



Arcadia Pierport Watershed Plan Update

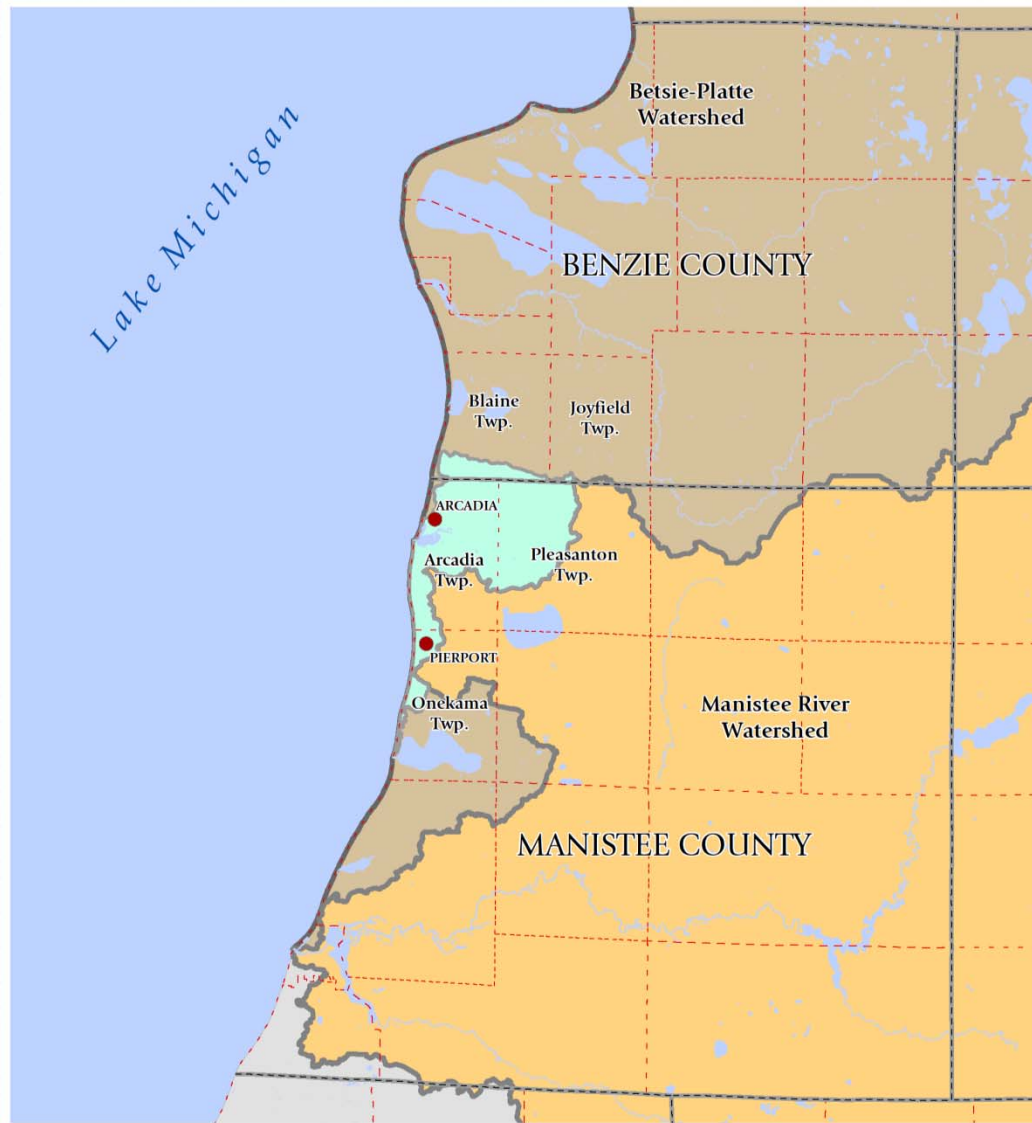
August 6, 2015

Sponsored by Arcadia Township
and



Purpose of Watershed Plan

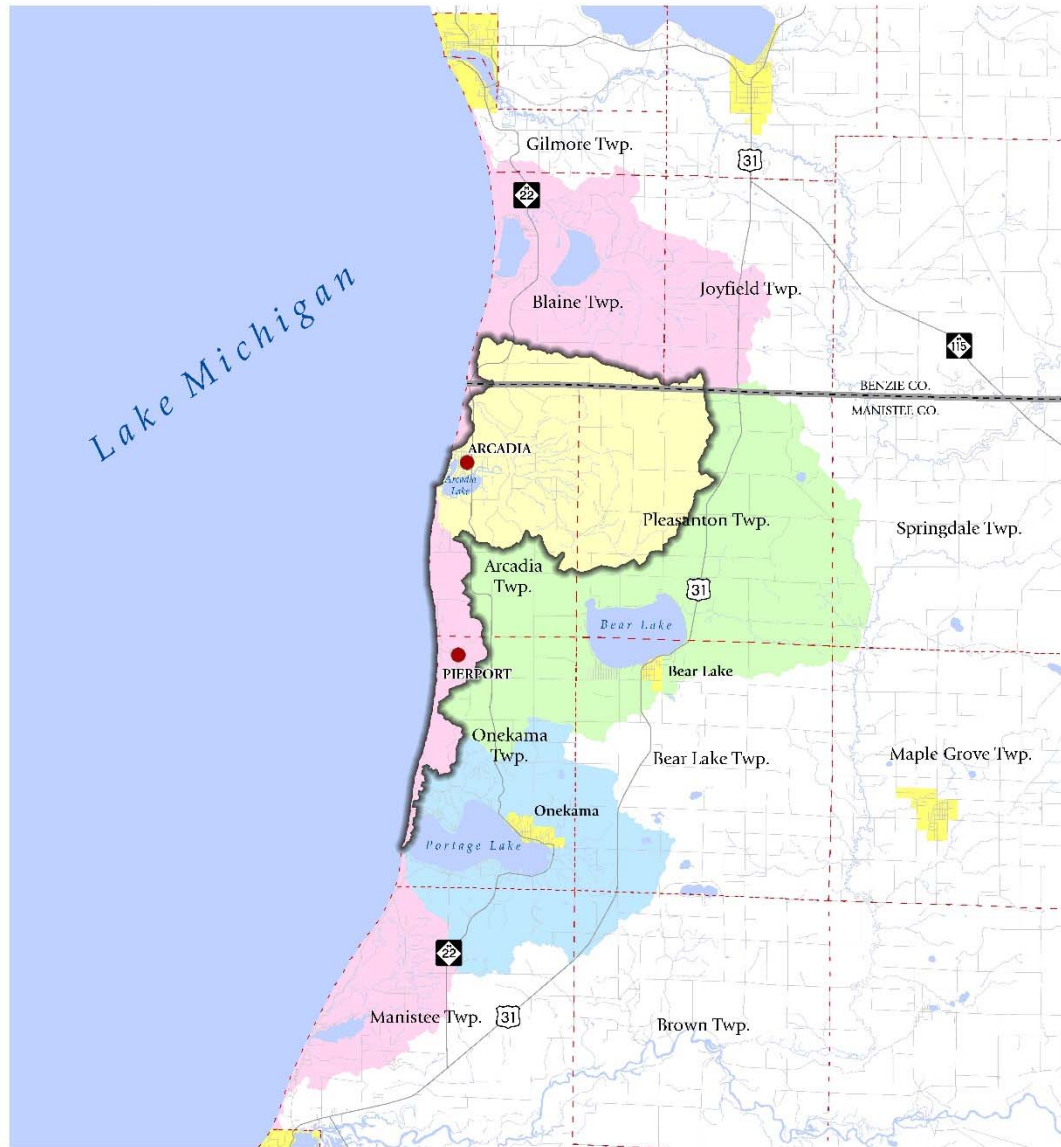
- Flexible framework for managing water resource quality and quantity
- Characterize existing conditions
- Identify and prioritize problems
- Define management objectives, develop protection or remediation strategies, and
- Implement and adapt selected actions as necessary.



ARCADIA-PIERPORT WATERSHED Regional Boundaries

Data Sources: State of Michigan Geographic Data Library, USDA Geospatial Data Gateway

- | | |
|---------------------------|---|
| — County Boundary | ■ Betsie-Platte Regional Watershed |
| - - - Township Boundary | ■ Manistee River Regional Watershed |
| ■ Lakes | ■ Other Regional Watershed |
| ● Unincorporated Villages | ■ Arcadia-Pierport Watershed Study Area |



ARCADIA-PIERPOT WATERSHED
Subwatershed Boundaries

Data Sources: State of Michigan Geographic Data Library

- City or Village
- County Boundary
- Township Boundary
- Roads
- Water Features
- Unincorporated Villages

Subwatershed Name:

- Arcadia Lake
- Lower Herring Lake-Frontal Lake Michigan
- Portage Lake
- Little Bear Creek
- Arcadia-Pierport Watershed

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- Jurisdictions:
 - Benzie and Manistee Counties
 - Blaine, Joyfield, Arcadia, Pleasanton, and Onekama Townships
 - Communities of Arcadia and Pierport
- Within the regional Betsie-Platte Watershed
- ~29.65 square miles, or ~18,973 acres
- Geographically less than a standard MI Township
 ~23,040 acres



ARCADIA-PIERPORT WATERSHED

Strong and Steep Slopes

Data Sources: State of Michigan Geographic Data Library

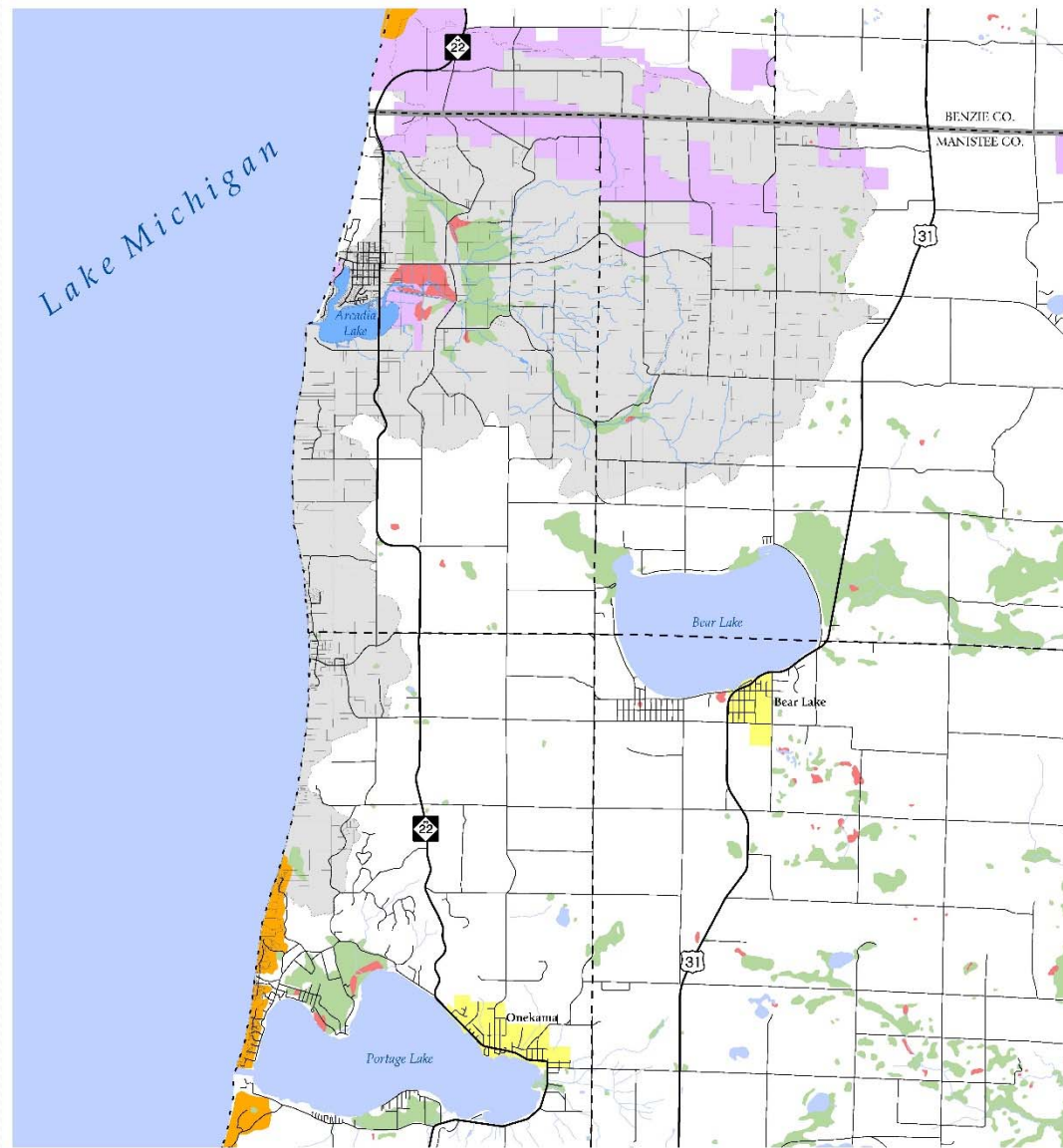
- Watershed Boundary
- County Boundary
- Township Boundary
- Major Road
- Minor Road

Slope Degree:

	9.1 - 16
	16.1 - 80







ARCADIA-PIERPORT WATERSHED

Natural and Sensitive Areas

Data Sources: State of Michigan Geographic Data Library, GTRLC

- Watershed Boundary
- Parcel Boundary
- City or Village
- County Boundary
- Township Boundary

- Major Road
- Minor Road

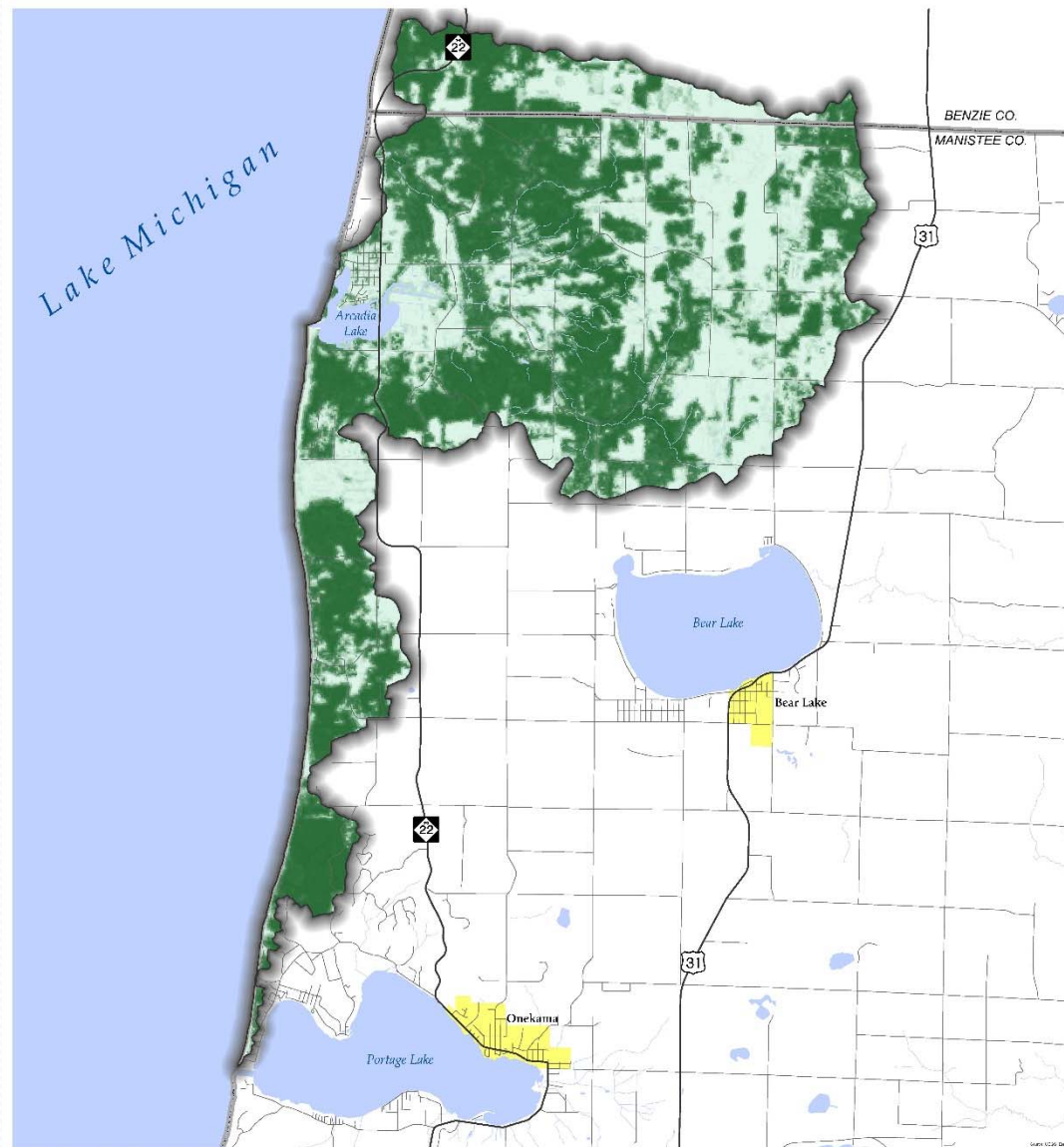
Wetland Type:

- Emergent
- Forested/Shrub

- GTRLC Nature Preserve
- Critical Dunes







ARCADIA-PIERPORT WATERSHED Tree Canopy Cover

Data sources: State of Michigan Geographic Data Library; National Land Cover Database

- Watershed Boundary
- City or Village
- County Boundary
- Major Road
- Minor Road

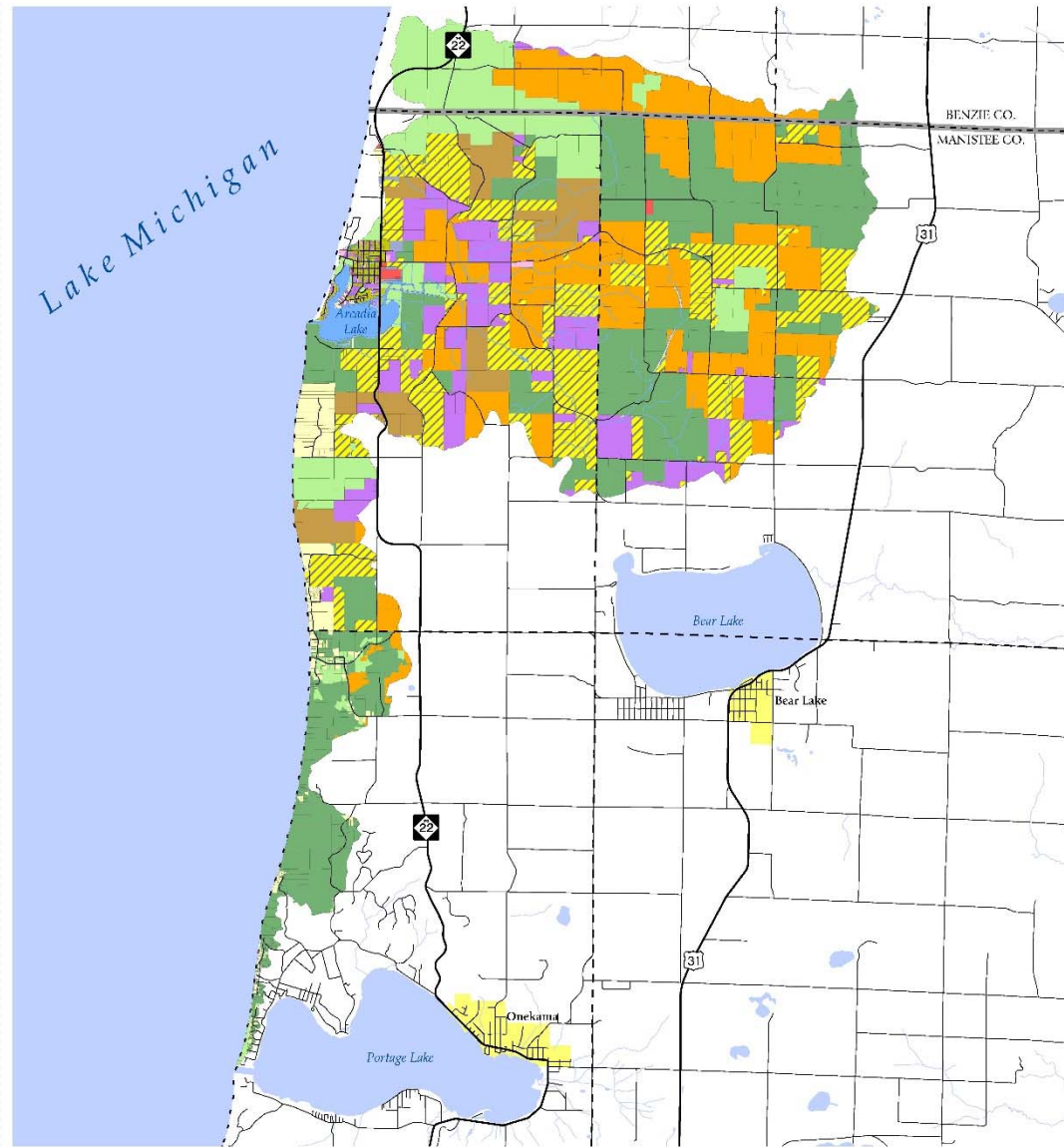
Percent Tree Canopy:

Low, 0%

High, 100%







ARCADIA-PIERPORT WATERSHED

Existing Land Use

Data Sources: State of Michigan Geographic Data Library, USDA

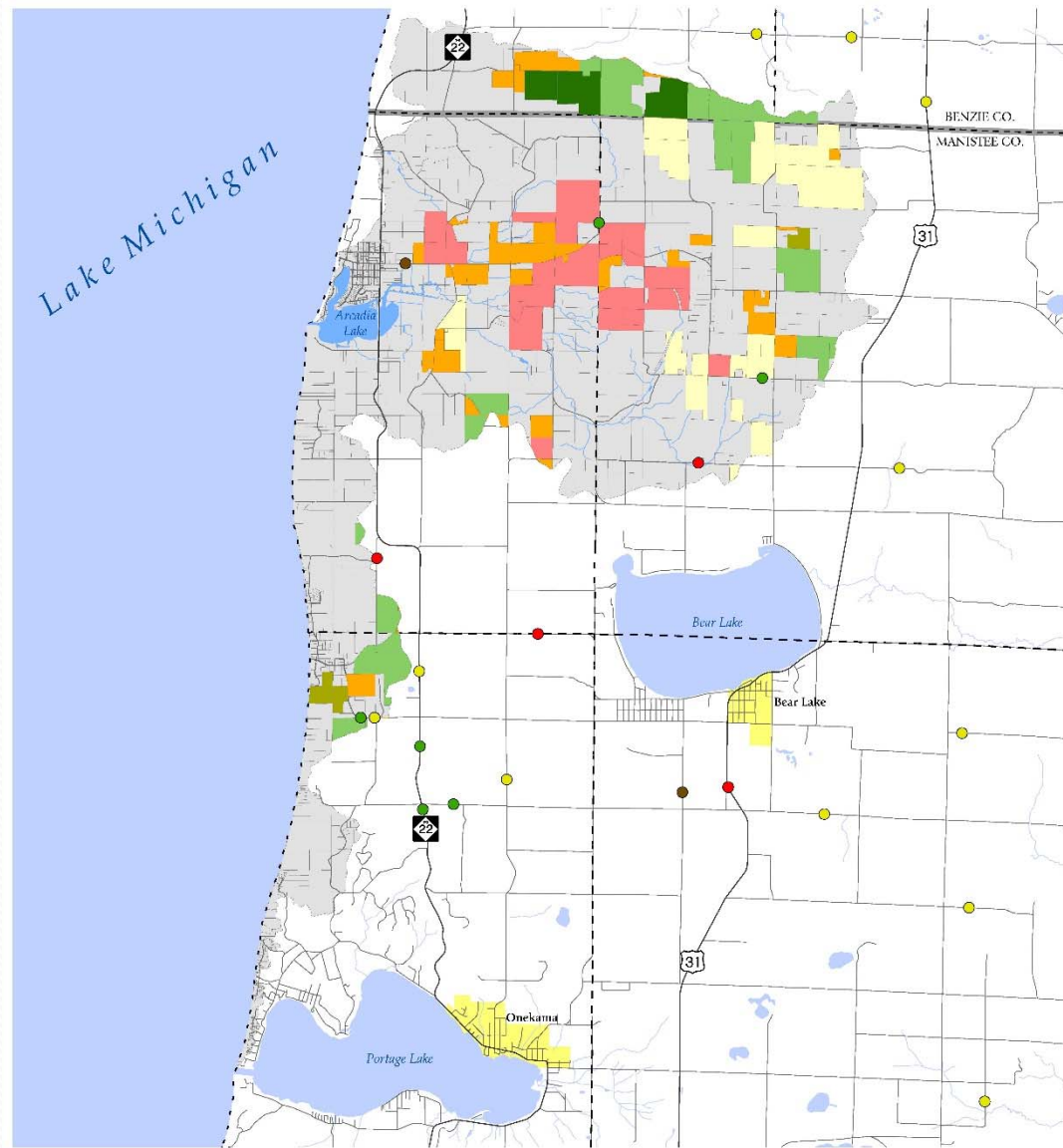
- Parcel Boundary
- City or Village
- County Boundary
- Township Boundary
- Major Road
- Minor Road

Type:

- Agriculture
- Forest
- Industrial
- Leisure Activities
- Mass Assembly
- Natural Resources
- Residential, Cottage/Resort
- Residential, Rural
- Residential, Settlement
- Shopping, Business, or Trade
- Social/Institutional
- Unclassified/Vacant







ARCADIA-PIERPORT WATERSHED Agricultural Land Uses by Type

Data Sources: State of Michigan Geographic Data Library; USDA NCS, GIPSC, Onkama Township, Arcadia Township, Pierport Township, Phoenix Township, Blaine Township

- Parcel Boundary
- City or Village
- County Boundary
- Township Boundary
- Major Road
- Minor Road

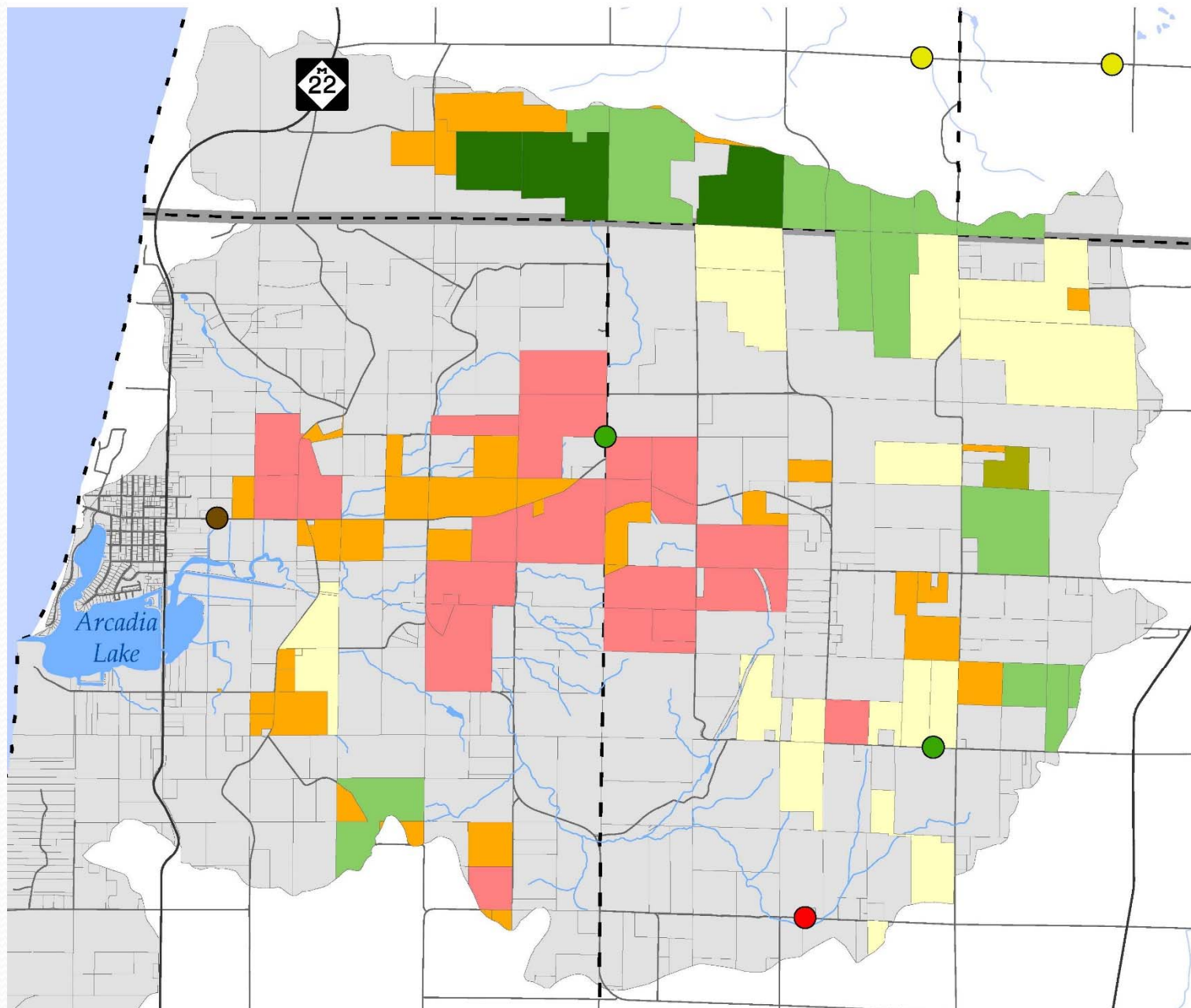
- Unspecified Agriculture
- Corn/Grain
- Cattle/Pasture
- Hay
- Orchard
- Christmas Trees

Other Land Uses

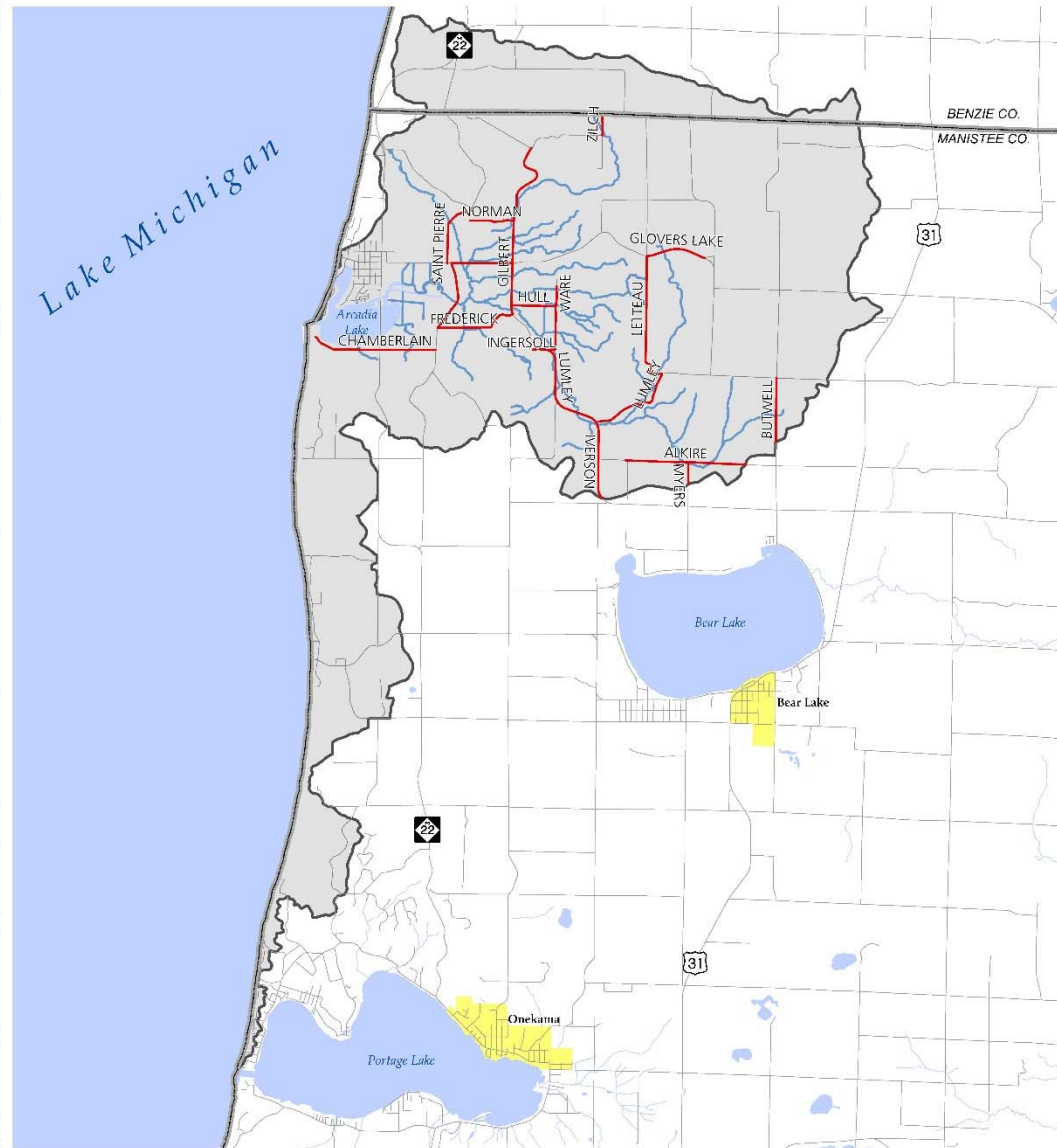
Farming Operations:

- General Crops
- Orchards
- Livestock
- Maple Syrup









ARCADIA-PIERPORT WATERSHED Road/Creek Crossings

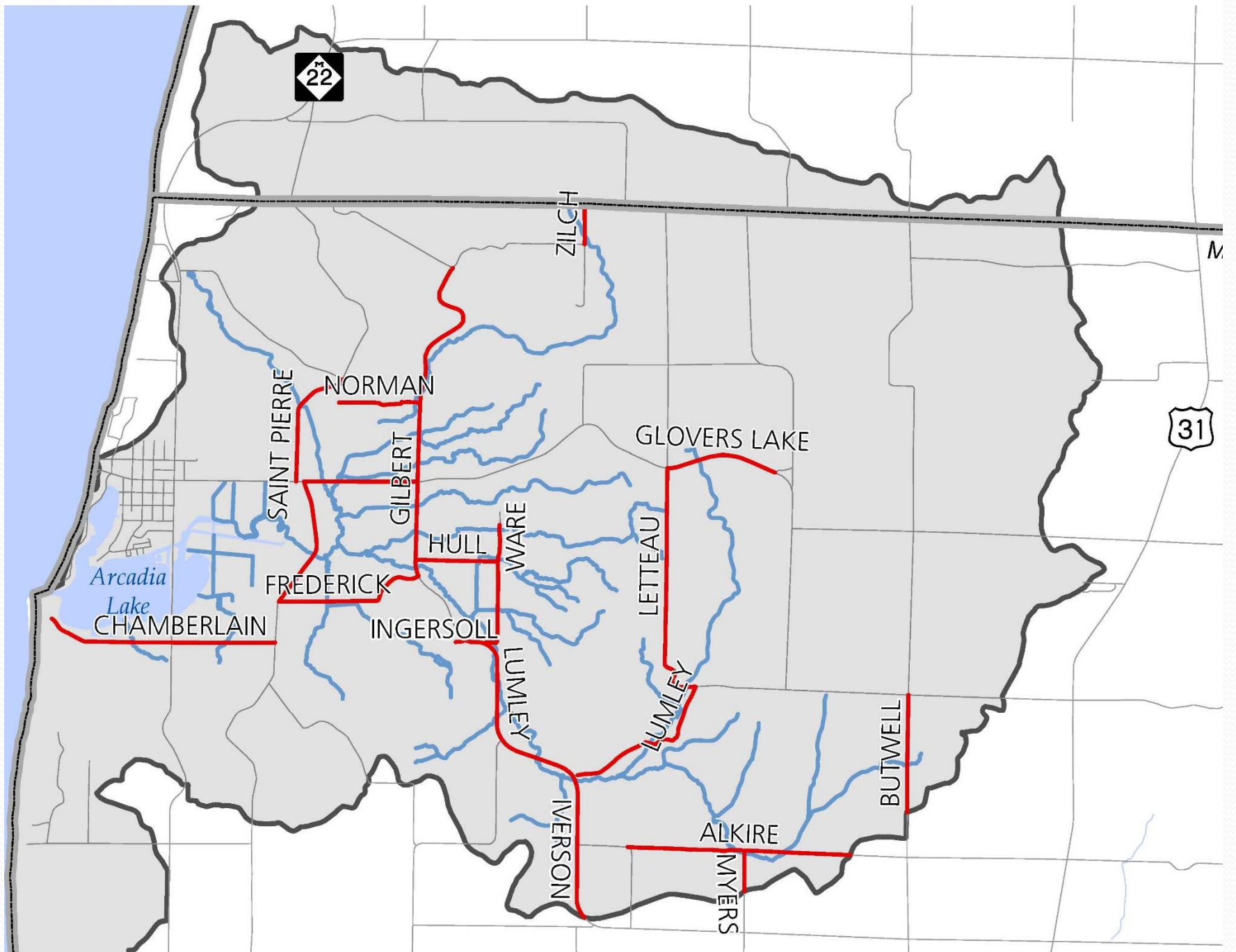
Data Sources: State of Michigan Geographic Data Library

Watershed Boundary
 City or Village

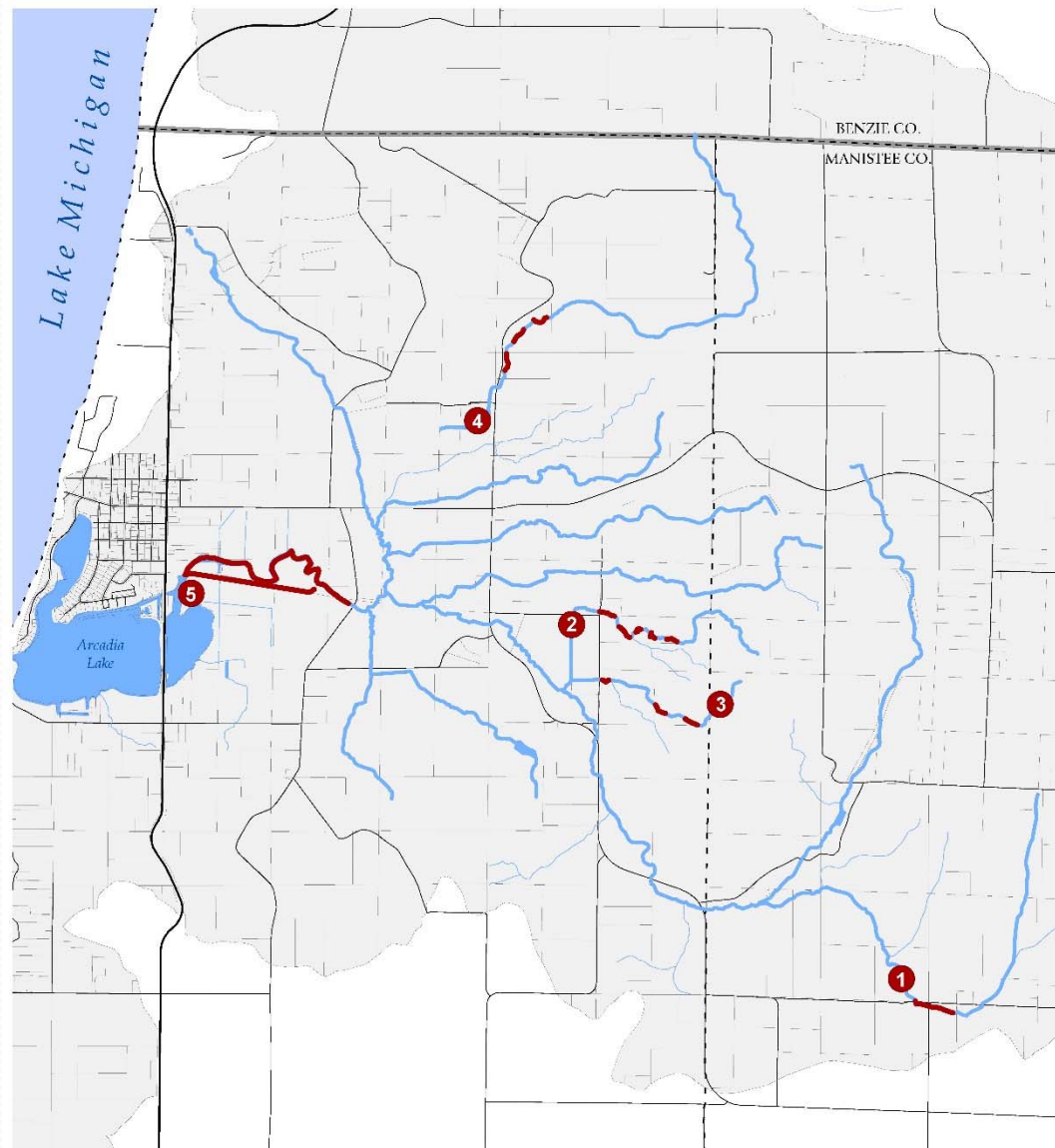
County Boundary
 Major Road

Crossings
 Rivers











ARCADIA-PIERPORT WATERSHED **Little River Band of Ottawa Indians Monitoring Stations**

Data sources: State of Michigan Geographic Data Library; USGS; Little River Band of Ottawa Indians

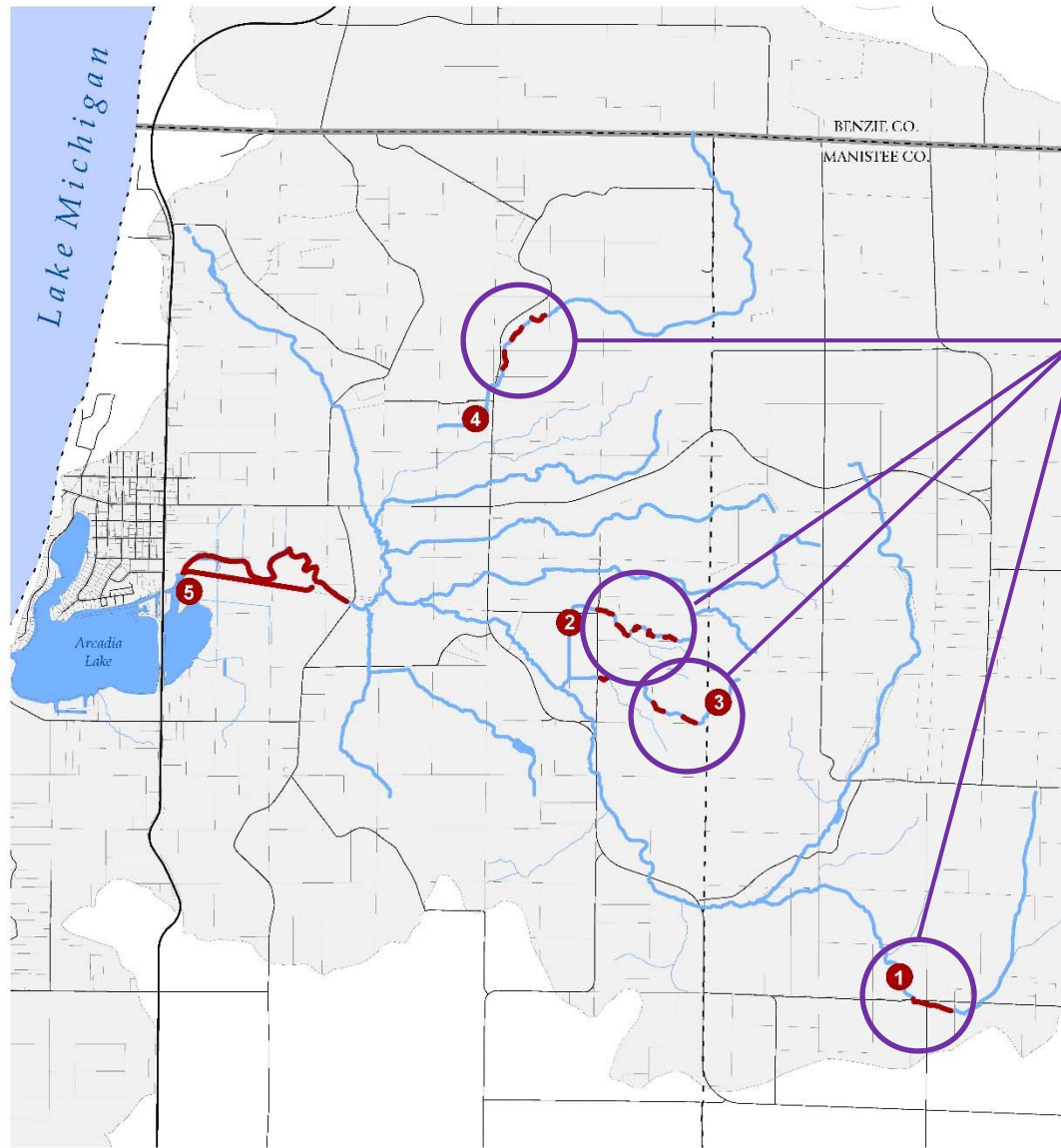
 Watershed Boundary
 Parcel Boundary

 County Boundary
 Township Boundary
 Major Road
 Minor Road

-  1 Alkire Creek
-  2 Hull Creek
-  3 Ware Creek
-  4 Toohey Creek
-  5 Bowens Creek

0 0.25 0.5 1 Miles





ARCADIA-PIERPOT WATERSHED **Little River Band of Ottawa Indians Monitoring Stations**

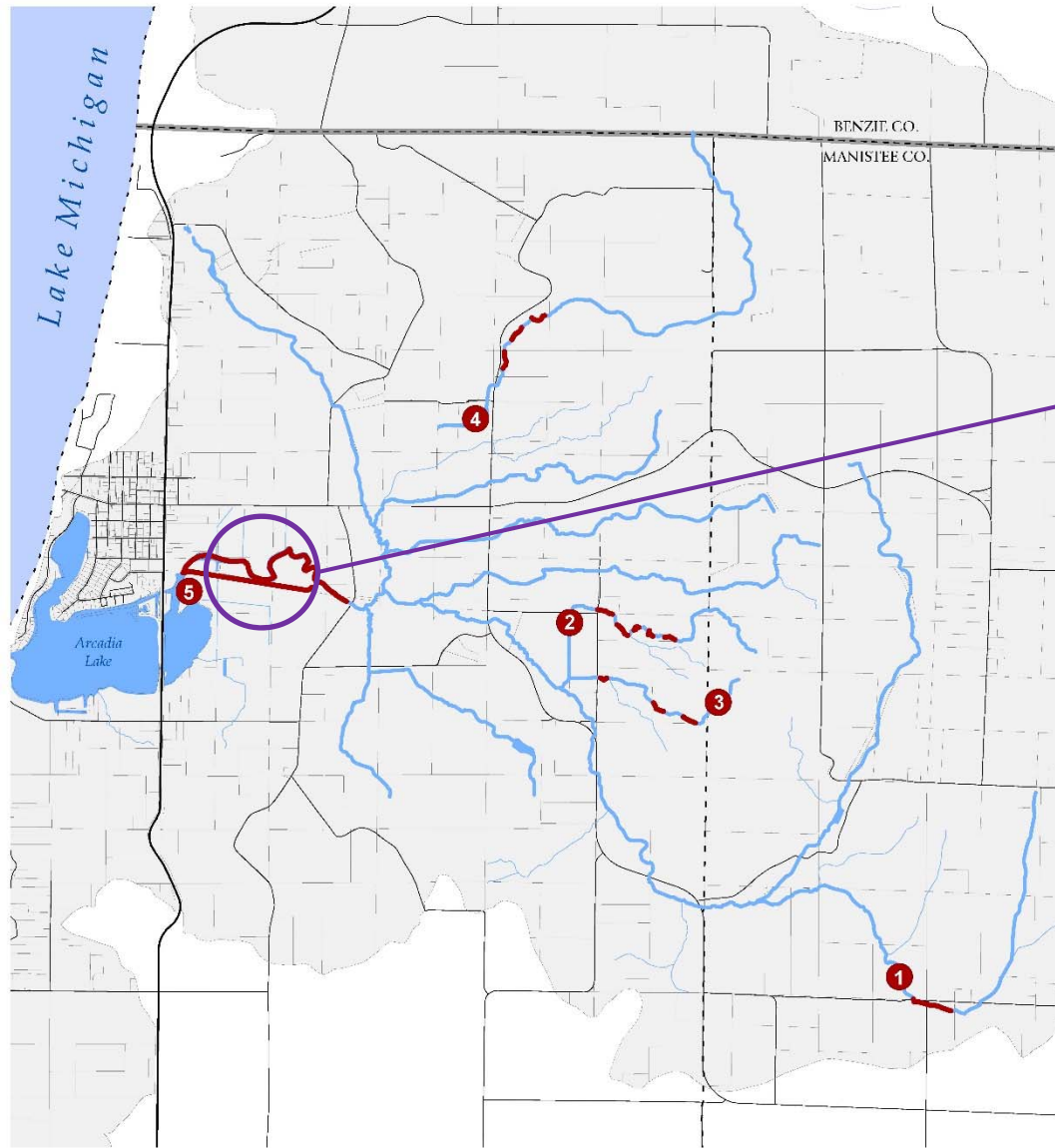
Data Sources: State of Michigan Geographic Data Library, USGS, Little River Band of Ottawa Indians

- | | | |
|--------------------|-------------------|----------------|
| Watershed Boundary | County Boundary | 1 Alkire Creek |
| Parcel Boundary | Township Boundary | 2 Hull Creek |
| | Major Road | 3 Ware Creek |
| | Minor Road | 4 Toohey Creek |
| | | 5 Bowens Creek |



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Water quality good,
 habitat good,
 diversity of
 macroinvertebrate
 good,
 Fish species – Coho
 Salmon, Sculpin, and
 Trout



ARCADIA-PIERPOT WATERSHED **Little River Band of Ottawa Indians Monitoring Stations**

Data Sources: State of Michigan Geographic Data Library, 1960s; Little River Band of Ottawa Indians

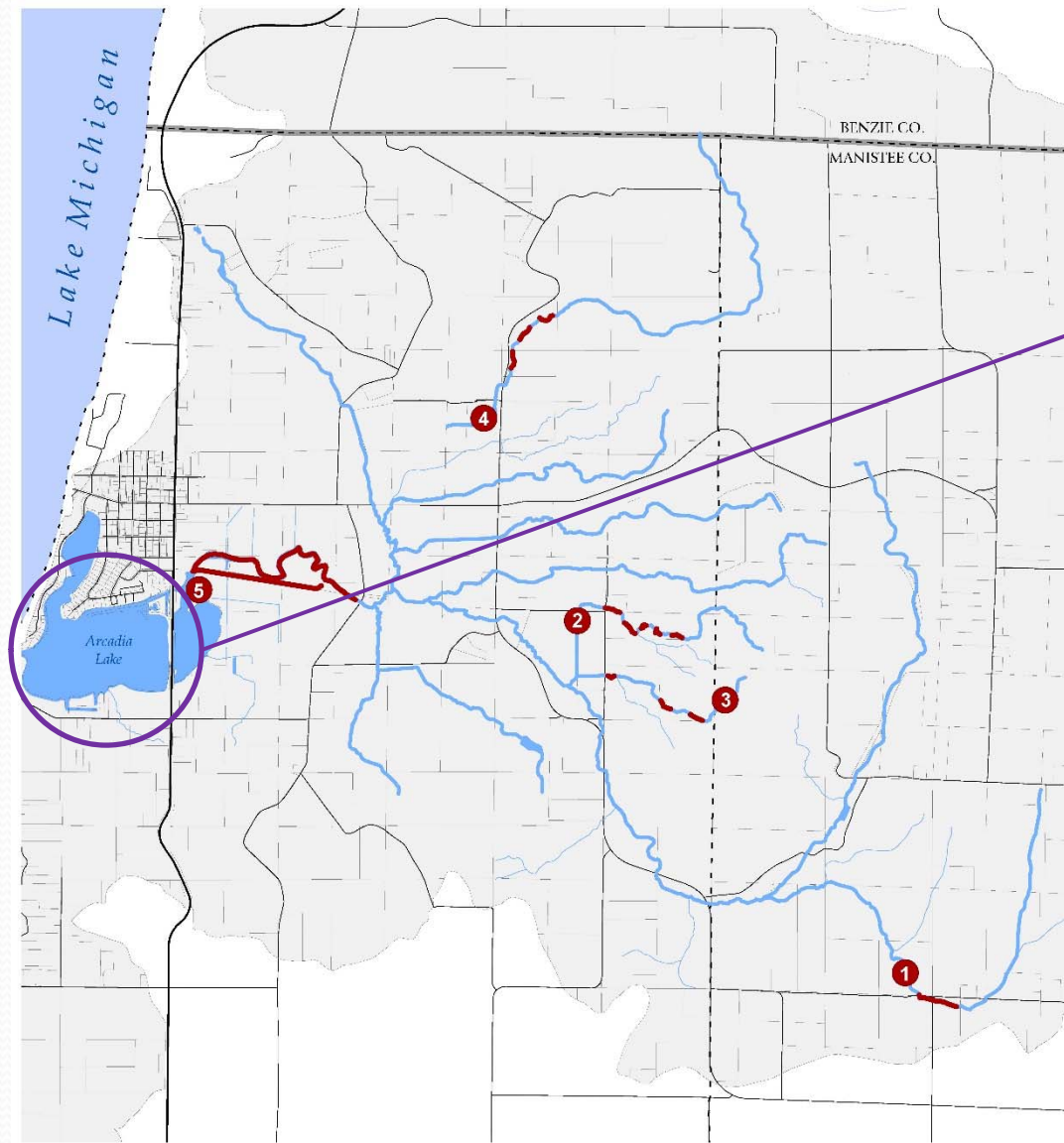
- Watershed Boundary
- County Boundary
- Township Boundary
- Major Road
- Minor Road
- Parcel Boundary

- 1 Alkire Creek
- 2 Hull Creek
- 3 Ware Creek
- 4 Toohey Creek
- 5 Bowens Creek



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Water quality better since restoration, macroinvertebrate not as good as upstream, Fish species – array of species but trout present after restoration



ARCADIA-PIERPORT WATERSHED Little River Band of Ottawa Indians Monitoring Stations

Data sources: State of Michigan Geographic Data Library, USGS, Little River Band of Ottawa Indians

- Watershed Boundary
- Township Boundary
- Major Road
- Minor Road
- Parcel Boundary

- 1 Alkire Creek
- 2 Hull Creek
- 3 Ware Creek
- 4 Toohey Creek
- 5 Bowens Creek



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Temperature and dissolved oxygen are acceptable.

Fish species sampled in 2012 included bass, northern pike, yellow perch, walleye, and brown bullhead.

Ecosystem and water quality are negatively impacted by invasive species like Eurasian watermilfoil

Water Quality of Arcadia Marsh

- Great Lakes Coastal Marsh
- Water quality and ecosystem have been affected by human influenced (*anthropogenic*) disturbances
- Invasive species like reed canary grass and phragmites threaten native species and ecosystem
- Fish species observed in 2008 included trout, coho salmon, and sculpin
- With redirection of Bowens Creek to historical meandering channel through Arcadia Marsh, fish species have been observed to have changed, and Marsh now seems to provide better environment for cold water species like rainbow trout

Community engagement

- 18 members serve on Watershed Leadership Team (WLT) to engage and update community
- 14 open WLT meetings held 7/18/13–6/10/15
- Presentations made to Blaine, Joyfield, Arcadia, and Onekama Townships
- Outreach conducted at community festivals and events
- Arcadia-Pierport Watershed Plan webpage created: Arcadia Pierport Watershed Property Owner/Resident Survey conducted in May 2014:
 - Questions inquired about water quality of Arcadia Lake, Arcadia Marsh, and Lake Michigan, recreational activities in watershed, threats to watershed, and basic knowledge of how a watershed works
 - 900 post card mailings to property owners of record - 27 responses

Designated uses of the watershed

- R 323.1100 Designated Uses Rule 100 of Part 4. Water Quality Standards states that “all surface waters of the state are designated and protected for all of the following uses:
 - (a) Agriculture.
 - (b) Navigation.
 - (c) Industrial water supply.
 - (d) Warmwater fishery.
 - (e) Other indigenous aquatic life and wildlife.
 - (f) Partial body contact recreation.
 - (g) Fish consumption.
- ...All surface waters of the state are designated and protected for total body contact recreation from May 1 to October 31...”
- (Part 4. Water Quality Standards, n.d.)

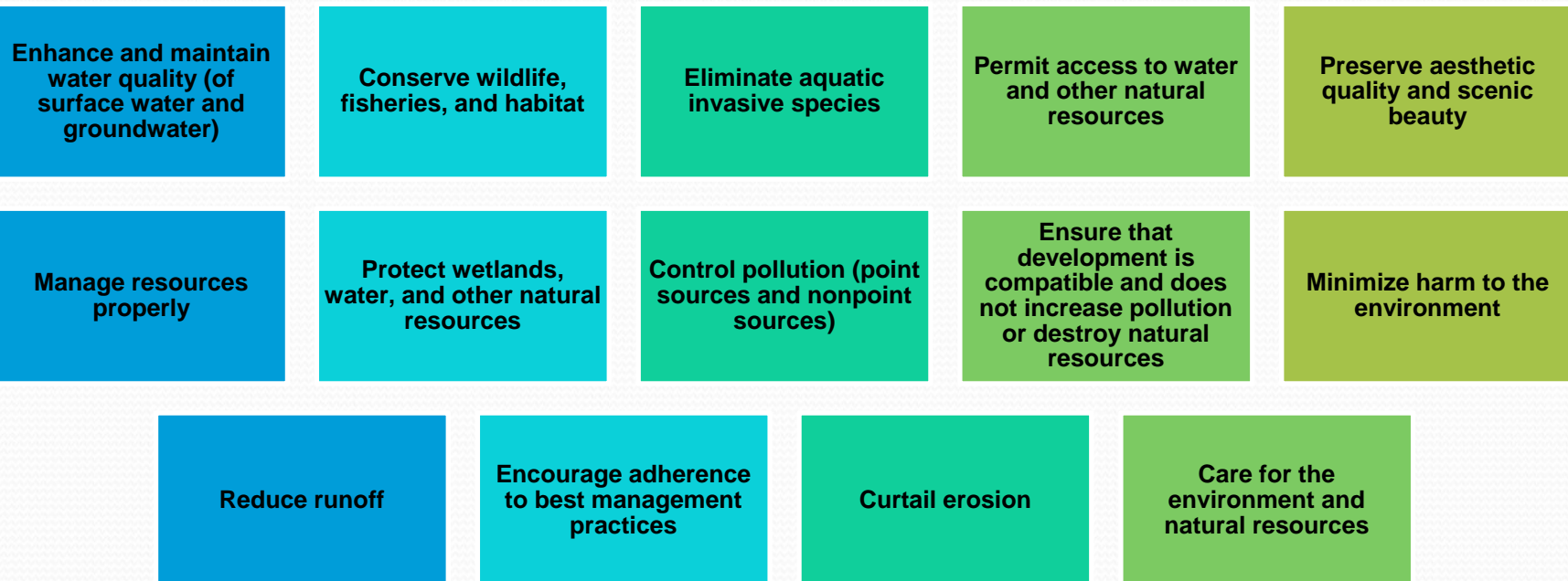
Evaluation of Water Bodies in APW in Regards to Designated Uses

Designated Use	Arcadia Lake	Onekama Beach (Lake Michigan)	Arcadia Park Beach (Lake Michigan)	Pierport Beach (Lake Michigan)
Total Body Contact Recreation	Not Assessed	Fully Supporting	Fully Supporting	Fully Supporting
Partial Body Contact Recreation	Not Assessed	Fully Supporting	Fully Supporting	Fully Supporting
Navigation	Fully Supporting	Fully Supporting	Fully Supporting	Fully Supporting
Industrial Water Supply	Fully Supporting	Fully Supporting	Fully Supporting	Fully Supporting
Agriculture	Fully Supporting	Fully Supporting	Fully Supporting	Fully Supporting
Warm Water Fishery	Not Assessed	Not Assessed	Not Assessed	Not Assessed
Other Indigenous Aquatic Life and Wildlife	Fully Supporting	Not Assessed	Not Assessed	Not Assessed
Cold Water Fishery	Not Assessed	Not Assessed	Not Assessed	Not Assessed
Fish Consumption	Not Assessed	Not Assessed	Not Assessed	Not Assessed

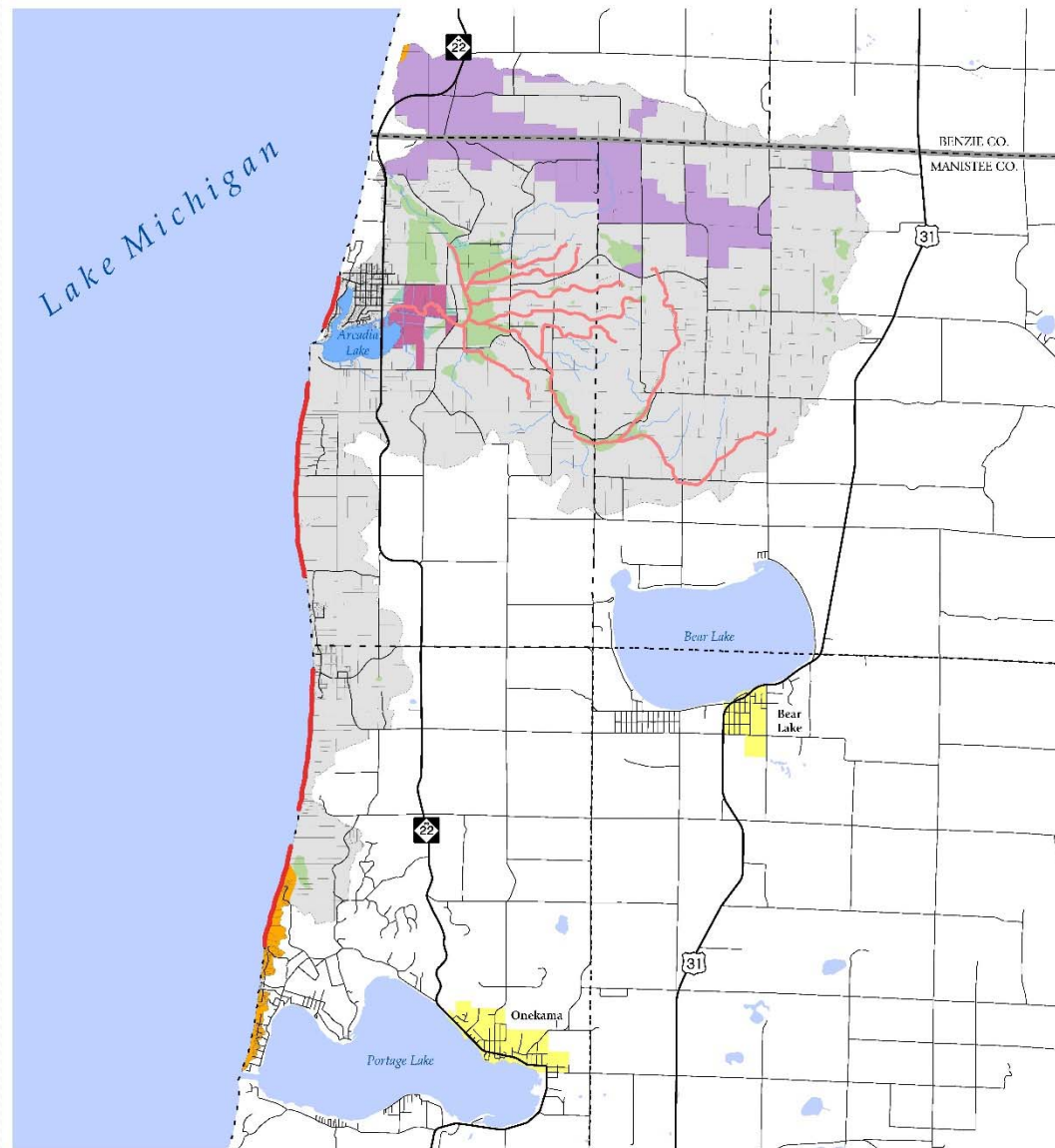
(Water Quality and Pollution Control in Michigan Sections 303(d), 305(b), and 314 Integrated Report: Final Draft 2014 Clean Water Act Sections 303(d), 305(b), and 314 Integrated Report: Appendix B2 – Comprehensive list of assessment unit designated use support (HUCs 04060101 – 07070001), 2014)

Desired Uses of Watershed

- Desired uses of APW obtained from goals expressed in Lakes to Land Regional Initiative plans:



(Arcadia Township Master Plan, 2014; Arcadia Township Visioning Session Results, n.d.; Benzie County 2020 Comprehensive Plan, 2000; Blaine Township Master Plan, 2014; Little River Band of Ottawa Indians Future Land Use Plan, 2005; Manistee County Master Plan 2008, 2009; Onekama Community Master Plan, 2010; Pleasanton Township Master Plan, 2015; Pleasanton Township Visioning Summary, n.d.)



ARCADIA-PIERPORT WATERSHED Priority Protection Areas

Data Sources: State of Michigan Geographic Data Library (GDL), Michigan DNR

- | | |
|--------------------|-------------------------|
| Watershed Boundary | City or Village |
| Parcel Boundary | Critical Dunes |
| Major Road | High Risk Erosion Areas |
| Minor Road | Trout Streams |
| County Boundary | |
| Township Boundary | |

- | |
|--|
| Arcadia Marsh Preserve |
| Arcadia Dunes: CS Mott Nature Preserve |
| Freshwater Forested/Shrub Wetland |
| Freshwater Emergent Wetland |

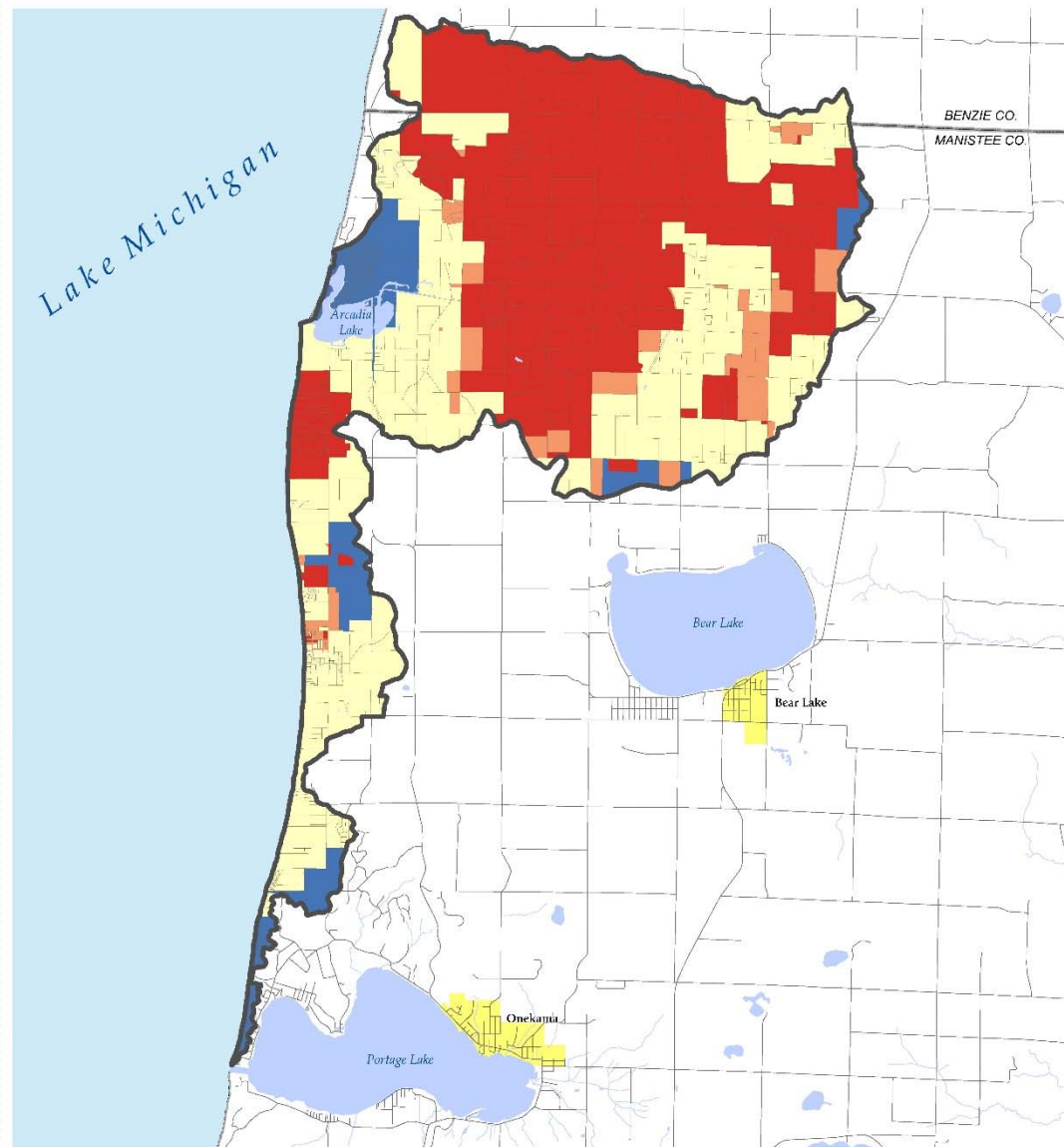


Priority Protection Areas

Priority Protection Area Category	Amount of Watershed in Priority Protection Area
Critical Dunes	189.22 acres
High Erosion Areas	5.70 miles of coastline
Trout Streams (not including Betsie River or Trout Lakes)	20.96 miles
Arcadia Marsh Preserve	~270 acres
Arcadia Dunes: C.S. Mott Nature Preserve	2,614.41 acres
Freshwater Forested / Shrub Wetland	877.97 acres
Freshwater Emergent Wetland	166.99 acres

Priority Parcel Analysis

- A GIS process that evaluates individual land parcels based on multiple ecological criteria and ranks parcels accordingly.
- 12 considerations:
 - Parcel Size
 - Groundwater Recharge Potential,
 - Wetland Preservation
 - Lake Shoreline/Riparian Ecosystems
 - Stream Shoreline/Riparian Ecosystems
 - Steep Slopes
 - Steep Slopes on Agricultural Land
 - Adjacency to Protected Lands
 - Adjacency to Agricultural Lands
 - Agricultural Lands Adjacent to Tributaries
 - Adjacency to Residential Lands
 - EPA Registered Pollutant Sites
- Dark blue parcels have lowest number of points; red parcels have most points and represent highest priority areas
- Highest priority areas are in northern and central areas of Arcadia portion of watershed



ARCADIA-PIERPORT WATERSHED

Hot Spot Priority Parcel Analysis

Data Sources: State of Michigan Geographic Data Library; Onokama Township, Arcadia Township, Pierport Township, Roscommon Township

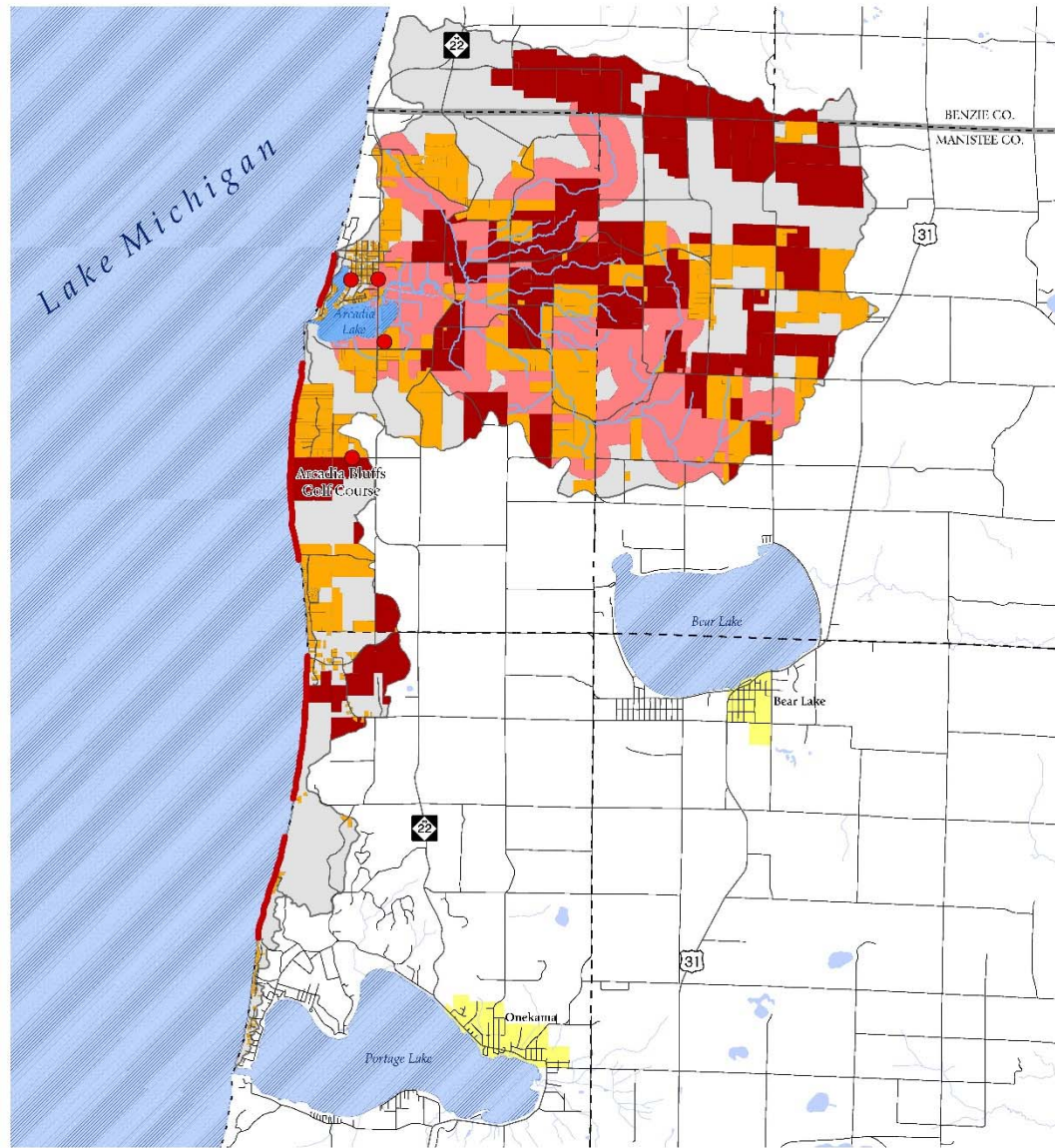
- Watershed Boundary
- City or Village
- County Boundary
- Roads
- Rivers
- Lakes

Parcel Point Distribution:

- Cluster of High Point Totals (High Priority)
- No Significant Cluster of Point Totals
- Cluster of Low Point Totals (Low Priority)



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ARCADIA-PIERPORT WATERSHED

Critical Areas

Data Sources: State of Michigan Geographic Data Library; Arcadia Township; Onkama Township; Pleasant Township; Blue Township; Jayfield Township; Village of OJ; EPA Environmental Database; Gateway

- Watershed Boundary
- City or Village
- County Boundary
- Township Boundary

Critical Areas:

- 1/4 Mile Creek Buffer
- Residential Land Uses
- Agricultural Land Uses
- EPA Impaired Waters

- EPA Registered Pollutant Sites
- Roads
- Creeks
- High Risk Erosion Areas



Critical Areas

Locations in need of additional management in order to decrease pollutant loads

Type of Critical Area	Size of Critical Area	Percentage of Watershed (%)
¼ Mile Creek Buffer	7,462.17 acres	39.33%
Residential Land Uses	3,942.71 acres	20.78%
Agricultural Land Uses	6,105.62 acres	32.18%
EPA Impaired Waters (only including Arcadia Lake)	242.82 acres	1.28%
Arcadia Bluffs Golf Course	234.39 acres	1.24%
Roads	71.03 miles	--
Creeks	37.06 miles	--
High Risk Erosion Areas	5.70 miles	--

Arcadia-Pierport Watershed Goals and Objectives

Goals and Objectives
Protect waterbodies, sources, and quality within the watershed
<i>Reduce pollution from potential sources in the watershed</i>
<i>Protect water and other natural resources in the watershed</i>
Increase and complete comprehensive water quality monitoring, inventorying, and data collection
<i>Complete a detailed water quality study in the watershed on a variety of parameters, including nitrates</i>
<i>Complete studies in the watershed on potential pollutants</i>
<i>Complete detailed inventories, including of nonpoint source pollution and stormwater, of the watershed</i>
Promote citizen engagement and create support programs for the watershed
<i>Promote citizen engagement</i>
<i>Create support programs</i>
Install public utilities to replace septic tanks in areas where densities exceed 3 housing units / acre
<i>Choose and install public sanitary sewer systems or alternative systems to replace septic tanks in watershed communities</i>
<i>Install public water systems to replace wells in watershed communities</i>
<i>Maintain existing septic tanks and wells</i>
Use green infrastructure in the watershed
<i>Support and invest in green infrastructure in watershed communities</i>

Preliminary

Recommended Implementation Tasks and Actions

GOAL	TASK	TIMING	RESPONSIBLE PARTY	BUDGET
Protect waterbodies, sources, and quality within the watershed				
	<i>Complete Private Parcel Nonpoint Source Pollution Inventory.</i>	Mid-Term	WLT	\$19,500
	<i>Inventory and rate the severity of improper road/stream crossings on aquatic habitats; this information would be used to prepare a plan to reconstruct the most "severe" crossings.</i>	Mid-Term	WLT, Benzie County Road Commission, Manistee County Road Commission	\$15,000
Increase and complete comprehensive water quality monitoring, inventorying, and data collection				
	<i>Coordinate with LRBOI and Grand Traverse Band of Ottawa and Chippewa Indians to perform watershed-wide water quality testing for nitrites, phosphorus, dissolved oxygen, pH, turbidity, and conductivity.</i>	Near-Term	WLT	\$35,000
	<i>Focus additional water quality monitoring in High Priority Areas, which have the greatest impacts on water quality.</i>	Near-Term	WLT	\$10,000
Promote citizen engagement and create support programs for the watershed				
	<i>Adopt Riparian Buffer Ordinance to establish an aquatic management zone from 25 to 50 feet adjacent to stream bank.</i>	Near-Term	Arcadia Township, Blaine Township, Joyfield Township, Pleasanton Township, Onekama Township	Riparian buffer ordinance template provided through L2L
	<i>Install a boat washing station to prevent the spread of invasive species.</i>	Mid-Term	WLT, Arcadia Township	\$10,000
	<i>Assess stormwater runoff within the unincorporated village of Arcadia and develop strategies based on findings.</i>	Long-Term	WLT, Arcadia Township	\$25,000
	<i>Establish a local watershed organization or partner with several watersheds to create a broader, more regional watershed organization.</i>	Mid-Term	WLT, Lakes to Land Non-Profit Board	N.A.
	<i>Establish a water quality testing volunteer program to perform basic water quality testing at defined locations throughout the watershed.</i>	Near-Term	WLT	\$7,500
Install public utilities to replace septic systems in areas where densities exceed three housing units per acre				
	<i>Conclude current sanitary sewer feasibility study being performed by Fleis & Vandenbrink through Arcadia Township.</i>	Near-Term	Arcadia Township	Being funded through an MDEQ SAW grant
Use green infrastructure in the watershed				
	<i>Prepare and adopt uniform ordinance that focuses on innovative stormwater management.</i>	Near-Term	Arcadia Township, Blaine Township, Joyfield Township, Pleasanton Township, Onekama Township	\$7,500

Arcadia-Pierport Watershed Process



Provided a \$30,000 grant toward the Plan preparation

Other funds in the amount of \$50,000 would be raised locally or through other grant sources



Anticipating receipt of a watershed plan by August 31, 2015

Absent funding to do detailed testing and field investigations – used available studies and Technical Team advice to pull together information to prepare a watershed plan. Focus on MDEQ approval; EPA approval may be delayed until further funding or projects within watershed are completed

Thank you



B R 
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