

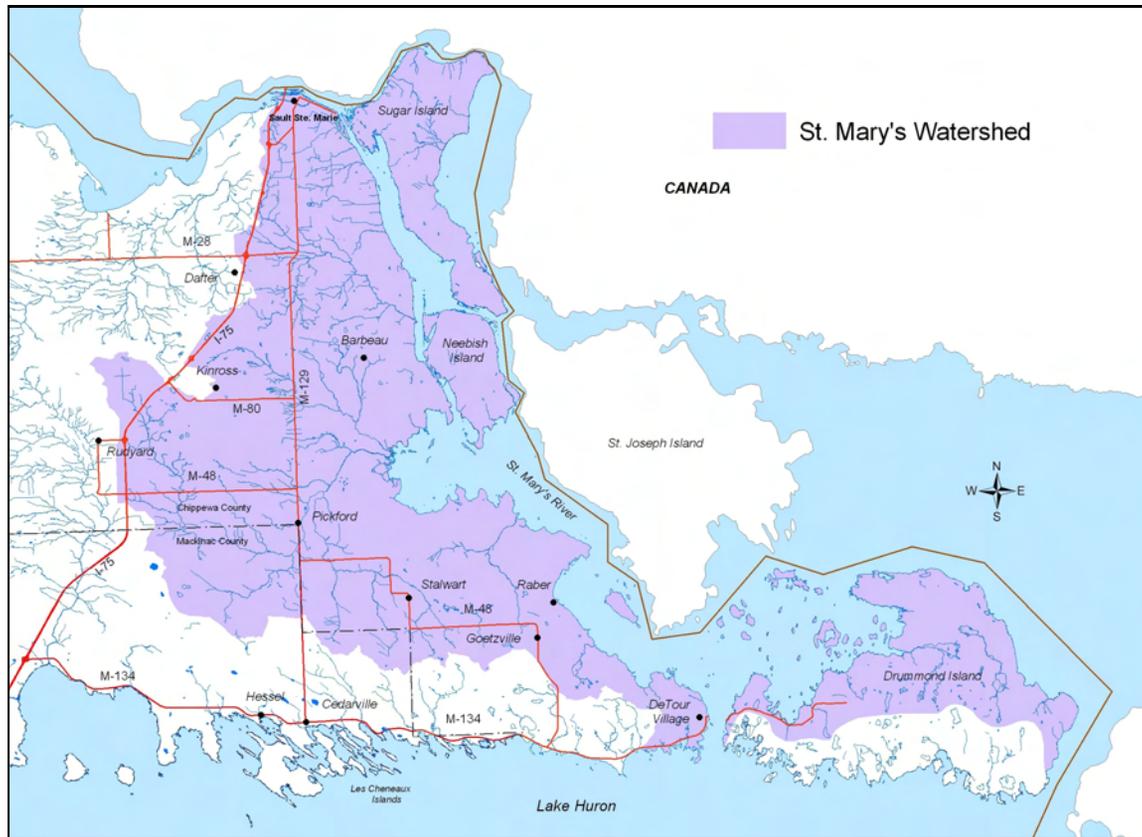
St. Mary's River

Rapid Watershed Assessment

Prepared by
Chippewa/East Mackinac Conservation District
2847 Ashmun Street
Sault Ste. Marie, Michigan 49783

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Rapid Watershed Assessment



January 2008

A Joint Project Between



Chippewa/
East Mackinac



Background

The St. Mary's River watershed began as the bottomlands of glacial lakes Algonquin and Nippising. Dry now for some 10,000 years, the watershed community still is feeling the effects of those glacial formations. The thick, impermeable clay lake bottom still presents obstacles for land use, especially agriculture and urban development. Fortunately, the community is beginning to see those natural obstacles as valuable natural assets. They are coming to realize that the future sustainability of the St. Mary's River watershed will be assured with active restoration and protection of its natural resources.

The St. Mary's River Watershed

The St. Mary's River watershed consists of approximately 410,351 acres within Michigan's Eastern Upper Peninsula, within a regional ecosystem referred to as the Rudyard Clay Lake Plain. It is one of the oldest settled regions in the United States, dating back to the mid-1600's. Over half of the Chippewa County population lives within the watershed boundaries. The watershed includes at least parts of the city of Sault Ste. Marie and the small towns and villages of Detour, Pickford, Kinross, Raber, and Dafter.

Political jurisdictions are broken into several townships within Chippewa County, including Soo, Dafter, Bruce, Pickford, Raber, Detour, Rudyard, and small parts of both Clark and Marquette townships in Mackinac County. The watershed of the St. Mary's River includes a number of small tributaries that drain directly into the river, including Ashmun, Mission, Frechette, Ermatinger, Hursley, Sailor's, and Carlton Creeks. Larger tributaries include the Charlotte, Little Munuscong, Munuscong, and Gogomain Rivers. Included in the watershed are several coastal river drainage areas.

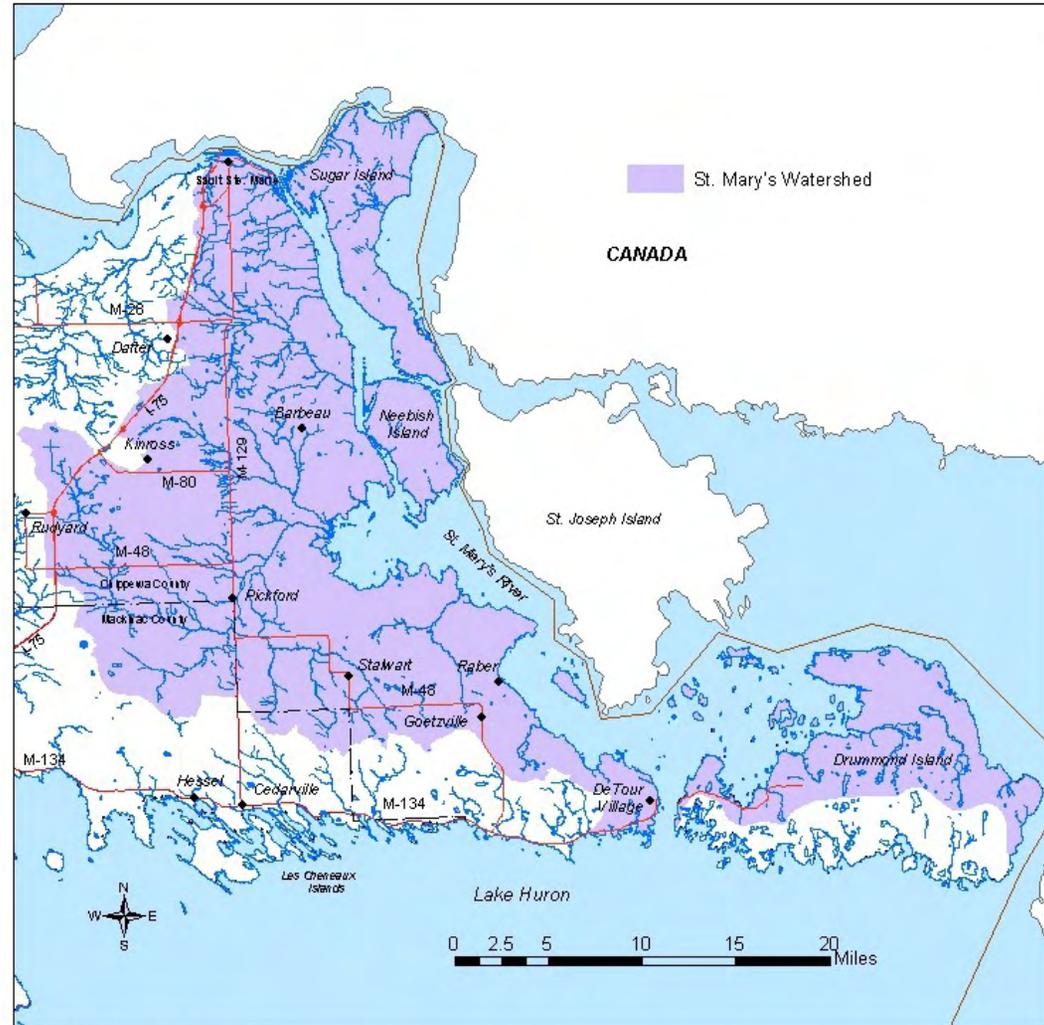


Several islands have been formed when the river divided into its numerous channels. Sugar Island is the largest upstream island and separates Lake George (east) and Lake Nicolet (west). Neebish Island is directly downstream, and at the end of the St. Mary's sits Drummond Island.

Most of the land is in private ownership (85%), following with 14% state land and 1% under the ownership of the Sault Ste. Marie tribe of Chippewa Indians. 63% of the land is forested, 25% is considered agricultural, and 12% is considered non-forested, including the several classes of urban land use.

Almost the entire project area is within the clay lake plain, where relatively thick, poorly drained clays overlie limestone and dolomite bedrock. Consequently, drainage issues have been a limiting factor for all land uses, including urban development and agriculture. Historically, much of the clay lake plain was cleared for agriculture and settlement, and deep ditches were dug to accelerate drainage. Some of that cleared plain is no longer farmed, and is now converting to herbaceous species and shrub land. Remaining forest cover is dominated by species adaptable to the poorly drained soils, including red maple, balsam poplar, black spruce, tamarack, and northern white cedar.

St. Mary's River Watershed (HUC 04070001)



Source: USDA, NRCS - Geodata
Prepared by CEMCD 2007

Sustainability of the St. Mary's River watershed community is tied directly to the wise use and protection of area natural resources. Forestry and agriculture play a key role in the health of the St. Mary's basin ecosystem. Collaborating long term natural resource protection with these operations guarantees economic and natural resource sustainability. Wildlife such as migratory birds use the cut fields in the watershed as an important feeding and resting stop, white-tailed deer graze on grain fields, and sharptail grouse use fields for their nesting and feeding grounds. A myriad of wildlife rely on area forests for food and shelter. The St. Mary's watershed community recognizes that these healthy relationships also contribute to a sustainable socio-economic system. CEMCD and local technical representatives are focused on protecting and improving the condition of natural resources in the watershed, not only to sustain the natural environment, but to also sustain the economic one.

Priorities for maintaining healthy natural resources for CEMCD, the Sault NRCS staff, and partners include:

- Minimizing soil erosion and sedimentation
- Improving water quality
- Enhancing fish and wildlife habitat

Rapid Watershed Assessments

In October 2006, the Chippewa/East Mackinac Conservation District (CEMCD) entered into an agreement with Upper Peninsula Resource Conservation and Development Council (RC&D) to develop a profile of the resource conditions and conservation efforts in the St. Mary's River watershed (HUC 04070001), to quantify the size, scope, and value of natural resource needs in the watershed. The project, referred to as the "Cooperative Conservation Partnership Initiative for the St. Mary's River Rapid Watershed Assessment (HUC No. 04070001)", constitutes an assessment conducted by CEMCD in collaboration with a local technical committee and local community steering committee, including an inventory of agricultural areas, identification of conservation opportunities, current levels of natural resource management, and estimation of impacts of conservation opportunities on the local priority resource concerns.

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 land-owners and local leaders set priorities and determine the best actions to achieve their goals (NRCS 2006).

¹ The Natural Resources Conservation Service (NRCS) is encouraging the development of rapid watershed assessments in order to increase the speed and efficiency generating information to guide conservation implementation, as well as the speed and efficiency of putting it into the hands of local decision makers.

According to the Natural Resource Conservation Service (2006), the rapid assessment provides less detail and analysis than full-blown studies and plans; they do provide the benefits of NRCS locally-led planning in less time and at a reduced cost. The benefits include:

- Quick and inexpensive plans for setting priorities and taking action
- Providing a level of detail that is sufficient for identifying actions that can be taken with no further watershed-level studies or analyses
- Actions to be taken may require further Federal or State permits or ESA or NEPA analysis but these activities are part of standard requirements for use of best management practices (BMPs) and conservation systems
- Identifying where further detailed analyses or watershed studies are needed
- Plans address multiple objectives and concerns of landowners and communities
- Plans are based on established partnerships at the local and state levels
- Plans enable landowners and communities to decide on the best mix of NRCS programs that will meet their goals
- Plans include the full array of conservation program tools (i.e. cost-share practices, easements, technical assistance)

Resource Protection Accomplishments

In order to define conservation needs and design appropriate remediation, it is necessary to recognize the current conservation work of private land managers. An indicator of these efforts is the work that has been undertaken in partnership with NRCS and the local conservation district. Since fiscal year 2005, St. Mary's River watershed landowners have improved resource conditions on 23,754 acres of privately owned lands, with assistance from NRCS and the conservation district. During this time, private land managers have worked with NRCS and the conservation districts in the watershed with a combination of private, state, and federal funding to:

- Improve the condition of 21,447 acres of grazing lands
- Improve water quality on 20,591 acres
- Restore and establish 1,466 acres of wetlands and riparian areas
- Improve 18,512 acres of forest stands
- Establish resource management systems on 5,864 acres

Summary of Conservation Opportunities

The goal of a rapid watershed assessment is not only to consider these conservation accomplishments; the assessment also defines what can be accomplished with a strong conservation partnership in the St. Mary's River watershed. Historically, land users have struggled with ways to deal with the obstacles characteristic of the *Rudyard Clay Lake Plain's* flat, clay soils, in order to sustain socio-economic viability. Ditches have been installed to accelerate spring and fall drainage. Wetlands have been filled to increase usability of marginal lands. Fortunately, resource professionals are working to increase awareness of the socio-economic benefits of protecting and enhancing the components of the *Rudyard Clay Lake Plain*. The recommendations that follow focus on three main goals for the St. Mary's River Rapid Watershed Assessment partners: 1) Restore Natural Hydrology, 2) Conserve and Manage Existing Soil, and 3) Protect and Enhance Fisheries and Wildlife Habitat. Partners recognize that focusing on these priorities encompass a broad range of environmental issues, and with successful implementation of conservation, this focus will result in accumulative long-term benefits for a wide range of natural resources, including but not limited to fish and wildlife species and their habitat, agricultural interests, as well as the economic interests of urban and other water users.

Restoring Natural Hydrology

A watershed's natural hydrology has a direct impact on many facets of water quality, including everything from water temperature and clarity to fish habitat, as well as water availability to agriculture and urban interests. The St. Mary's River watershed hydrology has been significantly altered by deforestation for agriculture and urban development, accelerated drainage by wetland destruction and landscape ditching, along with increased urban imperviousness. Other sources include creek channelization, riparian zone deforestation, poorly designed road/stream crossings, and other land use activity. Recent drought has illustrated the effects of hydrologic alterations, including reduced water in the soil profile and stream base flows during summer months.

Fortunately, private landowners can work with resource professionals to improve natural hydrology throughout the watershed by restoring and enhancing riparian wetlands, as well as reestablishing riparian forest and herbaceous buffers. Restoration of stream floodplains with their surrounding wetlands and riparian areas will increase the "sponge" effect of the landscape, allowing for the slow release of water through the long, dry summer months (Upper Klamath Basin).

Improving Fish and Wildlife Habitat

The St. Mary's River watershed supports a myriad of aquatic and terrestrial species of fish and wildlife. Interior and coastal wetlands rear a variety of waterfowl species and provide a stopover for waterfowl using the both the Mississippi and Atlantic Flyways as well as other birds that migrate through the watershed from Canada to South America. The many creeks, streams, and rivers that drain into the St. Mary's provide spawning and nursery habitat to both warm and coldwater fish species, including game species like walleye, perch, and brook trout. Researchers continue to assess remaining native sturgeon populations and habitat. Upland forests, open areas, and certain agriculture areas play host to many terrestrial species with special mention to the sharptail grouse, a species which has prospered as a result of resource partners creating and restoring habitat through activities like grassland protection. Opportunities for conservation on upland areas include tree planting and developing wildlife habitat along the edges of agriculture fields, wetland restoration and enhancement, and forest harvest management all contribute to enhancing wildlife habitat in the watershed.

Conserve and Manage Existing Soils

The basis for all natural resources is soil. Therefore, the sustainability of all natural resources begins with management of existing soils. Biomass productivity and vigor and the natural resources and socio-economic processes that depend on that productivity and vigor are all directly linked to stable, nutrient rich, healthy soils. Wildlife and domestic livestock forage availability and quality depends upon healthy soils, fisheries stocks depend upon healthy stable soils, most notably, humankind depend upon healthy soils.

The greatest threat to soil and the greatest opportunity for conservation is accelerated erosion. Erosion is the loss of nutrient-rich topsoil. It's the loss of that which supports all life. Fortunately, opportunities exist to stop it. Soil erosion reduction opportunities in the watershed range from improving access roads and stabilizing road/stream crossings to fencing livestock from waterways and other highly erodible land. We can also utilize heavy use area protection, tree/shrub establishment, and stabilizing eroding stream banks with native vegetation.

Comprehensive soil stabilization will result in benefits for all natural resource users. Agricultural fields will retain nutrients and increase plant productivity and vigor. Consequently, livestock will find an increase in forage quality and quantity -- both priority concerns for St. Mary's River watershed. Water quality will benefit, as soils stabilized with vegetation retain moisture, and vegetation provides filtration of storm water runoff.

Improving Water Quality

The St. Mary's River watershed drains into the 70 mile long St. Mary's River, a connecting channel between Lakes Superior and Huron in Michigan's Eastern Upper Peninsula. The river was identified in 1985 by the International Joint Commission (IJC) as one of 42 Areas of Concern (AOC) in the Great Lakes Basin. Areas of Concern were identified based on known impairments of beneficial water uses. The St. Mary's River was identified as an AOC as a result of problems associated with phosphorus, bacteria, heavy metals, trace organics, contaminated sediments, fish consumption advisories and impacted biota. Contaminants of concern include oils and greases, suspended solids, metals, phenols, ammonia, bacteria, and PAHs. In addition, sediments have become contaminated with arsenic, cadmium, chromium, copper, cyanide and lead. Point sources contributing to the use impairments include Algoma Steel, two Ontario water pollution control plants, St. Mary's Paper, and three Ontario tributaries. Non-point sources, such as the Cannelton Tannery site in Michigan (which operated during the years of 1900 – 1958), contribute to a lesser extent than the point sources, but are more prevalent throughout the watershed. Combined sewer overflows in Michigan and wet weather, by-pass events in Ontario also contribute to the use impairments. Loss of wetlands and rapids habitat due to urban/industrial development and operation of navigational structures are also a concern (USEPA 2006).

Water quality improvement opportunities abound within the urban sector, including storm water treatment strategies, industrial cleanup and pollutant management at Algoma Steel and St. Mary's Paper, as well as wastewater treatment improvements at the Ontario and Sault Ste. Marie, Michigan treatment plants. Non point source pollution remediation strategies should begin with restoration of wetlands and St. Marys River rapids habitat. Aforementioned soil erosion strategies should be implemented upstream within the many tributaries that drain the St. Mary's watershed. Nutrient management should also be implemented in upland and riparian area agricultural operations.

Evaluation of Success

The eventual success of the St. Mary's River Watershed Rapid Watershed Assessment will be the adoption of priority conservation practices on approximately 20,500 acres of private farmland, forests, wetlands, open areas, and the urban sector. Successful implementation will require \$7 million for installation of conservation practices and another \$291,000 annually for operation and maintenance. Successful implementation will require more than five years with estimated current financial and technical resources.

Bibliography²

Conservation participation was estimated using NRCS Social Sciences Technical Note 1801, Guide for Estimating Participation in Conservation, 2004. Four categories of indicators were evaluated: Personal characteristics, farm structural characteristics, perceptions of conservation, and community context. Estimates are based on information received from local conservationists in the watershed.

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² All data is provided "as is". There are no warranties, express or implied, including the warranty of fitness for a particular purpose, accompanying this document. Use for general planning purposes only.



United States
Department of
Agriculture

Natural Resources
Conservation Service

Michigan

January 2008

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St. Mary's River Watershed

Hydrologic Unit Code (HUC) — 04070001

Rapid Watershed Assessment of Conservation Opportunities

Resource Profile

This component of the St. Marys River Watershed Rapid Watershed Assessment is a profile of the resource conditions and conservation efforts in the St. Mary's River watershed. Maps and data tables quantify the size, scope, and value of natural resource needs. The following resource profile contains description of the St. Marys River watershed land use/land cover, hydrology, assessment of waters, soils, soil and land classification, population, and resource concerns.

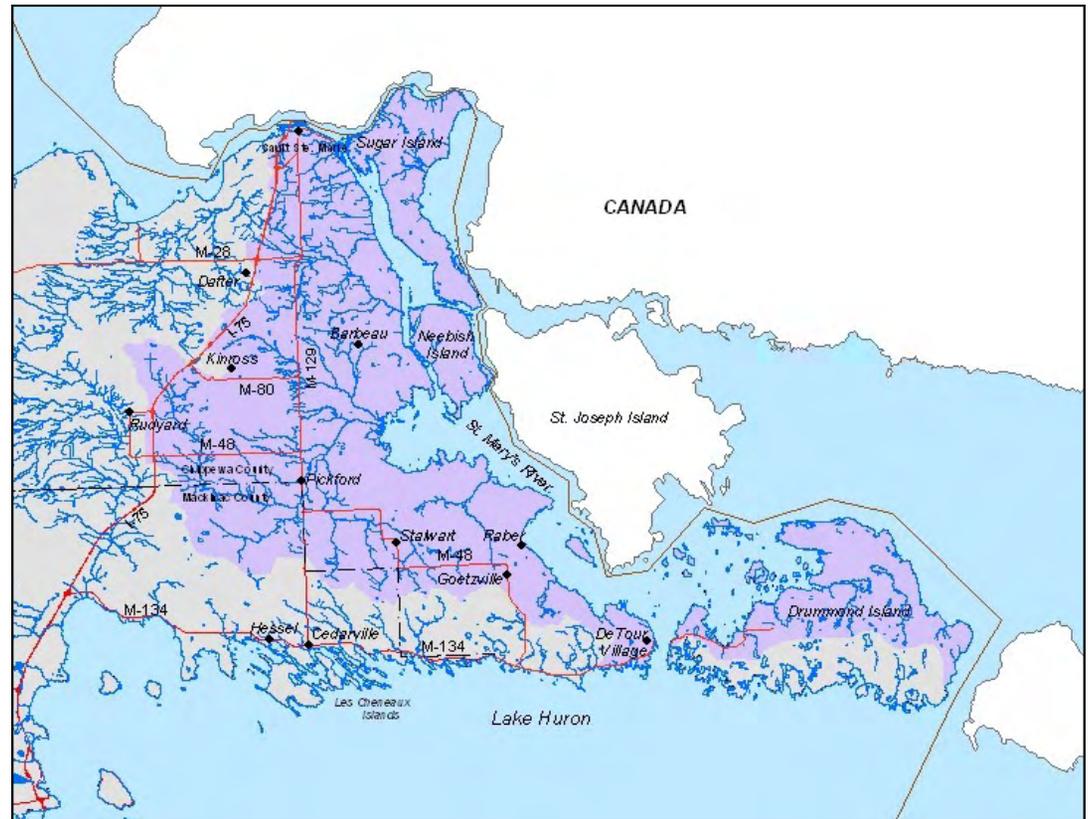


NRCS — Helping People Help the Land.

Introduction

The St. Mary's River 8-digit Hydrologic Unit Code (HUC) watershed is comprised of 410,351 acres. The St. Mary's River is a 70 mile connecting channel between Lakes Superior and Huron in Michigan's Eastern Upper Peninsula. The project area begins at Sault Ste. Marie, Michigan and runs southeast to Lake Huron at Detour, Michigan. The river falls approximately 22 feet between its headwaters and mouth, with 20 feet of that fall located at the rapids adjacent Sault Ste. Marie. The river is bordered on the west by Chippewa County in Michigan's Eastern Upper Peninsula and on the east, Ontario, Canada. The watershed also includes Sugar, Neebish, and Drummond Islands.

Drainage issues dominate the effectiveness of several land uses, including agriculture. Almost the entire area is within a clay lake plain, with relatively little topography and very poorly drained soils. Consequently, significant acreage of the landscape, including wetlands and riparian areas, have been altered for development and agriculture, resulting in degradation of natural hydrology, accelerated soil erosion, and loss of quality wildlife habitat in the watershed.



Fortunately, several partners are working to promote and implement conservation program assistance to area landowners, including the Sault area NRCS service center, which includes the Chippewa/East Mackinac Conservation District.

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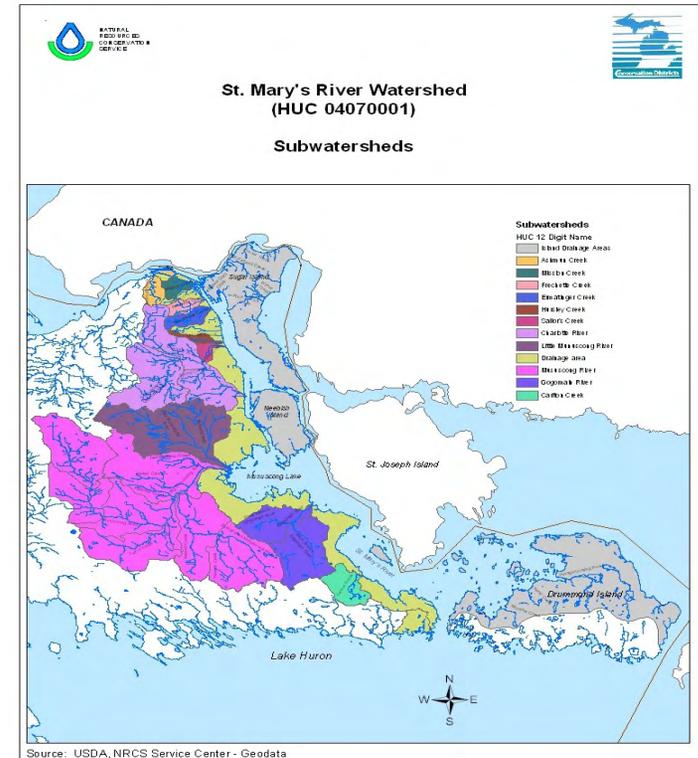
Hydrology

Several small creeks and rivers make up the St. Marys River watershed, with the Charlotte and Munuscong Rivers dominating the land area. The watershed is characterized by a typical dendritic drainage pattern on a landscape composed of broad clay plains and ridges that parallel the St. Marys River. The sub-watersheds are fed by an average of 32" of annual precipitation. The watershed has many scattered artesian wells that contribute to the area's characteristic, excessively turbid creeks and rivers. The watershed of the St. Mary's River includes a number of small tributaries that drain directly into the river, including **Ashmun, Mission, Frechette, Ermatinger, Hursley, Sailor's, and Carlton Creeks.** Included in the watershed are several coastal *river drainage* areas.

Assessment of Waters

In 1985, the International Joint Commission (IJC) identified the St. Mary's River as one of 42 Areas of Concern (AOC) in the Great Lakes Basin. Areas of Concern were identified based on known impairments of beneficial water uses. The St. Mary's River was identified as an AOC as a result of problems associated with phosphorus, bacteria, heavy metals, trace organics, contaminated sediments, fish consumption advisories and impacted biota. Contaminants of concern include oils and greases, suspended solids, metals, phenols, ammonia, bacteria, and PAHs. In addition, sediments have become contaminated with arsenic, cadmium, chromium, copper, cyanide and lead. Point sources contributing to the use impairments include Algoma Steel, two Ontario water pollution control plants, St. Mary's Paper, and three Ontario tributaries. Non-point sources, such as agricultural operations and road/stream crossings, also contribute nutrients and sediment and affect natural hydrology. Combined sewer overflows in Michigan and wet weather, by-pass events in Ontario also contribute to the use impairments. Loss of wetlands and rapids habitat due to urban/industrial development and operation of navigational structures are also a concern.

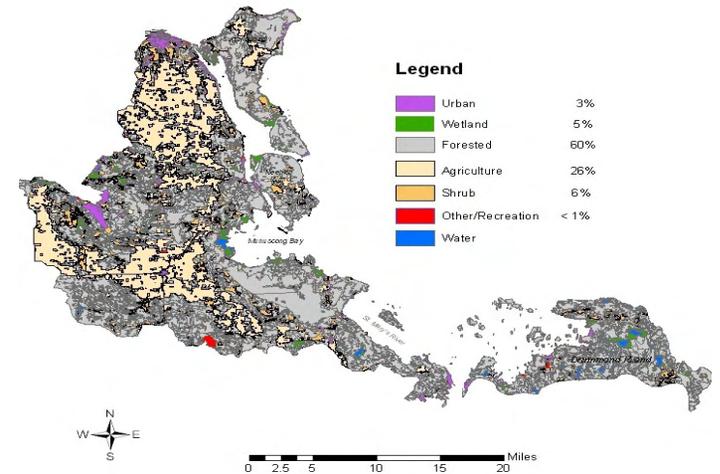
The Clean Water Act (CWA) requires Michigan to prepare a biennial report on the quality of its water resources as the principal means of conveying water quality protection/monitoring information to the United States Environmental Protection Agency (USEPA). The Integrated Report satisfies the listing requirements of Section 303(d) and the reporting requirements of Sections 305(b) and 314 of the CWA. The Section 303(d) list includes Michigan water bodies that are not attaining one or more designated use and require the establishment of Total Maximum Daily Loads to meet and maintain Water Quality Standards.



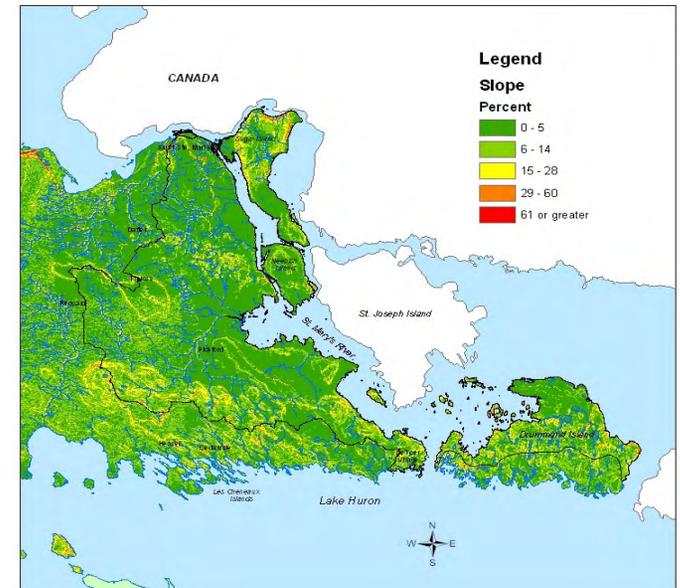
| 303/TMDL Listed Streams (DEQ) | Category (Pollutant) | TMDL Schedule |
|-----------------------------------|---|---------------|
| St. Mary's River Munuscong Bay | Mercury/fish, PCB/fish | 2011/2012 |
| Munuscong River—Parker Creek | Sedimentation/Siltation | 2016 |
| Frechette Creek | Escherichia coli, PCB/ water / fish, Mercury/Fish | 2011/2012 |
| St. Mary's River | PCB/fish, Mercury/fish | 45 |
| St. Mary's River | Ammonia, Phosphorus, flow regime alterations, anthropogenic substrate alterations | 2020-2024 |

Land Use/Land Cover

The St. Mary's River watershed is characterized by a landscape composed of a broad, relatively flat clay lake plain bordered to the west by a well-defined forested slope that parallels the St. Mary's River. Forest accounts for a large portion of the land use/land cover, along with a mixture of hay and livestock farms. Timothy, trefoil, and clover are the primary crops. The vast majority of the land is privately owned. Large areas of state-owned lands include the Lake Superior State Forest. The St. Mary's River watershed consists of approximately 410,351 acres within Michigan's Eastern Upper Peninsula. The watershed includes at least parts of the city of Sault Ste. Marie and the small towns and villages of Detour, Pickford, Kinross, Raber, and Dafter. Political jurisdictions are broken into several townships within Chippewa County, some of which share the same name. They include Soo, Dafter, Bruce, Pickford, Raber, Detour, Rudyard, and small parts of both Clark and Marquette townships in Mackinac County. Several islands were formed when the river divided into its numerous channels. Sugar Island is the largest upstream island and separates Lake George (east) and Lake Nicolet (west). Neebish Island is directly downstream, and at the end of the St. Mary's sits Drummond Island. Most of the land is in private ownership (85%), following with 14% state land and 1% under the ownership of the Sault Ste. Marie tribe of Chippewa Indians. 63% of the land is forested, 25% is considered agricultural, and 12% is considered non-forested, including the several classes of urban land use.



Slope

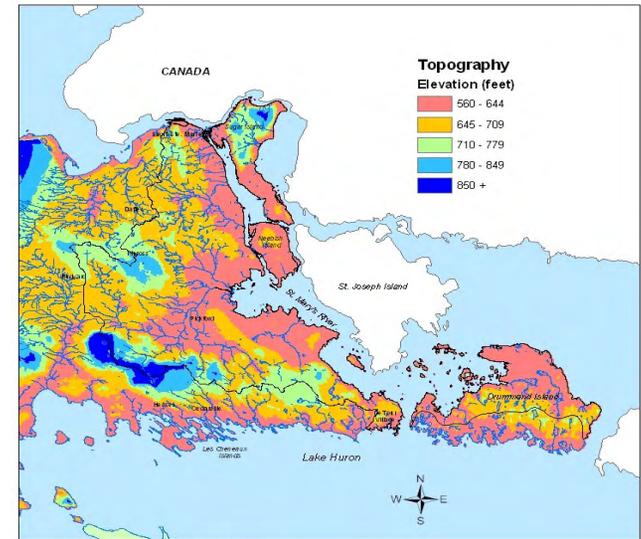


| St. Mary's | Chippewa County | | Mackinac County | | Total |
|---------------------|-----------------|---------|-----------------|---------|---------|
| | Acres | Percent | Acres | Percent | |
| Land Cover/Land Use | | | | | Acres |
| Forest | 213,648 | 58% | 31,798 | 78% | 245,446 |
| Agriculture | 100,779 | 27% | 5446 | 13% | 106,225 |
| Open Field | 22,746 | 6% | 1035 | 3% | 23,781 |
| Urban | 13,431 | 4% | 890 | 2% | 14,321 |
| Wetlands | 19,083 | 5% | 1497 | 4% | 20,579 |
| Total Acres | 369,687 | 100% | 40,665 | 100% | 410,351 |

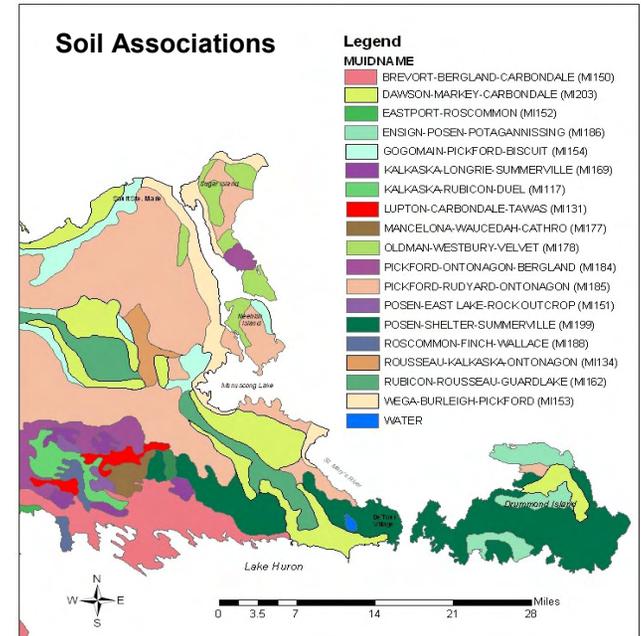
Soils

Soils of a watershed influence all land uses and ultimately determine the characteristics of its natural resources. Almost the entire project area is within the **Rudyard Clay Lake Plain**, a broad, ancient glacial lake bed landscape. Geology starts with Silurian and Ordovician age sedimentary bedrock, primarily limestone and dolomite. Above that lies thick, lacustrine clay, except for small areas of sand lake plain near the center of the watershed and cobbly loam near the south east end of the watershed. The clay soils are mostly **Pickford-Rudyard-Ontonogan**, i.e. very poorly drained. Sands are **Kalkaska-Rubicon**. The **St. Mary's River flows over** primarily glacial (Lake Nippising) lacustrine sediments and moraines. On the southwestern edge, level lakebed plains are interrupted by gently rolling plateaus, low rounded ridges, or lakeshore features such as remnant beach ridges, sand dunes, bluffs, or coastal marshes. Soils in the vicinity of the river are comprised of clays, loams, or sands that are very poorly drained. Much of the remaining watershed within the **Clay Lake Plain**, is the thick, poorly drained clays.

The dominate poorly drained soils in the St. Mary's River watershed have been a limiting resource in land use, including agriculture and urban development. Accompanying the thick clays of the **Rudyard Clay Lake Plain** is a relatively flat topography. Landowners have needed to install ditches to accelerate drainage and apply soil and gravel fill to raise developments above the flat, poorly draining landscape, mainly due to ponding. Much of the landscape, now, is changing to more pre-settlement conditions. Much of it that was cleared for farming has been left fallow and is reverting to herbaceous species and shrub land. Remaining forest cover is dominated by species adaptable to the poorly drained soils, including red maple, balsam poplar, black spruce, tamarack, and northern white cedar.



Source: USDA, NRCS Service Center - Geodata



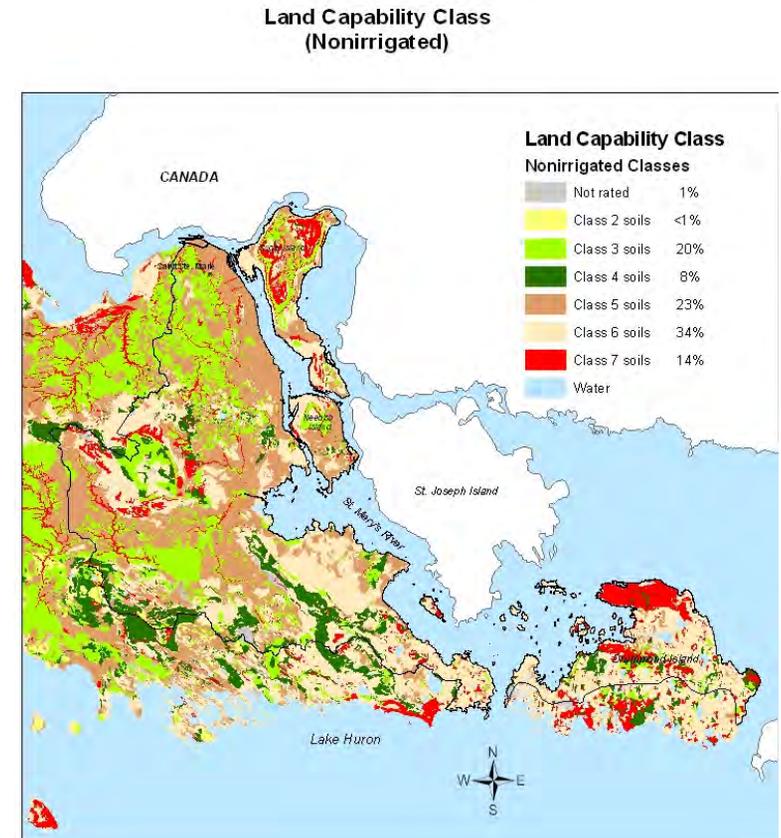
| St. Mary's River Watershed Soils | Percent |
|------------------------------------|---------|
| Well Drained/Moderately Drained | 24% |
| Somewhat Poorly Drained | 20% |
| Poorly Drained/Very Poorly Drained | 56% |
| Total | 100% |

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.

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 reduce the choice of plants or require special conservation practices, or both.
- Class 4** Soils have very severe limitations that restrict the choice of plants or require very careful management, or both.
- 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.
- 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.



The major soil classes found in the watershed reflect the land use challenges faced by St. Mary's River farmers. Over 70% of the land has significant limitations for agriculture production. Undoubtedly, the broad presence of poorly drained clay soils and problems faced farming these soils, contributes to this classification.

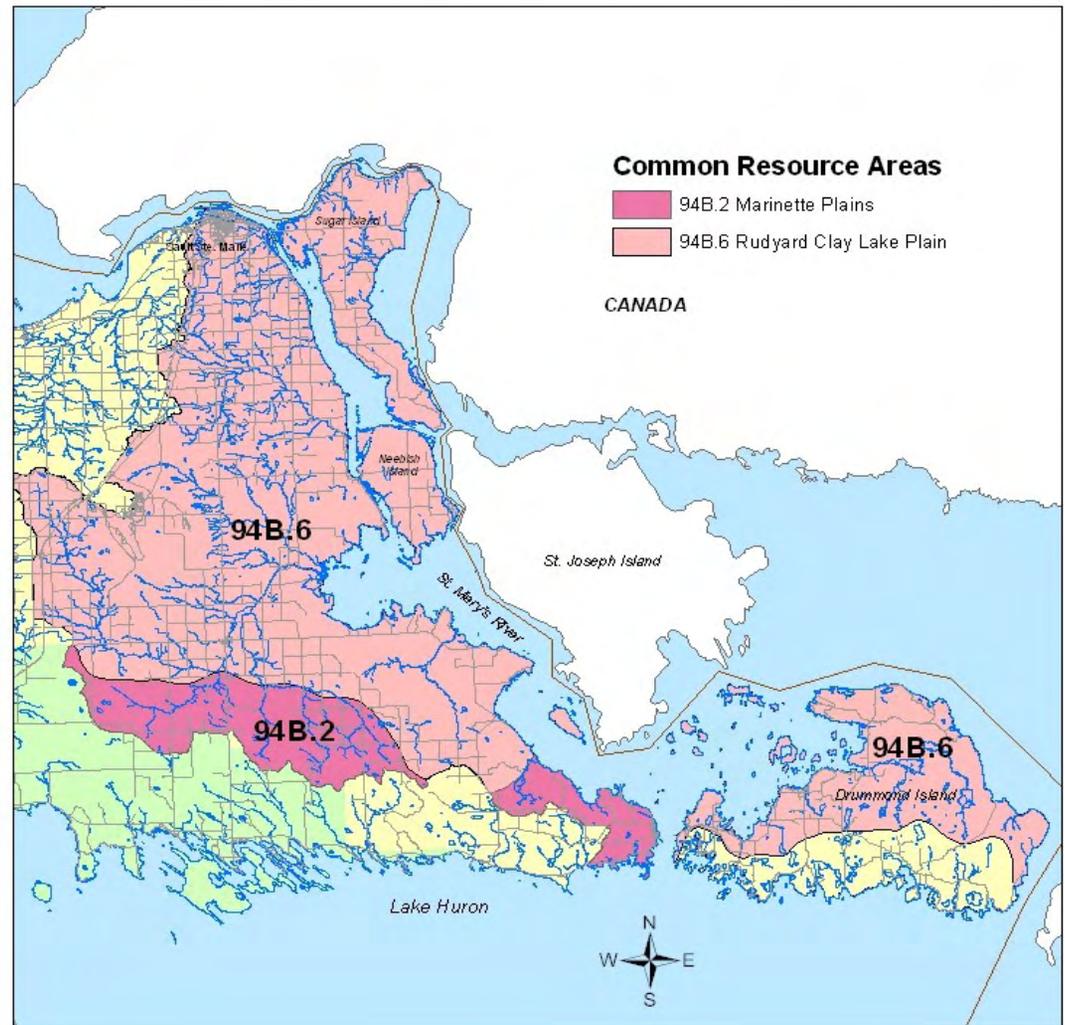
Common Resource Areas

Common Resource Area delineations are defined as geographical areas where resource concerns, problems and treatment needs are similar. Common resource Areas are a subdivision of an existing Major Land Resource Area (MLRA). Landscape conditions, soil, climate and human considerations are used to determine the boundary of the common resource area.

Almost the entire watershed is within the *Rudyard Clay Lake Plain* CRA. This constitutes nearly level poorly drained to well drained clayey soils on lake plains with some sandy beach ridges and low moraines. Mostly deciduous and coniferous forest. Predominant land use is woodland with some areas used for feed grains and dairy cattle. Primary resource concerns are soil erosion, groundwater quality, surface water quality, forestland productivity, forage quality on grazing land and wetland habitat restoration.

The southern fringe of the watershed is defined as *Marinette Plains*, which are nearly level and gently sloping somewhat poorly drained sandy soils on lake plains with organic soils in the depressions. Mostly deciduous and coniferous forest and wetlands. Scattered cropland, grazing land, and the Green Bay-Lake Michigan shoreline. Primary resource concerns are soil erosion, groundwater quality, surface water quality, forestland productivity and wildlife habitat.

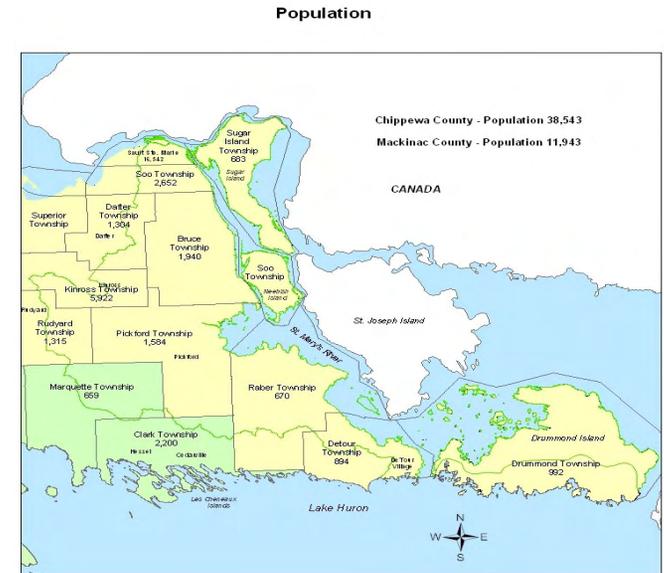
Common Resource Areas



Census and Social Data

The St. Mary's River watershed was one of the earliest settled regions in the United States. In the late 1660's, the first European settlement in Michigan was established at Sault Ste. Marie and that necessitated the first major changes to the landscape and its natural resources. During the 1800's, large-scale logging and farming began, utilizing slashing and burning of significant forest. Farming increased and peaked in the early 1900's with approximately 1,730 farms in the watershed (RC&D 1995).

The watershed is mainly rural, but home to over half of the residents in Chippewa County. Sault Ste. Marie (pop. 16,542) located in the north central part of the watershed contains the largest population concentration, with Kinross (pop. 5,922) and Soo Townships (pop. 2,652) being the next largest populous areas. Population has developed relatively slowly in the watershed, declining with the abandonment of the Kincheloe Air Force Base near Kinross. Population and economic growth has rebounded in some part by the establishment of the State of Michigan's Correctional Facilities at Kincheloe. Unfortunately, the unemployment rate in the watershed is relatively high at an average of 10% compared to 5% for the United States. (Department of Labor and Statistics 2007).



| Boundary | Population in SMRW(2000) | Density/mi2 | Ethnicity% | | | | Median House-hold Income | Unemployment Rate % |
|------------------|--------------------------|-------------|------------|-----|-----|-----|--------------------------|---------------------|
| | | | W | AA | AI | A | | |
| Sault Ste. Marie | 10,844 | 1,116 | 74 | 7 | 14 | 1 | 29,652 | 11 |
| Soo TWP | 2,061 | 53 | 84 | .11 | 11 | .4 | 42,917 | 7 |
| Dafter TWP | 512 | 27 | 84 | .23 | 11 | .31 | 42,452 | 7 |
| Kinross TWP | 1,397 | 49 | 65 | 17 | 11 | .61 | 36,525 | 9 |
| Sugar Island | 721 | 15 | 64 | 0 | 30 | 0 | 34,000 | 10 |
| Bruce TWP | 1,937 | 22 | 84 | .52 | 12 | .20 | 39,207 | 7 |
| Rudyard TWP | 347 | 15 | 89 | .30 | 5.5 | .61 | 37,000 | 6 |
| Pickford TWP | 1,582 | 15 | 92 | .06 | 5.8 | .06 | 40,850 | 9 |
| Rober TWP | 484 | 7 | 92 | .60 | 4.3 | .15 | 27,587 | 18 |
| Drummond Island | 621 | 8 | 91 | .20 | 4.8 | 0 | 36,131 | 16 |
| Detour TWP | 461 | 18 | 85 | 0 | 11 | .22 | 36,500 | 16 |
| Marquette TWP | 275 | 7 | 90 | 0 | 7.0 | .30 | 30,069 | 8 |
| Clark TWP | 232 | 28 | 87 | .05 | 10 | .36 | 33,975 | 12 |

Estimated Level of Willingness and Ability to Participate in Conservation

Traditionally, local interest in conservation programs has been superseded by pursuit of economic stability. The “hay days” of the early 20th century in the St. Mary’s River watershed saw a multitude of successful farming operations with more concentration on high production than for natural resource protection. Farming started in the late 1800’s and increased to its peak of close to 2,000 farms in the early 20th century. Much of the watershed has marginal soils, so natural resource destruction began with conversion of land to agriculture by clearing forests and installing ditches. Currently, there are 333 farms in the watershed, with almost half of them being between 50 and 249 acres. 93% raise livestock, mostly horses and beef cattle. Primary crops are hay (70%) and oats (10%). 91% of farms produce less than \$50,000 worth of agriculture products.

Hay production continues in the watershed, but to much less degree. Much of that land is turning fallow as aging farmers are retiring from the long struggle to make farming a profitable endeavor, where each spring, fields flood due to the heavy clay soils, as well as recent dry summers and skyrocketing fuel prices. They are witnessing cooperative landowners realizing success implementing different conservation programs. All of this has spawned an increase in willingness of both farmers and other landowners in conservation programs. CEMCD surveyed several local landowners concerning their willingness to participate in conservation programs, and consistently obtained a 50% approval rate. Agencies should increase awareness in applicable conservation programs and increased technical assistance to continue momentum of local conservation.

| Location | Hay (Acres) | Oats (Acres) | Cattle (#) | Dairy Cows (#) |
|-----------------|-------------|--------------|------------|----------------|
| Mackinac County | 6900 | N/A | 800 | 800 |
| Chippewa County | 33,800 | 750 | 9000 | 1000 |
| Michigan | 1,100,000 | 65,000 | 1,010,000 | 307,000 |



Progress/Status

The following table is a product of the NRCS Performance Results System (PRS) and reflects progress made over the past several years on several key areas of conservation. The PRS provides support for reporting the development and delivery of conservation programs, analyzing and reporting progress, and management applications by NRCS and conservation partners.

| St. Marys River Watershed | | | | |
|--|-------|--------|--------|--------|
| Summary Conservation Systems | 2005 | 2006 | 2007 | Total |
| Total Conservation Systems Planned (p) (acres) | 3442 | 3069 | 1266 | 7,777 |
| Total Conservation Systems Applied (acres) | 2616 | 2504 | 744 | 5864 |
| Summary Conservation Practices | 2005 | 2006 | 2007 | |
| Access Road (560) (ft) | 4661p | 599 | 7135 | 12,395 |
| Conservation Crop Rotation (328) (ac) | 102 | | | 102 |
| Cover Crop (340) (ac) | 102 | | | 102 |
| Forage Harvest Management (511) (ac) | 850 | 1151 | 808 p | 2809 |
| Nutrient Management (590) (ac) | 102 | | 580 p | 682 |
| Pasture and Hay Planting (512) (ac) | 550 | 490 | 609 p | 1649 |
| Pond (378) (no.) | 1 | 2 p | | 3 |
| Prescribed Grazng (528) (ac) | 119 | 1028 | 52 | 1199 |
| Prescribed Grazng (528A) (ac) | 1616 | | | 1616 |
| Recreation Trail and Walkway (568) (ft) | 1175p | 1538 | | 2713 |
| Tree/Shrub Site Preparation (490) (ac) | | | 9 | 9 |
| Tree/Shrub Establishment (612) (ac) | 85 | 17 | 23 | 125 |
| Upland Wildlife Habitat Management (645) (ac) | 1473 | 865 | 57 | 2395 |
| Use Exclusion (472) (ac) | 806 | | 2 | 808 |
| Waste Utilization (633) (ac) | 145 p | 6 p | | 151 |
| Wetland Enhancement (659) (ac) | 13 | 26 | 368 | 407 |
| Wetland Restoration (657) (ac) | 16 | 3 | 29 | 48 |
| Wetland Creation (658) (ac) | | | 2 | 2 |
| Wetland Wildlife Habitat Management (644) (ac) | 580 | 9 | 336 | 925 |
| Animal Trails and Walkways (575) (ft) | | 434 p | | 434 |
| Critical Area Plantings (342) (ft) | | 8 p | 1 | 9 |
| Early Successional Habitat Development/Management (647) (ac) | | 132 | 107 p | 239 |
| Fence (382) (ft) | | 39,234 | 4700 p | 43,934 |
| Forest Stand Improvement (666) (ac) | | 182 p | 59 | 241 |
| Heavy Use Area Protection (561) (ac) | | 35 p | | 35 |
| Hedgerow Planting (422) (ft) | | 3543 | 1011 p | 4554 |
| Pipeline (516) (ft) | | 10,660 | 1326 p | 11986 |
| Riparian Forest Buffer (391) (ac) | | 42 | 6 | 48 |
| Riparian Herbaceous Cover (390) (ac) | | 26 p | | 26 |
| Stream Crossing (578) (no) | | 4 | 1 | 5 |
| Water Well (642) (no) | | 1 | | 1 |
| Watering Facility (614) (no) | | 8 | 4 p | 12 |
| Windbreak/Shelterbelt Establishment (380) (ac) | | 3430 | 9204 | 12,634 |

Resource Concerns

The relatively flat topography and poorly drained clay soils of the watershed's *Rudyard Clay Lake Plain*, have required farmers, developers, and individual landowners to alter the landscape to utilize the watershed's resources. Changes, including wetland filling, ditch installation, and deforestation, have significantly altered the landscape. This change has been the precursor to the primary resource concern of altered hydrology. Wetland filling has decreased the capacity of wetlands to filter runoff and precipitation and contributed to increased soil impermeability and concentration of stormwater runoff into man-made conveyances. Installation of ditches to accelerate spring runoff for agriculture access has concentrated runoff and increased spring stream flows. Removing vegetation near water courses has decreased filtering vegetation, and destabilized stream-banks. Lastly, installation of failing culverts at road/stream crossings has contributed to impoundment flows and streambank erosion. All of these sources and causes contribute to other pollution issues, including sedimentation, fisheries and wildlife habitat degradation, and decrease in soil productivity, and, subsequently, plant vigor.

In addition to these rural area concerns, the St. Mary's River watershed suffers from pollutants originating from its urban center. Phosphorus, bacteria, heavy metals, trace organics, contaminated sediments originate from industrial and development sources in both Sault Ste. Marie, Michigan and Ontario, Canada. Contaminants of concern include oils and greases, suspended solids, metals, phenols, ammonia, bacteria, and PAHs. In additions, sediments have become contaminated with arsenic, cadmium, chromium, copper, cyanide and lead. Point sources contributing to the use impairments include Algoma Steel, two Ontario water pollution control plants, St. Mary's Paper, and three Ontario tributaries. Combined sewer overflows in Michigan and wet weather, by-pass events in Ontario also contribute to the use impairments. Loss of wetlands and rapids habitat due to urban/industrial development and operation of navigational structures are also a concern.

| Resource Concerns/Issues by Land Use | | | | | | |
|--------------------------------------|---|--------|-------------|--------|----------|-------|
| SWAPA + H Concerns | Specific Resource Concern/Issue | Forest | Agriculture | Fallow | Wetlands | Urban |
| Soil Erosion | Poorly designed road/stream crossings | x | x | | | x |
| | Agriculture operations | | x | | x | |
| Water Quantity | Altered Hydrology | | x | x | x | x |
| Water Quality | Turbidity | | | | | |
| | Altered Hydrology- Excessive storm flows/reduced base flows | | x | | x | x |
| Plant Condition | Productivity, health, and vigor | x | x | | | |
| Animal Habitat, Domestic | Forage/Water availability | | x | x | | |
| Animal Habitat, Wildlife | Food, Cover, and/or Shelter | x | x | x | x | x |
| Human, Economics | Low/Unreliable profitability | | x | | | |
| | Economic sustainability | | x | x | x | x |
| Human, Social | Sustainability of livelihoods | | x | x | x | x |
| Human, Political | Lack of technical assistance | | x | | x | |



United States
Department of
Agriculture

Natural Resources
Conservation Service

Michigan

January 2008

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St. Mary's River Watershed

Hydrologic Unit Code (HUC) — 04070001

Rapid Watershed Assessment of Conservation Opportunities

Assessment Matrices Summary

This Rapid Watershed Assessment (RWA) combines information contained in the Watershed Profiles with the Field Office Technical Guides and local professional knowledge. The assessment of conservation opportunities is documented in separate matrices created for each land use in the watershed (see appendices). Specific sources of assessment information include:

- Land Use Acres - Watershed Profiles based on USGS National Land Cover Data Set
- Typical Unit Size - Workload Analysis & local knowledge
- Conservation Status Current - Based on local knowledge
- Conservation Status Future - Based Landowner Willingness Survey & local knowledge
- Resource Concerns- Local knowledge
- Conservation Management Systems- FOTG Conservation System Guides & local knowledge
- Conservation Cost- FOTG Cost Price List

RWAs including both the profile and assessment summary are to be used to document both **what's known about the watershed, major resource concerns, current conservation status and potential future conservation opportunities** given adequate funding and staffing.

RWAs are pre-decisional, qualitative projections of what could be accomplished over a 5-year timeframe. RWAs are meant to be used by NRCS leadership along with other information in the development of programs, policies and strategies. Locally, RWAs hopefully will be useful to NRCS, Conservation Districts and other partners to start discussions on future conservation needs and opportunities for collaborative conservation efforts.

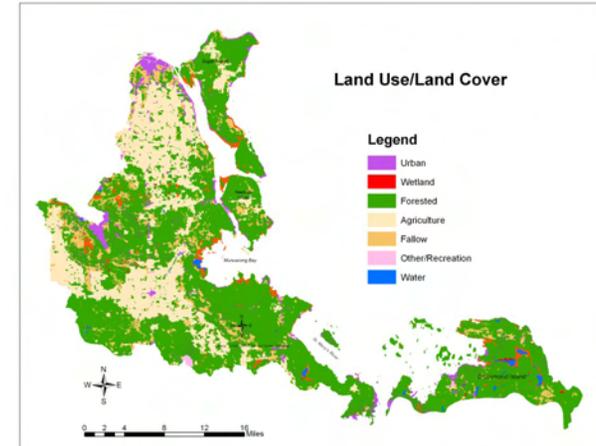
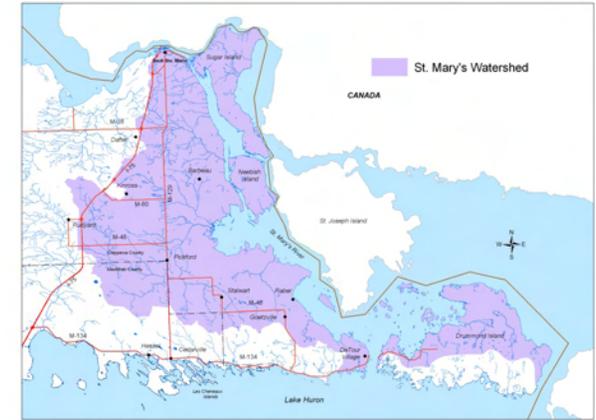
NRCS — Helping People Help the Land.

Summary For All Land Uses

The St. Mary's River watershed faces a unique challenge with its inhabitants. It began as a glacial lake, underwater for thousands of years. Remaining is that flat, dry glacial lake bed, with primarily thick, poorly-drained clay soils, known as the Rudyard Clay Lake Plain--a limited topographical, clay soil-dominated wetland ecosystem, where drainage and water removal has been a necessity since area settlement nearly 400 years ago. Currently, land use is in the hands of agricultural operations, urban entities, forest, wetlands, and open unused land.

Drainage characteristics of this landscape contribute to the primary resource concerns faced on private lands. These include: hydrological alterations from road/stream crossings, ditching, and wetland destruction, sedimentation from these same sources as well as construction sites and agriculture operations; plant productivity, health, and vigor and threat from noxious and invasive species; wildlife habitat fragmentation; inadequate quantity and quality of livestock forage; and private forest management. Additional concerns include water quality impairment from point source discharges. Contaminants of concern include oils and greases, metals, phenols, ammonia, bacteria, and PAHs. Sources include Algoma Steel, two Ontario water pollution control plants, combined sewer overflows, **St. Mary's Paper, and various non-point sources.** Sediments have become contaminated with toxics such as arsenic, cadmium, chromium, copper, cyanide and lead. Solutions to these concerns are dependent upon the level of awareness and acceptance of conservation activities and programs.

This assessment shows to sustain farming and conservation programs, along with an appropriate stewardship outreach campaign, an estimated 61553 acres of private land conservation could be addressed over the next five years. This level of treatment would cost an estimated \$8.4million dollars (\$4.2 million federal/\$4.2 million private). This would result cumulatively in 15 percent of the private working lands receiving some conservation treatment.



Summary of Assessment Matrices of Future Conservation Opportunities

| Cost Items and Programs | Costs | O&M Costs |
|---|-------------|-----------|
| Maintain Baseline Conservation-Annual Maintenance | 0 | \$434,000 |
| Total Investment at estimated rate of participation | \$7,223,100 | \$291,200 |
| Potential Investment From Farm Bill | \$3,611,550 | \$23,781 |
| Management Incentives | \$257,690 | \$20,579 |
| Total Potential Farm Bill Program Costs | \$3,869,240 | \$14,320 |
| Operator Investment | \$3,611,600 | \$725,200 |
| Total Average Annual Costs | \$1,279,500 | |
| Present Value of Total Avg. Annual Cost (5 years) | 15% | 410,351 |

| Land Use | Participation Rate | Total Acres |
|---------------|--------------------|-------------|
| Agriculture | 15 | 106,225 |
| Forestry | 15 | 245,446 |
| Open (Fallow) | 15 | 23,781 |
| Wetlands | 15 | 20,579 |
| Urban | 15 | 14,320 |
| Total | 15% | 410,351 |

Agriculture Operations

Current Agriculture Operation Description: The primary agriculture operations in the St. Mary's River watershed are hay production and livestock. Active farming is concentrated within the *Rudyard Clay Lake Plain*, where soils are relatively thick, poorly drained clay and topography is relatively flat, overlying limestone and dolomite bedrock. Pasture/hay vegetation consists mainly of timothy, trefoil, and clover.

Historically, drainage issues have been a limiting factor for agricultural land uses. Recently, this has been exacerbated by seasonal drought. During spring snow melt, agriculture operations are delayed due to flooding. Ditches and dead furrows are installed to accelerate surface runoff. Unfortunately, these ditches and dead furrows also work efficiently during summer months, when precipitation is desperately needed.

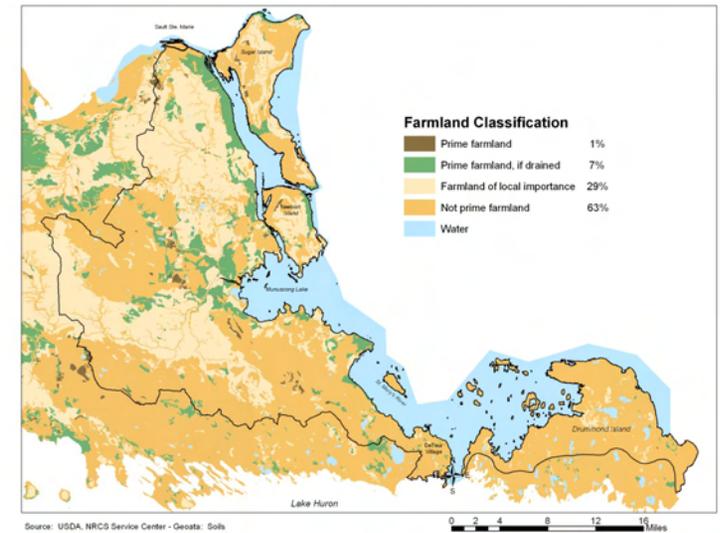
Primary hydrology and erosion concerns result from the agricultural challenges of utilizing clay soil. Soil particles are very fine and erodible. Disturbing the soil for planting exposes the fine particles to runoff. Soil particles are very cohesive and, therefore, poorly drained. This impermeability causes significant ponding during spring snowmelt and increased fall precipitation. Ditching and dead furrows are utilized to minimize flooding, which accelerates runoff discharge all year. Consequently, area streams are flashy and turbid during spring and fall and nearly dry during summer months. These challenges both limit the profitability of agriculture and threaten water quality.

Soil fertility and the resulting crops are threatened by current agriculture challenges. The inaccessibility of lime for stabilizing soils has corresponded with excessive nutrient application. Existing soil nutrients are depleted and artificial applied nutrients get washed into area surface waters.

Invasive species threaten the St. Mary' River watershed. Leafy Spurge, Spotted Knapweed, and Reed Canary Grass invade disturbed soils and threaten both valuable hay crops and recovering native vegetation.

Future Pasture/Hayland Opportunities: Over the next five years it is projected landowners will have a low (15%) interest in participating in conservation activities on their hay and pasture land. Those who might participate in conservation programs could benefit from the adoption of wetland restoration on marginal lands, critical area planting, windbreak/shelterbelt establishment, forage harvest management, pasture/hayland planting, prescribed grazing, heavy use area protection, nutrient management, watering facilities, and grazing practices to conserve water and improve forage production.

Based on the rapid watershed assessment, resource concerns on 16,000 (15%) acres of pasture/hayland could be addressed over the next five years. The assessment estimates this would cost \$1.6 million and require 1 FTE for planning and implementation.



| Primary Resource Concerns |
|---|
| Soil Erosion—Agriculture Induced |
| Water Quality — Surface Water Turbidity |
| Water Quantity – Spring/Fall Flooding; Summer Drought |
| Fish and Wildlife — Habitat Fragmentation |
| Plants—Soil Productivity; Plant Health and Vigor |
| Plants — Invasive Species |
| Animals — Quality and Quantity of Food and Forage |

Wetlands

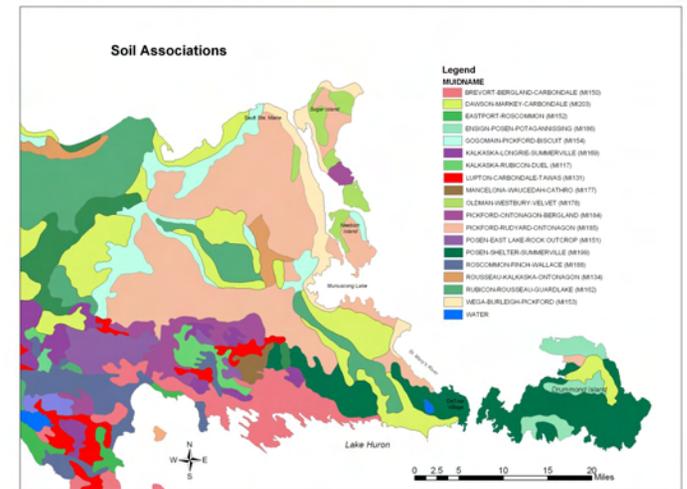
Current Wetland Description: Much of the St. Mary's River watershed consists of wetland soil, including *Pickford-Rudyard-Ontonogon* in the northern half and south/central region. At the west/central region, elevations reach above the ancient glacial Lake Nipissing lake shore, and soils begin to change to more sandy moraines. The south east region is still dominated by wetland soils, near the Gogomain Swamp. The island soils vary, with Sugar and Neebish more consistent with the mainland clays, and Drummond more consistent with the northern shore of Lake Huron.

Wetland land cover in the watershed is a mix of conifer/hardwood forest, agriculture, and urban areas. Significant agriculture wetlands have been abandoned and are quickly converting to herbaceous species and shrubland. When adjacent tree seed sources are available, these lands are converting to natural wetland forests with natural species like tamarack, spruce, and white pine.

Much of the clay lake plain has been converted to pasture or other agriculture use, following widespread use of 6-8 foot deep ditches and dead furrows. This has altered the efficiency of wetlands to filter runoff, maintain stable runoff patterns, and hold water for extended periods. This has also created flashy discharges in area streams and rivers. Much acreage would benefit from preserving strategic wetlands. Natural ponding areas would provide relief from seasonal flooding and hold water for use during summer droughts. Programs like the *Wetland Reserve Program, Conservation Reserve Program* would provide opportunities for producers to preserve this critical land type.

Future Rangeland Opportunities: Landowners have indicated a moderate (50%) interest in participating in conservation activities. Those who do participate would benefit from practices to improve wetland health through wetland preservation, prescribed grazing, fencing, riparian herbaceous cover planting. Based on the rapid watershed assessment resource concerns on 20579 acres of private wetlands could be addressed over the next five years. The assessment estimates this would cost \$11.0 million (\$6.3 federal and \$4.7 private) and require 2.2 FTEs for planning and implementation.

Cumulatively, conservation efforts targeted at this level would result in 91 percent of the rangeland receiving conservation treatment with 48 percent of the acreage treated to a RMS level.



| Primary Resource Concerns |
|--|
| Water Quality - Excessive turbidity, nutrients, and organics |
| Water Quantity-Insufficient flows in watercourses |
| Plant Quality — Forage |

Urban

Current Urban Description: The St. Mary's River Watershed contains the majority of population in Chippewa County, and for that matter, the Eastern Upper Peninsula. Sault Ste. Marie sits at the heart of this population with a concentration of approximately 10,000 people. Other concentrations include the small towns of Pickford, Rudyard, Kinross, and Detour. Population in the watershed is approximately 21,600. Urban infrastructure includes Wisconsin Central Railroad, Chippewa County Airport, and the many state, county, and private roads that intersect the landscape.

The thick, poorly drained soils of the St. Mary's River watershed have always been a limiting factor in development due to flooding and drainage issues. Consequently, significant wetland filling and alteration, along with ditching and channelization of small creeks have significantly altered natural hydrology in some locations.

Development along riparian areas, including road/stream crossings has significantly altered and destroyed critical wildlife habitat. Development practices without regard for natural hydrology and stabilization of highly erodible soils have increased problems for area water bodies.

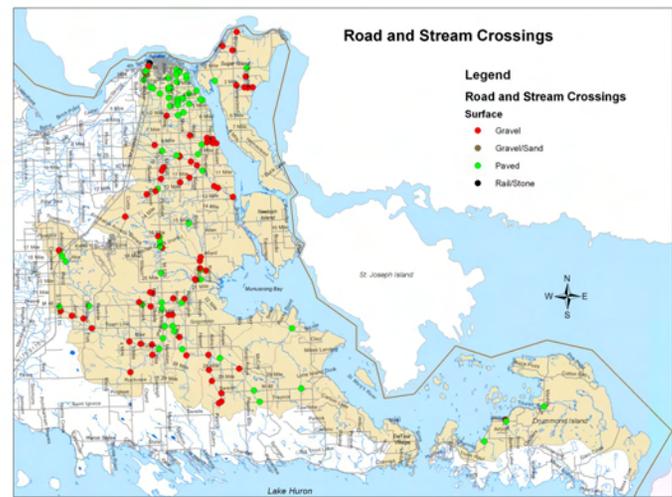
The most effective conservation practices include those that improve and restore natural hydrology and degraded wildlife habitat, minimize erosion of soils, and protect remaining critical areas, including wetlands, wildlife habitat, and riparian areas.

Future Urban Opportunities: Conservation on urban landscapes is challenging. Landowners pursue economic sustainability and accommodate urban infrastructure. Alteration of the landscape is generally required to establish homes and businesses, and their accompanying infrastructure, including roads, parking lots, etc. Fortunately, experience shows that residential landowners are amenable to reestablishing greenspace and local municipalities realize the economic value of protecting greenspace and increasing urban aesthetics with natural features.



| Population in RWA | 21,660 |
|---------------------------|--------|
| Sault Ste. Marie | 10,885 |
| Chippewa County Townships | 10,501 |
| Mackinac County Townships | 317 |

| Primary Resource Concerns |
|--|
| Soil Erosion |
| Soil Erosion – Irrigation Induced |
| Soil Condition – Organic Matter Depletion |
| Water Quantity - Inefficient Water Use on Irrigated Land |



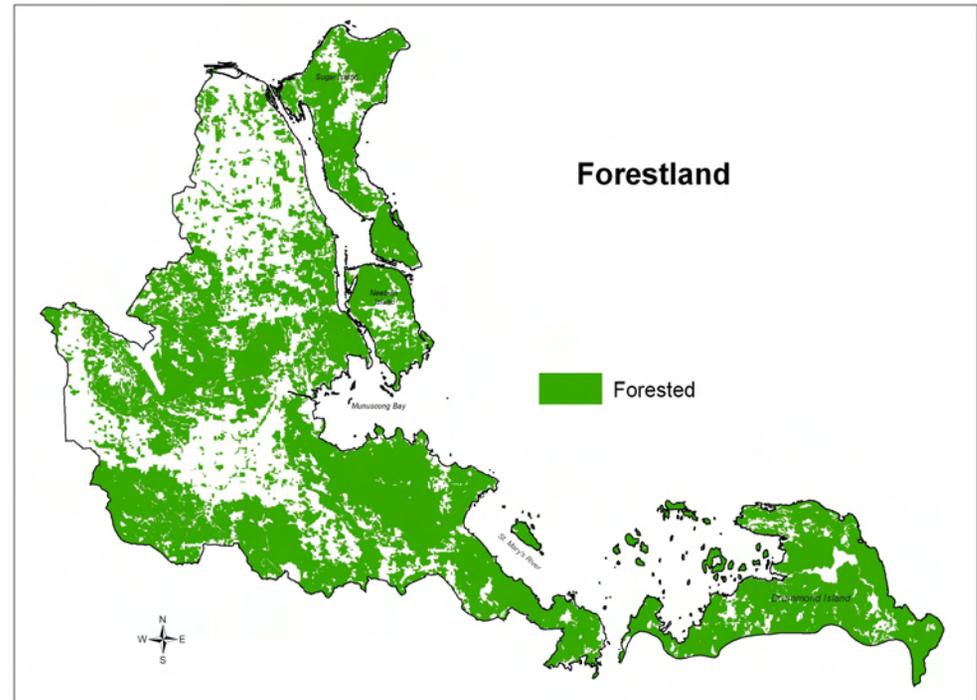
Forest Land

Current Forest Land Description: Most (~60%) of the land area in the St. Mary's River watershed is forested, much of which is of wetland forest composition due to the area's relatively flat topography and thick clay soils. Within this clay lake plain, species include white and black spruce, balsam fir, northern white cedar, tamarack, red maple, balsam poplar, and aspen. Within the higher elevations and more well-drained soils, northern hardwoods dominate with dry and wet hardwood/conifer mixed stands throughout.

The majority of forest land in the watershed is owned by non-industrial landowners. Many landowners fail to follow ecologically sound silviculture practices, which has a negative impact on the sustainability of area forests, wildlife habitat, and other natural resources. Absence of cyclical harvests, prescribed burns, and accelerated browsing by Whitetailed Deer have limited regeneration of forests in certain areas. The shallow rocky soils near the southern reaches of the watershed limit regeneration of mixed conifer/birch/aspen forests.

Future Forest Land Opportunities: Private, non-industrial forest landowners in the watershed would have a moderate interest (50%) in participating in additional conservation activities. Many of these landowners are not managing lands for timber production, or wildlife habitat. Focus should be on adopting practices that thin overstocked forest, replant appropriate abandoned agricultural and barren lands, and enhance wildlife habitat with strategic silviculture. Based on the rapid watershed assessment resource concerns on 86,787 acres of private, non-industrial forest could be addressed over the next five years. The assessment estimates this would cost \$2 million (\$1 federal and \$1 private) and require 1 FTEs for planning and implementation.

Cumulatively, conservation efforts targeted at this level would result in 30 percent of the forest land receiving conservation treatment to a RMS level.



Source: USDA, NRCS Service Center - Geodata: Land Use/Land Cover

| Primary Resource Concerns |
|--|
| Plant Condition - Productivity, Health and Vigor |
| Fish and Wildlife – Inadequate Food |
| Fish and Wildlife – Inadequate Cover/Shelter |

**Watershed:
St Mary's River**

| Current Conditions | | Total acres |
|---|-----|-------------|
| Total Crop/Hay/Pasture Land | | 106225 |
| Total Forest/Wildlife Land | | 289804 |
| Other Land Use | | 14320 |
| Typical Management Unit (avg farm size) | | 320 |
| Current Farm Bill participation % | 10% | |



| Future Conditions | | Total Acres |
|------------------------------------|--|-------------|
| Total Crop/Hay/Pasture Land | | 106,225 |
| Total Forest/Wildlife Land | | 289,804 |
| Other Land Use | | 14,320 |
| Total Watershed Acres in Treatment | | 410349 |

| | |
|---|-----|
| Estimated increase in Participation (potential participation in time frame for implementation). | 5% |
| Total participation Future | 15% |
| Time Frame - Years | 5 |

Cost Summary

| Cost Items and Programs | Costs | O&M Costs |
|--|-------------|-----------|
| Maintain the Baseline Conservation - Annual Maintenance | | \$434,000 |
| Total Investment at estimated rate of participation | \$7,223,100 | \$291,200 |
| Potential Investment from Farm Bill Programs | \$3,611,550 | |
| Management Incentives (Incentive Payments over 3 years) | \$257,690 | |
| Total Potential Farm Bill Program Costs | \$3,869,240 | |
| Operator Investment | \$3,611,600 | \$725,200 |
| Total Average Annual Costs | \$1,279,500 | |
| Present Value of Total Average Annual Costs over 5 years | \$5,558,762 | |

Potential Effects Summary

| | |
|---|-------|
| Estimated Acres Treated with new Implementation | 20500 |
| Total Effects Score | 425 |

Note:

Summary numbers rounded to even 100s

Cost Basis 2007

Discount Rate 4.875%

Practice and Effects:

| Baseline | Annual Cost to maintain Baseline |
|---|---|
| Watering Facility (614) | \$1,743.00 |
| Windbreak/Shelterbelt Establishment (380) | \$420.00 |
| Fence (382) | \$1,800.00 |
| Prescribed Grazing (528) | \$11,326.50 |
| Heavy Use Area Protection (561) | \$392,700.00 |
| Wetland Wildlife Habitat Management (644) | \$67.50 |
| Forest Stand Improvement (666) | \$0.00 |
| Pipeline (516) | \$1,693.20 |
| Nutrient Management (590) | \$10,487.50 |
| Waste Storage Facility (313) | \$8,400.00 |
| Riparian Forest Buffer (391) | \$5,320.00 |
| Total | \$433,957.70 |

| Crop/Hay/Pasture Treatment/Investment | Expected Installation Cost | Total Ave Ann Cost Investment |
|--|---|--|
| Fence (382) | \$71,100 | \$7,067 |
| Grade Stabilization Structure (410) | \$59,500 | \$8,254 |
| Pasture and Hay Planting (512) | \$1,225,350 | \$169,980 |
| Pipeline (516) | \$80,600 | \$11,987 |
| Prescribed Grazing (528) | \$46,200 | \$96,904 |
| Stream Crossing (578) | \$61,200 | \$13,998 |
| Nutrient Management (590) | \$52,610 | \$110,349 |
| Watering Facility (614) | \$12,425 | \$1,724 |
| Waste Utilization (633) | \$2,535 | \$5,317 |
| Water Well (642) | \$22,500 | \$3,121 |
| Subtotal | \$1,634,020 | \$428,701 |

Forest/Wildlife Land Treatment/Investment

| | | |
|---|-----------|-----------|
| Hedgerow Planting (422) | \$450 | \$65 |
| Riparian Forest Buffer (391) | \$26,880 | \$2,837 |
| Windbreak/Shelterbelt Establishment (380) | \$375 | \$24 |
| Fence (382) | \$41,000 | \$4,075 |
| Aquaculture Ponds (397) | \$120,120 | \$19,065 |
| Tree/Shrub Site Preparation (490) | \$27,500 | \$57,681 |
| Forage Harvest Management (511) | \$845 | \$194 |
| Recreation Trail and Walkway (568) | \$6,000 | \$952 |
| Tree/Shrub Establishment (612) | \$110,000 | \$10,508 |
| Forest Stand Improvement (666) | \$328,000 | \$42,220 |
| Use Exclusion (472) | \$48,000 | \$7,619 |
| Subtotals | \$709,170 | \$145,242 |

Other Land Treatment/Investment

| | | |
|---|-------------|-----------|
| Waste Storage Facility (313) | \$840,000 | \$75,656 |
| Diversion (362) | \$3,719,100 | \$553,103 |
| Stream Crossing (578) | \$10,800 | \$2,470 |
| Heavy Use Area Protection (561) | \$229,180 | \$63,877 |
| Windbreak/Shelterbelt Establishment (380) | \$10,000 | \$637 |
| Animal Trails and Walkways (575) | \$21,158 | \$2,935 |
| Well Decommissioning (351) | \$3,000 | \$386 |
| Water Well (642) | \$4,500 | \$624 |
| Watering Facility (614) | \$2,100 | \$291 |
| Roof Runoff Structure (558) | \$40,000 | \$5,549 |
| Underground Outlet (620) | \$66 | \$10 |
| | \$4,879,904 | \$705,539 |