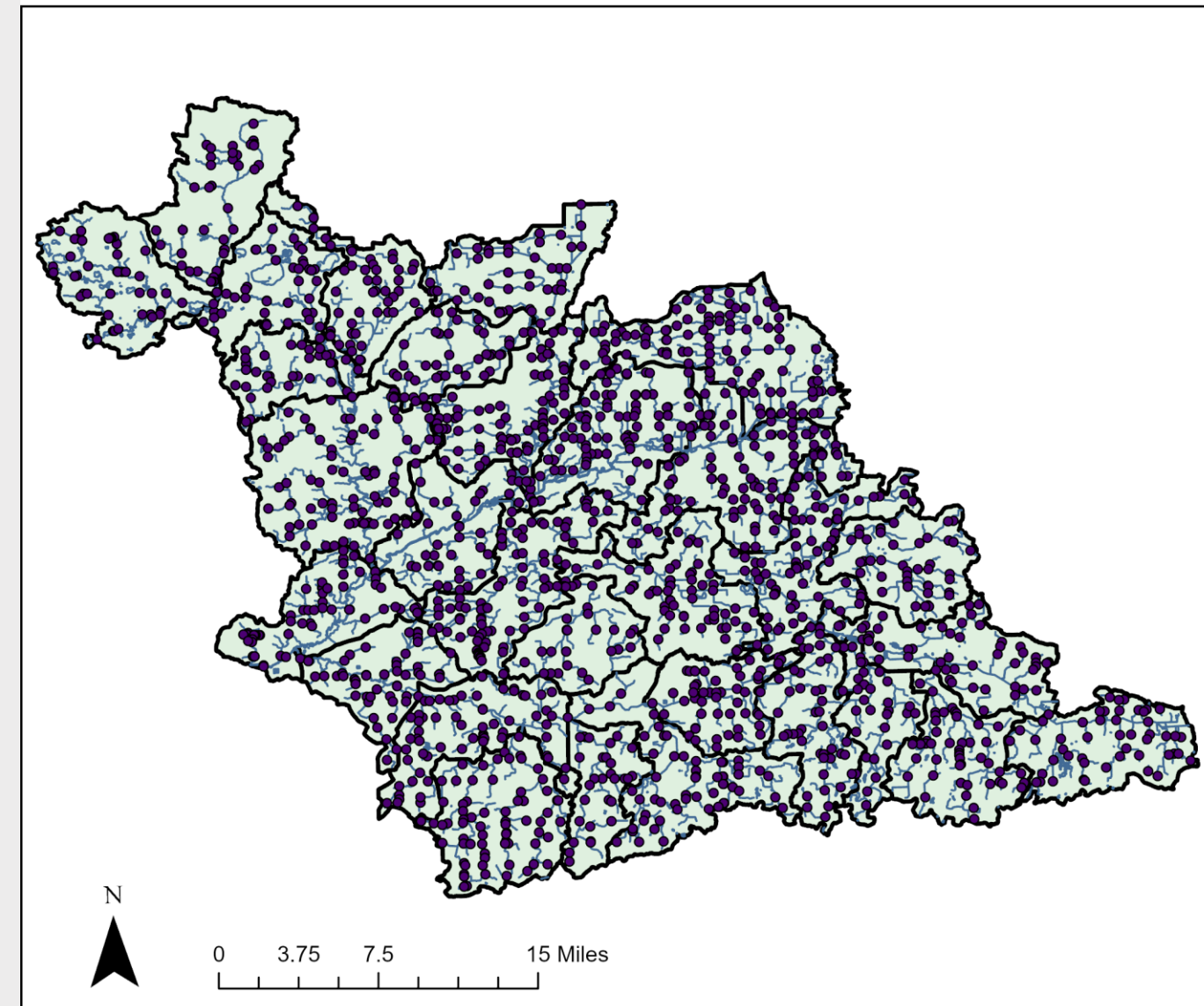


Spatial Reference
Name: NAD 1983 Michigan GeoRef Meters
PCS: NAD 1983 Michigan GeoRef Meters
GCS: GCS North American 1983
Datum: North American 1983
Projection: Hotine Oblique Mercator Azimuth Natural Origin

Map Metadata
Road and Stream Crossings
WSIO Geodatabase with Hydrologic Unit Code (HUC12) polygons
(2024)[download], EPA, <https://www.epa.gov/wsio/wsio-indicator->

Road-Stream Crossings in HUC12s of Maple Watersheds

Created by: R. Demond, December 2024



Legend

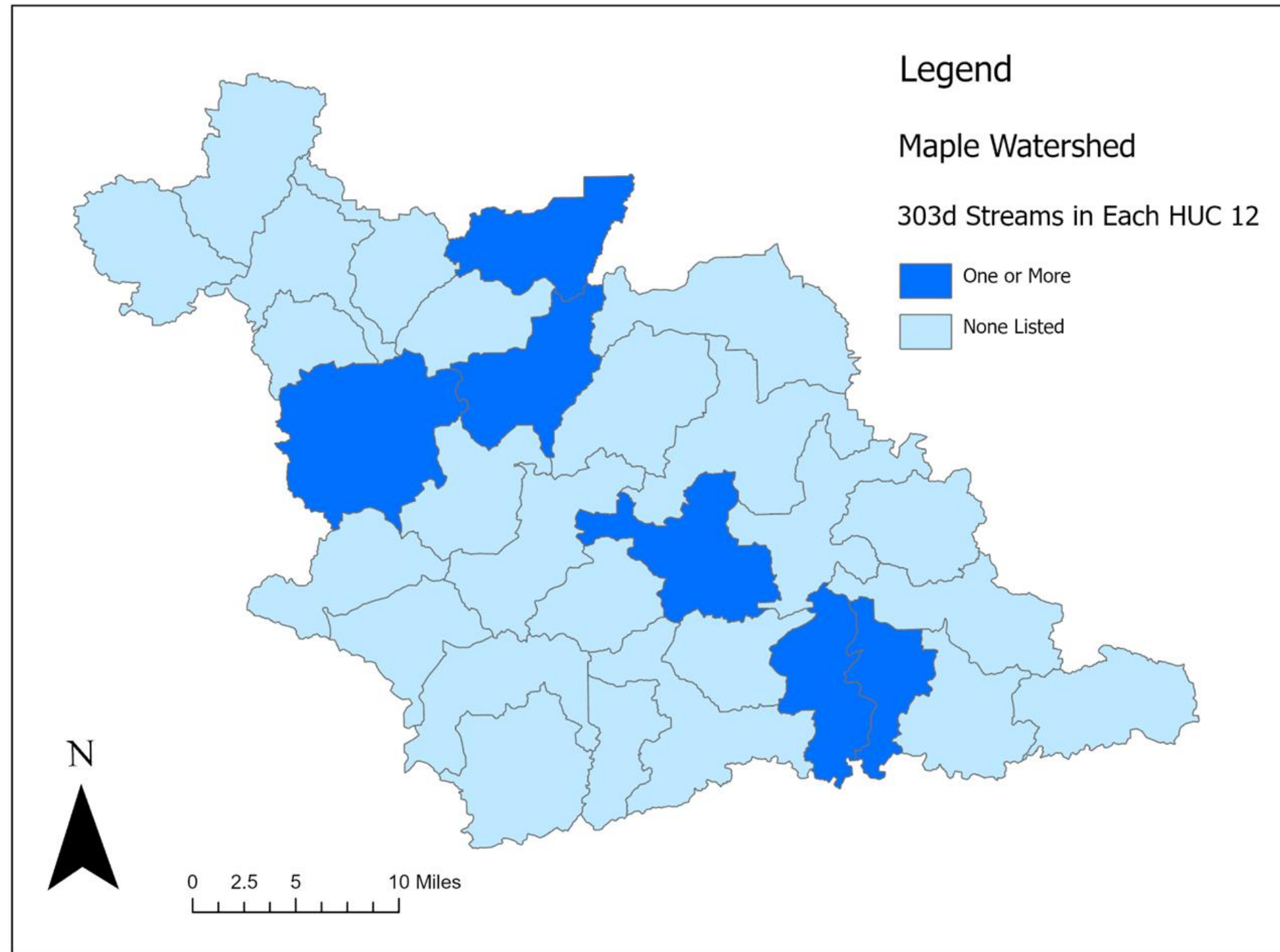
- Road-Stream Intersections
- Streams and Rivers
- Watershed Boundary
- Maple Watershed

Spatial Reference
Name: NAD 1983 Michigan GeoRef Meters
PCS: NAD 1983 Michigan GeoRef Meters
GCS: GCS North American 1983
Datum: North American 1983
Projection: Hotine Oblique Mercator Azimuth Natural Origin

WSIO HUC 12 Indicator Data for EPA Region 5 (2023) [download], EPA, <https://www.epa.gov/wsio/wsio-indicator-data-library>

Stream segments on the 303d list

Stream Segments on the 303d List in HUC12



Spatial Reference
Name: NAD 1983 Michigan GeoRef Meters
PCS: NAD 1983 Michigan GeoRef Meters
GCS: GCS North American 1983
Datum: North American 1983

Map Metadata
303d Streams
Section 303d List (2022) [downloaded], EGLE, <https://www.michigan.gov/egle/about/Organization/Water-Resources/GLWARM/integrated-report>

1f.

Pollutant Load Reductions

2.

- Reducing Nutrient Runoff in Agricultural Areas
 - Improve and decrease areas
- Minimizing impact of road-stream crossing
 - Decrease number and area of crossings
- Increasing the percentage of forested riparian buffers
 - Restore and Expand
- Limit impaired streams
 - TDMLS from 303(d) list

To reduce pollutant loads and improve the health of watershed

3.

Management Measures

Fencing

- Around farms and agricultural lands to decrease animal interference and nutrient runoff

Plant native trees:

- Restore forested riparian buffer

Replace culverts:

- Decrease road and stream crossing

TDMLS:

- Total Daily Maximum Load for 303(d) impaired streams

4.

Financial Analysis

\$19.51 billion

Fencing: about \$10 per foot.

- Approximately \$19 billion for 177.35 sq km.

Vegetation Restoration: \$100 per tree.

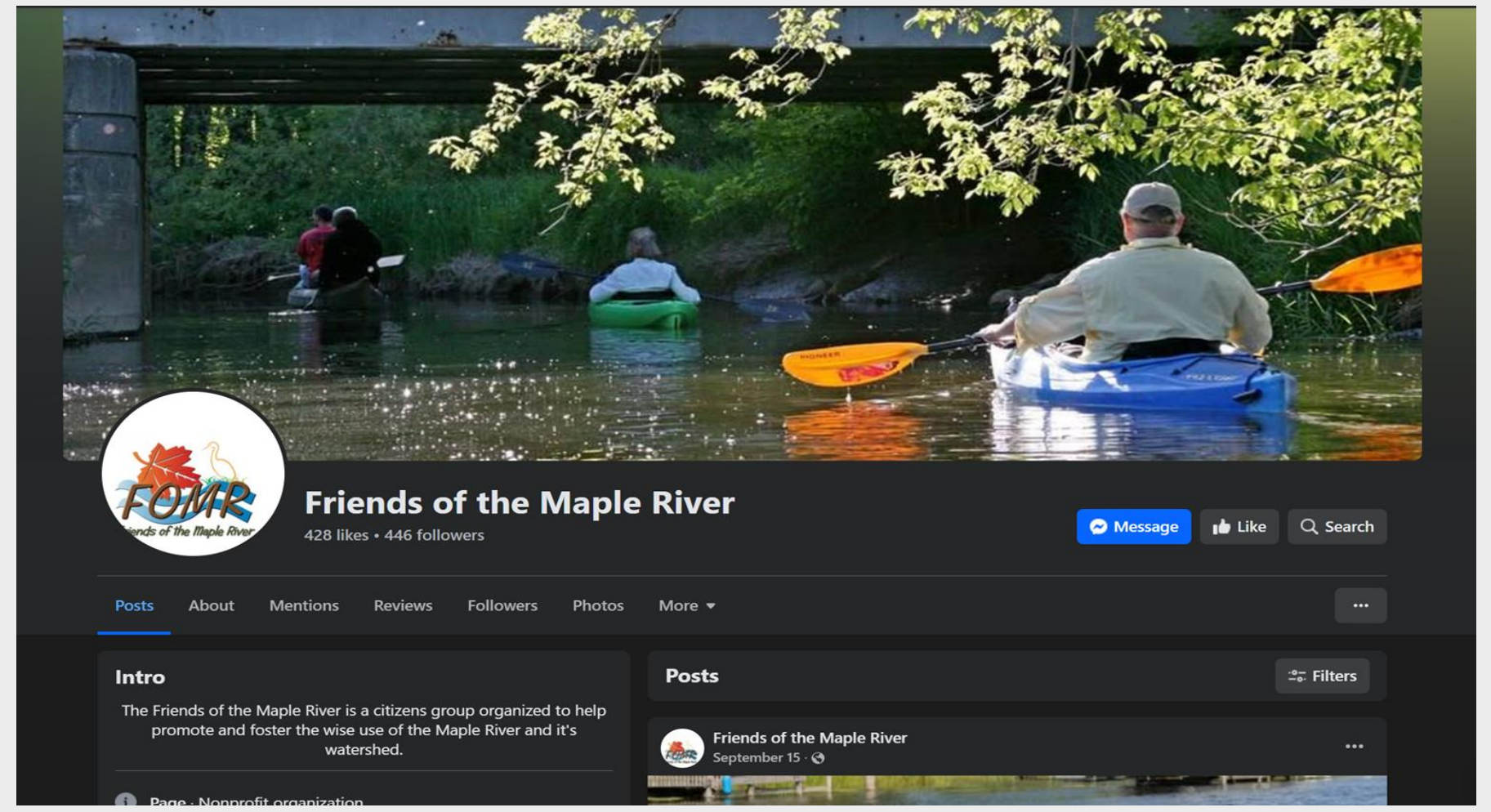
- Approximately \$50.6 million for four HUC 12.

Culvert Replacements: \$1,500 per culvert.

- Approximately \$1 million for 687 culverts.

Funding Sources:

- Grants and financial assistance programs.
- Contributions from local stakeholders.
- Fundraising campaigns and community events.
- Volunteer support to offset costs.



Outreach & Education

5.

Work with Friends of the Maple River to educate and inspire action and promote collective responsibility for the health of the Maple Watershed:

- Host community workshops to educate and involve residents.
- Launch social media campaigns to broaden outreach and engagement.
- Distribute educational pamphlets to inform the public about watershed challenges and solutions.



<https://www.facebook.com/FriendsoftheMapleRiver>



Friends of the
Maple River

Implementation Schedule

Educate the Public

- Raise Awareness
- Secure financial and volunteer support (Few months)



Acquire Resources

- Trees, culverts, fencing (Few months)



Hands-On Restoration Activities

- Volunteers planting trees and constructing fences
- Professionals installing culverts with volunteer support (1-2 years)



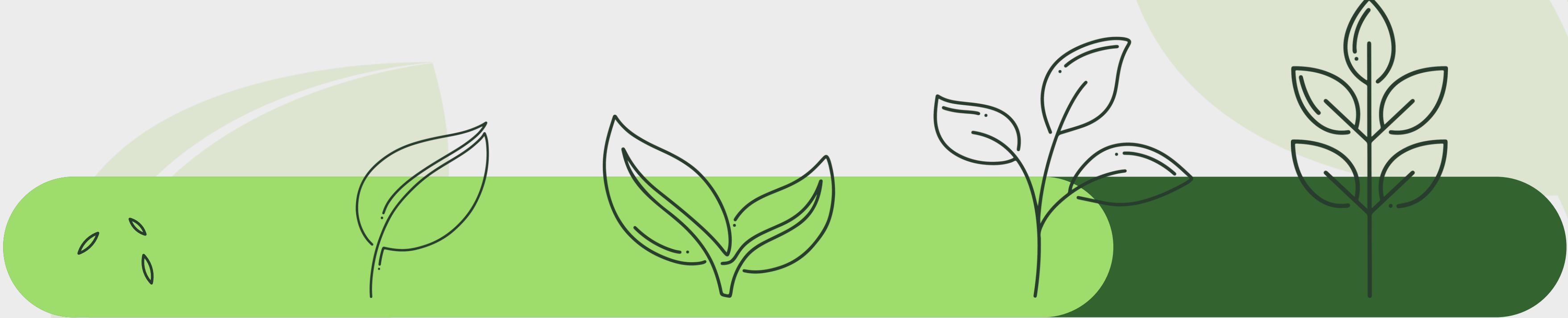
Financial Resource Acquisition

- Fundraisers
- Stakeholders
- Volunteer support (1-2 years)

6.

Overall: 1-2 years in total for implementation.

Measurable Milestones



1

Achieve 20% reduction in the number of road-stream crossings.

2

Decrease the total area of road-stream crossings by 40%.

3

Plant over 1,000 trees in riparian buffers

4

Fence in more than 50% of farms

5

Reduce overall pollution sources and evaluate the plan's success

Success Indicators

- Noticeable decrease in nitrogen and phosphorus levels around agricultural zones.
- Increase in forested riparian buffers.
- Reductions in both the number and area of road-stream crossings.
- Meeting water quality standards.
- Increase biodiversity in aquatic habitats.

Evaluation Criteria

8.

Monitoring Plan

9.

Monitoring Methods:

Objective

Regularly evaluate progress and adapt strategies to ensure the ongoing effectiveness of the restoration plan.

Purpose

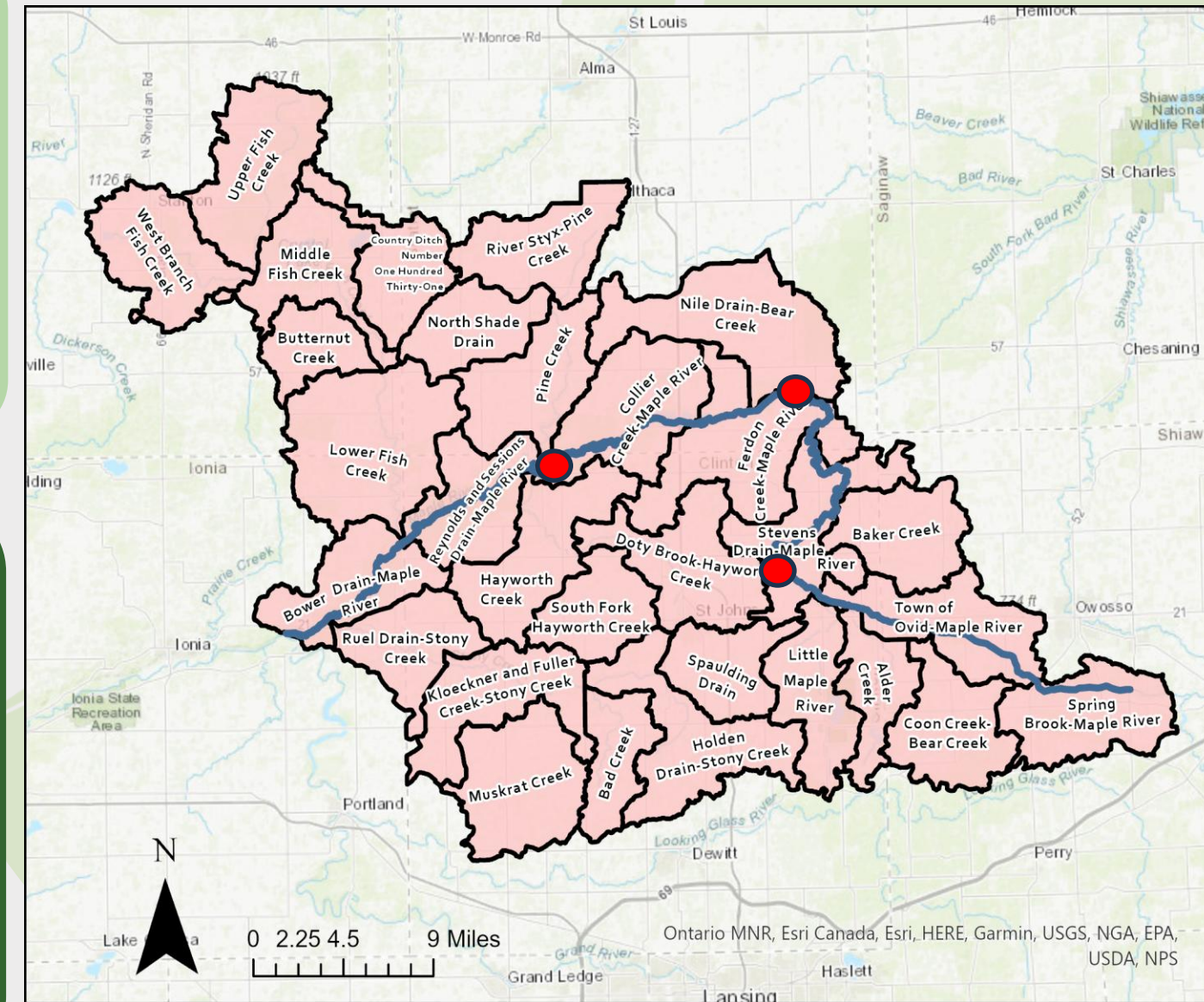
- Collect critical data to assess restoration success.
- Inform adjustments to strategies and guide future actions.

1. Water Sampling

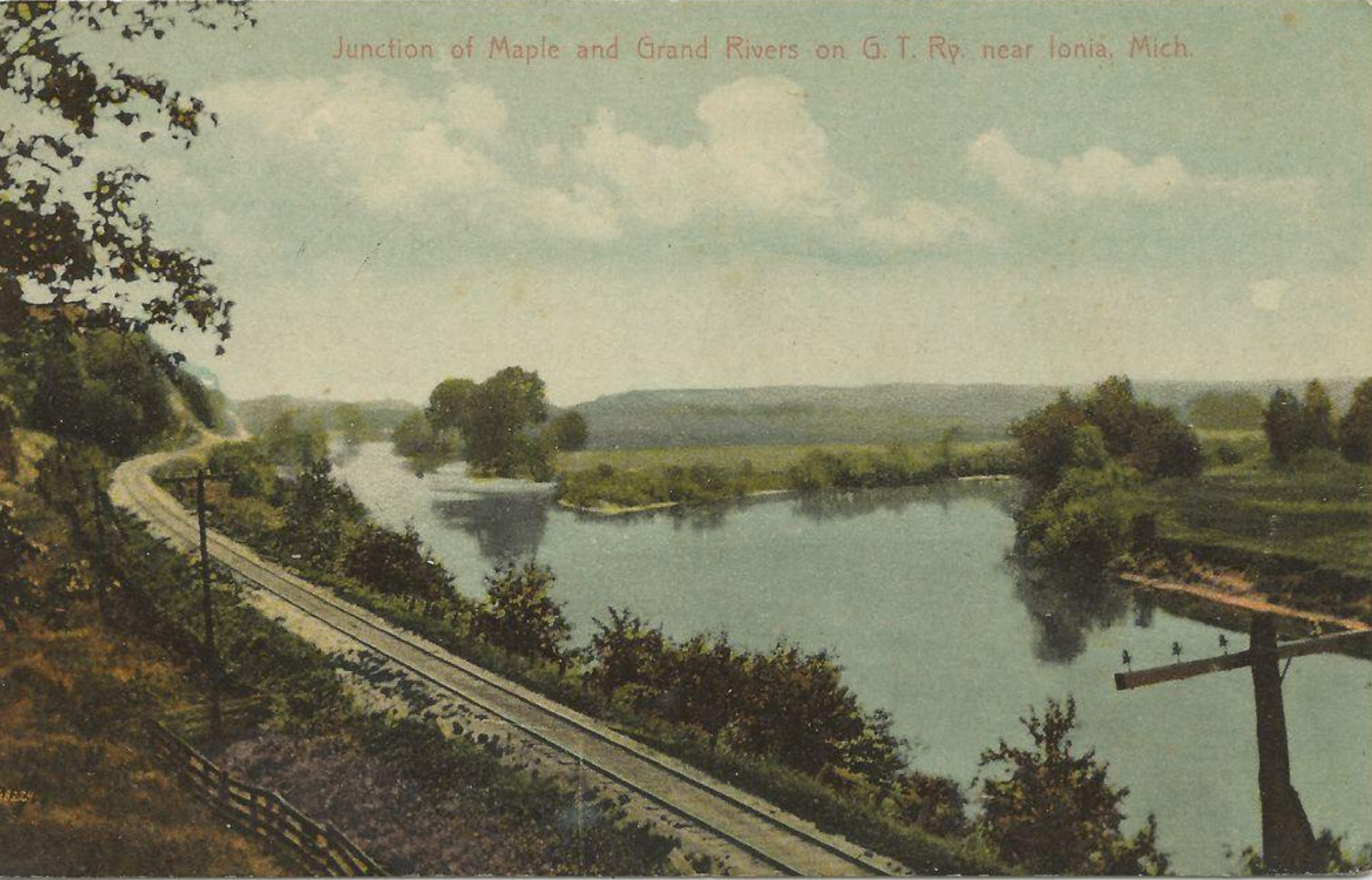
- Conduct consistent sampling at key locations (e.g., Central Zone around Maple River).
- Track changes in nutrient levels, sedimentation, soil quality, and overall water quality.

2. Biological Assessments

- Perform macroinvertebrate surveys to measure stream health.
- Identify trends in biodiversity and ecological conditions.



Junction of Maple and Grand Rivers on G. T. Ry. near Ionia, Mich.



Conclusion

- **The Nine-Element Plan**
 - Emphasizes the importance of addressing pollution, restoring natural buffers, and enhancing water quality.
 - Provides a strategic framework for the long-term health and sustainability of the watershed.
 - I urge stakeholders, local communities, and funding partners to contribute resources and support.
 - As well as, the collective responsibility to achieve shared restoration goals.
 - The Friends of the Maple River and other partners are how we can make this happen through their role in raising awareness and driving action for watershed restoration.
 - The Nine Element Plan promotes a sustainable and resilient future for the Maple Watershed through shared commitment and effort.

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