MICHIGAN NRCS

Rapid Watershed Assessment Resource Profile and Assessment Matrix

Otter River Watershed: Hydrologic Unit Code (HUC) - 04020104

Rapid Watershed Assessments provide initial estimates of where conservation investments would best address the concerns of landowners, conservation districts, and other community organizations and stakeholders. These assessments help landowners and local leaders set priorities and determine the best actions to achieve their goals.

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Western Upper Peninsula Planning and Development Region

The thirty-five Local Landowners and Citizens who attended the public meeting

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1.0 Purpose

The Rapid Watershed Assessment (RWA) is used to identify current and existing resource concerns within a specific watershed boundary. RWA's address the first six steps of the NRCS 9-step planning process on a broad scale. The information is designed to be general in nature and is not intended to be used to replace comprehensive watershed plans. It is an excellent starting point for resource partners as well, as local stakeholders, to get an overview of the watershed. Much of the information contained within is watershed description information.

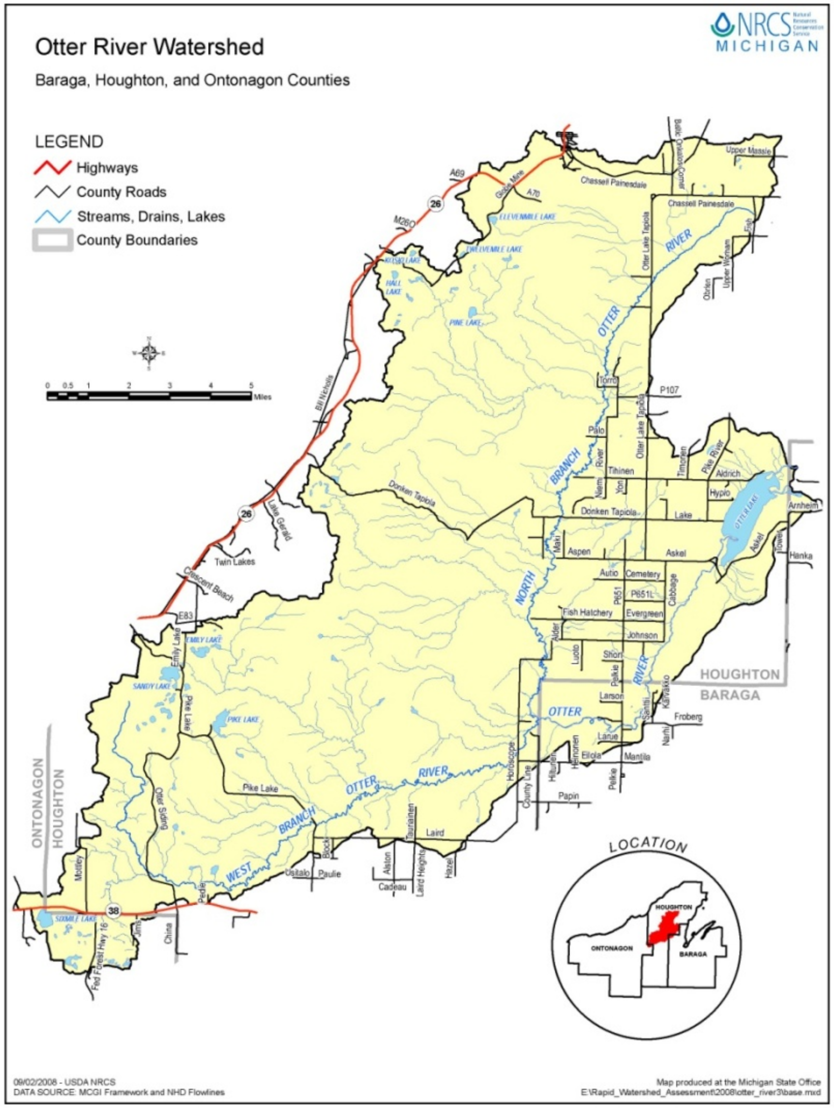
Having such a plan completed on a watershed basis gives resource partners a look at current existing conditions and specific needs of all waters flowing to a specific site. It also gives an excellent benchmark description of a watershed's economic and physical condition. Having such a report on a watershed level enables the user to direct financial resources to the most significant needs in the watershed. Though RWA's are brief when compared to comprehensive plans, they capture the main issues and are completed in a much shorter timeframe than comprehensive plans. Plans are then put in the hands of resource professionals and planners quicker for faster results and potential implementation.

2.0 Introduction

The Otter River Watershed is located in the Western Upper Peninsula of Michigan. The watershed spans three counties - Houghton, Baraga, and Ontonagon. The majority of the land is privately owned. Forestry is the primary land use, with farming and other uses taking place on the non-forested lands.

Table 1: Watershed Location		
Township	**County**	**Percent in Watershed**
Adams	Houghton	26.17
Baraga	Baraga	2.81
Bohemia	Ontonagon	3.59
Chassell	Houghton	7.98
Elm River	Houghton	41.33
Laird	Houghton	16.41
Portage	Houghton	72.62

The main agricultural resource concerns are water erosion, drainage management, and erosion and sediment control. Residential logging is a big issue to local people, as this does lead to damage to the watershed. Other high priority resource concerns are fisheries protection and habitat improvement, and sedimentation of the river systems in the watershed.



Map 1: Watershed Map

3.0 Physical Description

3.1 Sub-basins and River Systems

The Otter River Watershed drains 114,834 acres of land. The main tributaries of the Otter River are the North Branch of the Otter River and the West Branch of the Otter River. Numerous named and unnamed tributaries and streams flow into these main tributaries. This is a cold water fishery that is partially recharged with springs. The Otter River runs into Otter Lake, which is a principle tributary of the Sturgeon River that eventually flows into Lake Superior. Throughout the resource profile, the term "watershed" refers to these sub-watersheds collectively as a whole of the Otter River Watershed. The stream length of the Otter, including the North Branch and West Branches is 50.9 miles. Eleven percent of the watershed is within the Otter's specific sub-watershed. As one can see on Map 2, the Otter River sub-watershed appears on the map's southeast portion and is green in color.

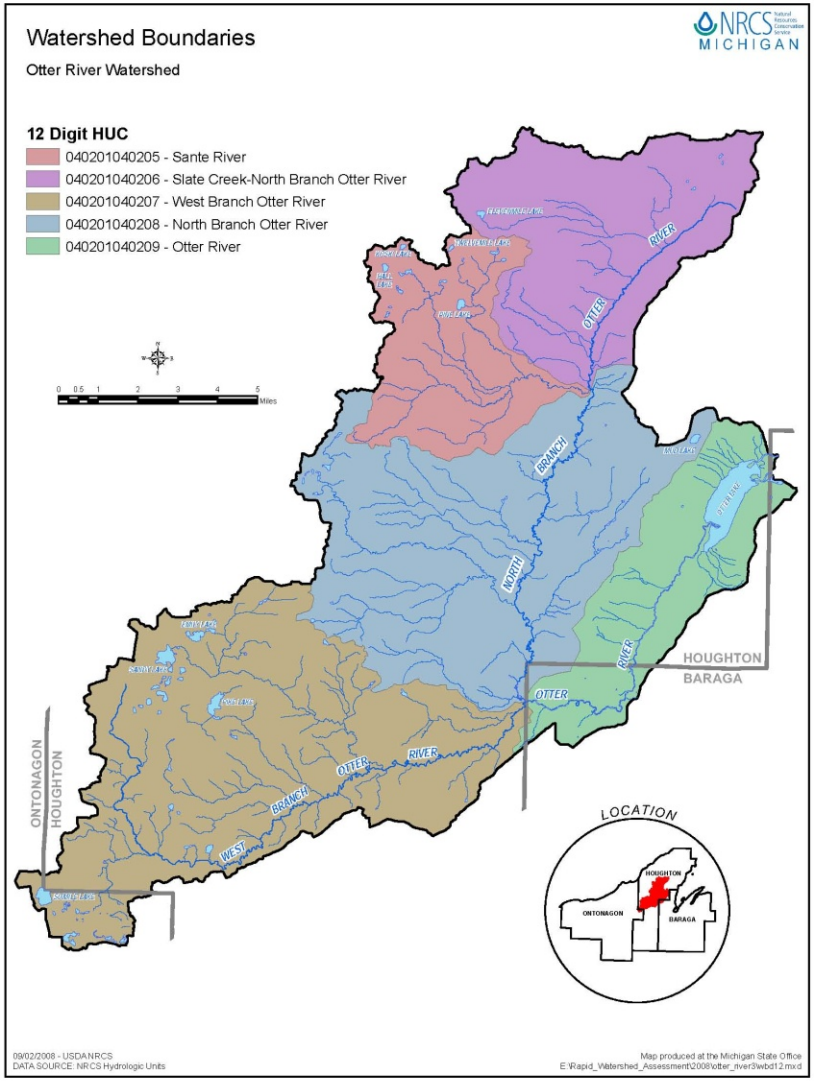
Table 2: Sub-Watersheds

Name	Acres	Percent of Watershed
Sante River	12,332	10.74%
Sante Creek	18,968	16.52%
West Branch Otter River	37,332	32.51%
North Branch Otter River	32,698	28.47%
Otter River	13,505	11.76%

The North Branch of the Otter River begins in the upper highlands near the small village of Painesdale. The northern edge of the North Branch is made up of many small tributaries, as well as intermittent streams. The West Branch, like the North Branch, originates with many small tributaries and intermittent streams. The watershed as a whole has a complex drainage pattern. Most of the waters which empty into the North Branch flow in an easterly direction initially then turn south as they join with the Otter River. The waters that eventually join with the West Branch of the river initially flow south until they meet up with the West Branch where they then turn northeast. Headwaters to this river system start at elevations near 1,500 feet and produce a total hydraulic overhead of over 800 feet. The Otter River is considered a navigable river by the State of Michigan.

There are numerous inland lakes within the watershed. Some of the lakes are named and some remain unnamed at the time of publication of this RWA. The named lakes range in size from three to 933 acres and are mostly located in the western portion of the watershed. The unnamed lakes range in size from smaller than an acre to larger than five acres. There is a significant amount of development occurring along the shores of both Otter and Sandy Lakes. The shorelines of the remaining lakes remain mostly undeveloped at this time.

Besides the named and unnamed lakes within this watershed boundary, there are numerous human-made ponds, as well as beaver impoundments. Ponds have been created in this watershed over the years for aquaculture, agriculture, wildlife enhancement, aesthetics, and recreation. Beaver trapping was at one time a common activity by local landowners and farmers. This activity has seen significant decline, as the beaver pelts are no longer worth very much.



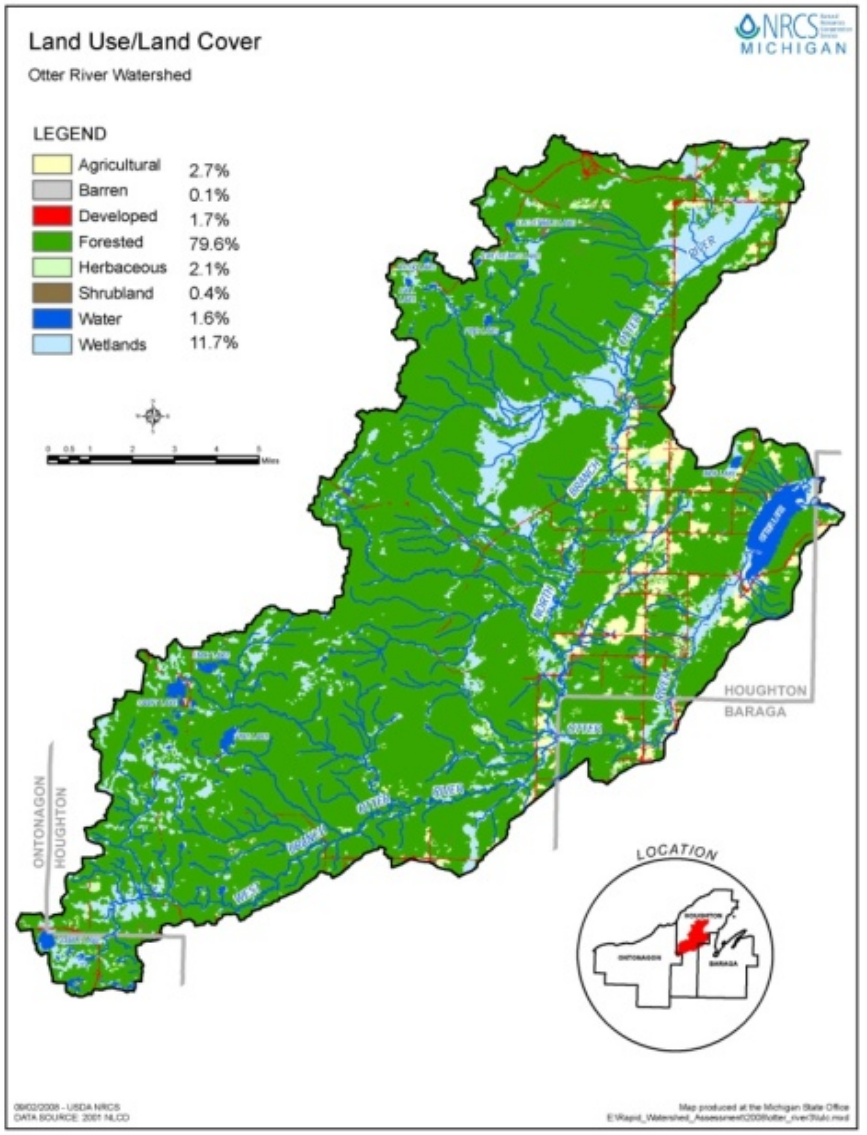
Map 2: Sub-Watersheds

3.2 Land Use/Land Cover

The land cover in this watershed is similar to that of the six county region that comprises the Western Region of Michigan's Upper Peninsula, which is ninety percent forested. This region of the UP produces about twenty-one percent the marketable timber in this state. Wise, sustainable use of this forested land, as well as the maintenance of high water quality standards, is very important to people who reside in the communities within this watershed.

Table 3: Land Cover	
Classification	**Percent of Watershed**
Agricultural	2.71%
Barren	.10%
Developed	1.68%
Forested	79.63%
Herbaceous	2.14%
Shrubland	.42%
Water	1.63%
Wetlands	11.69%

There has been a decrease in agriculture over the past few decades. Though only 2.7% of the watershed is in agricultural land, it is still a very important part of this community and there are several active farms producing dairy, beef, vegetables, berries, and orchard crops.

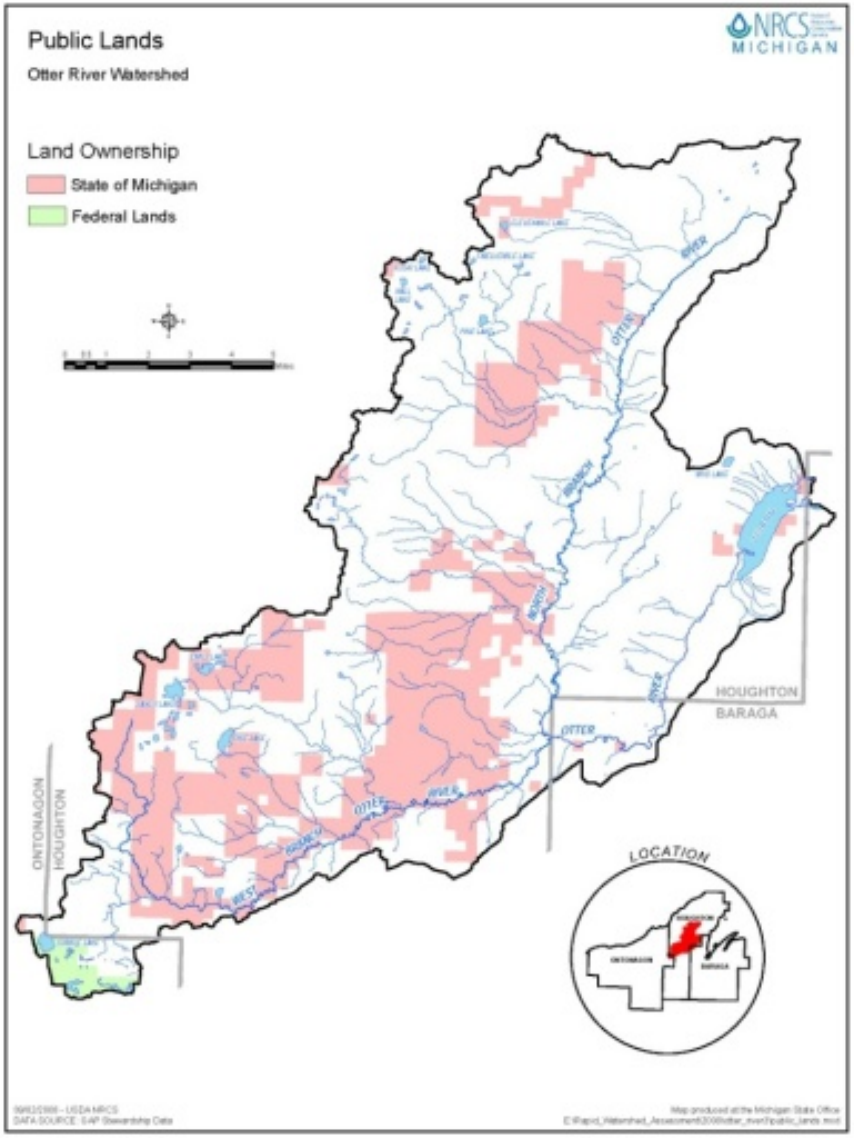


Map 3: Land Use/Land

3.3 Land Ownership

About 28 percent of the land in the Otter River Watershed is public land. As seen in Table 4, the public land is owned by the state or federal government. Nearly all of this land is in forest and managed for timber production. Several feeder streams, as well as larger streams, flow through public land. Forest Management Plans are followed on all logged public lands.

Table 4: Land Ownership	
Ownership	**Percent of Watershed**
Private	72.14%
State	26.92%
Federal	.94%

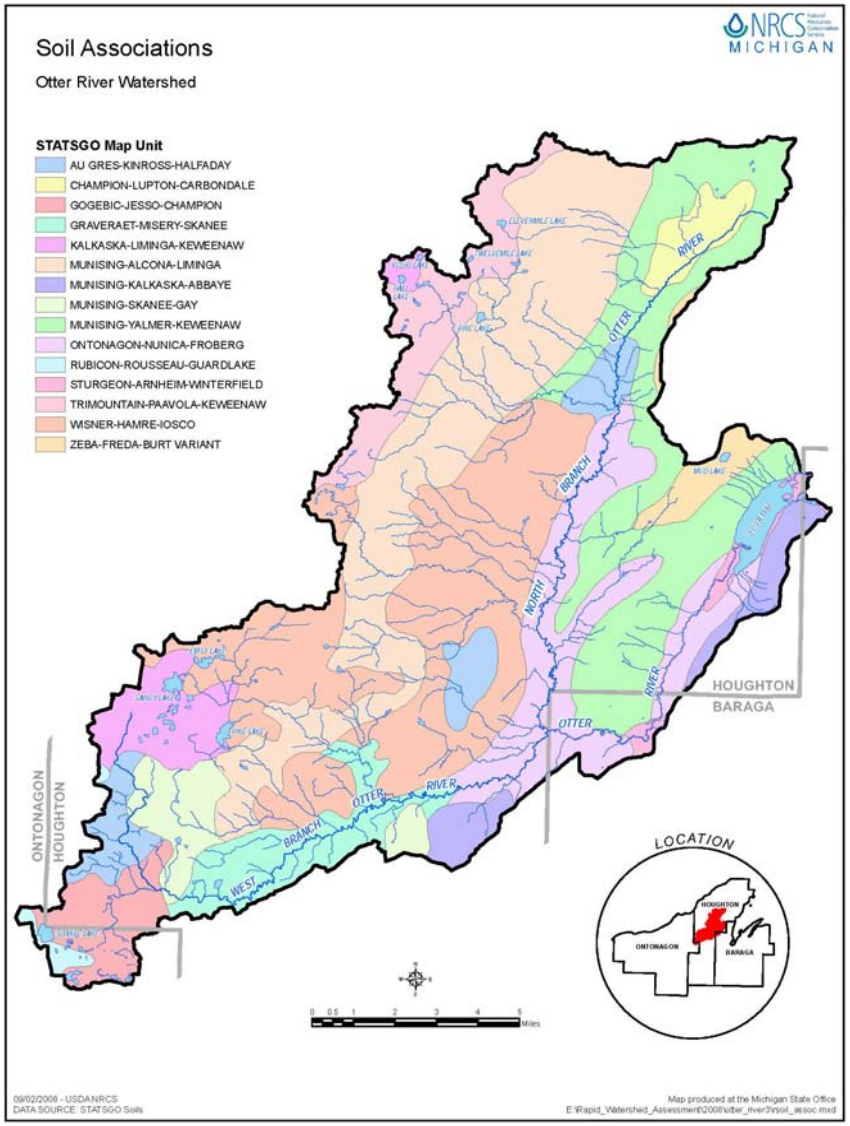


Map 4: Public Lands

3.4 Soil Associations

Table 5: Soil Associations	
Description	**Percent of Watershed**
Kalkaska-Liminga-Keweenaw	3.76%
Trimountain-Paavola-Keweenaw	4.91%
Munising-Yalmer-Keweenaw	18.08%
Sturgeon-Arnheim-Winterfield	1.51%
Champion-Lupton-Carbondale	1.82%
Zeba-Freda-Burt Variant	1.68%
Munising-Alcona-Liminga	18.64%
Au Gres-Kinross-Halfaday	3.94%
Wisner-Hamre-Iosco	5.78%
Ontonagon-Nunica-Froberg	9.89%
Munising-Kalkaska-Abbaye	2.70%
Rubicon-Rousseau-Guardlake	.50%
Graveraet-Misery-Skanee	4.67%
Munising-Skanee-Gay	3.16%
Wisner-Hamre-Iosco	1.73%
Gogebic-Jesso-Champion	3.27%

Detailed soil surveys have been completed in each of the three counties that this watershed spans. The surveys have been published and contain soils information and maps, as well as further information on the soil associations. The predominant soil series found in this watershed is the Munising Series. The main soil associations are the Munising-Yalmer-Keweenaw, and the Munising-Alcona-Liminga.



Map 5: Soil Associations

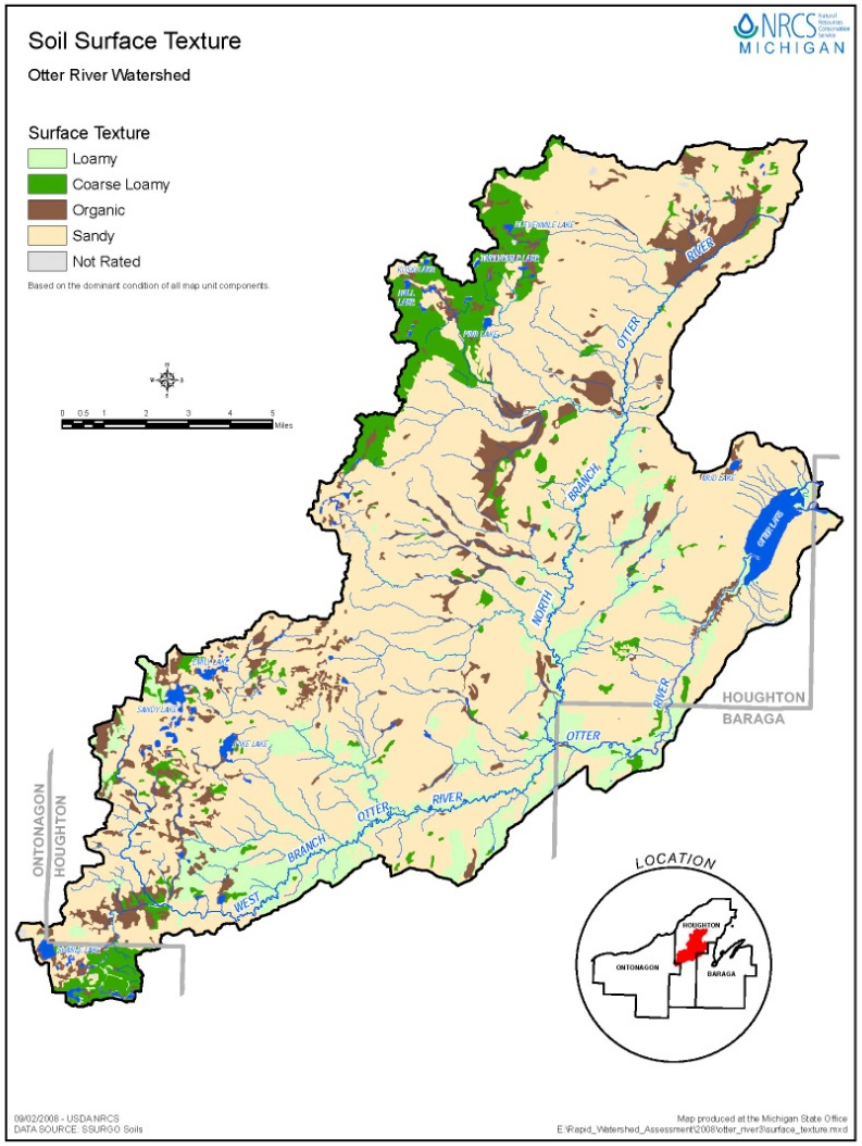
3.5 Soil Surface Texture

Soils associated with the landforms in this watershed are generally formed in lacustrine sand, poorly sorted gravels, and sandy clay. Soils range from well-drained to somewhat poorly-drained. The main features found in this region are moraines, swamps, and alluvial deposits.

Throughout most of the watershed, sandy soils are the dominant soil texture type, with organic soils mixed in. Coarse loamy soils make up about 7 percent of the soils, with the majority of these soils found in the upper northwest and lowest southern region of the watershed.

Table 6: Soil Surface Texture

Surface Texture	Percent of Watershed
Loamy	11.86%
Coarse Loamy	7.25%
Organic	7.76%
Sandy	71.60%
Not Rated	1.53%



Map 6: Soil Surface Texture

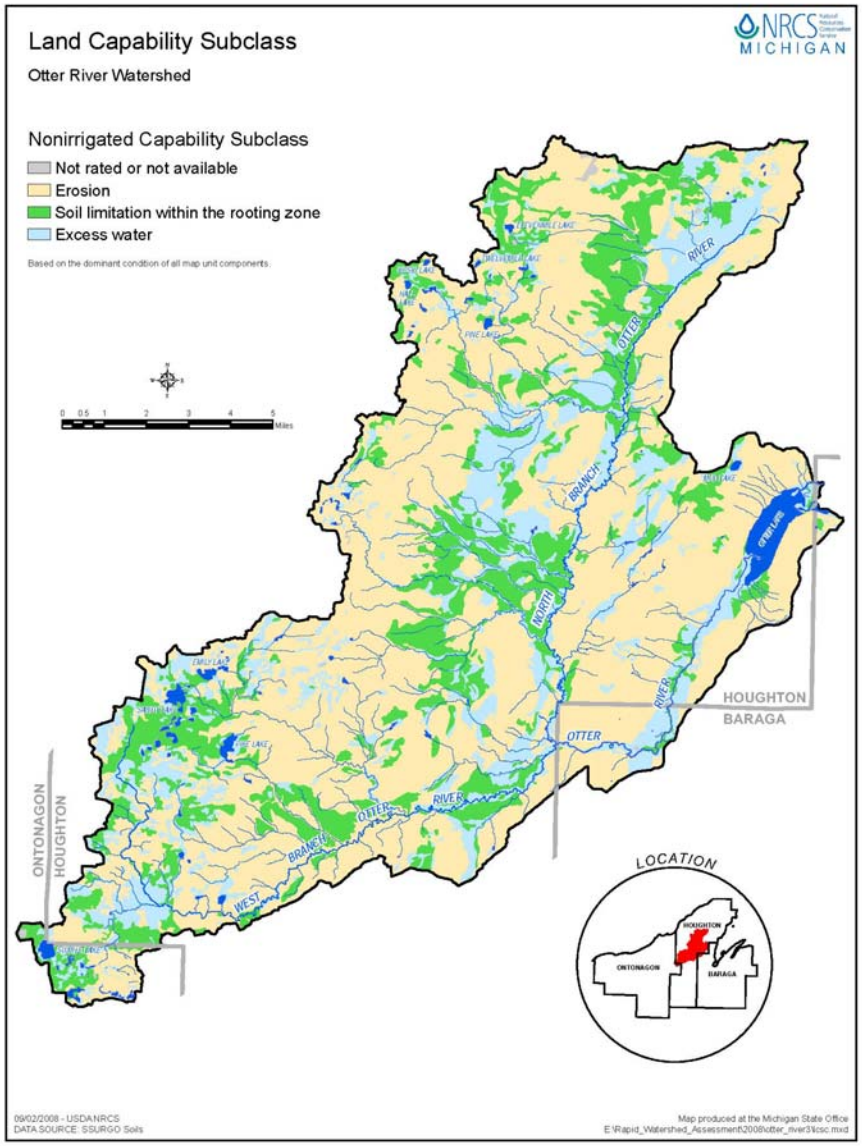
3.6 Land Capability

Land capability reports show suitability of the soil for growing common agricultural field crops. Crops that require special management techniques are excluded from land capability studies and reports. The soils are grouped according to their limitations for growing crops, risk of damage if the soils are used for growing crops, and the way that the soils respond to management.

The land capability of soils in the Otter River Watershed do have limitations for growing crops, as seen in table 7. Soil erosion is the major management concern in growing crops here, as 60% of the land is susceptible to erosion. These erosion factors may limit the use of soils or require special management techniques to conserve soil loss during the growing season.

Table 7: Land Capability

Subclass	Percent of Watershed
Erosion	60.81%
Soil Limitation Within the Rooting Zone	19.07%
Excess Water	18.55%
Not Rated	1.57%



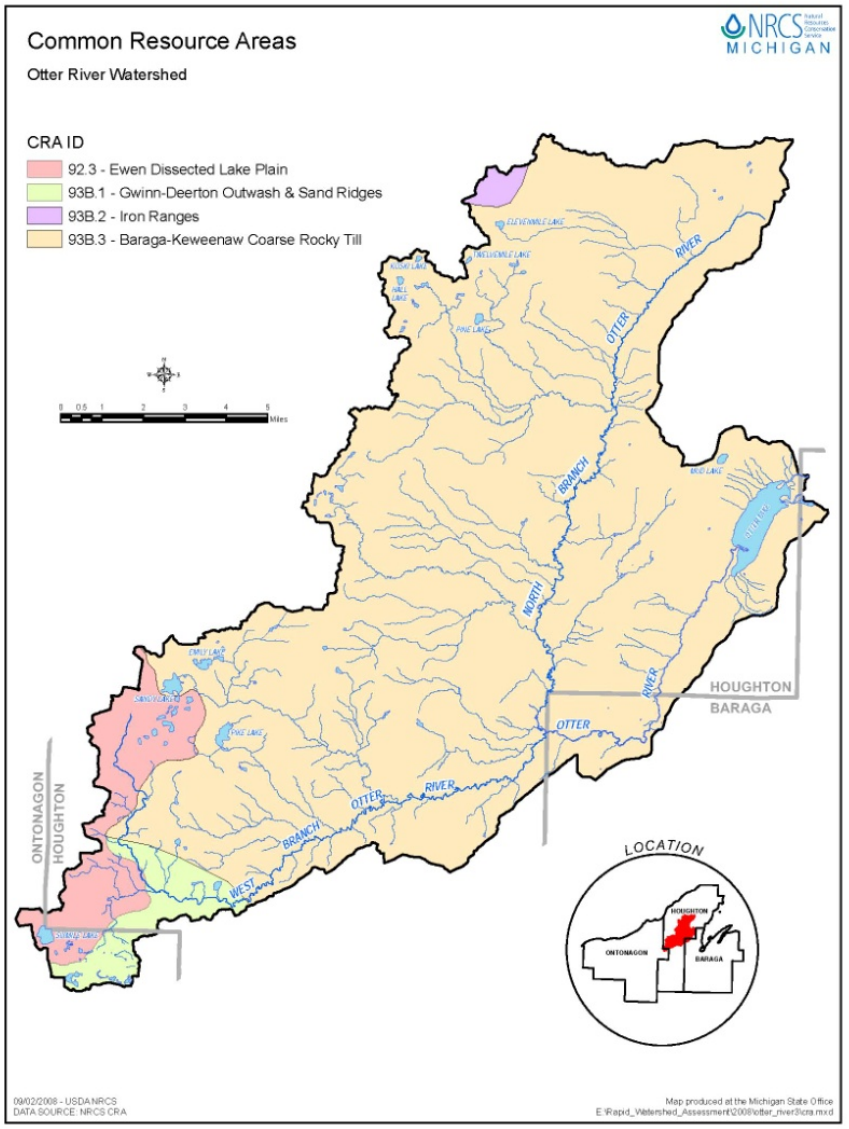
Map 7: Land Capability

3.7 Common Resource Areas

Common Resource Areas (CRA's) are created by subdividing Major Land Resource Areas into groups based on hydrologic units, soil groups, resource concerns, human considerations, topography, and resource use. CRA's are correlated across state boundaries to ensure consistency. A national, digital geographic coverage for CRA's is currently being developed in an interagency effort, which involves eight federal agencies. The dominant CRA in this watershed is the Baraga-Keweenaw Coarse Rocky Till, composing over 90 percent of the total area within the watershed boundary.

Table 8: Common Resource Areas

CRA Name	Percent of Watershed
Ewen Dissected Lake Plain	5.99%
Gwinn-Deerton Outwash & Sand Ridges	3.18%
Iron Ranges	.52%
Baraga-Keweenaw Coarse Rocky Till	90.31%

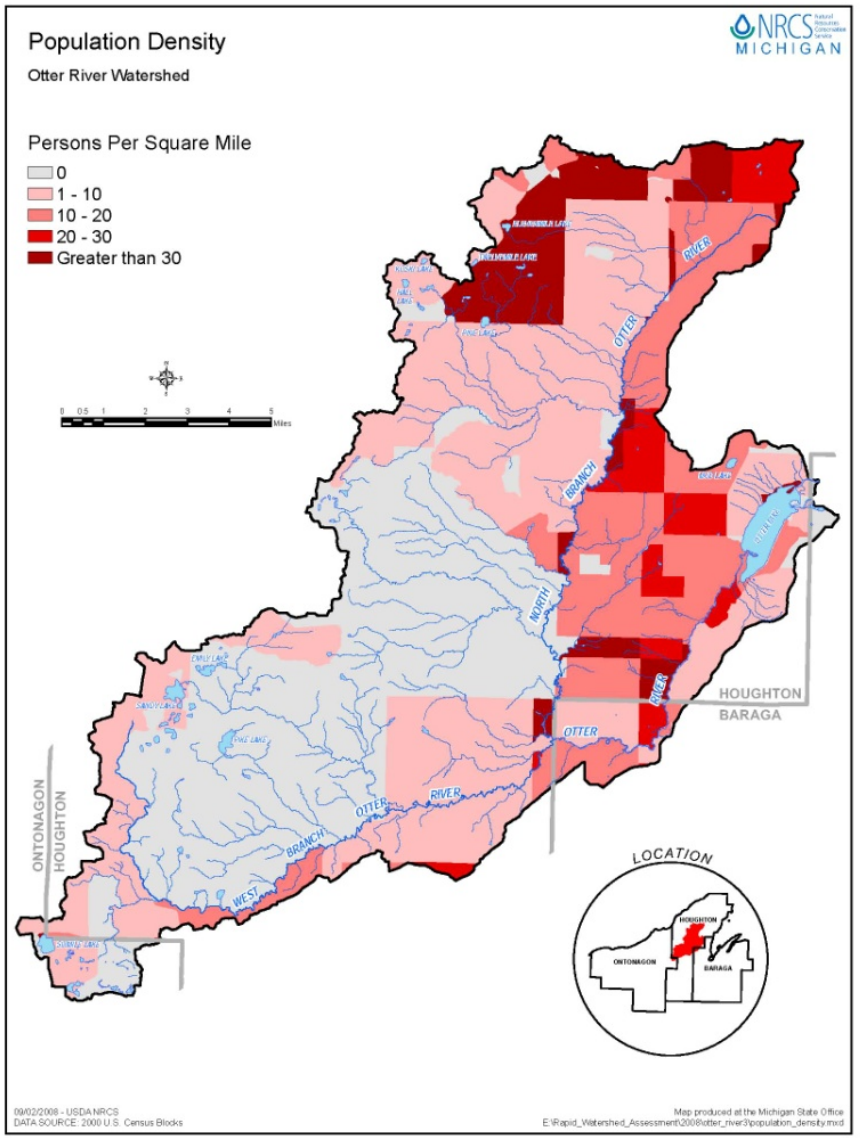


Map 8: Common Resource Areas

4.0 Socio-Economic Description

4.1 Population Statistics

The population in this watershed varies from zero to greater than 30 people per square mile. The highest population lies along the northern and eastern fringes of the watershed boundary. Just to the north of the Otter River watershed are the cities of Houghton and Hancock. They have a combined population of 11,073 people, according to 2007 data. East of the watershed lies the community of Chassell that has a population of 3,268. Within the watershed itself, there are many private rural residences.



Map 9: Population Density

4.2 Agriculture Census Data

The Nation's agricultural production is documented through the Census of Agriculture. This is the main and leading source of information relating to agricultural producers, agricultural products, farm size, and marketing. It also contains details related to who is in charge of running the operations. The data contained in the census is valuable information for Congress to develop changes in farm programs, plan for the future, and assess current conditions. Census data is used by both National and State programs to assist in the allocation of funds for various purposes, including but not limited to, soil conservation programs, agricultural research, extension service projects, and land-grant colleges and universities.

Table 9: 2002 US Census of Agriculture

Farms by size	
All farms	20
1-49 acres	6
50 to 999 acres	14
Value of all agricultural products sold	
Total farms with sales	20
Farms with less than $50,000 in sales	18
Farms with direct sales	4
Tenure	
Full time operator	14
Part time operator	6
Woman operator	8
Farms by type of production	
Livestock and dairy	9
Crops, hay, greenhouse, and nursery	1
Fruits, berries & vegetables	1

5.0 Surveys, Reports and Projects

5.1 Existing Reports Summary

Biological Diversity, Microclimate, and Decomposition to Landscape Structures within the Otter River Watershed, Michigan, USA – January 1994

This report was completed by Jiquan Chen, a graduate student at Michigan Technological University. This study focused on four different biological aspects of the Otter River Watershed. It looked at quantifying the ecological and social structures of the watershed using Geographic Information Systems, geostatstics and FRAGSTATS. The study also looked at the spatial distribution of plants, as well as the microclimate and decomposition rates. It focused on the different habitats and how they related to each other. The last thing the study did was compare biotic and abiotic characteristics of the watershed.

The Otter River Watershed Project – November 1993

This report was created and submitted by the Houghton/Keweenaw Conservation District, the Baraga County Conservation District, the Upper Peninsula Resource Conservation and Development Council, and the Natural Resources Conservation Service. The report summarizes the Resource Management System (RMS) level of the watershed and identifies resource needs that should be implemented to improve it. The report also discusses stream flows, channelization, special resources, wildlife, existing or potential water quality problems, and sedimentation. Sites of concern were identified in the project and areas of need were prioritized. This report was done through a Clean Michigan Initiative 319 grant process and took 2 years to complete.

The Otter River Watershed Plan - 2000

This plan was an update to the 1993 project. The comprehensive report was done in accordance with Clean Michigan Initiative Watershed Plan Guidelines. The plan contains everything from system Best Management Practices and costs, a water quality summary, watershed goals, and high priority areas. Problem sites were evaluated on a very detailed level and recommended site solutions, as well as associated costs, were figured and included in the final plan. Some of the main problems with the watershed, as identified by the plan, are listed below.

- Otter Lake aggradation of fluvial sediments along southern end of lake
- Stream crossings and potential mass wasting sections along banks of river
- Beaver ponds as they contribute to mass wasting and river eutrophication
- Small low gradient feeder streams with sand accumulation which inhibit macro invertebrate production

Restoration Management Procedures for Upper Peninsula, Michigan Watersheds

This plan was also completed in 2000. It was completed as the research portion of a Master of Science in Civil Engineering for Michigan Technological University student Jonathan M. French. The report, though title-wise sounds general in nature, is actually a summary of a stream restoration process on the Otter River which began in 1999. The plan describes the watershed, gives cross-sectional hydraulic gradient views via data charts, and discusses a rehabilitation plan for stream improvement. Some of the recommendations in this plan do match what was recommended in the 2000 Otter River Watershed Plan, though this plan does also mention the removal of severe vegetation overgrowth to increase fish habitat and the urgency of addressing unstable banks. Work was actually preformed during this research project to both improve the stream and assess it. The main projects completed were rip rap replacement, tag alder removal, installing tree drop deflectors, sky-hook installation.

5.2 NRCS Performance Results System (PRS)

Practices planned by NRCS, 2005-2007.

Table 10: Performance Results System

Otter River Watershed (HUC 04020104)	2005	2006	2007	Total
Conservation Systems				
Conservation System Acres Planned	2,263	349	419	3,031
Conservation System Acres Applied	1,924	186	697	2,807
Conservation Practices Planned				
Brush Management (ac)			5	5
Channel Stabilization (ft)	700			700
Comprehensive Nutrient Management Plan (no)	1			1
Conservation Cover (ac)		27	5	32
Conservation Crop Rotation (ac)	502			502
Critical Area Planting (ac)	4			4
Diversion (ft)	250	493		743
Fence (ft)	2,500	672		3,172
Forage Harvest Management (ac)	332			332
Forest Stand Improvement (ac)	140	77	165	382
Grassed Waterway (ac)	2			2
Heavy Use Area Protection (ac)	7	1	10	18
Hedgerow Planting (ft)		370	662	1,032
Lined Waterway or Outlet (ft)	700			700

Manure Transfer (no)		1		1
Nutrient Management (ac)	1,976	118		2,094
Pasture and Hay Planting (ac)	1,176			1,176
Pest Management (ac)	579			579
Pond (no)		2		2
Prescribed Grazing (ac)	129	19		148
Restoration & Mgmt of Declining Habitats (ac)	18			18
Riparian Forest Buffer (ac)		16		16
Roof Runoff Structure (no)	2			2
Shallow Water Management for Wildlife	28		7	35
Stream Crossing (no)	4	2		6
Tree/Shrub Establishment (ac)	4	27	9	40
Tree/Shrub Site Preparation (ac)		3	1	4
Upland Wildlife Habitat Management (ac)	144	3	201	348
Use Exclusion (ac)	1	9		10
Waste Storage Facility (no)	1	1		2
Waste Utilization (ac)	659			659
Wetland Enhancement (ac)		42	7	49
Wetland Restoration (ac)			24	24
Wetland Wildlife Habitat Management (ac)	78	6	81	165
Windbreak/Shelterbelt Renovation (ft)	1,000			1,000

6.0 Resource Concerns

Though the Otter River Watershed is still a clear, cold water stream which does not have some of the apparent problems of many water systems in lower Michigan and in other areas of the country, there are many resource concerns that need addressing. Maintaining and improving this water system is definitely very important to the local public. This system was once known for its prized fisheries, but has seen a drastic decline in the species, amount, and size of fish. It no longer seems to be a destination for sport fisheries, as it was in the past. A public meeting was held in Tapiola where many members of the local community came and spoke of their concerns on the Otter.

Photo 1: Bank Erosion
Courtesy of Dave Rulison (FOLK)

Table 11: Resource Concerns		
Sedimentation	Eroding Streambanks	This appears to be the single largest contributing factor to sedimentation in the Otter River Watershed. The fact that it is a meandering river system through a primarily sandy soil only exacerbates this fact.
	Water Level Control Structure	Though this seems to be an item of debate, many local landowners believe that since the installation of the water level control structure on Otter Lake, sedimentation has become a bigger issue.
	Road/Stream Crossings	Some road/stream crossings allow sediment to enter the rivers and streams.
	Crop Erosion	Open tilled land is susceptible to erosion and movement; this movement may enter surface water.
	Forestry	Best management practices are not always employed. When BMP's are ignored, particularly on lands adjacent to water systems, sedimentation and erosion can enter waterways.

Photo 2: Water Level Control Structure

Wildlife Habitat	Sedimentation	Sand sedimentation occurring in the river has covered once rocky spawning beds.
	Fish Ladder	The fish ladder that runs along the water control structure at the end of Otter Lake is not functioning as it should, according to many local residents, and needs further research and possibly improvement.
	Culverts	Improperly sized or perched culverts inhibit proper fish passage.
Bank Stability/Mass Movement	Saturation	After a storm event which leads to high river levels banks become saturated and eventually slough off. Entire trees have fallen into the river system as this happens.
	Meandering	Though this is a natural event, bank hydraulic parameters are sometimes negatively affected.

Photo 3: Culvert
Courtesy of Dave Rulison (FOLK)

Unplanned Development	Shoreland Development	Development pressure on area lakes and rivers has caused harm to system as people modify the once natural shoreline.
	Lack of Proper Zoning	Current zoning does not put enough emphasis on best land use or conservation planning principles.
Water Quality	Forestry	Access logging roads and the lack of following Best Management Practices for forestry adds to problems in the watershed.
	Agricultural Practices	Livestock access to water systems does occur within the watershed. Crop chemicals also have the ability to enter the system in areas lacking proper riparian buffers.

7.0 Assessment Matrix

The assessment matrix is a summary of current resource conditions and related costs to maintain current installed conservation practices. The matrix also summarizes desired resource conditions, opportunities for further conservation, and costs to install practices. The effect of conservation practices is also listed, as well as potential funding sources. Most of this work has been and will be implemented on the agricultural lands of the watershed (units are primarily in acres). Costs are figured by average spent to install and maintain listed practices. NRCS is not a regulatory agency and does not regulate forestry practices that occur in the watershed.

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Watershed: **Otter River**

Current Conditions	Total Acres
Total Crop/Hay/Pasture Land	3,112
Total Forest Land	75,577
Other Land Use	36,145
Typical Management Unit (avg farm size)	200
Estimated Current Farm Bill participation %	12%

Future Conditions	Total Acres
Total Crop/Hay/Pasture Land	3,000
Total Forest Land	75,577
Other Land Use	36,257
Total Watershed Acres with Treatment (Current & New Implementation)	114,834
Estimated Acres: New Implementation	2300
Estimated increase in Participation (potential participation in time frame for implementation).	2%
Total participation Future	14%

Cost Summary

Treatment / Investment	Expected Installation Cost	Annual Maintenance Cost	Total Average Annual Cost of Investment
Total Crop/Hay/Pasture Land	$9,774,439	$454,272	$2,347,629
Total Forest Land	$9,091,306	$453,236	$1,627,412
Other Land Use	$5,461,139	$259,939	$1,206,022
Cost Items and Programs		**Costs**	**O&M Costs**
Maintain the Baseline Conservation - Annual Maintenance			$1,040,000
Total Investment at estimated rate of participation		$24,326,900	$1,167,400
Potential Investment from Farm Bill Programs		$12,163,450	
Management Incentives (Incentive Payments in yr 2 & 3)		$1,956,472	
Total Potential Farm Bill Program Costs		$14,119,922	
Operator Investment		$12,163,500	$2,207,400
Total Average Annual Costs		$2,833,400	
Present Value of Total Average Annual Costs over 5 years		$12,309,600	

Note:

Summary numbers rounded to even 100s

Cost Basis:	Discount Rate:	Time Frame - Years:
2008	4.875%	10

Total Effects Score	1,166

Sum of CPPE for all practices and resource concerns.

Resource Concerns Selected:	CPPE
Wildlife - Threatened and Endangered Fish and Wildlife Species	26
Wildlife - Inadequate Food	103
Wildlife - Inadequate Cover/Shelter	103
Wildlife - Imbalance Among and Within Populations	82
Water Quantity - Reduced Capacity of Conveyances by Sediment Deposition	88

Water Quantity - Insufficient Flows in Water Courses	22
Water Quantity - Excessive Runoff, Flooding, or Ponding	61
Water Quantity - Drifted Snow	14
Water Quality - Excessive Nutrients and Organics in Surface Water	69
Soil Erosion - Streambank	47
Soil Erosion - Shoreline	40
Soil Erosion - Sheet and Rill	76
Soil Erosion - Road, Road Sides and Construction Sites	39
Soil Erosion - Mass Movement	22
Soil Erosion - Irrigation-induced	16
Soil Erosion - Classic Gully	48
Soil Condition - Damage from Sediment Deposition	50
Soil Condition - Contaminants - Salts and Other Chemicals	36
Plants - Wildfire Hazard	34
Plants - Threatened and Endangered Plant Species	9
Plants - T&E Plant Species: Declining Species, Species of Concern	17
Plants - Noxious and Invasive Plants	149
Air - Objectionable Odors	15

9.0 Bibliography

1. Brown, Elaine, A. Peterson, R. Kline-Robach, K. Smith, and L. Wolfson. 2000. Developing a Watershed Management Plan for Water Quality: An Introductory Guide. MSU Institute of Water Research, MSU Extension, MI Department of Environmental Quality
2. Agriculture Census Data was downloaded from the National Agriculture Statistics Service (NASS) website. http://www.nass.usda.gov/

3. USDA Natural Resources Conservation Service national website was used for general Rapid Watershed Assessment information. http://www.nrcs.usda.gov/

4. Soil Survey Geographical Database (SSURGO) tabular and spatial data were downloaded for the following surveys:
    a. Baraga County, MI Published in August, 1988
    b. Houghton County, MI Published October, 1991

5. Metadata and SSURGO data for the above surveys were downloaded from the NRCS Soil Data Mart at https://soildatamart.nrcs.usda.gov/. Official and up to date USDA soil information is available through the Web Soil Survey. http://soils.usda.gov/survey/geography/cra.html

6. The Otter River Watershed Plan, August 2000, The Sturgeon/Otter River Watershed Council

7. French, Jonathan M. 2000. Restoration Management Procedures for Upper Peninsula, Michigan Watersheds

8. The CRA map found within this document is taken from NRCS data. http://soils.usda.gov/survey/geography/cra.html

9. Population Statistics have used in this document have been taken from the US Census Bureau at. http://www.nass.usda.gov/

10. National Land Cover Data (NLCD) was obtained from the United States Geological Survey (USGS). http://www.mcgi.state.mi.us/mgdl/

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

12. Public land information is obtainable through the state of Michigan. http://www.mcgi.state.mi.us/mgdl/?rel+ex&action=cext

13. The Performance Results System (PRS) is online at http://ias.sc.egov.usda.gov/prshome/default.html and can be queried on a watershed basis.

14. Jiquan Chen. 1994. Biological Diversity, Microclimate, and Decomposition to Landscape Structures within the Otter River Watershed, Michigan, USA

15. City population data was obtained from http://www.city-data.com/city/Houghton-Michigan.html

16. Michigan Dams information is available through the Michigan Department of Environmental Quality. http://www.glfc.org/glgis/support_docs/html/lake_GISs/LHGIS_index.htm