2008

Rapid Watershed Assessment, Keweenaw Bay Indian Community

Western Upper Peninsula Planning & Development Regional Commission

10/1/2008

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Acknowledgements

The Rapid Watershed Assessment (RWA) was completed in cooperation with USDA, Natural Resource Conservation Service, Upper Peninsula Resource Conservation and Development (RC&D), Western Upper Peninsula Planning & Development Region, Keweenaw Bay Indian Community, Natural Resource Department, Baraga Conservation District and County Road Commission.

Purpose

A RWA is a rapid assessment of a defined watershed project area. The RWA should take no longer than 8-10 months to complete. The information is general in nature and is not to be used as a plan, but rather an initial estimate of where conservation investments would best address the concerns within the watershed. This information should be a solid starting point for local stakeholders to use in a more detailed watershed planning effort.

A RWA has two main components, a watershed resource profile and an assessment matrix. The resource profile is compiled using Geographic Information System (GIS) where applicable and consisted of:

- Introduction
- Population Density
- Physical Description
- Precipitation
- Public Lands
- Land cover/Land use
- Soil Drain Classification
- Land Capability Class
- Common Resource Areas
- Local Resource Concerns

The assessment matrix summarizes current resource conditions and related maintenance costs within the watershed. The assessment matrix contains:

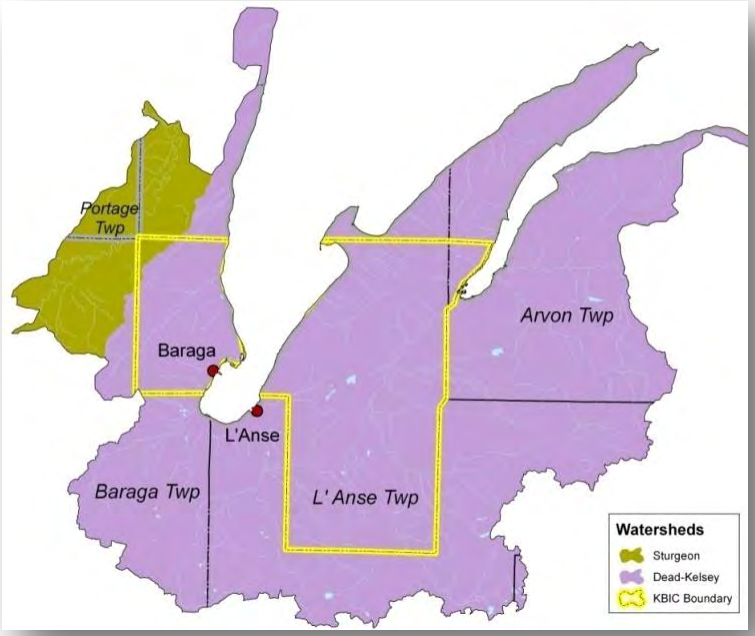
Current Condition Table – detailing the current level of conservation in the watershed.

Future Condition Table – identifying appropriate suites of conservation practices needed to deal with the primary resource concerns for each major land use.

Summary Table – summarizing the various costs associated with the resource management systems developed in the previous step.

Introduction

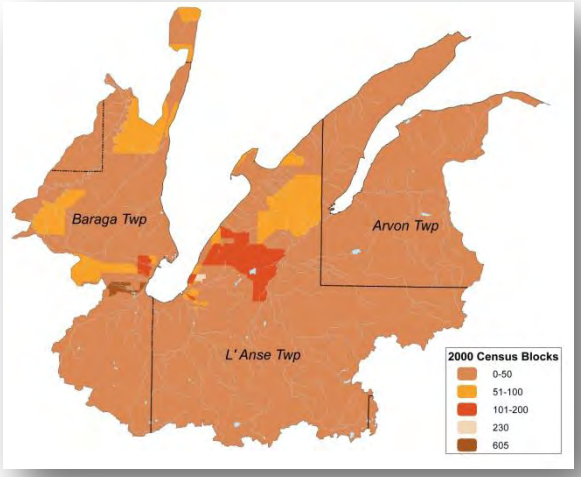
The Keweenaw Bay Indian Community (KBIC) Rapid Watershed Assessment project study area consists of two 8-digit Hydrological Unit Code (HUC) sub-basins, the Dead-Kelsey and Sturgeon Watersheds. Within these watersheds there are 9 sub watersheds which reference the 12-digit HUC. These watersheds are located within Baraga and Houghton Counties in the Western Upper Peninsula of Michigan. The majority of the area is within Baraga County, which drains into Lake Superior's Keweenaw and Huron Bays to the North. In addition, there are 4 townships located in the watershed.



Map 1: Base Map, Appendix 1

The total project area is 313 square miles, with 92 square miles of it being within the KBIC boundary. The greater part of the project (283 square miles) is within the Dead-Kelsey Watershed, the remaining 30 square miles is in the Sturgeon.

According to the 2000 Census, the population of the project area is 7,967, with 46% of that total being tribal members (see Chart 1). The majority of the non-tribal population is centralized within the Village limits of Baraga and L'Anse.



Map 2: Population, Appendix 2

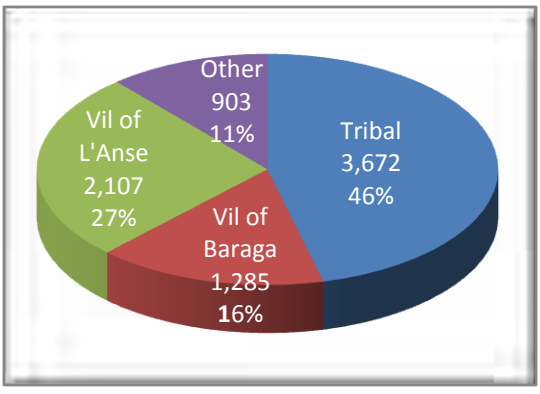
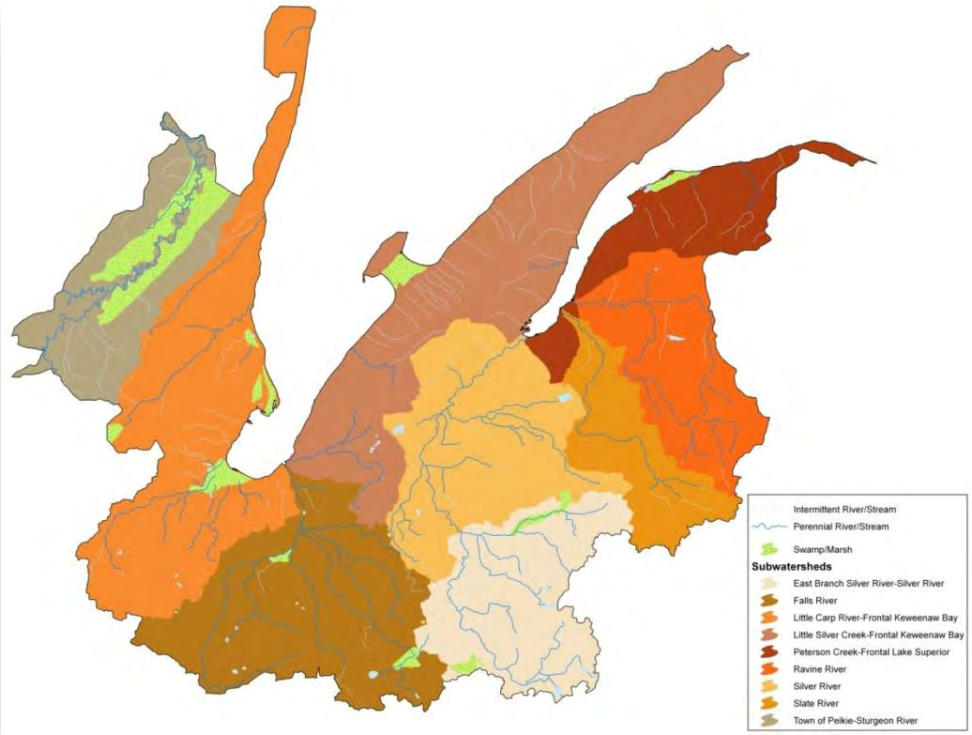


Chart 1: Population

Resource Profile

Physical Description

Sub-Basins and River Systems



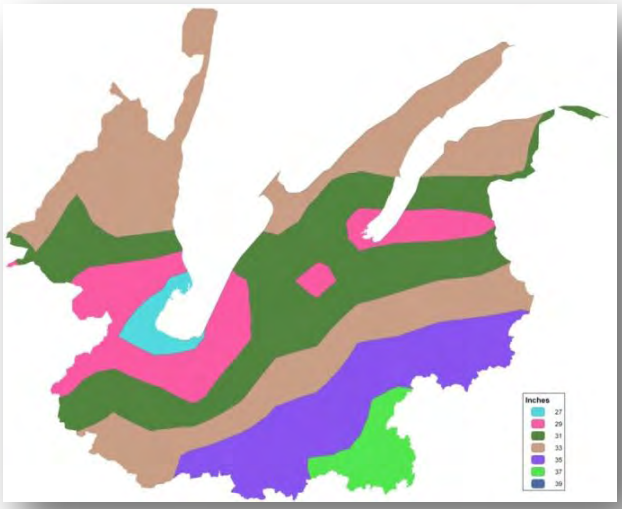
Map 3: Sub Watersheds, Appendix 3

The scope of this project incorporates 9 sub-basins. Within the 9 sub watersheds there are 16 perennial rivers and numerous intermittent stream systems. There are 257 miles of perennial rivers and 117 miles of intermittent rivers/streams. In addition, there are a total of 74 miles of coastline of Lake Superior. All but one water system drains into either Keweenaw or Huron Bay of Lake Superior. The Sturgeon River sub-watershed flows into Portage Lake, which is a tributary of Lake Superior. The other main rivers consist of the Silver, Slate, Falls and Ravine River that flow into Lake Superior.

KBIC Rapid Watershed Assessment project area has an average annual precipitation of 32 inches (see Map 4).

Table 1: Watershed Sub-basins

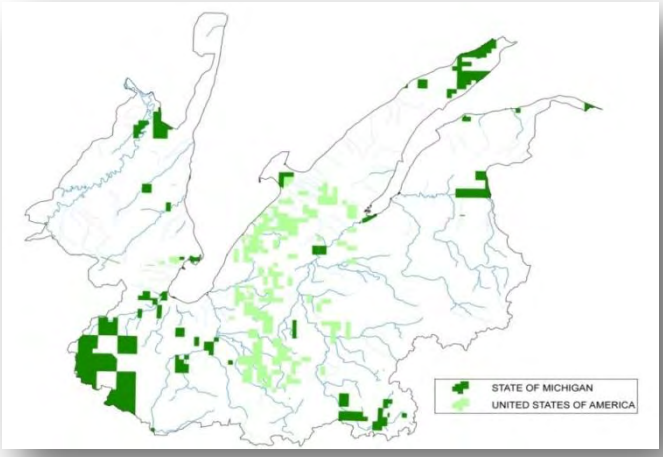
Sub watersheds (HUC 12)	Acres	Square Miles	% of Total Watershed
East Branch Silver River-Silver River	20,200	31.5	10%
Falls River	30,047	46.9	15%
Little Carp River-Frontal Keweenaw Bay	37,999	59.37	19%
Little Silver Creek-Frontal Keweenaw Bay	34,600	54.06	17%
Peterson Creek-Frontal Lake Superior	4,554	7.11	2%
Ravine River	17,303	27.03	9%
Silver River	24,927	38.94	12%
Slate River	11,911	18.61	6%
Town of Pelkie-Sturgeon River	19,370	30.26	10%



Map 4: Precipitation, Appendix 4

Public Lands

The total watershed has nearly 40 square miles of public lands, which accounts for only 13% of the total watershed area. These public lands are either State or Federal and are dispersed throughout the watershed area. The land cover of this publicly owned land is primarily forest land of a mix of northern deciduous and coniferous trees.



Map 5: Public Land, Appendix 5

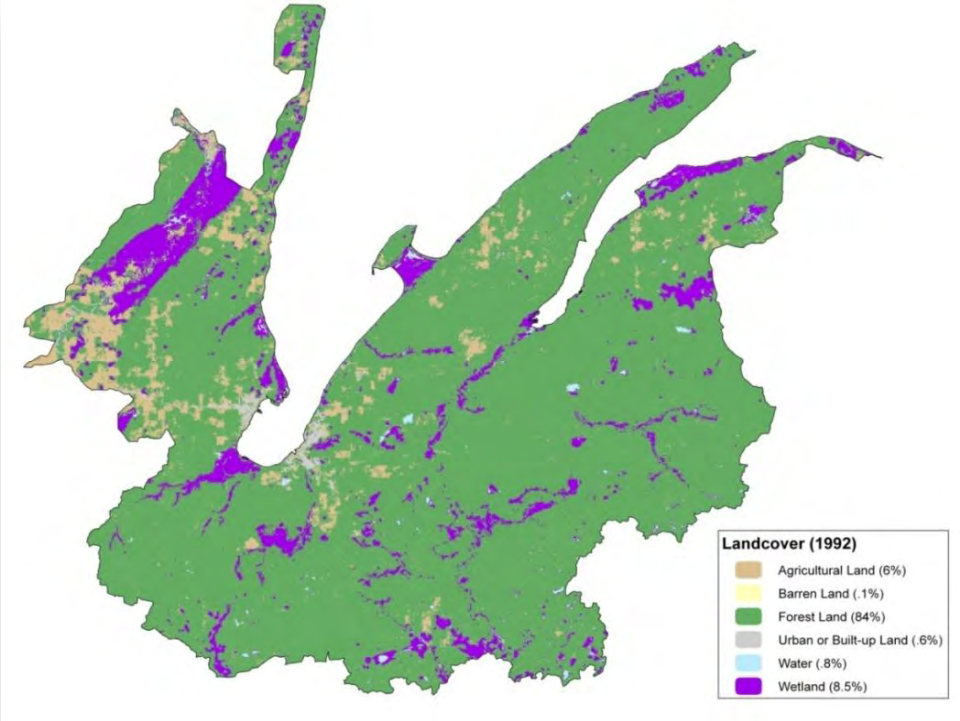
Table 2: Public Lands

Ownership	Acres in Watershed	% in Watershed
State of Michigan	12,597	6.20%
U.S. Government	10,020	5%

Land Cover

The terms land cover and land use tend to be interchangeable. However there are differences. Two land parcels may have similar land cover, but different land use. Land cover refers to the features that cover the land. For example, the land covered by trees, water, or by buildings. The land cover within the project area is primarily forest land accounting for 84% of the coverage, followed by wetland at 8.5%. Land use refers to how land is used by humans. That is, economic use to which land is placed. For an example, forest land used for recreational purposes or commercial forestry or even residential.

The land uses that were depicted within the project area were agriculture and golf course within 1,000 ft of a water body. We saw these land uses as resource concerns which is shown in the resources concern portion of the assessment.



Map 6: Land Cover, Appendix 6

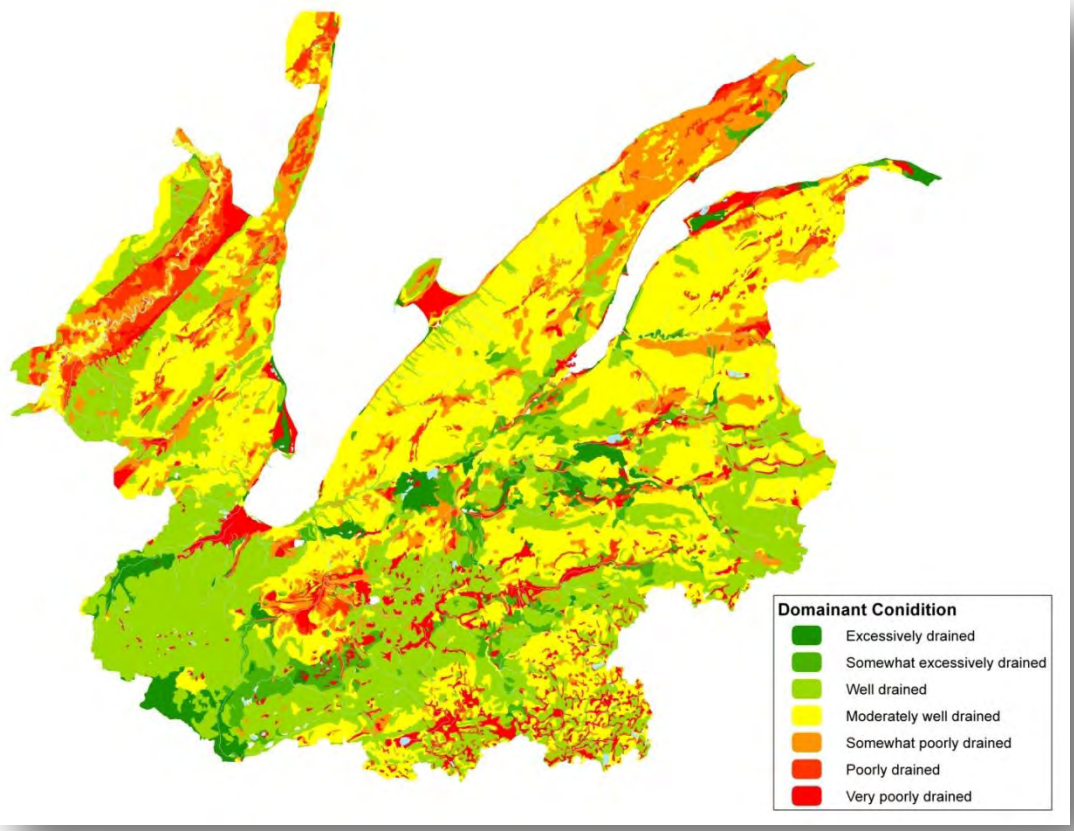
Table 3: Land Cover Classification

Land Cover	Acres in Watershed	% of Watershed
Agricultural	12,849	6.0%
Barren Land	15	0.1%
Forest Land	174,943	84.0%
Urban or Built up Land	1,240	0.6%
Water	1,722	0.8%
Wetland	18,059	8.5%

Soil Drain Classification

Drainage class refers to the frequency and duration of wet periods under conditions similar to those under which the soil formed. Alterations of the water regime by human activities, either through drainage or irrigation, are not a consideration unless they have significantly changed the morphology of the soil.

Seven classes of natural soil drainage shown in Map 7 "Soil Drain Classification" are recognized and are defined in the "Soil Survey Manual".



Map 7: Soil Drain Classification, Appendix 7

Table 4: Soil Drain Classification

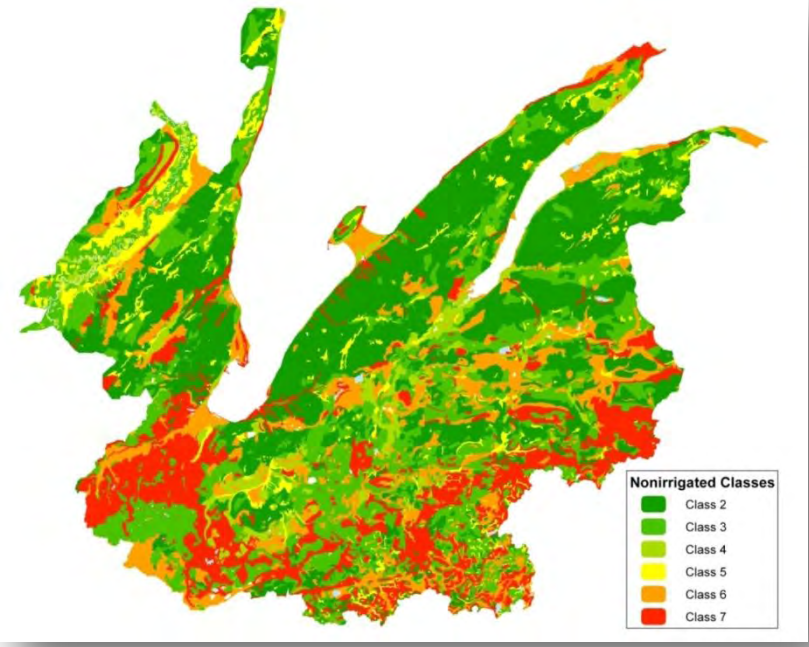
Domainant Condition	Acres in Watershed	Sq Miles	% of Watershed
Excessively drained	7,231	11.2	3.5%
Somewhat excessively drained	8,165	12.7	4.0%
Well drained	63,912	99.8	31.1%
Moderately well drained	77,187	120.6	37.6%
Somewhat poorly drained	25,484	39.8	12.4%
Poorly drained	11,549	18	5.6%
Very poorly drained	11,809	18.4	5.8%

Land Capability Class

Land capability classification shows, in a general way, the suitability of soils for most kinds of field crops. Crops that require special management are excluded. The soils are grouped according to their limitations for field crops, the risk of damage if they are used for crops, and the way they respond to management. The criteria used in grouping the soils do not include major and generally expensive land forming that would change slope, depth, or other characteristics of the soils, nor do they include possible but unlikely major reclamation projects. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for rangeland, forestland, or engineering purposes.

Class codes 1,2,3,4,5,6,7, and 8 are used to represent both irrigated and non-irrigated land capability classes.

Class 1 soils have slight limitations that restrict their use.
Class 2 soils have moderate limitations that reduce the choice of plants or require moderate conservation practices.
Class 3 soils have severe limitations that restrict the choice of plants or require very careful management or both.
Class 4 soils have very severe limitations that restrict the choice of plants or require very careful management.
Class 5 soils have little or no hazard of erosion but have other limitations, impractical to remove, that limit their use mainly to pasture, range, forestland, or wildlife food and cover.



Map 8: Land Capability Class, Appendix 8

Class 6 soils have severe limitations that make them generally unsuited to cultivation and that limit their use mainly to pasture, range, forestland, or wildlife food and cover.
Class 7 soils have very severe limitations that make them unsuited to cultivation and that restrict their use mainly to grazing, forestland, or wildlife.
Class 8 soils and miscellaneous areas have limitations that preclude their use for commercial plant production and limit their use to recreation, wildlife, or water supply or for esthetic purposes.

Table 5: Land Capability Class

Nonirrigated Classes	Acres in Watershed	Sq Miles	% in Watershed
Class 2	69,986	109.35	34.0%
Class 3	51,390	80.29	25.0%
Class 4	10,530	16.45	5.0%
Class 5	11,097	17.33	5.0%
Class 6	28,131	43.95	14.0%
Class 7	34,204	53.44	17.0%

Common Resource Areas

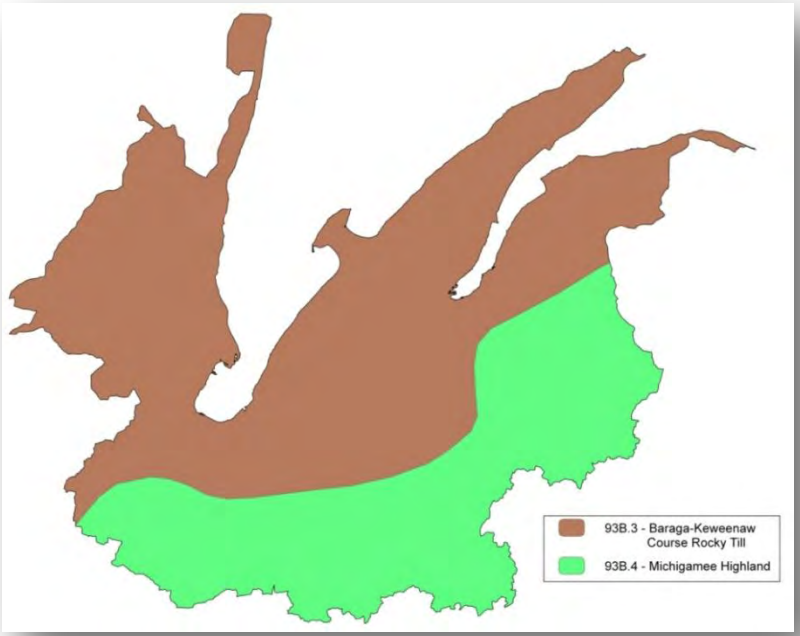
The project area consists of two common resource areas, Baraga-Keweenaw Coarse Rocky Till and Michigamee Highland (see Map 9 "Common Resource Areas").

93B.3 Baraga-Keweenaw Coarse Rocky Till

Nearly level to steep ground moraine and ridges with areas of rock outcrops. Well drained to somewhat poorly drained loamy and sandy soils predominate. Mostly deciduous and coniferous forest. The major land use is woodland and recreation. Primary resource concerns are soil erosion, groundwater quality, surface water quality, forestland productivity, erosion during timber harvest and wildlife habitat.

93B.4 Michigamee Highland

Rock outcrop and nearly level to very steep, deep and moderately deep soils on bedrock controlled uplands. Well drained to somewhat poorly drained loamy soils predominate. Dominant land use is woodland. The primary resource concerns are soil erosion, groundwater quality, surface water quality and forestland productivity.



Map 9: Common Resource Areas, Appendix 9

Table 6: Common Resource Areas

Common Resource Area	Acres in Watershed	Sq Miles	% in Watershed
Baraga-Keweenaw Coarse Rocky Till	133,904	196	64%
Michigamee Highland	75,177	117	36%

Resource Concerns

The main local resource concerns of this project area are fish passages on rivers and sedimentation being deposited at the mouths of rivers flowing into Lake Superior. Road crossings are known areas of sediment input if poorly constructed and drained. Sediment input into Keweenaw and Huron Bays can negatively impact spawning and other fishery habitat in the bays.

The picture to the right shows sedimentation deposit at the mouth of the Ravine River in Huron Bay.

Mouth of the Ravine River into Huron Bay

In addition to sedimentation at the mouths of streams, sedimentation within a stream system is a major concern, as sediment covers spawning gravel and other valuable habitat, causing systems to run wider and shallower, and may increase turbidity of a system, which can increase temperature. Erosion caused by wider and shallower systems removes stream bank shade and filter areas.

A major water quality concern is the industrial development in the form of potential sulfide mining activity in the Silver River watershed, and possibly other watersheds. Mineral exploration firms have been actively completing exploration activities including boreholes in the Silver and Huron River watersheds.

Additional concerns were gathered by a community survey. The results shown in Chart 2 indicate that water quality ranks high in local resource concerns.

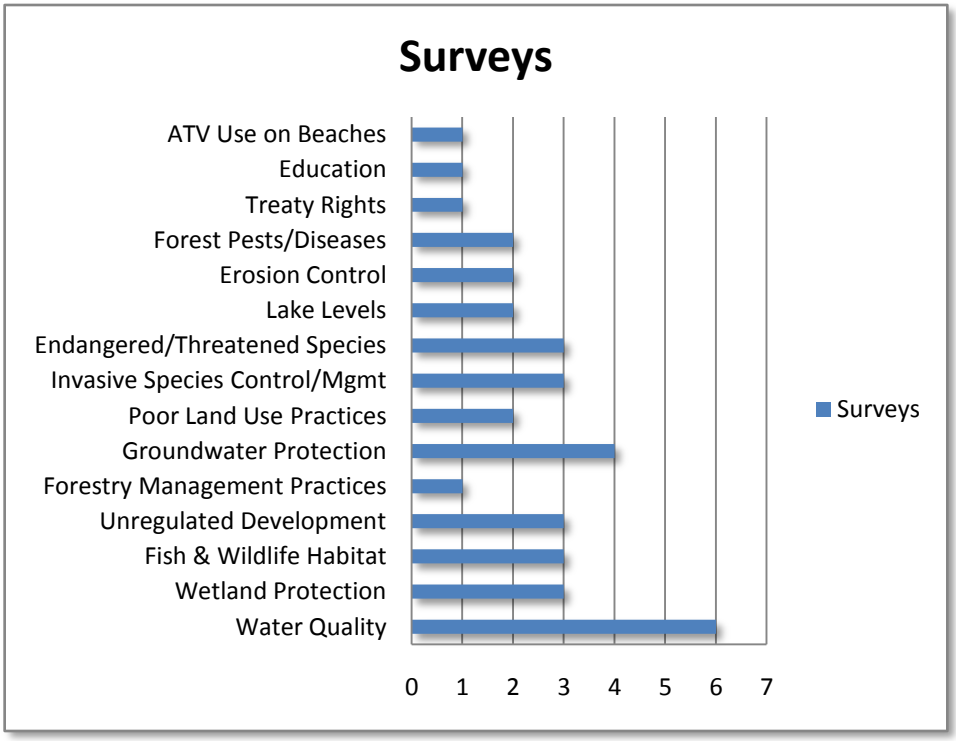
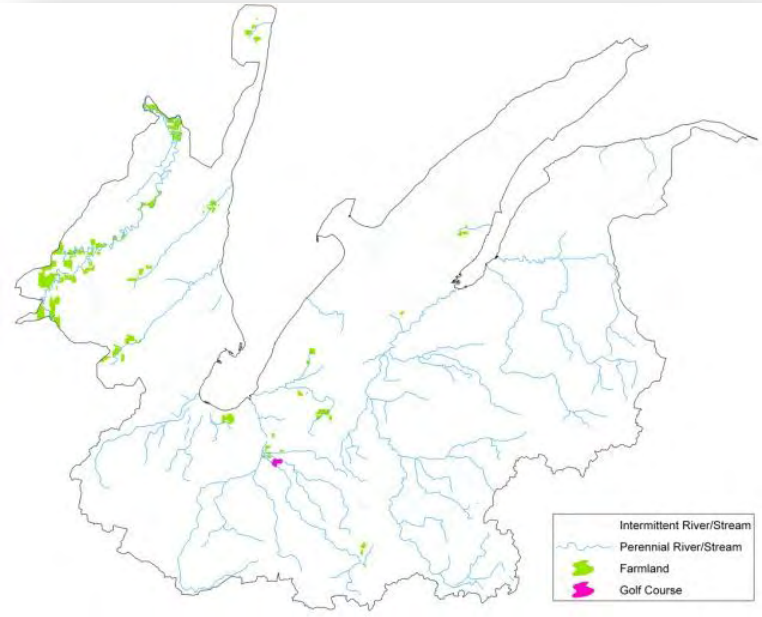


Chart 2: Survey Results

Land Use

Possible land uses of active farmland and golf courses may contribute to non-point source pollution, if adequate prevention measures are not implemented. Increasing the chemicals these land uses encounter places the natural resources of the watershed at higher risk of pollution because of their proximities to bodies of water. Farmland use may also introduce nutrients and bacteria into waters. These land uses are within 1,000 ft of a body of water and are indicated in Map 10.



Map 10: Land Use, Appendix 10

Table 7: Land Use Concerns

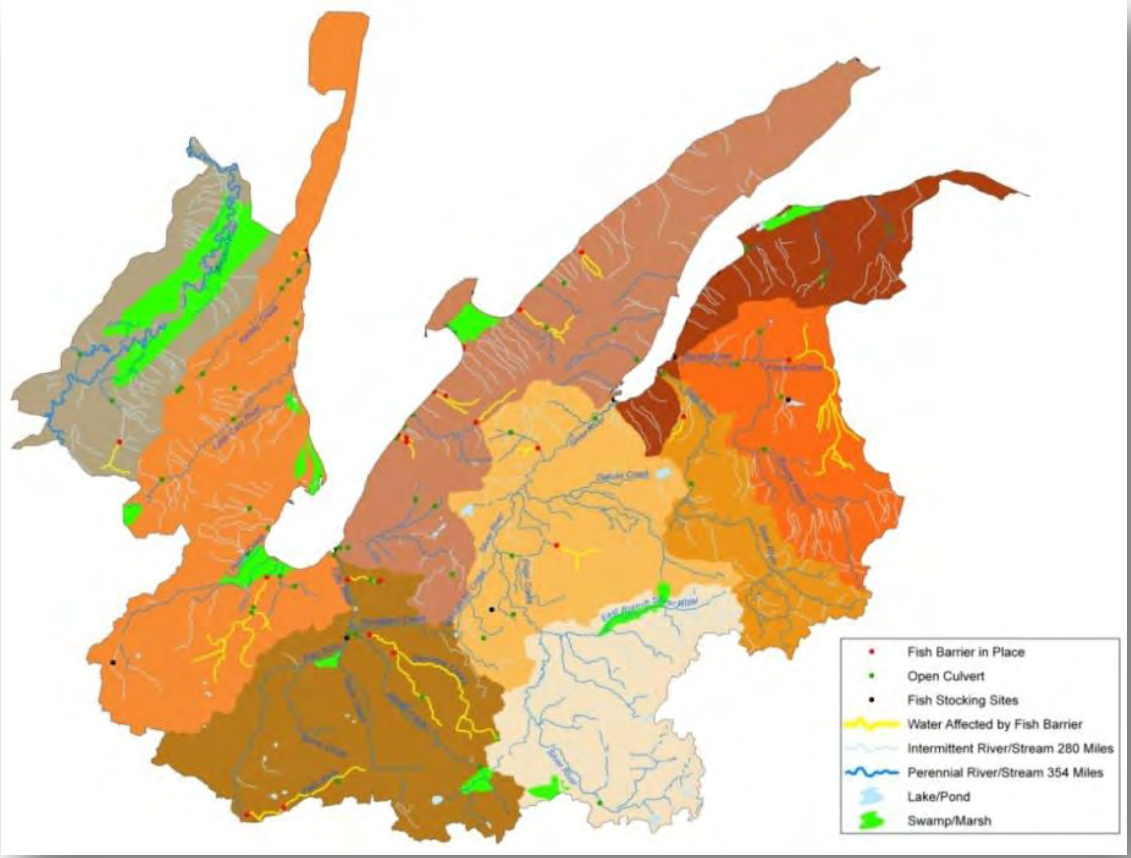
Land Use	Acres
Active Farmland	2,202
Golf Courses	58

Fish Barriers

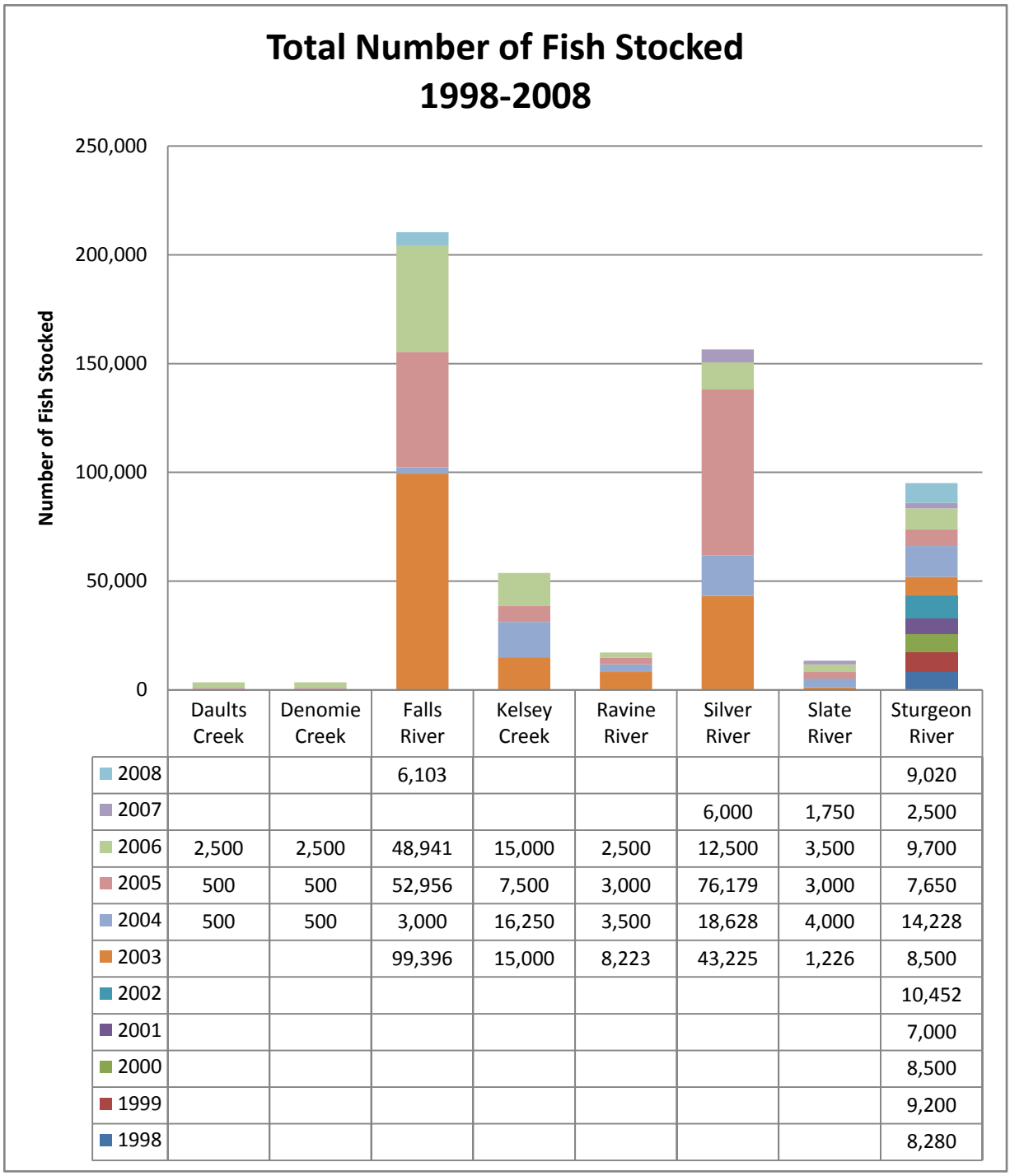
Nearly all road crossings of rivers and streams are culverts and bridges that are intended for the purpose of vehicle access. However these crossings can lead to unintended blocking of migration of fish up or down streams. Fish movement within rivers and streams are vital for maintaining healthy populations.

There are a total of 15 fish stocking points within the project area. The Michigan Department of Natural Resources and Keweenaw Bay Indian Natural Resource departments have stocked over 626,424 fish since 1998 (see Chart 3 “Fish Stocking”).

A survey was taken of 92 culverts and bridges within the project area. Of these 92 culverts and bridges inventoried, 25 of the culverts had a fish barrier. These fish barriers are affecting 32 miles of perennial rivers and 19 miles of intermittent streams (see Map 11 “Fish Barriers”).



Map 11: Fish Barriers, Appendix 11



	Daults Creek	Denomie Creek	Falls River	Kelsey Creek	Ravine River	Silver River	Slate River	Sturgeon River
2008			6,103					9,020
2007						6,000	1,750	2,500
2006	2,500	2,500	48,941	15,000	2,500	12,500	3,500	9,700
2005	500	500	52,956	7,500	3,000	76,179	3,000	7,650
2004	500	500	3,000	16,250	3,500	18,628	4,000	14,228
2003			99,396	15,000	8,223	43,225	1,226	8,500
2002								10,452
2001								7,000
2000								8,500
1999								9,200
1998								8,280

Chart 3: Fish Stocking

Invasive Species

Non-native species have been detected throughout the Upper Peninsula of Michigan and have an adverse affect on the natural environment. Invasive species concerns include sea lamprey, other ballast water invaders, stickleback (three and four spine), goby (tubenose and round), ruffle, Bacterial Kidney Disease (BKD), Viral Hemorrhagic Septicemia (VHS), Whirling Disease (fish diseases/viruses introduced), zebra mussels, and crayfish.

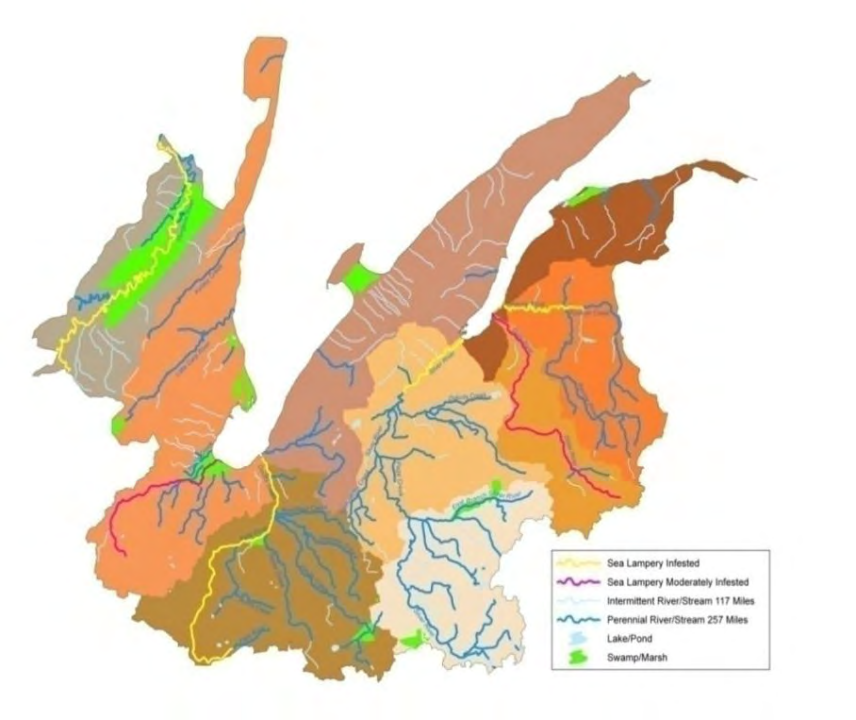
The terrestrial invasive species include buckthorn, purple loosestrife, curly leafed pond weed, spotted knapweed, toad flax, emerald ash borer, pine beetle, and others. These invasive spicies like borers, beetles and non-native plants have the potential to significantly change forest and land cover, which may alter hydrologic regimes.

Some effects of Invasive Species

- Loss of biodiversity as native species are replaced by invader species
- Harm to wildlife and fish habitat by loss of native food sources, nesting habitat, and introduction of disease
- Thick beds of invasive aquatic plants impede boat passage and pose a risk to swimmers
- Invasive plants such as European swamp thistle and Japanese barberry form spiny thickets and impede recreation and hunting access
- Non-native forest pests such as emerald ash borer and hemlock wooly adelgid threaten many forest trees

Sea Lamprey

The U.S. Fish and Wildlife Service (USFWS) Sea Lamprey Control program treats the following infested streams in the KBIC project area: the Ravine, Silver, Falls, and Sturgeon Rivers. The Slate and Six Mile Creek are two that are sometimes infested with sea lamprey and they survey these streams regularly and treat when necessary. There are a total of 72 miles of infested streams and 30 miles of moderately infested streams within the KBIC Rapid Watershed Assessment. These rivers are depicted on Map 12.



Map 12: Sea Lamprey Infested Waters, Appendix 12

Falls River

The Falls River is infested with larval sea lamprey from the mouth up to the waterfall at US-41. The bay is also infested offshore of the Falls River. The USFWS has estimated that approximately 22 acres of silt/sand habitat offshore of the Falls River is contaminated with larval lamprey.

Annual treatments occurred during 1989-1997 and were reinstituted in 2007 after lentic area surveys found extremely high densities, and larval lamprey were found in the stream. In 2008, the bay will be treated with the lampricide granular bayluscide and the stream will be treated with liquid lampricide from the mouth to US-41.

Ravine River

The Ravine River has been treated for larval sea lamprey five times since 1998, and will be treated again in 2008. The main stream is often infested up to the junction of Fossom Creek. Fossom Creek is typically infested up to Roland Lake Road. There are also 12 acres infested offshore of the Ravine and this area will be treated in 2008.

Silver River

The Silver River has been treated for larval sea lamprey nine times in the past 10 years and will be treated in 2008. None of the small tributaries are known to harbor larval lamprey. The lamprey are generally found up to the Silver Falls.

Sturgeon River

The Sturgeon River has been treated for larval sea lamprey four times in the past 10 years. Lamprey distribution on the river is usually up to the Prickett Dam and around the mouth of Clear Creek. This river is generally treated every four or five years if treatments are successful.

Summary of Assessment Matrix

The Keweenaw Bay Indian Community Rapid Watershed Assessment Matrix information was inputted by the Natural Resource Conservation Service (NRCS) Technical Team. The contributors were District and Soil Conservationist assigned to the project area that have knowledge of the local conservation practices. Assistance was also provided by the regional Resource Conservation and Development (RC&D) and State Agricultural Economist.

The team established a baseline of Conservation Practices Physical Effect (CPPE) on the land currently within the project area. These existing practices were used to identify future conditions through an estimated percent increase in participation to deal with primary resource concerns. The estimated costs to install future conservation practices are based on a cost list within the assessment matrix provided by the USDA-NRCS State Agricultural Economist (see Assessment Matrix on following page).

The assessment matrix breaks down the current conditions and forecasts future conditions and costs by estimating the increase of participation in the time frame of implementation. The total average annual costs and present value of total average annual cost over 5 years is indicated within the cost summary.

Assessment Matrix

MICHIGAN

Watershed:
Keweenaw Bay Indian Community

Current Conditions	*Total Acres*
Total Crop/Hay/Pasture Land	*12,849*
Total Forest Land	*193,002*
Other Land Use	*2,977*
Typical Management Unit (avg farm size)	*200*
Estimated Current Farm Bill participation %	*2%*

Future Conditions	*Total Acres*
Total Crop/Hay/Pasture Land	*11,500*
Total Forest Land	*194,351*
Other Land Use	*2,977*
Total Watershed Acres with Treatment (Current & New Implementation)	*208,828*
Estimated Acres: New Implementation	*8400*
Estimated increase in Participation (potential participation in time frame for implementation).	*2%*
Total participation Future	*4%*

Cost Summary

Treatment / Investment	*Expected Installation Cost*	*Annual Maintenance Cost*	*Total Average Annual Cost of Investment*
Total Crop/Hay/Pasture Land	*$4,372,528*	*$207,083*	*$955,051*
Total Forest Land	*$2,155,334*	*$106,887*	*$411,671*
Other Land Use	*$3,362,273*	*$164,376*	*$643,388*
Cost Items and Programs		*Costs*	*O&M Costs*
Maintain the Baseline Conservation - Annual Maintenance			*$478,500*
Total Investment at estimated rate of participation		*$9,890,100*	*$478,300*
Potential Investment from Farm Bill Programs		*$4,945,050*	-
Management Incentives (Incentive Payments in yr 2 & 3)		*$650,640*	-
Total Potential Farm Bill Program Costs		*$5,595,690*	-

Operator Investment	*$4,945,100*	*$956,800*
Total Average Annual Costs	*$1,055,100*	
Present Value of Total Average Annual Costs over 5 years	*$4,583,900*	

Note:
Summary numbers rounded to even 100s

Cost Basis: 2008	*Discount Rate: 4.875%*	*Time Frame - Years: 5*

Total Effects Score	*1,001*

Sum of CPPE for all practices and resource concerns.

Resource Concerns Selected:	*CPPE*
Wildlife - Threatened and Endangered Fish and Wildlife Species	*29*
Wildlife - Inadequate Food	*104*
Wildlife - Inadequate Cover/Shelter	*103*
Wildlife - Imbalance Among and Within Populations	*91*
Water Quantity - Reduced Capacity of Conveyances by Sediment Deposition	*70*
Water Quantity - Insufficient Flows in Water Courses	*23*
Water Quantity - Excessive Runoff, Flooding, or Ponding	*53*
Water Quantity - Drifted Snow	*9*
Water Quality - Harmful Levels of Heavy Metals in Surface Water	*30*
Soil Erosion - Streambank	*45*
Soil Erosion - Shoreline	*47*
Soil Erosion - Sheet and Rill	*61*
Soil Erosion - Mass Movement	*17*
Soil Erosion - Classic Gully	*47*
Soil Condition - Damage from Sediment Deposition	*44*
Soil Condition - Contaminants - Salts and Other Chemicals	*33*
Plants - Wildfire Hazard	*33*
Plants - Threatened and Endangered Plant Species	*9*
Plants - T&E Plant Species: Declining Species, Species of Concern	*19*
Plants - Noxious and Invasive Plants	*134*

Footnotes/Bibliography

Hydrologic Unit Boundary maps Natural Resources Conservation Service Geospatial Data Gateway. http://datagateway.nrcs.usda.gov/GatewayHome.html

National Land Cover Data (NLCD) – Originator: United States Geological Survey (USGS). Information available http://www.mcgi.state.mi.us/mgdl/ then navigate to geographic extent, County, then 1992 National Land Cover Dataset.

Public Land information is available from Baraga County 911 department 906-524-6911.

Soil Survey Geographic Database (SSURGO) tabular and spatial data were downloaded from Natural Resources Conservation Service Geospatial Data Gateway. http://datagateway.nrcs.usda.gov/GatewayHome.html

Common Resource Area (CRA) map delineations data. http://datagateway.nrcs.usda.gov/GatewayHome.html

Population Statistics were obtained from the US Census Bureau. http://www.esri.com/data/download/census2000_tigerline/

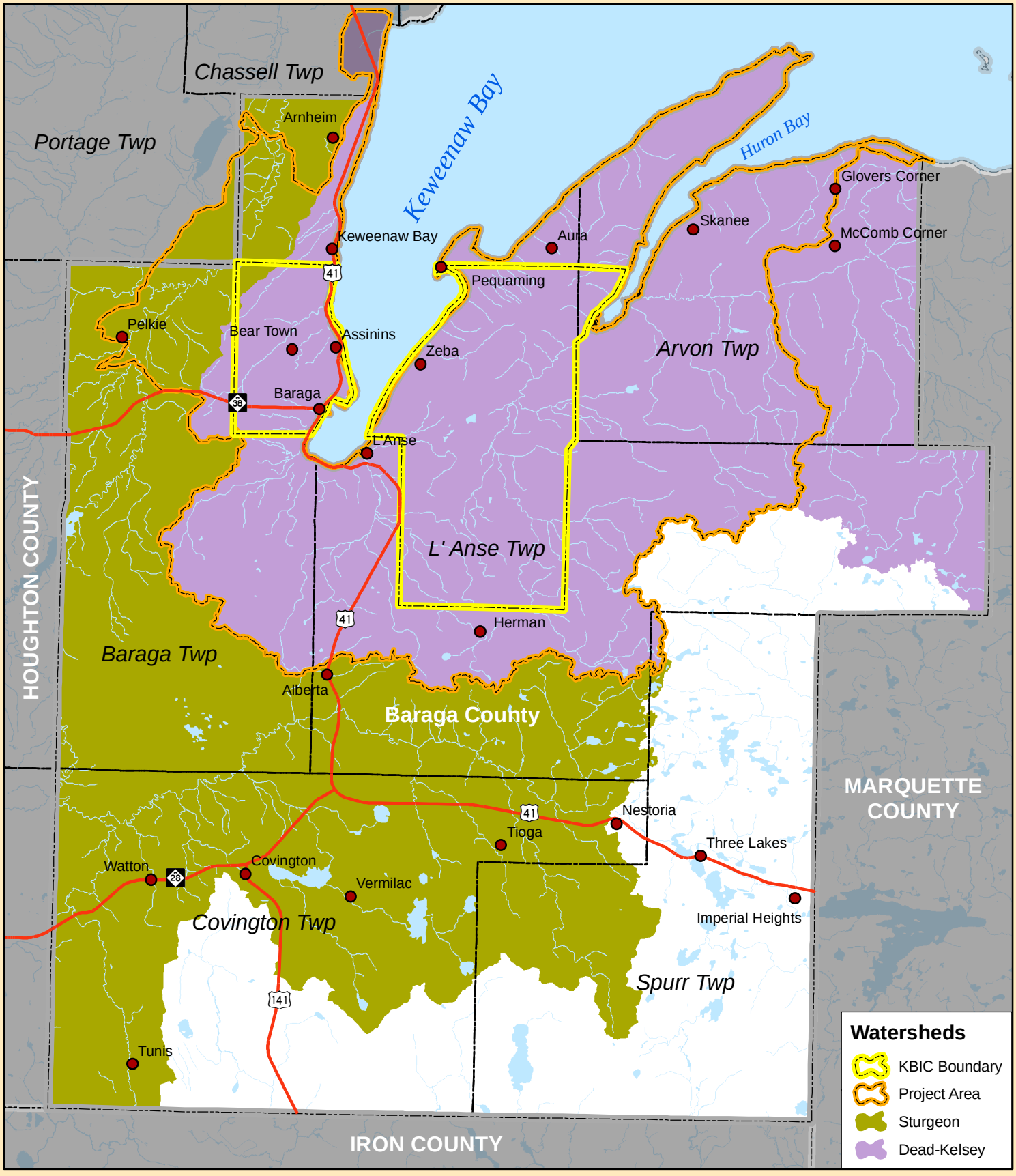
Precipitation dataset was obtained from http://datagateway.nrcs.usda.gov/GatewayHome.html

Land use dataset was derived using 2005 NAIP imagery and consisted of active farm land 1,000 ft from rivers and streams.

Fish stocking table was downloaded from the Michigan Department of Natural Resources. http://www.michigandnr.com/fishstock/

Sea Lamprey information came from the U.S. Fish and Wildlife Service, Marquette, MI

Appendix A



Keweenaw Bay Indian Community

Rapid Watershed Assessment

Base Map (A - 1)

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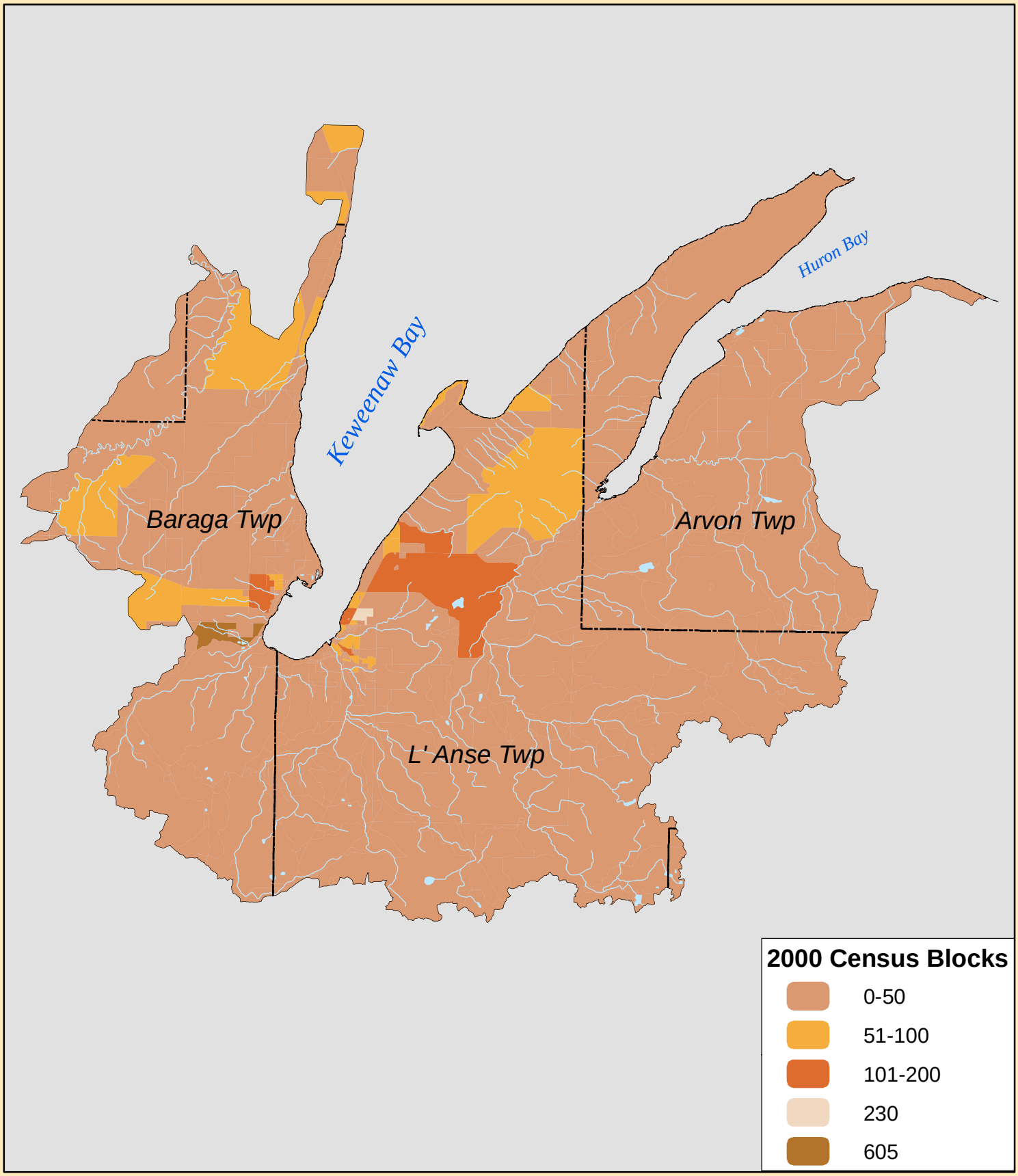
Miles

WUPPDR of Michigan

Source: MCGI, USGS, KBIC



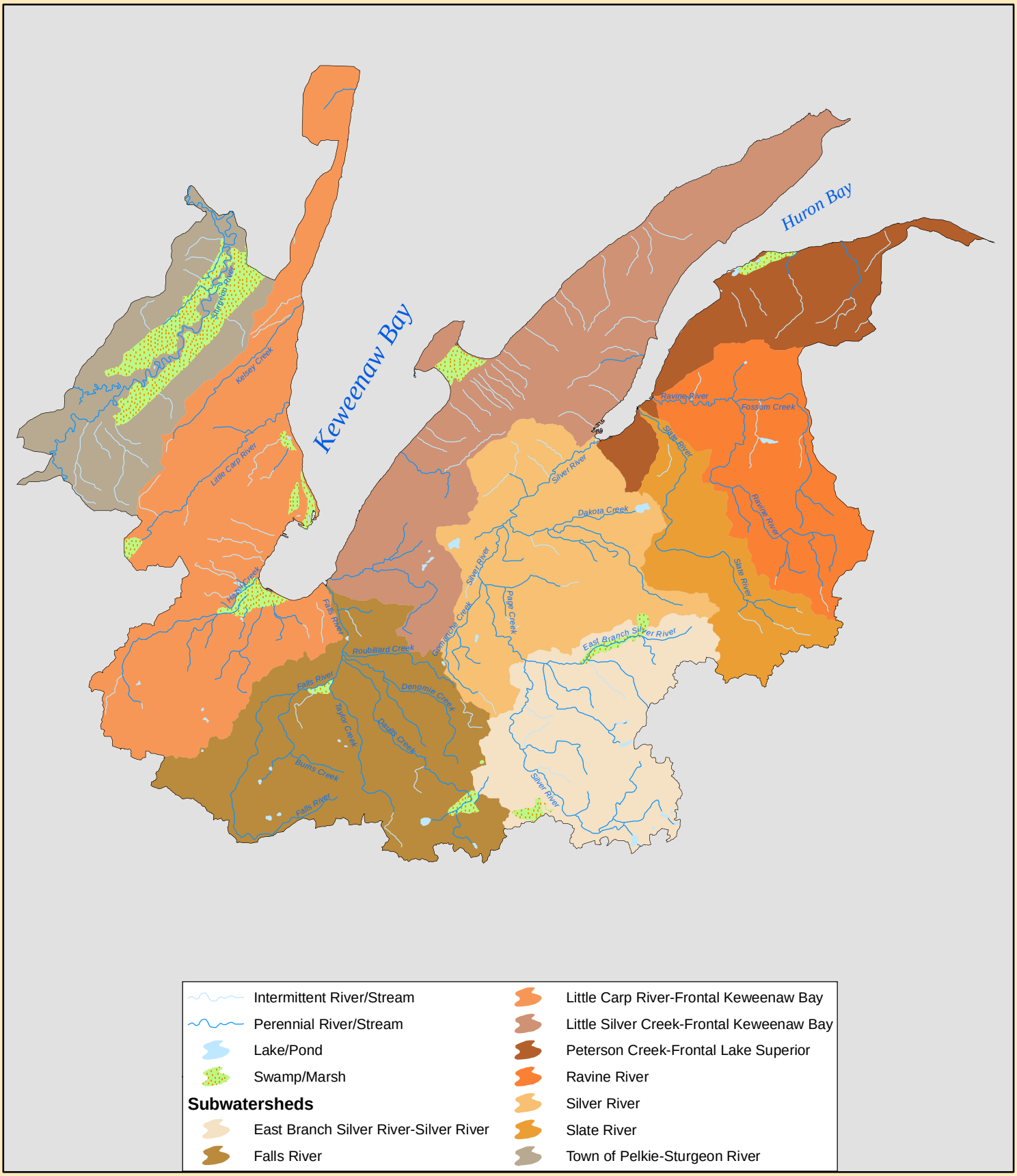
Keweenaw Bay Indian Community

Rapid Watershed Assessment

Population (A - 2)

WUPPDR of Michigan

Source: US Census



Keweenaw Bay Indian Community

Rapid Watershed Assessment

Sub Watersheds (A - 3)

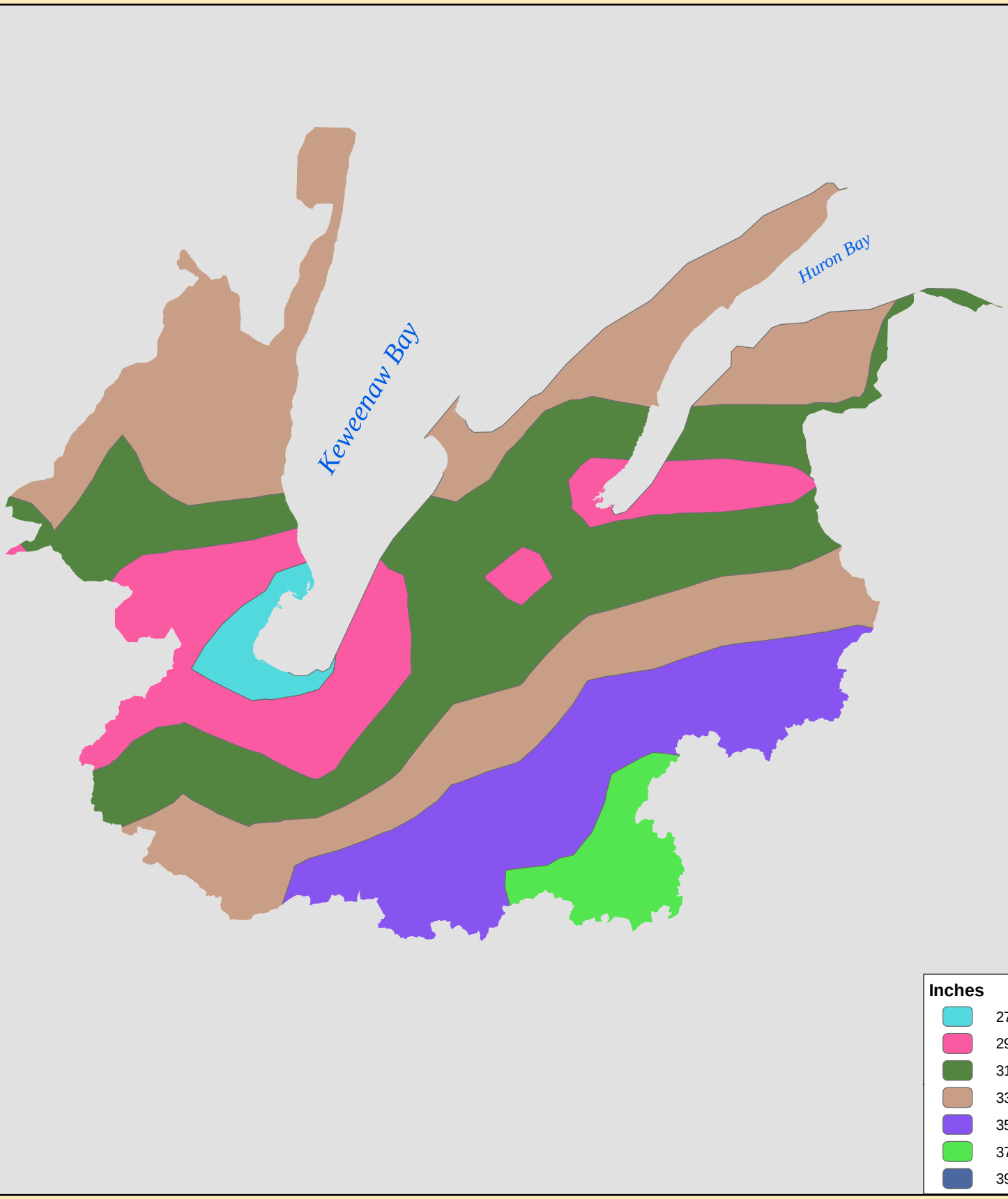
N

0 1.5 3 6

Miles

WUPPDR of Michigan

Source: USGS



Keweenaw Bay Indian Community

Rapid Watershed Assessment

Annual Precipitation (A - 4)

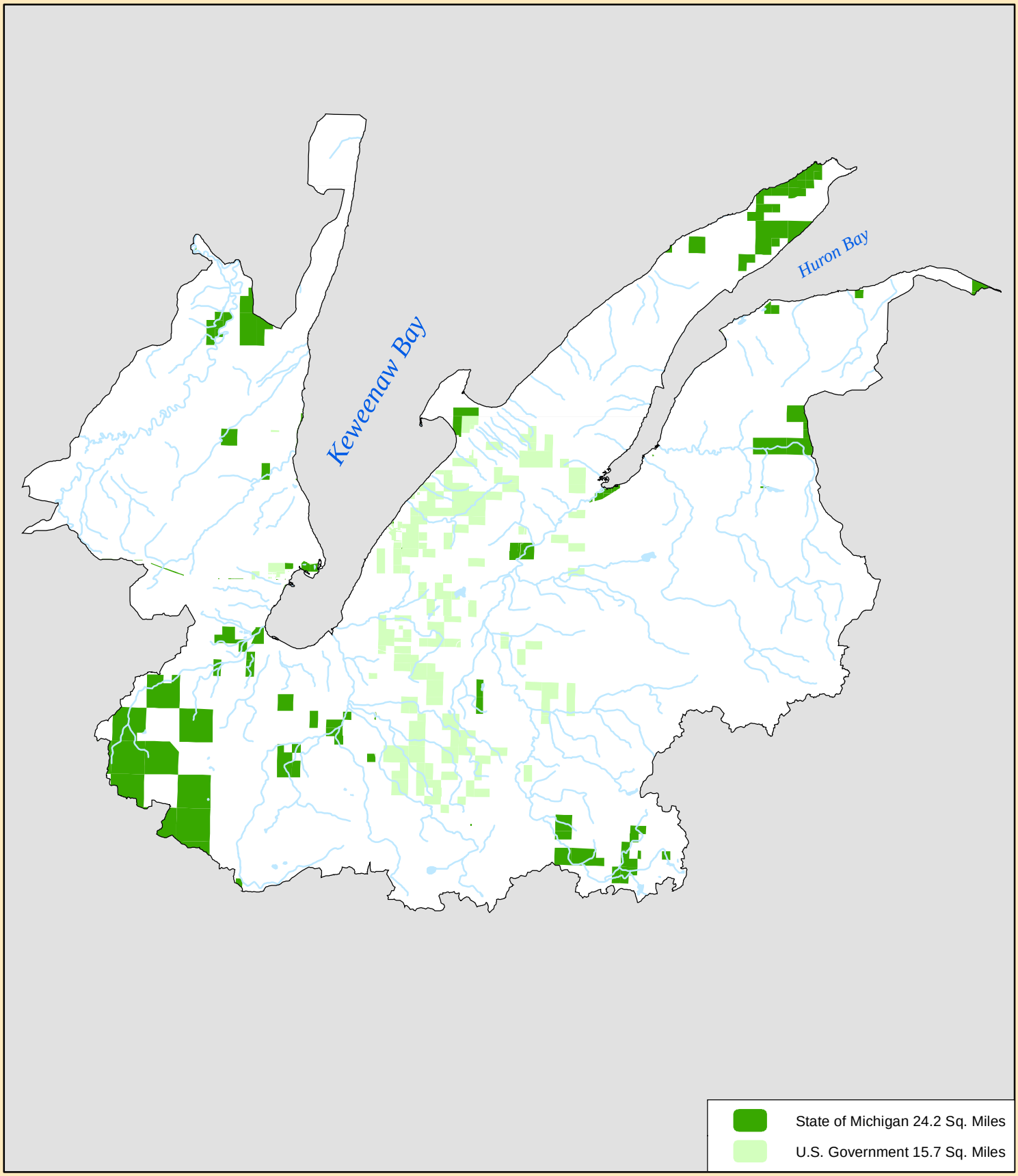
N

0 1.5 3 6

Miles

WUPPDR of Michigan

Source: USDA



Keweenaw Bay Indian Community

Rapid Watershed Assessment

Public Land (A - 5)

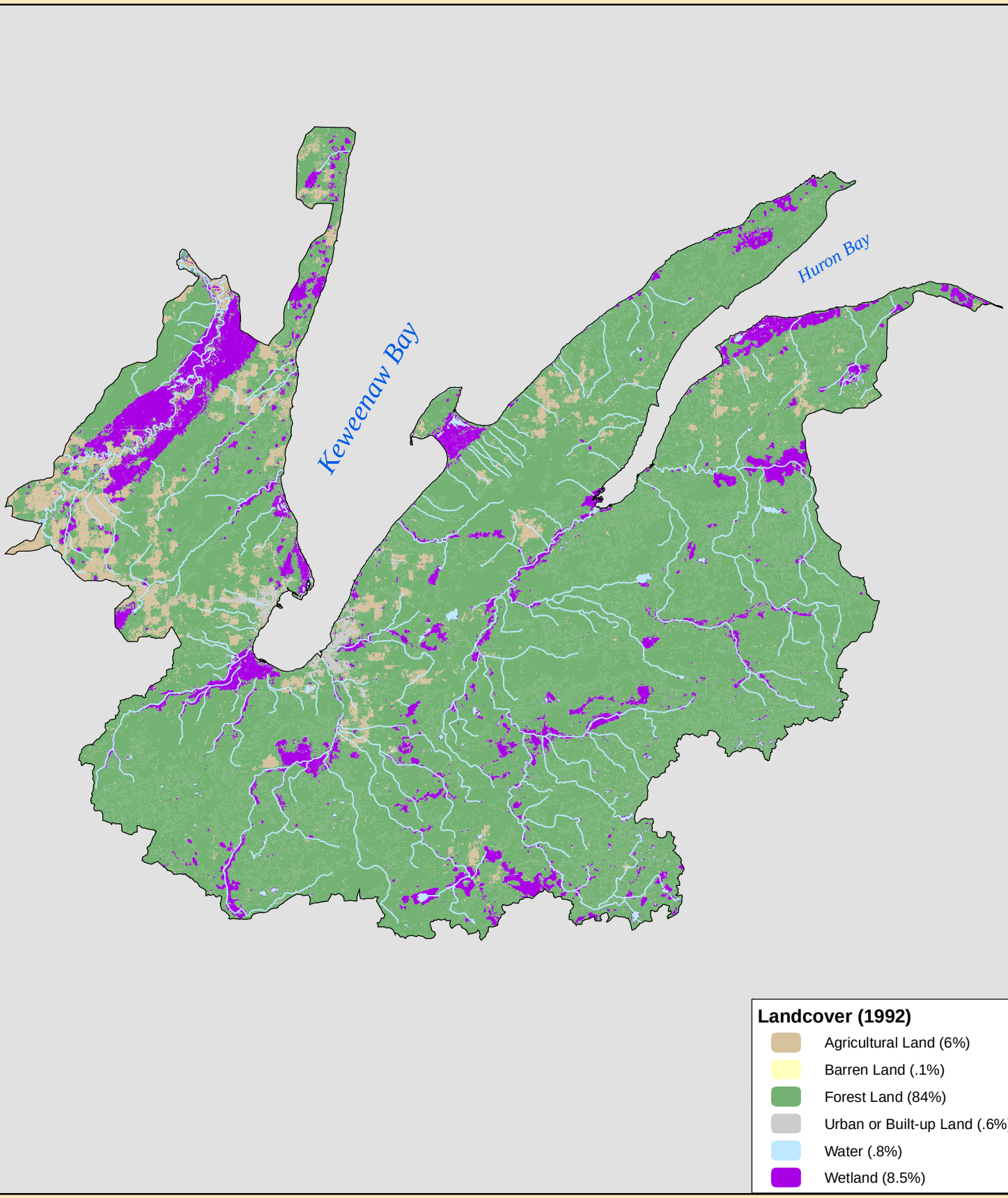
N

0 1 2 4

Miles

WUPPDR of Michigan

Source: County



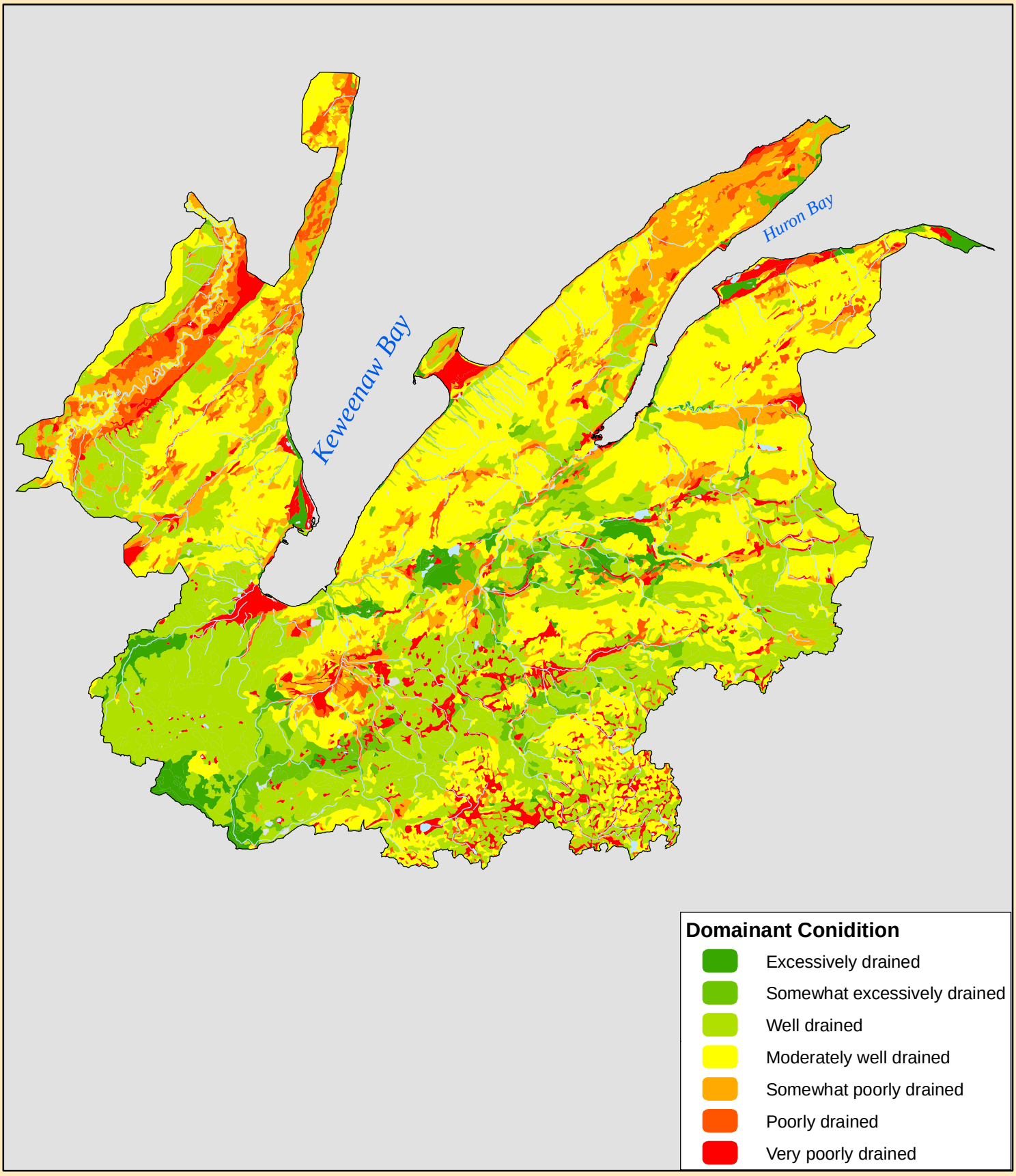
Keweenaw Bay Indian Community

Rapid Watershed Assessment

Land Cover (A - 6)

WUPPDR of Michigan

Source: MCGI



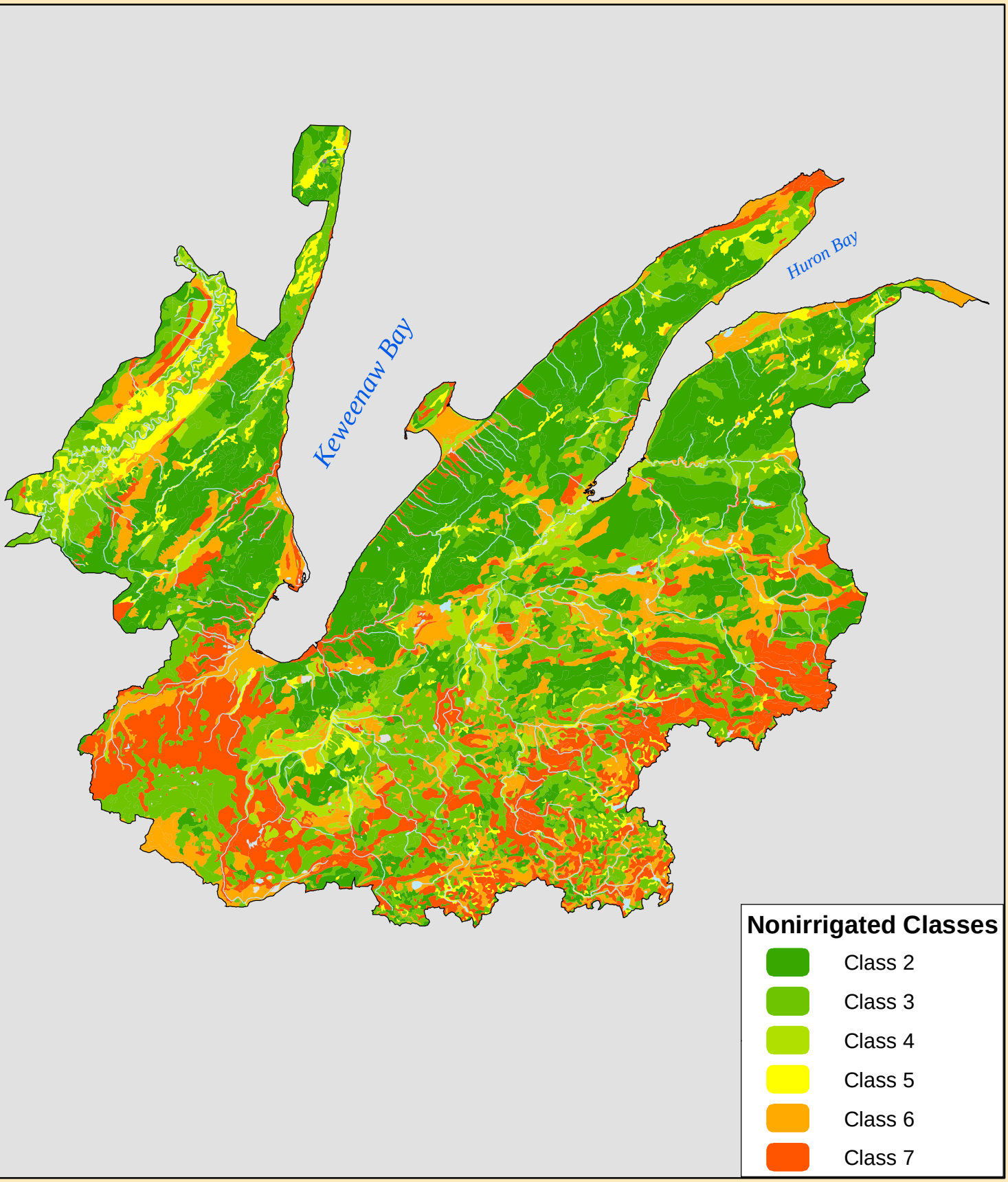
Keweenaw Bay Indian Community

Rapid Watershed Assessment

Soil Drain Classification (A - 7)

WUPPDR of Michigan

Source: NRCS



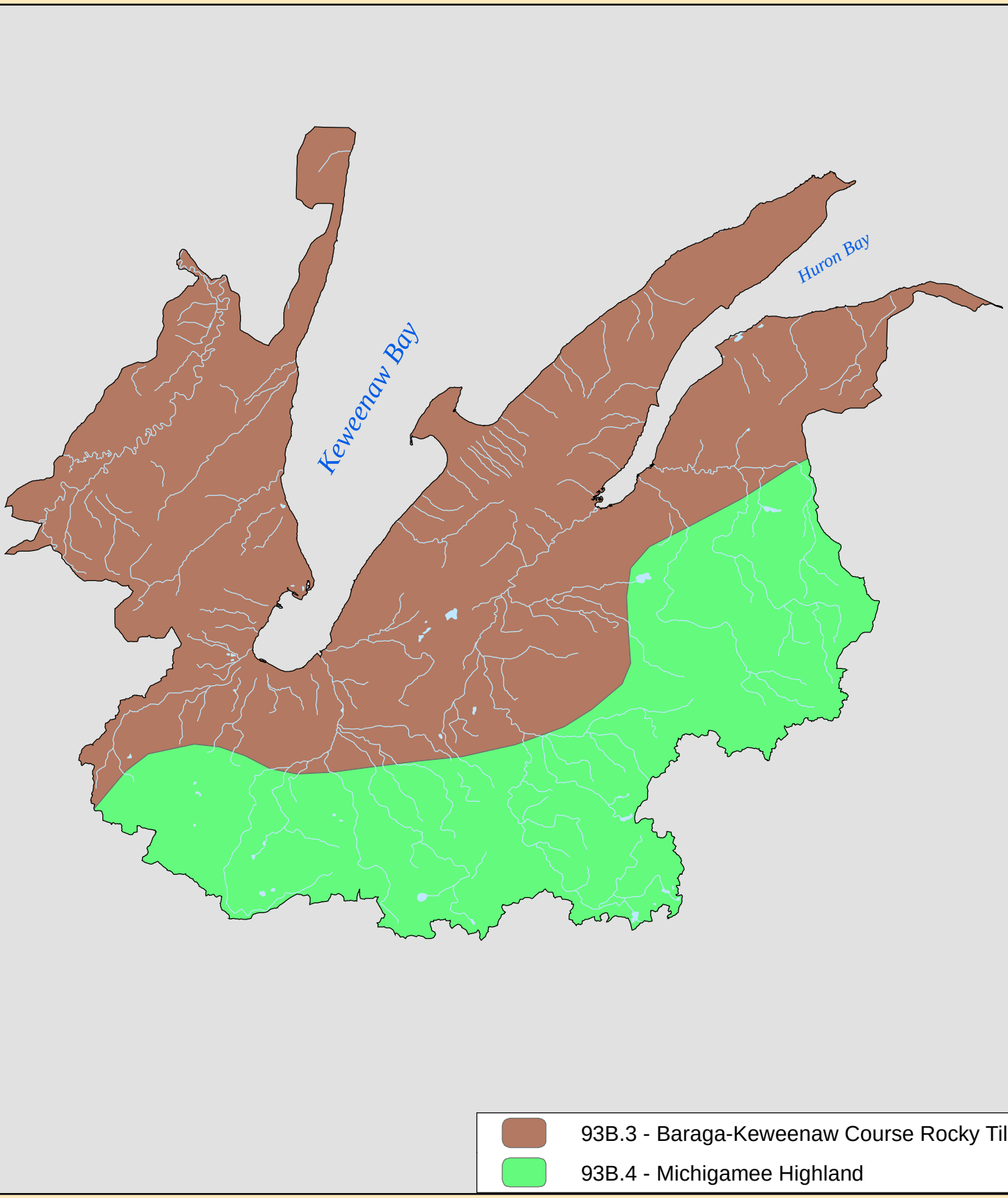
Keweenaw Bay Indian Community

Rapid Watershed Assessment

Land Capability Class (A - 8)

WUPPDR of Michigan

Source: NRCS Surgo Data



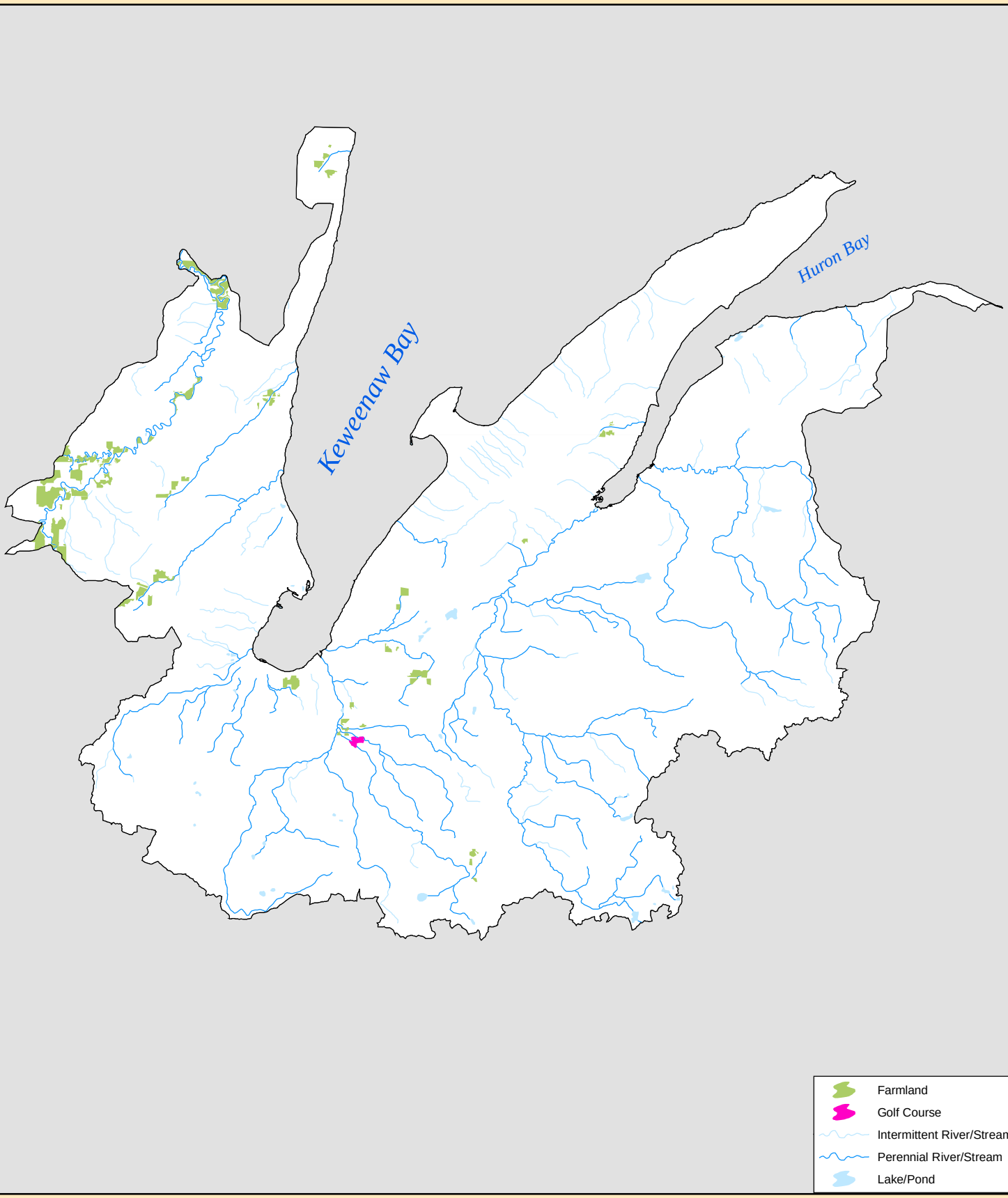
Keweenaw Bay Indian Community

Rapid Watershed Assessment

Common Resource Areas (A - 9)

WUPPDR of Michigan

Source: NRCS



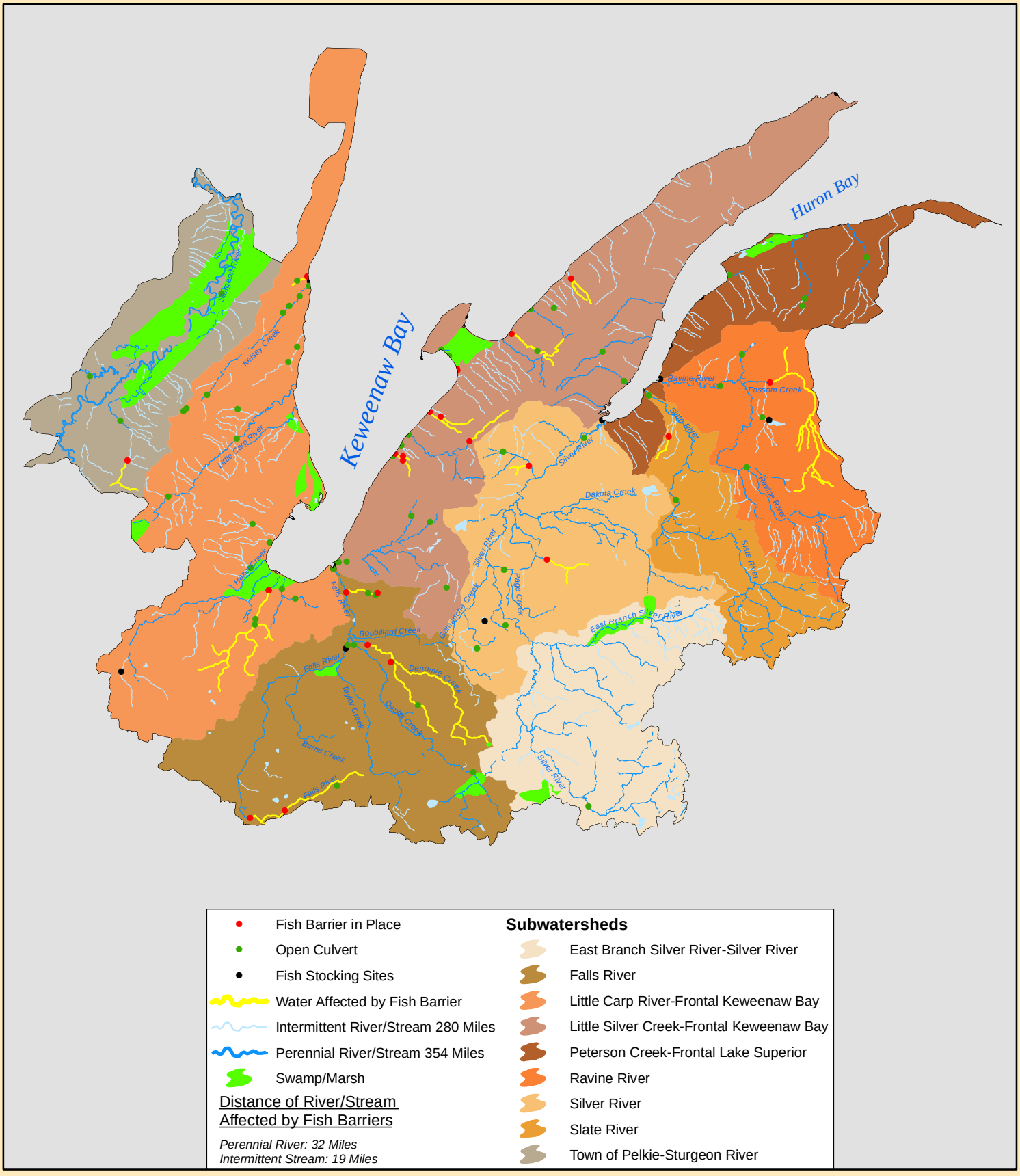
Keweenaw Bay Indian Community

Rapid Watershed Assessment

Land Use (A - 10)

WUPPDR of Michigan

Source: USGS



- Fish Barrier in Place
- Open Culvert
- Fish Stocking Sites
- Water Affected by Fish Barrier
- Intermittent River/Stream 280 Miles
- Perennial River/Stream 354 Miles
- Swamp/Marsh

Distance of River/Stream Affected by Fish Barriers

Perennial River: 32 Miles
Intermittent Stream: 19 Miles

Subwatersheds

- East Branch Silver River-Silver River
- Falls River
- Little Carp River-Frontal Keweenaw Bay
- Little Silver Creek-Frontal Keweenaw Bay
- Peterson Creek-Frontal Lake Superior
- Ravine River
- Silver River
- Slate River
- Town of Pelkie-Sturgeon River

N

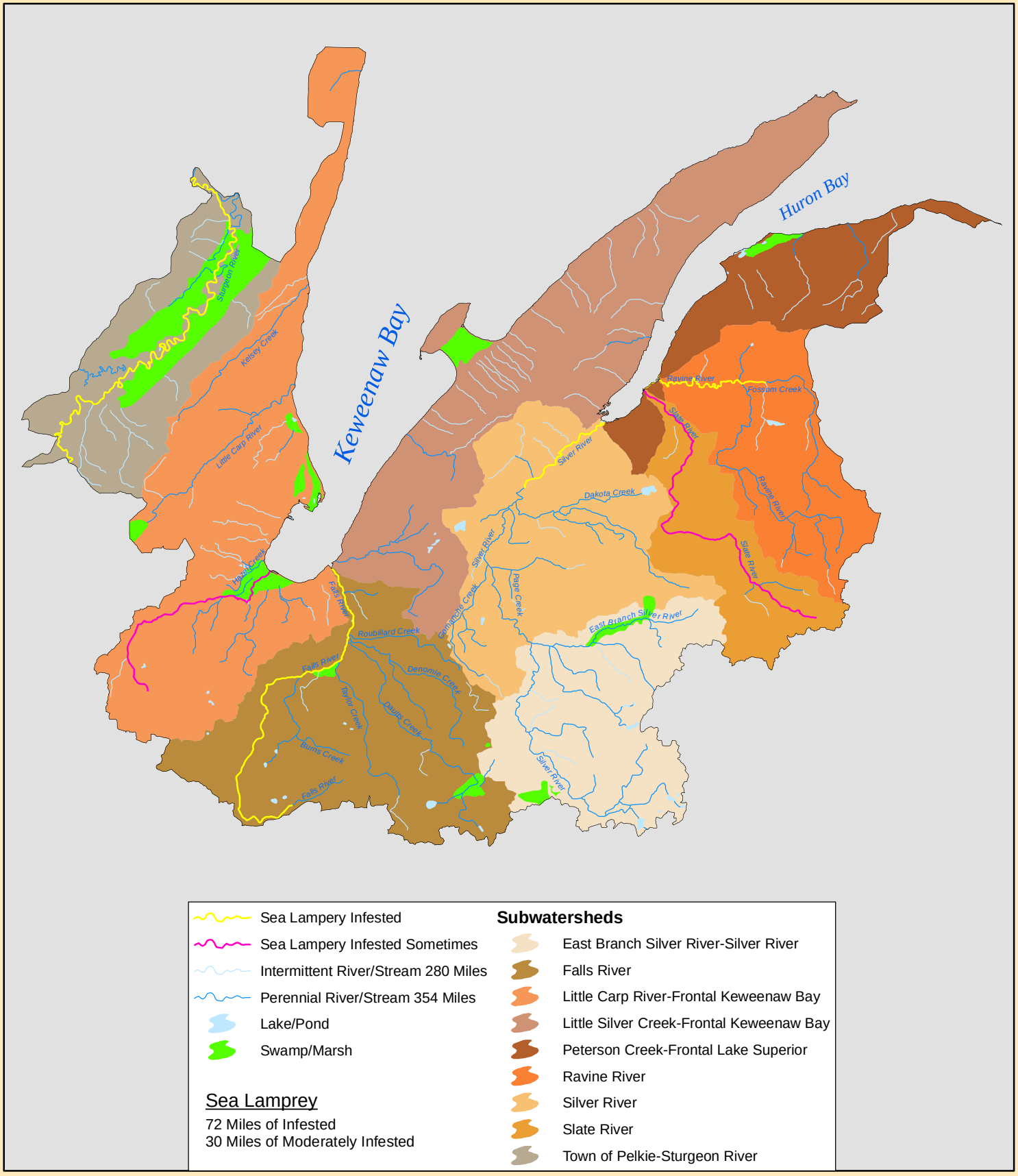
0 1.25 2.5 5
Miles

Keweenaw Bay Indian Community

Rapid Watershed Assessment

Fish Barriers (A - 11)

WUPPDR of Michigan



Keweenaw Bay Indian Community

Rapid Watershed Assessment

Sea Lamprey Infested Waters (A - 12)

WUPPDR of Michigan

Source: USGS