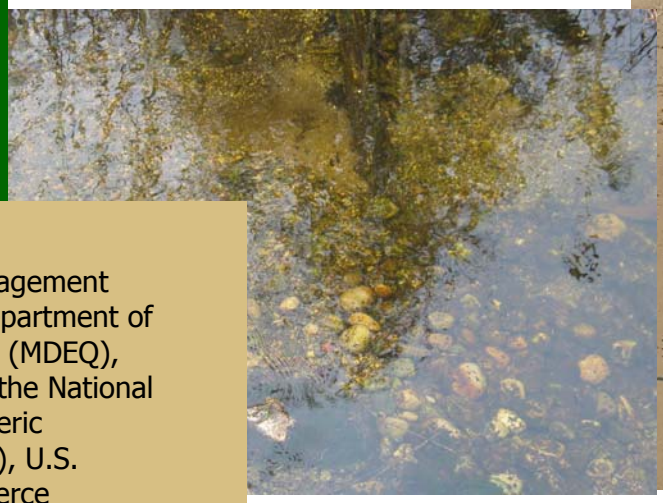
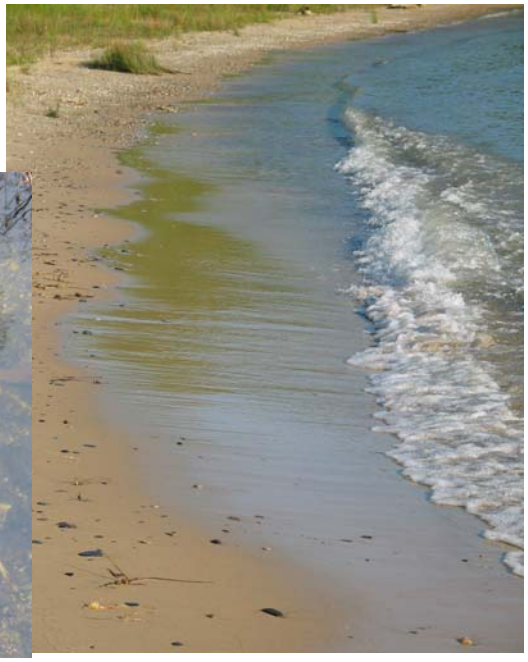
Alcona Black River & Coastal Watersheds
2011 Watershed Management Plan





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Prepared by:

NEMCOG

Northeast Michigan Council of Governments

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Chapter 1 - INTRODUCTION

Location and Regional Setting

This planning initiative covers the Black River Watershed, a coastal Lake Huron watershed located in northeast Alcona County, and a narrow band of smaller watersheds that runs from the outlet of the Black River south to the City of Harrisville. These water resources are locally known for their excellent water quality supporting a vast array of recreational and aesthetic opportunities. The Black River watershed encompasses approximately 62 square miles. The river drains parts of Alcona, Caledonia, Haynes, Hawes, Harrisville Townships in Alcona County and a small part of Sanborn Township in Alpena County, and discharges directly into Lake Huron at the historic community of Black River.

Background

The north branch Black River drains the large, pristine Black River Swamp, identified as a key ecological coastal resource in the Huron Greenways Plan. The land area that the river flows through is very scenic with a mix of upland forests, lowland forests, wetlands and farmland. Recreation, forest management and farming are important uses within the watershed. The narrow band of smaller watersheds has numerous small creeks and intermittent drainages that empty into Lake Huron. Mill Creek flows through the City of Harrisville and is the only named creek. Although, these watersheds are relatively small in comparison to other northern Michigan watersheds, coastal areas have a significant impact on the quality of the larger water body, Lake Huron. As more development occurs along the coastal areas, it is imperative that programs are in place to provide for both corrective and proactive measures for long-term water resource protection.

The Black River prized by many is a diverse river system. There are no man-made dams on the main branch and north branch of the Black River to obstruct movement of fish from Lake Huron. The North Branch of the Black River supports cold water fisheries and the natural reproduction of steelhead, brook trout, Chinook salmon and cohoe salmon. There is a spring steelhead spawning run and Chinook, cohoe and potentially a Coaster Brook Trout late fall/early winter spawning run. The river is treated for sea lamprey every 4-5 years and to date, invasive species such as Eurasian ruffe or round goby have not been found.

It is a river of historical significance as it has supported a run of Coaster Brook Trout since the 1920's; one of two remaining native salmonids present in Lake Huron. In fact, the Coaster Brook Trout, once abundant and widespread in tributaries of Lake Huron, are now extremely rare, and reportedly naturally reproducing in the Black River. Due to in-stream habitat loss, over-harvest and sedimentation of in-stream spawning areas, the coaster brook trout virtually disappeared from the Lower Peninsula's rivers. The brook trout spends part of its life in the near-shore areas of Lake Huron and has a preference for shoreline habitat and depths of less than 7 meters. Efforts are currently underway to restore and protect the remaining coaster brook trout population found in Lake Huron tributary streams.

Plan Development

This project was funded in part under the Coastal Zone Management Act of 1972, as amended, Office of Ocean and Coastal Resource Management, National Oceanic and Atmospheric Administration, U.S. Department of Commerce and the Michigan Coastal Management Program, Michigan Department of Environmental Quality.

Development of a Watershed Management Plan for the Alcona Black River was divided into two phases. The purpose of Phase I was to assess the existing condition of the watershed and identify current problems. Phase II of the study identified potential future threats and developed strategies for long term protection of water quality and the natural environs. Before this study was undertaken, data on nonpoint source pollution was limited. The Alcona Black River Watershed Advisory Council (ABRWAC), with the assistance and oversight of the Huron Pines RC&D Council, conducted a road stream crossing inventory of the Black River Watershed. Managing water resources requires the use of complete and reliable information which necessitated filling the 'information void' with this intensive study.

The Council worked together to create a vision for the future of the Alcona Black River watershed and smaller coastal watersheds. This vision guided the Council in developing the Phase I Watershed Condition Report, and continued to do so while developing the Watershed Management Plan in Phase II. Through Phase I, the Council worked to conduct a detailed non-point source inventory and assessment of the natural resources; identify issues and concerns within the watersheds; and define priority conservation areas. Phase II efforts included an evaluation of planning and zoning status; identifying values and assets; and developing recommendations for the protection of the ecological resources in the area. An important step in implementing the plan will be to build local support for the recommendations and strategies. An education and outreach effort will include several articles in local newspapers, posting of the plan on NEMCOG's web site and presentations to local groups, governmental units and/or organizations.

The need to take a proactive approach to protecting the water quality is paramount. All townships and the City of Harrisville administer their own planning and zoning. Information and recommendations compiled in this plan will help communities make better land use decisions. Communities, major landowners and associations have a history of internal planning. Coordinated planning between all of the players has been somewhat limited. Bringing the players together at one table to guide the plan development will have long term benefits.

Watershed Planning Steering Committee

This plan was developed in partnership with the Alcona Black River Watershed Advisory Council. The Council was created in 2006 by local citizens who were interested in supporting long term conservation of the Alcona Black River. In 2007, the Council worked with the Huron Pines RC&D Council to complete a road stream crossing inventory. The inventory was completed with volunteers and the financial support of a grant from the Community Foundation of Northeast Michigan. Since that time, the Council has actively participated in opportunities to improve the watershed resources. Council members participated in non-point source pollution inventories, restored eroding streambanks, and attended numerous meetings related to watershed issues.

Council Members

Jack & Carol Bare
Dan & Annabel Brasier
Roger & Peggy Carlin
Dan & Cheryl Gauthier
Lanny Gerard & Sandy Kienzle
Tom & Annette Kane
Charlie Lagerberg
Bob McDonald
Lanny & Pam McGuire
Dennis & Cindy Neveu
John Whatcott
Walt & Patti Wynbelt

Other Participants
Nico Tucker, NEMCOG
Richard Deuell, NEMCOG
Eric Nelson, Huron Pines RC&D
Brandon Schroeder, MI Sea Grant, MSU Extension
Brian Matchett, Alcona Community High School

Chapter 2 - GETTING TO KNOW THE ALCONA BLACK RIVER AND COASTAL WATERSHEDS

The Black River and Lake Huron Coastal Watersheds are located in northeastern Lower Michigan and cover approximately 56,000 acres, principally in Alcona County. The Black River Watershed accounts for the majority of this land area, at 39,808 acres (62.2 square miles), with the Coastal Watersheds accounting for the remaining 16,192 acres (25.3 square miles). **Figure 2-1** is a map of watersheds.

The Black River drains parts of Alcona, Caledonia, Haynes, Hawes, and Harrisville Townships in Alcona County, a small part of Sanborn Township in Alpena County, and discharges directly into Lake Huron at the historic community of Black River. The north branch drains the large, pristine Black River Swamp, while the south branch flows through a large portion of agricultural land. There are numerous tributary streams including Butternut Creek, Haynes Creek, Gauthier Creek and Silver Spring Creek.

The narrow band of smaller watersheds, which runs south from the outlet of the Black River to just south of the City of Harrisville, has numerous small creeks and intermittent drainages that empty into Lake Huron. Mill Creek flows through the City of Harrisville and is the only named creek. Although, these watersheds are relatively small in comparison to other northern Michigan watersheds, coastal areas have a significant impact on the quality of the larger water body, Lake Huron.

Climate

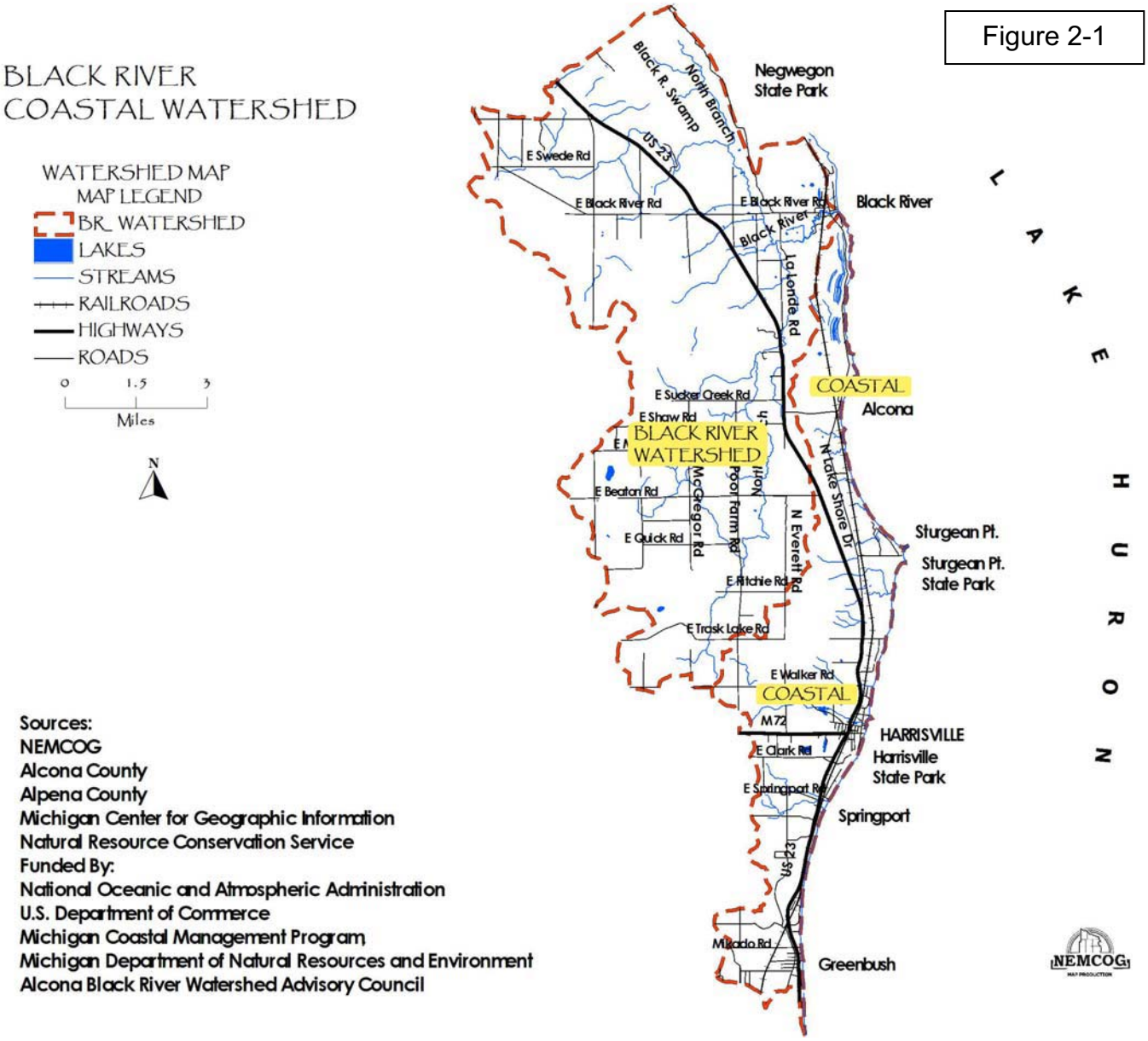
The climate of the Black River and Coastal Watersheds is characterized by long cold winters and moderate warm summers. The proximity of Lake Huron serves to moderate temperature extremes in comparison to areas located inland. Because of lake effect, the area generally experiences first frost in the fall as much as four to six weeks later than the west side of Alcona County. The proximity to Lake Huron also influences the length of the growing season; the closer to Lake Huron, the longer the growing season. Growing season length across Alcona County varies from 90 to more than 140 days. Typically, the lowest mean temperature of the year occurs in January, and the highest in July. Average annual precipitation is 27 to 28 inches, and average snowfall is 60 to 70 inches annually.

Geology

The rolling hills, river valleys, swamps and lakes were created by the retreating continental glacier some 12,000 years ago. Beneath this thick mantel of the glacial deposits lays a foundation of layered sedimentary bedrock. This section will describe the glacial landforms or quaternary geology and the underlying bedrock geology.

Beneath the glacial deposits, hundreds of feet below the surface, is sedimentary bedrock that was created during the Late Mississippian ages of the Paleozoic Era. The bedrock was formed in ancient seas that covered the area some 310- 345 million years ago. The shallow marine seas deposited layers of silt, clay, sediments, marine animals, plants, coral, and other calcareous materials. These deposits formed sandstone, shale, limestone, and dolomite bedrock

Figure 2-1



and were formed during the upper and lower Mississippian series of the Paleozoic era. The uppermost and youngest bedrock, consisting of Coldwater Shale, is found in the southern portions of the coastal watersheds. Antrim Shale bedrock formations subcrop most of the planning area. Antrim shale contains rich deposits of natural gas. In recent years, intensive exploration has resulted in numerous producing wells throughout Northeast Michigan. Other bedrock formations beneath the glacial overburden include Sunbury shale, Berea sandstone and Bedford shale.

Starting some 2 million years ago, during the Pleistocene era, continental glaciers formed in the Hudson Bay area. Several times, over this two million year period, the massive sheets of ice built up and inched their way south across what is today Michigan. The massive ice sheets, more than one mile thick, advanced in a southerly direction and bulldozed their way across the

landscape. The glacier pushed material in front of it, incorporated rocks and soil into the debris laden ice; and scraped, ground and broke apart the sedimentary bedrock of the Michigan Basin.

Each advance and retreat of the continental glaciers took tens of thousands of years. This reoccurring process shaped and reshaped the land; obliterating and then creating hills, valleys, rivers and lakes, swamps and marshes. The last glacial period, called the Wisconsin era, created the landscape we know today. The glacier left behind boulders, rocks, cobble, sand, gravel, silt, clay and loam. In some areas, the material was deposited in unsorted masses called till plains, ground moraines and end moraines. Water flowing from the melting glaciers also sorted materials, creating outwash channels, sand deltas, kames and eskers. Fine materials, captured in the fast moving glacial meltwater, settled to the bottom of expansive glacial lakes creating lacustrine clay and silt plains. **Figure 2-2** shows the formation of glacial landforms.

Figure 2-3 is a quaternary or glacial geology map of the planning area. Landforms include ice contact outwash and glacial lake plains consisting of sand dunes and lacustrine sand and gravel

An extensive area of ice contact outwash sand and gravel covers much of the planning area. US-23 traverses the eastern edge of these glacial deposits. Part of the Lakeshore Drive follows the eastern base slope of the landform area. A grouping of large knolls called kames interspersed with ice-block depressions or kettle holes are located in the vicinity of Lost Lake Woods. A kame is a mound or knob composed of stratified sand and gravel deposited by a subglacial stream as a fan or delta at the margin of a melting glacier; by a subglacial stream in a low place or hole on the surface of the glacier; or as a ponded deposit on the surface or at the margin of stagnant ice. Outwash consists of sand and gravel deposited by meltwater streams in front of the end moraine or the margins of an active glacier.

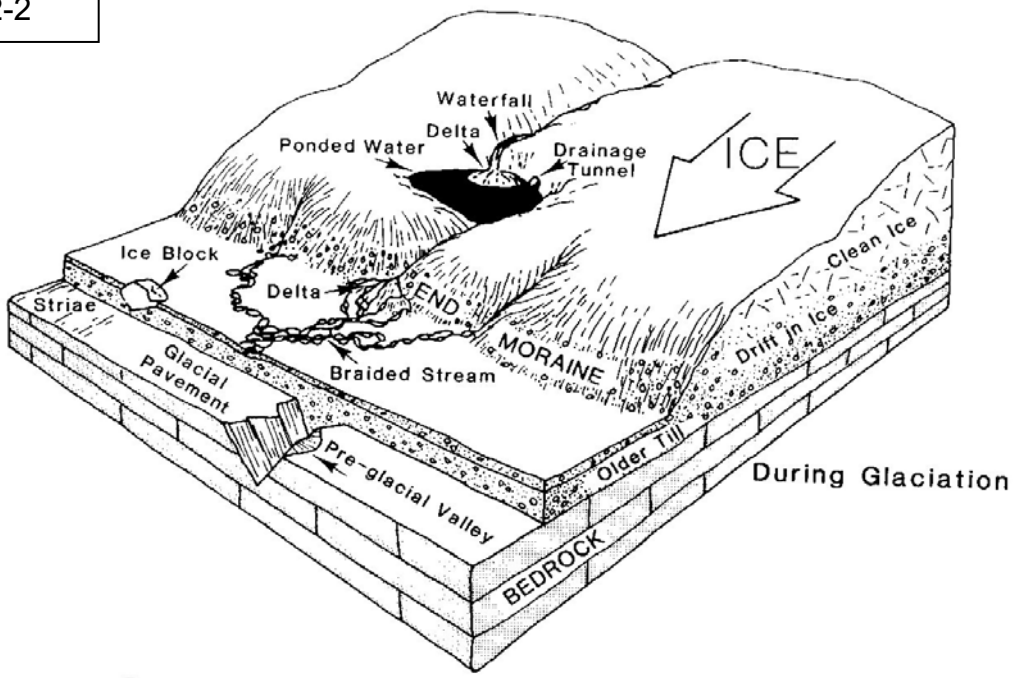
As the continental glaciers melted, water flowed across the landscape creating landforms and pooling into the expansive post glacial lakes. These emerging lake basins were the beginnings of our Great Lakes. During different periods, the post glacial great lakes were both much higher and lower than the lake levels we have grown accustomed to in recent times. Geologists have identified and named the different postglacial great lake stages, Lake Warren, Lake Algonquin, Lake Nipissing and Lake Algoma.

Landforms and soils in eastern parts of the watershed were heavily influenced by these different post glacial lake stages. The Nipissing Great Lakes was the largest of all the Great Lakes stages and inundated eastern parts of the planning area some 5000 years ago. These old lake plains are dominated by extensive wetlands such as the Black River Swamp and sand dunes.

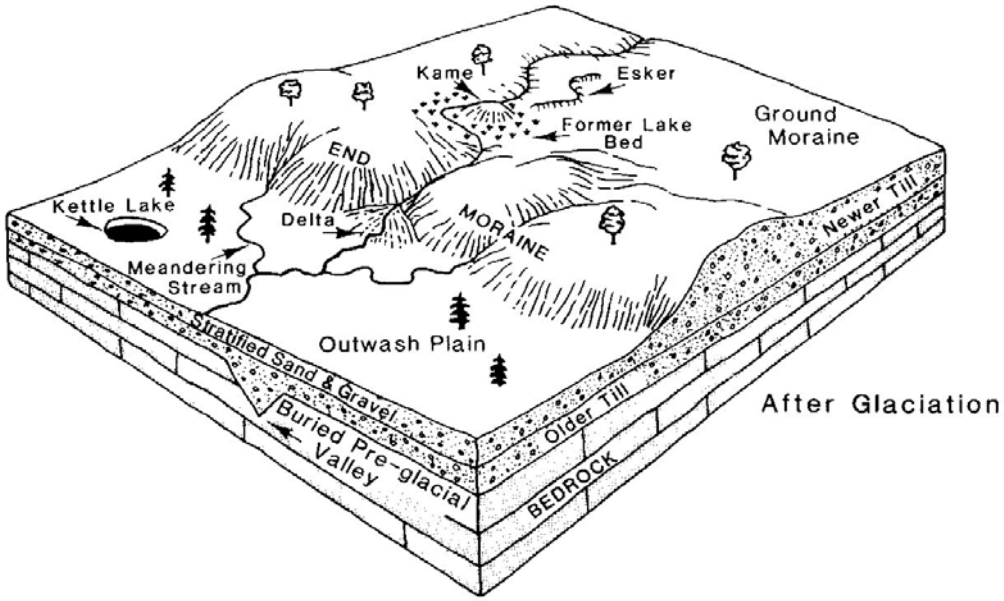
Some of the best examples of old glacial great lake shorelines can be found in Negwegon State Park, see **Figure 2-4**. Dune and swale complexes are a series of alternating old beach ridges and linear depressions that parallel the Lake Huron shoreline. Near the lakeshore, the ridges are covered with oak, pine and aspen while lowland conifers and brush can be found growing in the wet depressions. The width of the ridges and associated swales is dependent upon the underlying geology and length of time in which the lake levels receded. The distance between old beach ridges can range from less than 100 feet to a mile or more.

The Glacial Lakes around Michigan, William R. Farrand

Figure 2-2

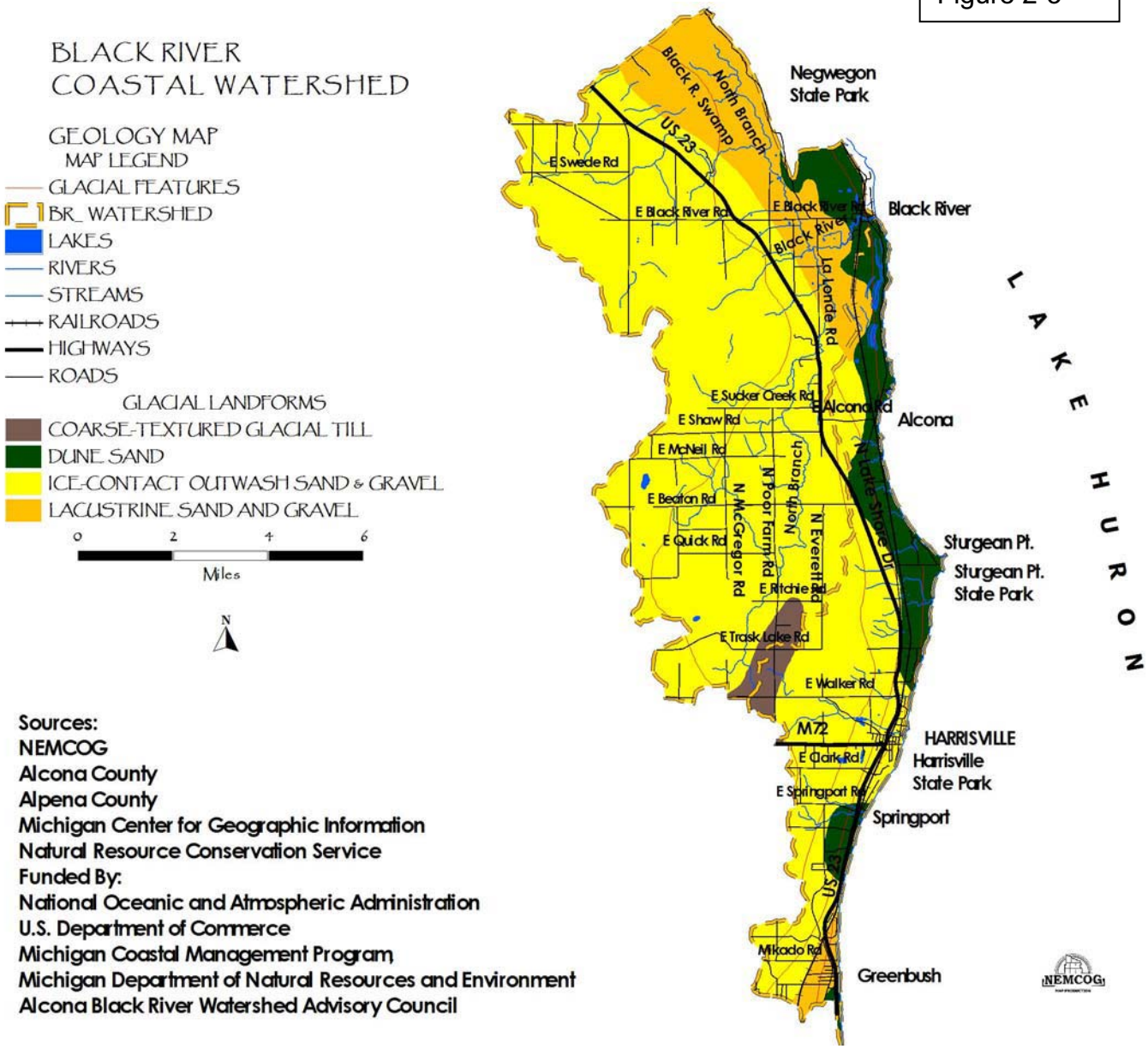


Features originating at a glacier front occur in a definite order.



Landforms of continental glaciation are unmistakable.

Figure 2-3


BLACK RIVER
COASTAL WATERSHED
GEOLOGY MAP
MAP LEGEND
GLACIAL FEATURES
BR_WATERSHED
LAKES
RIVERS
STREAMS
RAILROADS
HIGHWAYS
ROADS
GLACIAL LANDFORMS
COARSE-TEXTURED GLACIAL TILL
DUNE SAND
ICE-CONTACT OUTWASH SAND & GRAVEL
LACUSTRINE SAND AND GRAVEL
0 2 4 6
Miles
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Sources:
NEMCOG
Alcona County
Alpena County
Michigan Center for Geographic Information
Natural Resource Conservation Service
Funded By:
National Oceanic and Atmospheric Administration
U.S. Department of Commerce
Michigan Coastal Management Program
Michigan Department of Natural Resources and Environment
Alcona Black River Watershed Advisory Council
Negwegon State Park
Black R. Swamp
North Branch
US-23
E Swede Rd
E Black River Rd
Black River
Black River
La Londe Rd
LAKE HURON
E Sucker Creek Rd
E Alcona Rd
Alcona
E Shaw Rd
E McNeil Rd
E Beaton Rd
N McGregor Rd
N Poor Farm Rd
North Branch
N Everett Rd
N Lake Shore Dr
Sturgeon Pt.
Sturgeon Pt. State Park
E Quick Rd
E Ritchie Rd
E Trask Lake Rd
E Walker Rd
M72
HARRISVILLE
Harrisville State Park
E Clark Rd
E Springport Rd
Springport
US-23
Mikado Rd
Greenbush
NEMCOG

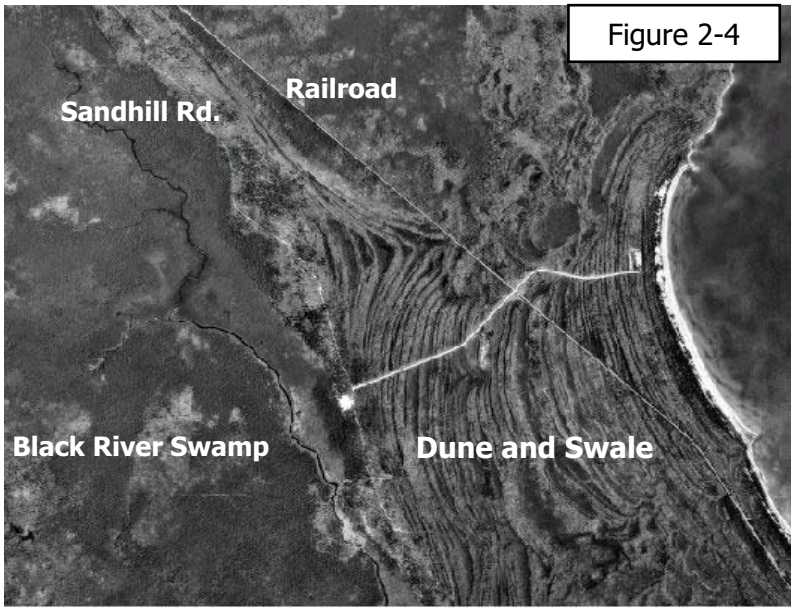


Figure 2-4

A wide sandy ridge, one to two miles inland from the Lake Huron Shoreline, runs from the community of Black River in Alcona County, through Negwegon State Park and Ossineke continuing north into Alpena Township and City of Alpena. Sandhill Road in Alcona County as well as Piper Road in Alpena County follow this dry sandy ridge. The wide sand ridge extends into Alpena Township and the City crossing Werth Road at Hobbs Road, following the west edge of Mud Lake, continuing in a northeasterly direction, crossing the Thunder Bay River and eventually ending northeast of the Thunder Bay Recreation Center in the City of Alpena.

Soils

Soils information is important in the determination of types and intensity of land uses. Water quality of a river system is influenced by soils and the slopes of the land. These factors determine potential land use, soil infiltration rates, water-holding capacity and soil erodibility and therefore are directly related to the amount of non-point source pollution in the watershed. The construction of roads, buildings, and septic systems on steeply sloped areas or areas with organic and hydric soils require special design considerations. If developed improperly the impacts to natural resources, particularly water quality, can be far-reaching.

The Natural Resource Conservation Service (NRCS) completed detailed soil surveys of Alcona and Alpena Counties. A digital or computerized version of the soil survey maps was acquired from the Michigan Department of Natural Resources, MIRIS program. The following information is derived on the published soil surveys, and highlights hydric soils, slopes 18 percent and greater and soils with septic system limitations.

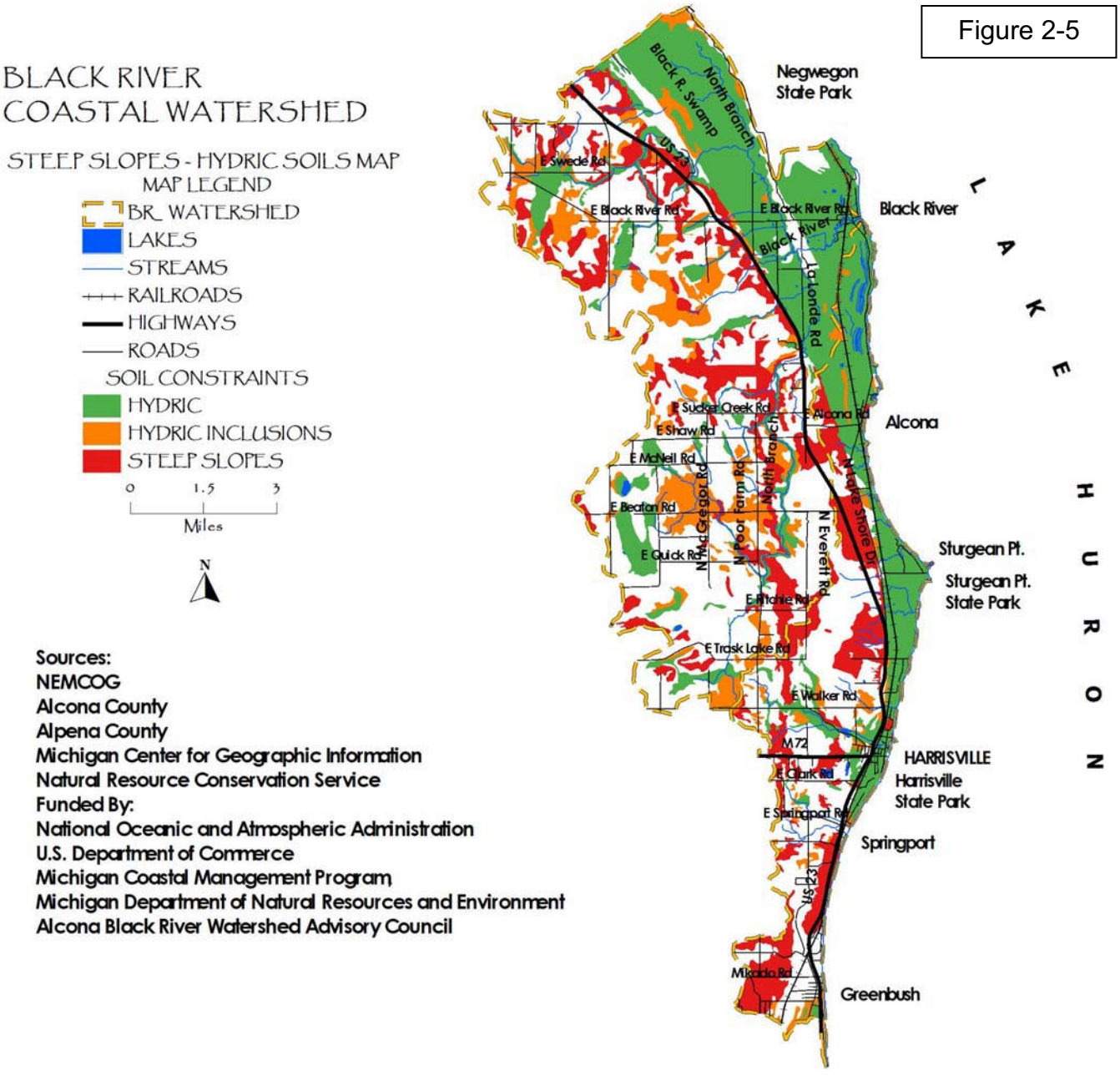
Hydric Soils and Steeply Sloped Areas

Figure 2-5 shows hydric soils and areas of steep slopes. Hydric soils are saturated, flooded or ponded during part of the growing season and are classified as poorly drained to very poorly drained. Hydric soils have poor potential for building site development and sanitary facilities. Wetness and frequent ponding are severe problems that are difficult and costly to overcome. Sites with high water tables may be classified as wetlands and a wetlands permit would be required to develop these areas. Less intensive development should be directed to these areas with severe constraints.

According to information presented in the Alcona County and Alpena County Soil Surveys extensive hydric soils areas are found in the coastal lake plain, see **Figure 2-5**. The Black River

Swamp is a major wetland complex drained by the North Branch. Dune and swale complexes in Negwegon State Park are included in the hydric soils category. Land around La Londe Road

Figure 2-5



have been cleared for farming. Higher water tables limit productivity and crop types. Hydric soils are less prevalent in upper regions of the watershed and tend to be associated with streams and lakes.

Steeply sloped land, shown as red on **Figure 2-5**, can be found throughout the upland areas west of US-23. While hills and steeply rolling terrain provide opportunities for spectacular views of the landscape, these steeply sloped sites have severe building constraints, and are more difficult and costly to develop. Maintenance costs tend to be higher on steeply sloped terrain. Special design standards such as erosion control measures, limiting size of disturbed areas, retaining natural vegetation, revegetation, slope stabilization and on-site retention of water run-off from impervious surfaces would all serve to minimize resource impacts.

Septic System Limitations

Using a computer mapping system soils maps have been color coded to show areas with slight to severe septic system limitations as defined by the USDA Natural Resource Conservation Service. Criteria include depth to water table, wetness, filtering capacity, bedrock, large stones, and ability to infiltrate water. **Figure 2-6** is a septic system limitations map. Much of the study area is classified as having severe limitations. Clearly, the greatest limiting factor is the prevalence of high water tables. Sandy soils have severe limitations due to poor filtration of septic effluents. Septic systems constructed in sandy soils combined with high water tables can negatively impact water resources particularly when close to lakes and streams. Limiting types and density of development or making public water and/or sewer available for high density development are likely the best options for protecting the groundwater and surface water resources in these areas. Other severe limiting factors for development include steep slopes, soils that percolate slowly. Water percolates or moves slowly finer soils like loams and clays. Therefore, slower absorption rates equate to higher surface run-off rates.

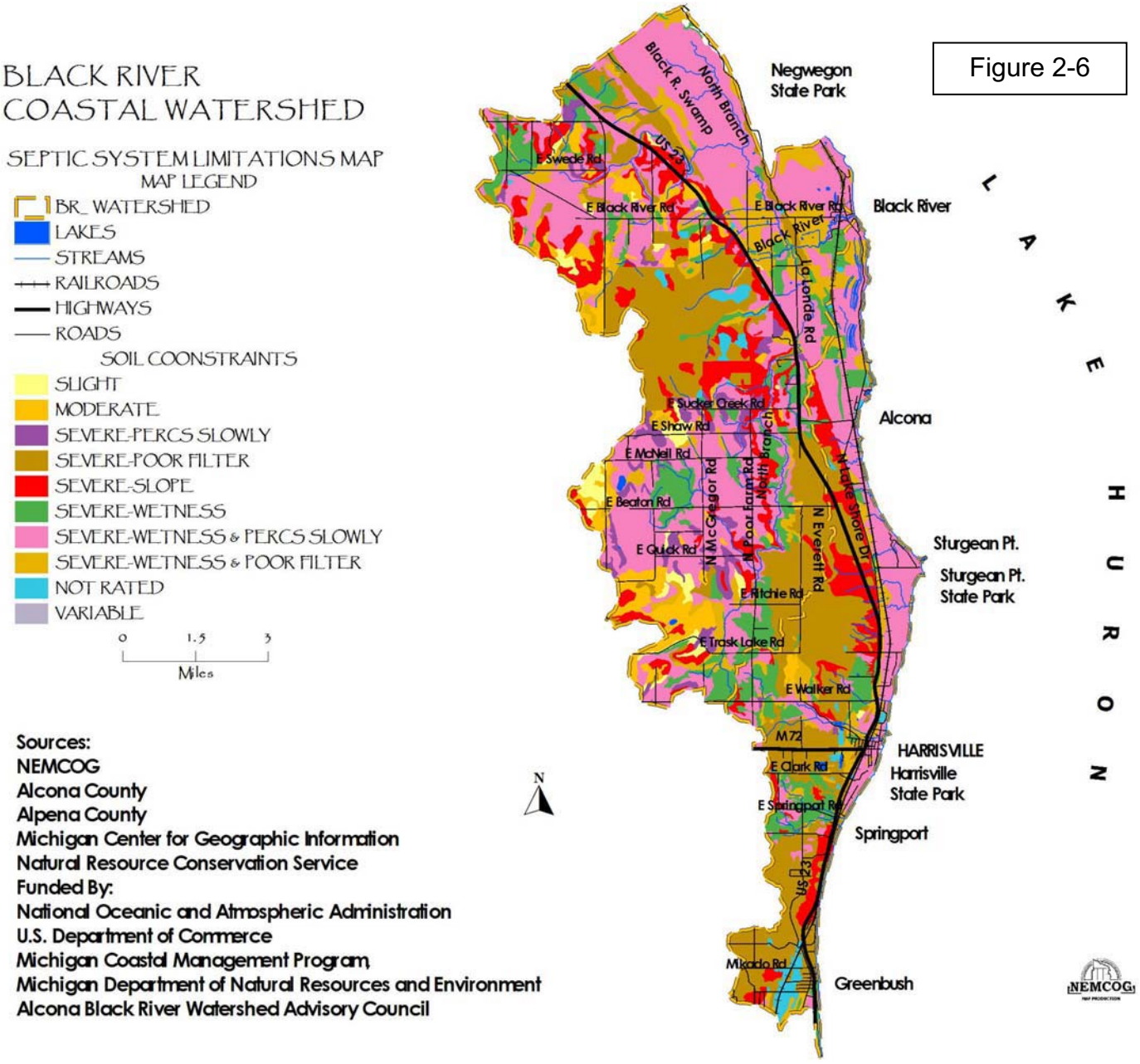
Hydrology

The amount of flow in rivers changes throughout the year. In general, flow is greater in late winter and early spring when snowmelt and rainfall produce more surface runoff. Although summer is a period of high precipitation, much water is lost through evaporation and transpiration, causing river flow to be lowest in late summer.

One factor greatly affecting hydrology of the watershed is the lake effect snow produced by Lake Huron. Lake effect snow can occur when cold winds blow across a large lake. Evaporation of warm surface water increases the amount of moisture in the colder drier air above the lakes surface, causing water vapor in the cold air to condense and form ice-crystal clouds. When these clouds reach the lake's edge, they deposit heavy snowfall along the shoreline. Once the snow begins to melt the water may be absorbed by the ground and may enter the lakes and streams as groundwater or may flow over land and enter surface water as runoff.

Runoff rates in the South Branch are influenced by the amount of farmland and soil types. As a result, fluctuations in water are more pronounced than in the North Branch. The Black River Swamp functions as a huge detention basin capturing the runoff and gradually discharging the water into the stream. Many of the small coastal creeks are intermittent and flow during the fall and spring, with the greatest flow volumes during spring run-off.

Figure 2-6



Water Quality

The Black River and all of its tributaries are considered cold water streams. According to the MDEQ's Surface Water Information Management System (SWIM), the Black River, South Branch Black River, and Haynes Creek are classified as oligotrophic with low nutrients and high alkalinity, and are primarily groundwater driven with high baseflow and moderate peakflow. The North Branch Black River is classified as eutrophic with high nutrient levels and is primarily runoff driven with moderate baseflow and fair peakflow.

The MDNR has conducted fishery surveys over the years at various locations throughout the watershed. The survey results indicate that the Black River and its tributaries support populations of trout. The Black River also supports the natural reproduction of steelhead, brook trout, Chinook salmon and cohoe salmon.

The MDEQ has conducted various biological surveys and visual assessments over the years. A P-51 Biological Survey in 1998 noted fair habitat conditions and an acceptable macroinvertebrate community at one location on the Black River. A 2002 Visual Assessment at locations on Butternut Creek and the North Branch Black River did not indicate any non-attainment issues.

The SWIM database did not contain any information on the Coastal streams. However, all of the Coastal streams are considered cold water streams. Some of the streams are intermittent and only flow during spring runoff or other times of high precipitation levels.

The cold water status and trout population dictates that proper water temperature, flow, and water chemistry be maintained. Available water quality data is scarce. This is probably due to the watersheds small size, remoteness, and general high quality waters. Maintaining the high quality waters will require a more consistent and defined water quality monitoring program.

Land Cover/Use Inventory

The type and intensity of a land use can greatly influence non-point source pollution. Therefore, developing an accurate representation of the existing land use conditions within the watershed is a critical step in the planning process.

NEMCOG developed a Land Use/Land Cover map to evaluate development and resource conditions in the study area. The map was developed by updating Michigan Resource Information System (MIRIS) land cover/use data with 2006 digital aerial photographs. Limited field checking further refined the maps. **Figure 2-7** is a color thematic map of the study area. The write-up below reflects the entire study area.

Residential

For the most part, residential development found in the watershed consists of single-family dwellings. Residential accounts for 1,864 acres in the Black River watershed and 2,732 acres in the Coastal watersheds. Residential uses are concentrated in the communities of Black River and Harrisville, and along the Lake Huron shore. In addition to new dwellings being built on waterfront property, many of the seasonal homes have undergone a transition to year-round residences. Residential development is also occurring along county roads throughout the watershed as larger parcels are split into ten-acre and smaller parcels.

Commercial

Commercial land uses include primary/central business districts and neighborhood business districts, including commercial strip development. Commercial developments accounts for 83 acres in the Black River Watershed and 110 acres in the Coastal watersheds. Commercial development is very limited within the Black River watershed, being found in small nodes of one to five commercial entities. Commercial development is more prevalent in the southern reaches of the small coastal watersheds with the greatest amount concentrated within the City of Harrisville and along US-23 in Harrisville Township.

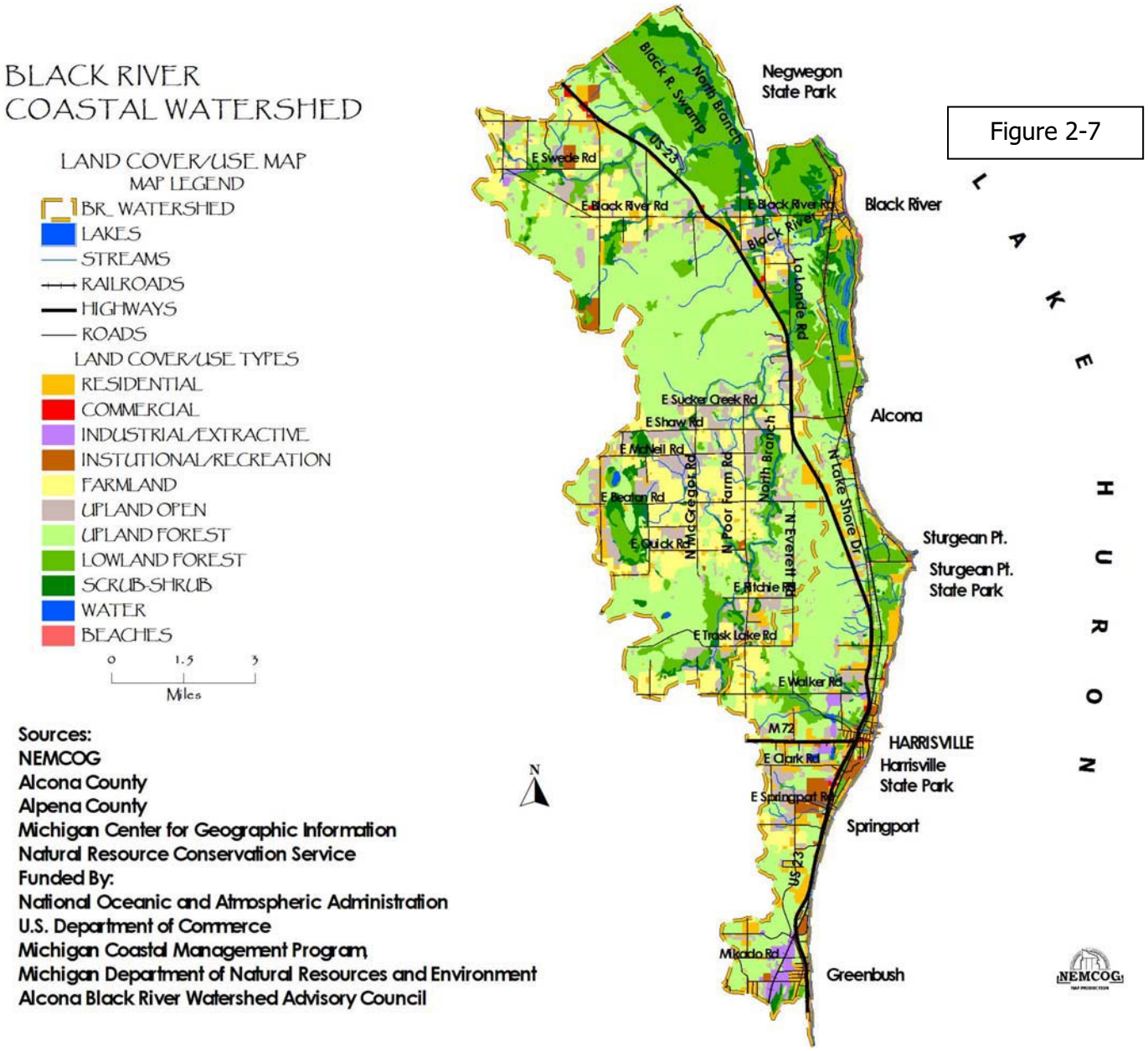


Figure 2-7

Industrial

In addition to industrial and extractive development, this land use category includes airports, extractive, oil and gas, communication and utility facilities. Clearly, most of this category is sand and gravel pits, with large areas located adjacent to the community of Greenbush. The Harrisville airport and sewage treatment facility is also included in this category. Industrial and extractive developments account for 118 acres in the Black River Watershed and 484 acres in the Coastal watersheds.

Table 2-1
Black River and Coastal Watershed 2010 Land Cover/Use

	Black River Watershed		Coastal Watersheds	
Category	Acres	Percent	Acres	Percent
Residential	1,864	5	2,732	17
Commercial	83	<1	110	1
Industrial/Extractive	118	<1	484	3
Institutional/Recreational	302	1	514	3
Agricultural	6,084	15	819	5
Upland Openings	3,956	10	1,176	7
Upland Forest	17,235	43	6,918	43
Lowland Forest	7,257	18	2,848	18
Non-Forest Wetlands	2,783	7	308	2
Water	55	<1	10	<1
Beaches	-	-	256	2
Source: NEMCOG				

Institutional/Recreational
This category includes parks, public access, cemeteries, public marinas, and public building. State of Michigan lands such as Negwegon State Park are open for public recreation. However, these lands were mapped by their vegetation type and not land use category. These uses account for 302 acres in the Black River Watershed and 514 acres in the Coastal watersheds.

Agricultural Lands
Agricultural lands are concentrated in the southern areas of the Black River watershed and to a lesser extent in the northern parts. These uses account for 6,084 acres in the Black River Watershed and 819 acres in the Coastal watersheds. Farming includes row crops, hay land and pastures. Noted in the update process, there has been a loss of land dedicated to farming. However, the conversion is to less intensive land use such a fallow land and large tract residential and not to urbanization.

Non-forested Uplands
Open-land is defined as areas supporting early stage of plant succession consisting of plant communities characterized by grasses or shrubs. Upland non-forest accounts for 3,956 acres in the Black River Watershed and 1,176 acres in the Coastal watersheds. Such areas often occur on abandoned agricultural land or recently timbered areas. Typical plants are quack grass, fescues, timothy, bromegrass, Kentucky bluegrass, sedges, spotted knapweed, goldenrod, reed canary grass and clovers. Typical shrub species include blackberry and raspberry briars, dogwood, willow, sweet fern, sumac and tag alder.

Upland Forests
Upland forests is the predominate cover type in the planning area. Forest types include aspen-birch (quaking aspen, bigtooth aspen and white birch), oak (northern red oak, white oak and northern pin oak), pine (red, white and jack pine) and northern hardwoods (sugar maple,

basswood, white ash, beach, red maple, hemlock and yellow birch). Upland forest accounts for 17,235 acres in the Black River Watershed and 6,918 acres in the Coastal watersheds.

Lowland Forests
Lowland forests include areas that support lowland hardwoods and conifers, such as northern white cedar, black spruce, balsam fir, elm, red maple, ash and aspen species. Lowland forests are concentrated along the coastal areas and are adjacent to lakes and streams. Lowland forest accounts for 7,257 acres in the Black River Watershed and 2,848 acres in the Coastal watersheds.

Non-Forest Wetlands
Wetlands are those areas between terrestrial and aquatic systems where the water table is at, near, or above the land surface for a significant part of most years. The hydrologic regime is such that it permits the formation of hydric soils or it supports the growth of hydrophytic vegetation. Examples of wetlands include marshes, mudflats, wooded swamps and floating vegetation situated on the shallow margins of bays, lakes, rivers, ponds, streams. These wetland categories include of shrub wetlands, fresh-water marshes, wet meadows, open bogs, emergent wetlands and aquatic bed wetlands. Lowland forest accounts for 2,783 acres in the Black River Watershed and 308 acres in the Coastal watersheds.

Two of the most important functions of wetlands, whether forested or non-forested, are water quality protection and ecological corridors. As can be noted on the Land Use/Land Cover Map, major wetland areas are adjacent to rivers and creeks. This network of wetlands receives surface water and subsurface water discharge, creating the streams and creeks, which in turn flow into area lakes. These interconnected resources exemplify how activities distant from major water bodies can still have an impact on the water quality. Forested and wetland information contained in the MIRIS data was not verified by field inspection when the data was compiled. Thus, areas shown as wetlands on the MIRIS system may not actually meet State and Federal criteria for legally regulated wetlands. However, the information is still valuable for general land use planning decisions.

Beaches/Dunes
Beaches include all sloping accumulations of exposed sand and gravel along shorelines and sand dunes. Beaches account for 256 acres in the Coastal watersheds.

Surface Water
Most of the waterways are too narrow to delineate, the only stream segment delineated is the lower section of the Black River. There are a few small lakes and ponds within the planning area. There are 256 acres of surface water in the Black River watershed.

Planning and Zoning Overview

Watershed management requires the use of many different techniques in order to be effective. Several valuable management tools are available to communities, organizations and local government to aide in the development of a watershed management plan. These include proactive elements such as research, monitoring, educational outreach programs, and voluntary land protection incentives for property owners in critical areas. Remedial measures such as implementation of Best Management Practices to restore nonpoint source pollution sites and incorporating conservation-friendly design standards into new developments are also important watershed management tools. Land use planning and zoning at the local level is a vital

component in watershed protection. In addition to the direct benefits for aquatic resources, planning and zoning tools can be used to ensure the conservation of wildlife habitat, provide for sustainable development, protect property values, and to help maintain community character.

A sound planning and zoning program requires that a community not only support the idea, but dedicate the trained personnel and funding to make the program work; effective planning and zoning involves commitment and resources.

In the state of Michigan, planning and zoning are implemented at the township, city, village, and county level. Communities have been given the authority, by the State of Michigan through the Michigan Planning Enabling Act (PA33 of 2008, as amended), to "make and adopt a basic plan as a guide for the development of unincorporated portions of the Township". One of the primary purposes of this Act is to secure the general, health, safety, and welfare of the Township by distributing wisely the Township's resources - physical, economic, and social - "in accordance with their character and adaptability".

Following adoption of a master plan, the local unit of government creates a zoning ordinance. In accordance with these acts, the zoning ordinance must be based on the goals and policies set forth in the master plan. The Michigan Zoning Enabling Act, Act 110 of Public Acts of 2006, as amended, provides the authority for the communities in the watershed to develop and administer a zoning ordinance.

In addition to planning & zoning, there are state regulations that are intended to help conserve natural resources. Relevant state laws for water resource protection include:

- Act 451, Part 91, Soil Erosion Control and Sedimentation Act (for earth changes within 500 feet of the shoreline)
- Act 451, Part 303, Wetland Protection (covers the dredging, draining, or filling of regulated wetlands; however, non-contiguous wetlands in rural counties are generally not regulated wetlands)
- Act 451, Part 301, Inland Lakes & Streams Act (covers work conducted below the ordinary high water mark)
- Public Act 368 (1978), Aquatic Nuisance Control

This is only a brief summary, please see the respective law or contact MDEQ for more information.

For some of the issues related to watershed management, agencies (beyond the local unit of government) have a regulatory role. In the case of soil erosion & sedimentation, the Michigan Department of Environmental Quality (MDEQ) has jurisdiction; they typically have an agreement with counties to enforce the program at the local level (thus counties have a Soil Erosion Officer). With regard to regulation of wetlands, MDEQ also has jurisdiction, authorized through the federal Clean Water Act. Regulations for septic systems are handled through the District Health Department. In all three of the areas listed above, a local community may adopt their own programs for managing the resource (standards adopted cannot be weaker than what the state would otherwise use). Such a decision to adopt a local ordinance may lead to more work for the local unit of government and a greater expenditure of fiscal resources; it may also create an opportunity to better achieve the goals identified in the community’s comprehensive master plan.

In any event, a local unit of government should develop a master plan (based on public input) that allows planning for future needs while maintaining existing features that are important to the community. The plan becomes the basis for the zoning ordinance. Attention should be paid to whether the standards in the zoning ordinance actually achieve the goals set forth in the master plan; oftentimes they do not. Once local government units have "good" land use policies in place, there is still work that needs to be done -- the governing body must keep their policies up-to-date and make decisions regarding infrastructure and zoning in accordance with their plan.

Often volunteers on local zoning boards are pressured to make a decision on a site-specific issue without considering the whole system. Zoning standards and decisions must be made with the comprehensive master plan in mind; it can be extremely difficult to step back from a particular issue and consider the big picture, but that is exactly what trained planning commission officials must do. In addition, zoning regulations need to be enforced and monitored. Without fair and impartial enforcement, the majority who comply with land use regulations are, in effect, penalized, because of the greater effort and expense they have incurred than those who disregard regulations. If enforcement is not consistent and fair, regulations will become increasingly ineffective as the majority of landowners disregard the rules, or as the court system ceases to uphold the regulations due to discriminatory enforcement

The following review of local land use regulations in the Black River Watershed was prepared by the Northeast Michigan Council of Government in 2011. This review is not intended to evaluate the history of planning and zoning within the watershed, nor is it intended to be the sole basis for determining the effectiveness of policies regarding water resource management. This evaluation should provide insight into how effective local units of government are at protecting aquatic resources and help to identify some of the obvious weaknesses in current zoning ordinances.

Planning and Zoning Review

All townships and the City of Harrisville administer their own planning and zoning. Alpena County has a County Planning Commission while Alcona County has chosen to not maintain a county planning commission. **Table 2-2** lists local government units within the watershed along with the adoption, amendment or revision dates of their master plans and zoning ordinances.

Table 2-2
Status of Planning and Zoning

Political Unit	Master Plan Year Adopted	Zoning Ordinance
Alcona Twp	2005	2009
Caledonia Twp	2005	2010
Greenbush Twp	NA	1996
Harrisville Twp	2008	Process of Updating
Hawes Twp	2005	
Haynes Twp	NA	NA
Sanborn Twp	2005	1995
City of Harrisville	2010	Process of Updating

Master Plans

The Michigan Planning Enabling Act, P.A. 33 of 2008, states a City, Village, Township and County may adopt, amend, and implement a master plan. The Michigan Planning Enabling Act states: *The general purpose of a master plan is to guide and accomplish, in the planning jurisdiction and its environs, development that satisfies all of the following criteria:*

a. *Is coordinated, adjusted, harmonious, efficient, and economical.*
b. *Considers the character of the planning jurisdiction and its suitability for particular uses, judged in terms of such factors as trends in land and population development.*
c. *Will, in accordance with present and future needs, best promote public health, safety, morals, order, convenience, prosperity, and general welfare.*
d. *Includes, among other things, promotion of or adequate provision for 1 or more of the following:*
    i. *A system of transportation to lessen congestion on streets.*
    ii. *Safety from fire and other dangers.*
    iii. *Light and air.*
    iv. *Healthful and convenient distribution of population.*
    v. *Good civic design and arrangement and wise and efficient expenditure of public funds.*
    vi. *Public utilities such as sewage disposal and water supply and other public improvements.*
    vii. *Recreation.*
    viii. *The use of resources in accordance with their character and adaptability.*

The enabling legislation clearly establishes a local unit of government has the authority and responsibility to plan for the natural resources in their community. The planning should consider the resources character and adaptability. In order to adequately accomplish this action, the master plan must first present a comprehensive inventory of its resources. Next the master plan should address the resources in its goals and objectives section. Finally, the future land use plan should indentify resource areas and provide recommendations for proper use and conservation of their resource base.

This section presents a review of each community's master plan. This task was a challenge from the stand point it was difficult to get copies of plans since none of the communities have planning staff, plans are not in digital format and several of the communities do not even have a copy machine to make copies for distribution. Three areas of the plans were examined, resource inventory in the existing sections, goals and objectives, and future land use plan. The review found that local community planning for resource conservation and protection is lacking. Most of the communities do not 1) provide a reasonable inventory of their resource base, 2) address natural resources in their goals section and 3) do not address natural resources in their future land use. Below is a summary of information from each community's master plan as related to natural resources.

Alcona, Caledonia and Hawes Townships (Tri-Townships)

In 1994 Alcona Caledonia and Hawes Township joined together to create a Tri-Townships Master Plan. The unifying element was water resources, in particular, Hubbard Lake. The townships retained their own planning commissions and administer their own zoning. However, the joint plan and quarterly

intergovernmental meetings have fostered coordination and consistency. The Tri-Townships Master Plan was updated in 2006.

Resource Inventory in Existing Conditions

The natural resources section provides detailed information, including maps, on resources and issues in the township. The following categories are addressed: climate, geology, topography, hydric soils and steeply sloped areas, septic system limitations, forests, wetlands, fish and wildlife, water, resources, Hubbard Lake shoreline assessment of greenbelts, cladophora, and erosion, and groundwater issues.

Goals and objectives

Public input sessions held during the master plan development found residents felt the communities are blessed with an abundance of high quality natural resources, including forests, wetlands, farmland/open space, lakes, rivers, wildlife and fish.
Additionally, there is a concern that failing septic systems, use of fertilizers and elimination of greenbelts negatively impacts water quality in lakes and streams. Other environmental concerns include low water levels, and gas production and processing facilities.

Natural Resource Goal: Protect and preserve the natural environment by protecting groundwater, surface water, environmentally sensitive areas, highly erosive areas, woodlands, wetlands, open space, fish and wildlife.

Objectives:

- Encourage a land use pattern that is oriented to the natural features and water resources of the area. Evaluate type and density of proposed developments based on soil suitability; slope of land; potential for ground water and surface water degradation and contamination; compatibility with adjacent land uses; and impacts to sensitive natural areas like wetlands, greenways and wildlife corridors.
- Limit and control the density and type of residential and commercial development adjacent to lakes, ponds, streams, and wetlands.
- Promote greenbelt areas adjacent to lakes, ponds, streams, and wetlands through development of a greenbelt section in each community's zoning ordinance.
- Implement groundwater protection and stormwater management regulations in each community's zoning ordinance, while encouraging the continued natural use of wetlands as groundwater recharge, stormwater filtering and stormwater holding areas.
- Limit development on steeply sloped areas. Require erosion control measures where construction is permitted. Require slope stabilization and revegetation on disturbed slopes or in extraction areas.
- Preserve topography such as slopes, valleys and hills by limiting the amount of cut and fill during site development.
- Encourage the integration of wetlands, woodlands and meadows into site development as aesthetic and functional features.
- Encourage the retention of agricultural lands, forest lands and ecological corridors through available mechanisms such as open space and farmland agreements, forest stewardship programs, and conservation easements, as well as zoning incentives.
- Encourage the use of native plant species and naturalized landscape designs, where appropriate, to enhance the communities' existing character.

- In recognizing the importance of trees in the suburban environment, encourage the retention of existing native trees and the establishment of street and shade trees in residential neighborhoods and commercial developments.

Future Land Use Plan
The Tri-Township master plan has three future land use areas that address natural resources and water resources. A summary of the three future land use categories follow.

Conservation Future Land Use Area
Location and Setting: The Conservation future land use category includes extensive areas of wetlands, lowland forests and flood plains associated with the interconnected network of streams and lakes. The areas include public and private lands conservation areas provide the backbone of the green infrastructure system in the Tri-Townships and function as stormwater retention areas, water quality buffers, critical wildlife habitat and recreation areas. Road access is limited and consists primarily of seasonally maintained county roads.

Uses: Conservation areas should be protected from intense development without denying private property owners reasonable economic use of the land. Primary uses to be encouraged in this category include hunting, fishing, skiing, hiking, camping, wildlife management and forestry management. Other compatible uses are large lot homes, and cabins. This plan encourages the retention of contiguous resource areas, river greenbelts, wetlands, scenic areas and wildlife habitat.

Development Density: The Conservation category is designed to provide protection to environmentally sensitive areas, while allowing for very limited and low intensity development to occur. This development would be consistent with recreational and conservation uses. A development density of one dwelling per 20 to 40 acres is recommended for the category.

Other Development Considerations: The plan further recommends communities consider incorporating open space development options, river setbacks, native vegetation greenbelts, waterfront overlay zones, and landscaping requirements into zoning ordinances. This future land use plan recognizes that existing parcels within the planning area may be less than the recommended minimum lot size. The Townships do not intend to restrict the construction of new residences or continued residential use of these existing parcels.

Forest Recreation Future Land Use Area
Location and Setting: The Forest Recreation future land use category is the most extensive future land use category in the Tri-Townships planning area. The land cover is a mix of upland forests (aspen, oak, northern hardwoods and pine), and old farm fields. Parcel sizes are mostly 40 acres and larger and include public and private ownership. Hunting camps are common on large tracts that are typically accessible by seasonally maintained roads.

Uses: The protection of forested land, wetlands, and non-forested open space is critical to preserving the rural character of the Townships. The fragmentation of large parcels is

discouraged. This category encourages the continuation of resource management and wildlands recreation activities

Development Density: The plan recommends this category accommodates single family dwellings at an average density of one unit per five to ten acres.

Other Development Considerations: The plan further recommends incorporating open space development options, native vegetation greenbelts, and landscaping requirements into the Zoning Ordinance.

Shore Area Residential Future Land Use Area
Location and Setting: Land adjacent to Hubbard Hake, Lake Huron and lower sections of the Black River are included in Shore Area Residential. Water features serve as important recreational, economic and natural assets within the Townships, shoreline properties will continue to be popular locations for residential growth. Environmental protection measures are key to sustaining long term, high quality surface water.

Uses: It is anticipated that single-family dwellings and cottages would be the primary uses, but existing water dependent services, tourism and recreation uses, and vacation resorts should continue to exist.

Development Density: Any new development along or near the many lakes and streams should require a greater standard of review to maintain or improve the quality of the Townships' water resources. New lots should be a minimum of 100 feet in width and 15,000 square feet in lot area.

Other Development Considerations: Future development proposals should address issues including erosion control, minimum building elevations, setbacks from the high water mark of the Great Lakes and inland lakes and streams, stormwater run-off, septic field setbacks from the water, shoreline buffering, keyhole development standards, and lower density development. In recognition of the common shared water features and interconnected network of lakes and streams, the Townships should consider adopting shore area overlay districts with common supporting language.

Greenbush Township

Greenbush Township completed an update of their master plan in 2005. The plan is very brief and does not address natural or water resources in the existing conditions, goals or future land use sections.

Resource Inventory in Existing Conditions
Cursory review of natural resource, there are no maps in the section.

Goals and objectives
Natural Resources are not specifically addressed in the goals section.

Future Land Use Plan
There is no future land use element in the master plan.

Harrisville Township

Harrisville Township completed an update of their master plan in 2008.The master plan addresses the water and natural resource base.

Resource Inventory in Existing Conditions

The natural resources section provides detailed information, including maps, on resources and issues in the township. The following categories are addressed: climate, geology, topography, soils, water resources, wetlands and woodlands, fish and wildlife, threatened and endangered species, and sites of environmental contamination, including maps on topography, soil conditions, and environmental resources.

Goals Section

Public input sessions held during the master plan development found residents greatly valued the abundance of high quality natural resources, including forests, wetlands, farmland/open space, lakes, rivers, wildlife and fish. The goal section is very brief with only four goals and no objectives. There is one goal that addresses natural resources.

Goal: Preserve the natural environment by protecting ground and surface water resources, especially Lake Huron, hillsides from erosion, glacial lake shorelines, woodlands and wetlands, and fish and wildlife.

Future Land Use Plan

Shoreline Protection

Recommended for all areas along the Lake Huron Shoreline and is considered an overlay to all land uses along the coast. Plan recommends addressing erosion protection measures on bluffs, protection of water views, water quality protection measures and waterfront density and access controls.

Haynes Township

The Township's master plan, while outdated, addresses the natural environment.

Resource Inventory in Existing Conditions

The master plan presents information on soils and use constraints, geology, wetlands and highly erodible Lake Huron shorelines, and surface and groundwater resources. The plan provides an analysis of development potential that considers environmental constraints. Included is a coastal management plan, which identifies Areas of Particular Concern.

Goals and objectives

Goal: To preserve and enhance the natural environment, according to its capabilities and limitations.

Objective and Policies: To recognize the limitations of the environment in terms of human developments.

- Avoid development of marginal soil types through strengthening of the Township's zoning ordinance.
- Protect groundwater resources from pollution and overuse to insure safe drinking water for all residents into the future.
- Identify and protect wetlands, flood plains and high risk erosion areas.

- Protect public and private forests through zoning and timber management.
- Protect the Lake Huron coastline from over development.
- Protect the existing wildlife species with a concerted effort to conserve their habitats.
- Adopt general design standards for preserving aesthetic qualities.

Future Land Use Plan
The future land use plan is lacking in addressing long term water resource protection. The plan has a future land use category called Forest/Open Space/Recreation; however its focus is strictly recreational.

Sanborn Township

Resource Inventory in Existing Conditions
The master plan presents information on geology, soils with development limitations, topography, surface water, and vegetation and wildlife.

Goals and objectives
Goal: To utilize and protect the natural environment and Lake Huron shoreline.
Objective: To recognize the importance of environmental development limitations and avoid overuse or misuse of the environment.

- Promote the protection of wetlands and high-risk erosion areas.
- Promote and conserve the public and private forests through zoning and sustainable timber management.
- Promote the Open Space Preservation Act, PA 177 of 2001.

Future Land Use Plan
The plan does not present future land use categories that address natural resources. There is a statement of Environmental Concerns. *"Due to the combination of forest and shoreline found in Sanborn Township, there are concerns for the protection of wetlands, floodplains, and high-risk erosion areas as well as conservation of forests. These can be addressed in part through strict adherence to existing laws, codes and ordinances and through the promotion of reasonable timber and wetlands management."*

City of Harrisville

Resource Inventory in Existing Conditions
The natural resources section provides detailed information, including maps, on resources in the city. The following categories are addressed: climate, geology, soils, wetlands, fish and wildlife, water resources, scenic values, surface water discharge permits, site of environmental contamination and sir quality.

Goals and Objectives
Goal: Protect and preserve natural resources.
Objectives:

- Encourage a land use pattern that is oriented to and respects the natural features and water resources of the area. Evaluate type and density of proposed developments based on soil suitability; slope of land; potential for ground water and surface water degradation and contamination; compatibility with adjacent land uses; and impacts to sensitive natural areas like wetlands, greenways and wildlife corridors.

- Evaluate the environmental impact of all new development.
- Protect land resources and water quality related to our lakes, streams and wetlands.
- Encourage the continued natural use of wetlands as groundwater recharge and stormwater holding areas.
- Protect shoreline areas from urban development impacts through conservation techniques like Lakescaping, conservation easements and resource education programs.
- Maintain greenbelt areas adjacent to the lake, pond, streams, and wetlands to protect water quality and critical wildlife habitat.
- Establish regulations and standards necessary to protect and preserve the quality of the air from degradation due to fumes, odors, smoke, dust and other pollutants.
- Establish regulations and standards to protect the community against high noise levels and exterior lighting glare.
- Encourage the use of native plant species and naturalized landscape designs, where appropriate, to enhance the city's existing character.

Future Land Use Plan

The future land use plan has a category called Conservation Residential. Areas designated as Conservation Residential are planned for moderate to large lot residential development including Planned Unit Developments. The goal of this future land use category is to maintain the rural character of the area by allowing single- and two-family residential development while at the same time protecting significant natural resources and features such as wetlands and forested areas. This document also recommends that Planned Unit Developments (PUD) be listed as an allowable use in this district. Flexibility should be built into the PUD regulations to allow for flexible design standards and variation in lot sizes to accommodate the need to design the development around natural features. Hydric soils are found in both of these areas, so any development that occurs in these areas should take the soil suitability into consideration and each site should be evaluated by a qualified professional before development occurs.

Special Issue Planning Area: Waterfront: The City of Harrisville encompasses approximately 1.25 miles of Lake Huron shoreline in its boundaries. The ecological and economic importance of this shoreline has led the City to place the shoreline in a Waterfront Special Issue Planning Area. This plan recommends development regulations in a Shoreline Protection Overlay Zone in order to take proactive measures to protect coastal property values by maintaining the attractive natural character, to prevent water pollution and control shoreline erosion, and to maintain and manage native vegetation and wildlife habitat. The provisions of the Shoreline Protection Overlay Zone are intended to protect the unique and sensitive natural environment of the Lake Huron shoreline in Harrisville. All site plans in this zone should depict the shoreline, all structures proposed and existing, neighboring structures, planned changes in grade, any temporary or permanent soil erosion and sedimentation control measures, and vegetation to be cleared, to remain, and to be planted. Additional review items may be added as Zoning Ordinance provisions are amended. The site plan review standards should reflect: minimal impact to fish, birds, wildlife, and native vegetation; erosion and sedimentation prevention; the natural character and aesthetic value of the shoreline is maintained; site development is appropriate to the topography and soil; and structures are located to maintain an open

and unobstructed view to the waterfront from adjacent properties to the maximum extent possible.

Zoning Ordinances

To determine regulatory coverage for aquatic resources within the Black River Watershed, local zoning ordinances were reviewed to evaluate what, if any, environmental provisions are in place that may have an impact on water resources. **Table 2-3** can assist local government policy makers in identifying how their ordinances might be amended to better protect water resources. The ordinances were specifically reviewed for the following:

- *Vegetative Buffer Zones* (Greenbelts): With regard to minimizing the impact of residential development along the waterfront, ensuring that natural vegetation is retained along the shoreline is generally considered one of the most important actions that can be taken. Vegetative buffers help to filter nutrients, reduce erosion, and provide natural habitat. Although much research has been done through the years to verify the effectiveness of vegetative buffers, there are several practical difficulties with having a "greenbelt ordinance." It can be difficult to enforce, many local officials and residents are unaware of what an effective greenbelt consists of, historic patterns of development have already degraded many areas (and these may be "grandfathered" in), zoning language is often poorly worded for proper enforcement, and citizens are often unaware that there is an ordinance in place. Even with the negatives, however, maintaining a greenbelt is essential to protecting water resources – even a 25-foot greenbelt can be effective.

  The waterfront greenbelt language is sorely lacking in local zoning ordinances. Alcona Township is the only community in the watershed area that addresses waterfront greenbelts or waterfront vegetative buffer zones.

- *Setbacks of structures* along the waterfront are important for reducing the amount of impervious surface near the water, helping to ensure that a greenbelt can be maintained, and reducing the potential for serious resource problems. A structure that is setback only 30 or 40 feet is more likely to generate runoff pollutants and sediments into water resources than a structure 75 or 100 feet away from the water's edge. Unfortunately, many local units of government that do have an effective setback for homes will make many exceptions for large decks and boathouses. Such exemptions defeat the intent of the setback, as impervious surface cover will still be present near the water's edge. Setback requirements should be regarded as a key element for water resource protection. In the watershed setback requirements from waterfronts range from 25 feet to 40 feet. These setbacks are not adequate to address water quality protection.

- *Minimum Lot Width for waterfront parcels* is important for the protection of water bodies because it ultimately determines the number of homes that will be built on the water. Smaller lot widths around a lake lead to more homes, which in turn will increase wastewater treatment needs; user conflicts; fertilizer inputs to the lake; stormwater runoff; increased site erosion, and loss of native vegetation. The compounding factor for shoreline development is the water table adjacent to lakes and streams tend to be closer to the surface and therefore septic systems function less effectively in treating septage. As seasonal home convert to year round homes the construction of upgraded septic systems

and providing required drinking well and septic system separation become an issue. Lot widths range from 66 feet to 100 feet.

- *Open space preservation* is used for communities to protect their rural character, as well as maintain prime recreational, farm or forest land. Unfortunately, most zoning ordinances, if implemented as written, will not accomplish those goals. In the Black River Watershed, Alcona, Greenbush and Sanborn Township and the City of Harrisville provide open space development options in their Planned Unit Development (PUD) sections. .

- *Septic Systems* are under the jurisdiction of the District Health Department. While new systems are required to meet health standards, the Health Department does not routinely inspect older systems unless there are severe problems. Some local units of government have begun to initiate their own programs for inspections, maintenance, or replacement requirements. Generally, such a program is being run as a "Point of Sale" program, whereby inspections of septic systems are required at the time of property transfer. System upgrades are then required for those systems that are not working properly. Alcona and Hawes Townships have septic system inspections requirements within their respective zoning ordinances.

- *Wetland Protection* is handled through the Michigan Department of Environmental Quality. Communities have the ability to adopt their own wetland ordinance, which is authorized through the state wetland act. The ordinance has to be the same or more restrictive than the State. Communities can also address wetland protection in their zoning ordinance. As can be noted in **Table 2-3**, none of the communities in the watershed has a "stand alone" ordinance or address wetland protection in their zoning.

- *Stormwater Management*
  Managing stormwater run-off is important to protecting surface water quality. The use of retention basins, vegetative buffers, rain gardens and swales will slow the discharge and cleanse the water before it is discharged to a stream or lake. Alcona Township is the only community with stormwater management provisions it its zoning ordinance.

- *Other Environmental Provisions*
  Communities have the ability to address water quality and resource protection through the state's planning and zoning enabling legislation. Other mechanisms include: soil erosion and sedimentation control ordinance; keyhole development regulations; natural rivers ordinance; high risk erosion areas ordinance; environmentally sensitive future land use plan; environmental assessment requirements; fees for professional reviews; sensitive areas protection; cluster development and planned unit development;, shoreline protection; groundwater protection standards; site plan review; and permit coordination checklist. Alcona Township has groundwater protection and keyhole development provisions and Hawes Township address keyhole development.

In summary, as with the community master plans, most communities are lacking in resource conservation in the zoning regulations. Only two of the communities have provisions for waterfront greenbelts. Waterfront setbacks are not adequate to provide water quality protection. None of the communities address wetland protection in the zoning. Only one community has stormwater management provisions and well as groundwater protection provisions.

Table 2-3
Summary of Environmental Provisions in the Black River Watershed

	Alcona Twp	Caledonia Twp	Greenbush Twp	Harrisville Twp	Hawes Twp	Haynes Twp	Sanborn Twp	City of Harrisville
Vegetative Buffer Zones/ Greenbelt	50 ft.	No provisions	No provisions	20 ft.	No provisions	——	No provisions	20 ft. Bluffline 45'
Waterfront Setbacks	40 ft.	40 ft.	25 ft.	50 ft.	40 ft.	——	25 ft.	Not addressed
Minimum Lot Width for Riparian Parcels	100 ft. AG- 300 ft.	100 ft.	100 ft.	Underlying zone	80 ft.	——	80 ft.	66 ft.
Open Space Provisions	Multifamily Residential	No provisions	PUD Section	No provisions	No provisions	——	Yes Residential	PUD Section
Septic Systems Provisions	Yes	Yes	No provisions	50 ft. water	Yes	——	No provisions	Public Sewer
Wetland Protection provisions	No provisions	No provisions	No provisions	No provisions	No provisions	——	No provisions	No provisions
Stormwater Management Provisions	Parking, Site Plan Review, & Stormwater Retention Requirements	No provisions	No provisions	No provisions	No provisions	——	No provisions	No provisions
Other Environmental Provisions	Groundwater Protection Keyhole Development	No provisions	No provisions	Shoreline Overlay Zone Environmental Conservation Zone	No provisions	——	No provisions	No provisions

Recreation

The largest single landowner is the State of Michigan. State forest land and Negwegon State Park are open to public for recreation. Negwegon State Park is accessible by a single road off Sandhill Road. From the parking lot, users can access the parklands on non-motorized trails. The Park is a popular access site for Kayakers. There are back country campsites for hikers and kayakers. Sturgeon Point Lighthouse and State Park is located on the coast approximately half way between the community of Black River and Harrisville. The park is an historic site and provides day use recreational opportunities. Harrisville State Park, located on the southern edge of the City of Harrisville, is a popular campground and day use park.

The City of Harrisville operates a marina. A boat launch facility, operated by the State of Michigan, is located adjacent to the City Marina. Alcona Township has a park at the mouth of the Black River. It is a day use park with picnic facilities and a boat ramp, which provides access to Lake Huron. Kayakers also launch at the Alcona Township Park and paddle to Negwegon State Park.

Governmental Units

The Black River/Coastal Watersheds are located primarily in Alcona County, with a small part extending into Sanborn Township in Alpena County. Within Alcona County, minor civil divisions in the watershed planning area include Alcona, Haynes, Harrisville, Greenbush, Hawes and Caledonia, and Sanborn Townships and the City of Harrisville. Planning and zoning is administered at the township and city level. Alpena County has a countywide planning commission but does not administer zoning.

Demographics

Population by Municipality

All of the communities, except Sanborn Township, gained year round population between 1990 and 2000, **Table 2-6**. Obtaining accurate numbers of seasonal residents and tourists is difficult. Since the U.S. Census is conducted each decade in April, the population numbers only reflect those persons who live in the county on a year-round basis. Given the high number of seasonal residences **(Table 2-4)**, particularly waterfront properties, the population is significantly higher during summer months and key holidays. Population growth is also related to the high number of seasonal structures. As second home owners from downstate retire, they often sell their primary residence and move to their "up-north" residence.

Table 2-4
Population For Counties & Municipalities, 1990-2000

Municipality	1990 Population	2000 Population	Population Change 1990-2000	Percent Change 1990-2000
Alcona Township	906	1,089	183	20.2%
Caledonia Township	987	1,203	216	21.9%
Greenbush Township	1,373	1,499	126	9.2%
Harrisville Township	1,315	1,411	96	7.3%
Hawes Township*	1,035	1,167	132	12.8%
Haynes Township	549	724	175	31.9%
City of Harrisville	470	571	47	9.4%
Alcona County	10,145	11,719	1,574	15.5%
Sanborn Twp.	2,196	2,152	-44	-2.0%
Alpena Co.	30,605	31,314	709	2.3%

Source: U.S. Bureau of the Census
* Includes parts of Village of Lincoln

Household Characteristics

Table 2-5 presents information on household characteristics gathered in the 2000 US Census. Information includes total number of households, average household size, family households and householder living alone. The average household size in both Counties was smaller than the state average, a reflection of households with older couples and no children. Additionally, younger families with children are migrating out of the region in search of employment.

Table 2-5
Household Characteristics - 2000

MUNICIPALITY	Total Households	Avg. Household Size	Family Households	Householder Living Alone
Alcona Township	524	2.08	361	154
Caledonia Twp.	535	2.25	380	129
Greenbush Twp.	685	2.19	474	187
Harrisville Twp.	555	2.37	405	125
Hawes Twp.*	528	2.20	354	156
Haynes Township	308	2.35	230	70
City of Harrisville	239	1.92		99
Alcona County	5,132	2.24	3,568	1,366
Sanborn Twp.	838	2.54	619	184
Alpena County	12,818	2.40	8,694	3,557
Michigan	----------	2.56	----------	----------

Source: U.S. Bureau of the Census
* Count includes parts of Lincoln

Housing Characteristics

The US Census reports a wide variety of housing characteristics. Within the watershed rural areas tend to have a very high percentage of owner occupied housing units, whereas, the City of Harrisville and the State as a whole have much lower percentages. In Alcona County, another housing characteristic that contrasts sharply with the state is percent seasonal housing units. The percent seasonal housing units range from 20 to 57 percent for local communities as compared to 5.5 percent in the State. Sanborn Township and Alpena County have numbers closer to the State figures. See **Table 2-6.**

Table 2-6
Housing Characteristics - 2000

MUNICIPALITY	Total Housing Units	Total Occupied Housing Units	% Owner Occupied	% Renter Occupied	Total Seasonal Housing Units	% Seasonal *	Total Vacant % Owner	Total Vacant % Renter
Alcona Township	1313	524	94.5%	5.5%	748	57.0%	3.3%	9.4%
Caledonia Twp.	1074	535	92.9%	7.1%	513	47.8%	2.0%	11.6%
Greenbush Twp.	1453	685	90.2%	9.8%	733	50.4%	2.2%	10.7%
Harrisville Twp.	790	555	90.8%	9.2%	205	25.9%	1.9%	12.1%
Hawes Twp.**	1003	528	91.5%	8.5%	433	43.2%	2.4%	18.2%
Haynes Township	598	308	93.5%	6.5%	276	46.2%	0.7%	0.0%
City of Harrisville	327	239	64.9%	35.1%	66	20.2%	3.1%	13.4%
Alcona Co.	10584	5132	89.9%	10.1%	5067	47.9%	2.6%	11.0%
Sanborn Twp.	979	838	93.3%	16.7%	90	9.2%	1.0%	11.4%
Alpena County	15,289	12,818	79.1%	20.9%	1,658	10.8%	1.6%	6.5%
Michigan	----------	----------	73.8%	26.2%	---------	5.5%	1.6%	6.8%

Source: U.S. Bureau of the Census
* Figure shows the seasonal housing units as a percentage of the unit's total housing units.
** Count includes parts of Lincoln

Selected Economic Indicators for Alcona County

In Alcona County, population estimates show a loss in population. The number of people in the labor force, and employment has dropped from 2004; as well, the unemployment rate has increased. Alcona County was 25th in the nation (3144 counties) in highest unemployment rate. Per capita and median household income has increased since 2000. However, poverty rates have also increased in recent years.

Population (2008)	11,556	Per Capita Personal Income (2006)	$23,303
Population (2004)	11,624	Median Household Income (2007)	$34,121
Labor Force (2009)	4,171	Adults over 25 years with Bachelor's Degrees (2007)	10.9%
Employment (2009)	3,392	Poverty Rate (2007)	13.5%
Unemployment Rate (2009)	18.7 %	Children in Poverty Rate (2005)	27.2%

Agencies and Organizations

The following agencies and local organizations are involved with environmental programs and concerns within the watershed:

Michigan Department of Natural Resources
Mission Statement: The Michigan Department of Natural Resources is committed to the conservation, protection, management, use and enjoyment of the state's natural and cultural resources for current and future generations.

Four Priorities of the DNR
- ✓ A Renewed Emphasis on Customer Service
- ✓ Strong Support of the Recreation Passport
- ✓ Increase Participation in Outdoor Recreation and Reverse the Decline in Hunting and Fishing Participation
- ✓ Fostering the Growth of Michigan's Natural Resource-Based Economy

Michigan Department of Environmental Quality
Vision: We, in the Michigan Department of Environmental Quality (DEQ), protect and enhance Michigan's environment and public health. As stewards of Michigan's environmental heritage, we work on behalf of the people of the Great Lakes state for an improved quality of life and a sustainable future. In service to the public, we administer programs and enforce laws that protect public health and promote the appropriate use of, limit the adverse effects on, and restore the quality of the environment. We encourage voluntary actions to enhance our natural resources and the environment. We preserve biological diverse, rare, sensitive, or endangered plants, animals, and ecosystems through identification, education, management, and public/private partnerships and initiatives. We advance environmental protection through innovation and improvements to regulations and programs.

Huron Pines Resource Conservation & Development Council
Huron Pines RC&D Council is a non-profit, non-governmental organization serving the eleven county region of Northeast Michigan.

Mission: Huron Pines' mission is to conserve the forests, lakes and streams of Northeast Michigan.

Vision: Huron Pines is the recognized leader for developing projects and partnerships that restore, enhance and sustain the natural resources in Northeast Michigan.

US Department of Agriculture
Mission: Enhance the quality of life for the American people by supporting production of agriculture:
- ✓ Ensuring a safe, affordable, nutritious, and accessible food supply
- ✓ caring for agricultural, forest, and range lands
- ✓ supporting sound development of rural communities
- ✓ providing economic opportunities for farm and rural residents
- ✓ expanding global markets for agricultural and forest products and services
- ✓ working to reduce hunger in America and throughout the world

Natural Resource Conservation Service
Mission Statement: The Natural Resources Conservation Service provides leadership in a partnership effort to help people conserve, maintain, and improve our natural resources and environment.

Conservation Districts
Michigan's Conservation Districts are "unique" local units of State Government that utilize state, federal and private sector resources to solve today's conservation problems. The guiding philosophy of all Conservation Districts is that decisions on conservation issues should be made at the *local level*, by *local people*, with technical assistance provided by government.

Northeast Michigan Council of Government
Mission Statement: NEMCOG is committed to facilitating the development of intergovernmental cooperation and coordination within the eight-county region of Northeast Michigan. The agency is also committed to providing for a controlled growth policy; to preserve and improve the environment, to pursue greater efficiency and responsiveness of local units of government, and to improve the ecological, social, and economic well being of citizens within the region.

District Health Department #2
Vision: District Health Department #2 will be the primary resource for individual, community and environmental health. Our values will be responsiveness, caring and excellence. The employees and board of District Health Department #2 are committed to:

- ✓ Customer - through our customer service focus
- ✓ Employees - through our staff development efforts
- ✓ Fiscal responsibility - through our prudent management
- ✓ Improvement - through our quality process
- ✓ Community - through our collaboration and partnerships

Mission: District Health Department #2 provides leadership in promoting environmental and personal health through health promotion, disease detection, disease prevention, education and regulation.

In cooperation with community resources, the department is responsible for assisting the community and citizens to assume responsibility for their health and the health of the community

Michigan Sea Grant
Michigan Sea Grant is a cooperative program of the University of Michigan and Michigan State University and is part of the National Sea Grant College Program. Michigan Sea Grant enhances the sustainability of Michigan's coastal communities, residents, and businesses through research, outreach and education.

Mission: Michigan Sea Grant supports research, outreach, and education to enhance the sustainable use of Great Lakes resources to benefit the Michigan, Great Lakes and national economy, the environment, and quality of life.

Our vision is healthy and sustainable Great Lakes resources achieved through an integrated program that engages universities, public and private sectors.

Headwaters Land Conservancy
HeadWaters Land Conservancy is a Michigan based 501c3 non-profit land trust comprised of a Staff, Board of Directors, Volunteers and Members who all share in the mission of protecting and preserving the remaining undisturbed natural resources of northeast Michigan. These natural resources include regionally important agricultural lands, undeveloped tracts of forests for both timber and wildlife habitat, scenic or aesthetically pleasing landscapes for both daily enjoyment and to encourage tourism, and perhaps the most important, the protection of our fresh water resources in our sensitive swamps, streams, and lakes.

Michigan State University Extension
Mission: "Michigan State University Extension (MSUE) helps people improve their lives through an educational process that applies knowledge to critical issues, needs and opportunities."

Since its beginning, MSUE has focused on bringing knowledge-based educational programs to the people of the state to improve their lives and communities. Today, county-based staff members, in concert with on-campus faculty members, serve every county with programming focused on agriculture and natural resources; children, youth and families; and community and economic development.

US Fish and Wildlife Service
"The U.S. Fish and Wildlife Service's mission is, working with others, to conserve, protect and enhance fish, wildlife, and plants and their habitats for the continuing benefit of the American people."

Chapter 3 - ALCONA BLACK RIVER AND COASTAL WATERSHEDS RESOURCE INVENTORY AND ASSESSMENT

A complete inventory and assessment of a watershed is critical to the planning process. The inventory and assessment results provide insight into the overall health of the watershed. A resource inventory and assessment can be broken down into three general categories: 1) non-point source pollution inventories, 2) water quality sampling, and 3) other resource assessments used to identify potential risks to water quality. Non-point source pollution inventories include the assessment of streambank and shoreline erosion, road/stream crossings, agriculture practices, and stormwater systems. Water quality sampling includes an assessment of such parameters as biological, chemical and temperature. Other resource assessments include analyses of watershed geology, soils characteristics, climate, land use and local planning and zoning policies. The resulting data sets help identify critical areas of the watershed, guide development of watershed planning goals, and provide baseline data from which future progress can be measured.

Nonpoint Source Pollution Inventory

Nonpoint source pollution can find its way into a water system through various means. When streambanks and shorelines erode, sediments are deposited into lakes and rivers. Sediments and other pollutants can be washed into streams at road/stream crossings. Agricultural and residential areas contribute fertilizers and pesticides, and storm drains provide an even more direct route for pollutants to enter waterways during a storm event.

Streambank Erosion Inventory

Eroding streambanks deposit excess soil into the river system. This sedimentation can reduce water clarity, impede navigation, contribute excessive nutrients, and degrade habitat for fish and other aquatic life. Evaluation of the streambanks in the watershed is critical in determining not only which sites need immediate attention, but also in identifying sites that may pose potential sedimentation problems in the future.

In order to determine the quantity, severity and location of streambank erosion sites within the watershed, a field inventory was conducted in the summer of 2009.

Methodology
The streambank inventory was conducted by the Alcona Black River Watershed Advisory Council (ABRWAC) members and Northeast Michigan Council of Governments (NEMCOG) staff using a variety of methods, including topographical maps, soil studies, watercraft were used where the stream was navigable, and walking the streams. Each erosion site was given an identification number, the condition of the site was documented, and photographs were taken of the streambank. Data collected at each site include: area of eroded bank; slope of bank; soil type; amount of vegetation present; the condition of the bank; and the extent and causes of the erosion. In order to identify the most critical erosion sites, a ranking system that evaluates the collected data was used, and each erosion site was determined to be either a *Minor*, *Moderate*, or *Severe* environmental concern. A copy of the data collection form and severity scoring sheet can be found in **Appendix A**.

Pollutant Loading Estimates
The total sediment loading was calculated for each streambank erosion site identified within the watershed. The Channel Erosion Equation (CEE) was used to calculate the total sediment loading in tons per year.

$$\text{CEE} = \text{Length (ft)} * \text{Height (ft)} * \text{LRR (ft/year)} * \text{Soil Weight (ton/ft}^3\text{)}$$

The Lateral Recession Rate (LRR) is the thickness of soil eroded from the bank surface (perpendicular to the face) in an average year. For this application, the LRR was determined using the severity index for each site. The following values were used for erosion severity: Slight = .02, Moderate = .14, Severe = .4, and Very Severe = .5.

The sediment load estimate for each erosion site was used to calculate the estimated amount of attached nutrients, specifically phosphorus and nitrogen, which are transferred into the water body. This process uses information collected by USDA-ARS researchers and starts with a phosphorus concentration of 0.0005 lbP/lb of soil and a nitrogen concentration of 0.001 lbN/lb of soil. The following equations were used to calculate the nutrient loading:

$$\text{Phosphorus Loading} = \text{Sediment Load (ton/yr)} * 0.0005 \text{ (lbs P/lb soil)} * 2000 \text{ (lbs/ton)} * \text{soil correction factor}$$

$$\text{Nitrogen Loading} = \text{Sediment Load (ton/yr)} * 0.001 \text{ (lbs N/lb soil)} * 2000 \text{ (lbs/ton)} * \text{soil correction factor}$$

Soil texture is determined and a correction factor is used to better estimate nutrient holding capacity of the soil (MDEQ, 1999). The soil correction factor for sandy soils is 0.85 and for clay soils is 1.15.

Pollutant Reduction Estimates
With an analysis of both the causes and severity of each streambank erosion site, best management practices (BMPs) were recommended. Installation of vegetative buffers on eroded sites will reduce approximately 75% of sediment loading into a river system. Sediment reduction estimates were calculated by multiplying the sediment load for each erosion site by a value of 0.75 for the BMP efficiency.

Because the nutrient load estimates are based on the total sediment loading, the load reduction estimates for phosphorus and nitrogen are based on the amount of sediment reduction.

Phosphorus Reduction = Sediment Reduction (ton/yr) ∗ 0.0005 (lbs P/lb soil) ∗ 2000 (lbs/ton) ∗ soil correction factor

Nitrogen Reduction = Sediment Reduction (ton/yr) ∗ 0.001 (lbs N/lb soil) ∗ 2000 (lbs/ton) ∗ soil correction factor

Results

Fourteen streambank erosion sites were located within the Alcona Black River watershed (See **Map 1 – Streambank Erosion Sites**). Two of the sites show minor amounts of erosion, eight have moderate erosion, and four sites are considered severe. The causes of erosion varied from site to site. A few of the erosion sites were naturally occurring from a bend in the river, wildlife access or bank seepage. The erosion at many of the sites, however, was the result of human activities. **Table 3-1** provides a summary of erosion causes, recommended treatments, erosion severity, and the sediment loading and reduction estimates. When implementing streambank BMPs, priority should be given to those sites contributing the highest amounts of sediment to the river system. However, variables such as landowner cooperation, partner involvement and the level and availability of funding may also be considered. Implementation of BMPs at the three sites contributing the most sediment would result in a 45% reduction of sediment loading from streambank erosion. Implementation at the five largest contributing sites would result in a 60% reduction of sediment loading. However, due to the relatively small number sites and associated landowners, and their close proximity to one another, restoring all 14 erosion sites is recommended.

Table 3-1
Sediment Load Reduction for Streambank Erosion Sites

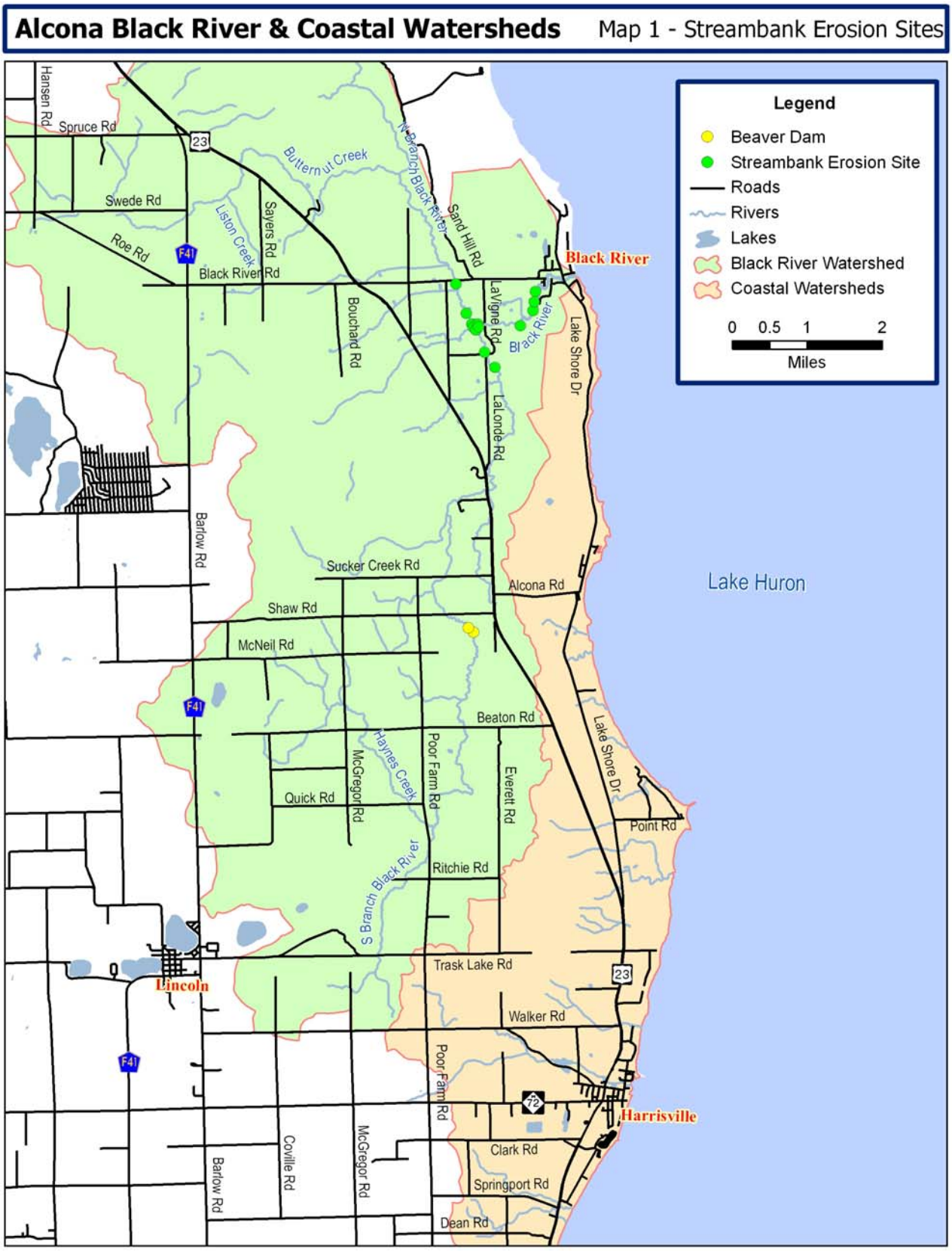
Water Body	Site ID	Apparent Cause	Recommended Treatment	Length/ Height of Site (ft)	Severity	Current Load (tons/year)	Estimated Reduction (tons/year)
North Branch Black River	SB01	Bend/obstruction (logjam) in river	Reposition log jam, Brush placement	16 / 2	Minor	0.03	0.02
	SB02	Bend in river, foot traffic, landuse	Revegetation, bank sloping or log terrace, biolog, tree revetment	175 / 7	Severe	26.95	20.21
	SB03	Bend in river, foot traffic, wildlife, landuse	Revegetation, bank sloping, biolog, tree revetment	200 / 9	Severe	39.60	29.70
	SB04	Bend in river, landuse	Revegetation, bank sloping or terrace, biolog, tree revetment	125 / 9	Moderate	8.66	6.50
	SB05	Bend in river, bank seepage	Revegetation, bank slopingor log terrace, biolog, tree revetment	125 / 9	Moderate	8.66	6.50
	SB06	Bend in river, landuse	Revegetation, bank sloping or log terrace, biolog, tree revetment	125 / 8	Minor	1.10	0.83
	Subtotal					85.00	63.76
Black River	SB07	Bend/obstruction in river, foot traffic, landuse	Revegetation, bank sloping, obstruction removal, biolog/revetment	80 / 10	Moderate	17.60	13.20
	SB08	Bend in river, bank seepage	Revegetation, bank sloping, biolog, tree revetment	100 / 10	Moderate	4.90	3.68
	SB09	Bend in river, landuse	Revegetation, bank sloping, biolog, tree revetment	200 / 6	Moderate	9.24	6.93
	SB10	Bend in river, foot traffic, lanuse	Revegetation, bank sloping, biolog, tree revetment	150 / 6	Moderate	6.93	5.20
	SB11	Bend in river, wave action, bank seepage	Revegetation, bank sloping, biolog, tree revetment, brush placement	400 / 6	Severe	52.80	39.60
	SB14	Bend in river, confluence of N & S branches, foot traffic	Revegetation, LUNKER structure, Rock rip-rap	100 / 3	Moderate	2.31	1.73
	Subtotal					93.78	70.34
South Branch Black River	SB12	Bend in river, landuse	Revegetation, LUNKER structure, biolog, tree revetment	125 / 4	Moderate	3.85	2.89
	SB13	Bend in river, foot traffic, landuse	Revegetation, bank sloping or log terrace	175 / 10	Severe	38.50	28.88
	Subtotal					42.35	31.77
Totals						**221.13**	**165.85**

Table 3-2 outlines the current loading for phosphorus and nitrogen as well as the estimated nutrient reductions with BMP implementation.

Table 3-2
Nutrient Load Reduction for Streambank Erosion Sites

Water Body	Site ID	Phosphorus (lbs/year)		Nitrogen (lbs/year)	
		Current Load	Estimated Reduction	Current Load	Estimated Reduction
North Branch Black River	SB01	0.03	0.02	0.06	0.04
	SB02	22.91	17.18	45.82	34.36
	SB03	33.66	25.25	67.32	50.49
	SB04	7.36	5.52	14.73	11.04
	SB05	7.36	5.52	14.73	11.04
	SB06	0.94	0.70	1.87	1.40
	Subtotal	72.26	54.19	144.53	108.37
Black River	SB07	14.96	11.22	29.92	22.44
	SB08	5.64	4.23	11.27	8.45
	SB09	7.85	5.89	15.71	11.78
	SB10	5.89	4.42	11.78	8.84
	SB11	44.88	33.66	89.76	67.32
	SB14	1.96	1.47	3.93	2.95
	Subtotal	81.18	60.89	162.37	121.78
South Branch Black River	SB12	3.27	2.45	6.55	4.91
	SB13	32.73	24.54	65.45	49.09
	Subtotal	36.00	26.99	72.00	54.00
Total		**189.44**	**142.08**	**378.88**	**284.16**

For more detailed information on each erosion site, see **Appendix B: Streambank Erosion Inventory.**


Alcona Black River & Coastal Watersheds
Map 1 - Streambank Erosion Sites
Legend
Beaver Dam
Streambank Erosion Site
Roads
Rivers
Lakes
Black River Watershed
Coastal Watersheds
0 0.5 1 2
Miles
Lake Huron
Black River
Lincoln
Harrisville
Hansen Rd
Spruce Rd
Swede Rd
Roe Rd
Black River Rd
Buttern ut Creek
Liston Creek
Sayers Rd
N Branch Black River
Sand Hill Rd
Bouchard Rd
LaVigne Rd
Black River
Lake Shore Dr
LaLonde Rd
Barlow Rd
Sucker Creek Rd
Alcona Rd
Shaw Rd
McNeil Rd
Beaton Rd
Haynes Creek
McGregor Rd
Poor Farm Rd
Everett Rd
Quick Rd
Point Rd
Ritchie Rd
S Branch Black River
Trask Lake Rd
Walker Rd
Clark Rd
Springport Rd
Dean Rd
Coville Rd
23
F41
72

Road/Stream Crossing Inventory

A road/stream crossing site exists wherever a road or street and a stream intersect. Road/stream crossings can be major contributors of sediments and other pollutants to the water system. Dirt and gravel from shoulders of the roads, or from unpaved roads, can be washed into a stream. The resulting build up of sediments in the stream is called *sedimentation*. Although sediments entering waterbodies is a natural process, excess amounts can wreak havoc on the aquatic environment. Some detrimental effects of sedimentation are:

- Destruction of aquatic habitat and the extermination of aquatic wildlife
- Negative impacts on birds and mammals dependent on the aquatic environment
- Restriction of plant productivity due to reduction of sunlight penetration
- Warming of waters, which can lead to destruction of coldwater fisheries
- Release of nutrients into the water system, causing the stimulation of algae growth
- Introduction into the water body of harmful pesticides, toxic metals, and bacteria which may adhere to the grains of sediment
- Disruption of the fish life cycle by affecting their ability to feed, spawn, and inhibiting gill function
- Reduction of width and depth of the stream channel, and the potential increase in flooding events

The amount of sedimentation experienced by a waterbody depends on several factors, such as the length and slope of the approaches, steepness of the embankment, whether or not the road is paved, the amount of vegetative cover along shoulders and ditches at the site, and the runoff path. These factors need to be taken into consideration in the development of any plan proposed to reduce the rate of sedimentation at road/stream crossings.

Methodology

Volunteer members of the ABRWAC conducted the road/stream crossing inventory, with assistance from the Huron Pines RC&D Council and the financial support of a grant from the Community Foundation of Northeast Michigan. Huron Pines provided training to the council members in May 2007. The first step in the training was a presentation by Huron Pines staff on what affects water quality, and instructions on how to fill out the inventory data form. Next, Huron Pines staff assisted council members in inventorying several road/stream crossings so they could gain some hands on experience. The council members inventoried the remaining road/stream crossings in June of 2007 and supplied all of the information to Huron Pines. Huron Pines compiled the data, identified priority sites, and developed suggested BMPs and cost

estimates. In the summer of 2009, council members and NEMCOG staff completed the road/stream crossing inventory for the coastal watersheds.
At each site, photographs were taken of crossing structures, the stream, and approaches. Physical condition and measurements of the culvert, the roadway, the length and slope of approach, road width and surface type, stream depth and current, amounts and causes of erosion, and extent of vegetation were recorded. Using the data collected, each site was assigned a ranking of minor, moderate or severe based on the point system found on the severity-ranking sheet. Sample inventory data sheets and ranking sheets are included in **Appendix A**.

Pollutant Loading Estimates
The total sediment loading was calculated for each road/stream crossing site identified within the watershed. Two equations were used to determine the total sediment loading. First, the Revised Universal Soil Loss Equation (RUSLE) was used to calculate the sediment load for each approach.

$A = R * K * LS * C * P$

A = average annual soil loss in tons/acre
R = rainfall-runoff erosivity factor
K = soil erodibility factor
LS = slope factor
C = cover management factor
P = support practice factor

The cover management factor for paved roads is 0.12 and for unpaved roads is 1. The second equation was the Channel Erosion Equation (CEE). The CEE was used to calculate the sediment load of each embankment.

$$CEE = \text{Length (ft)} * \text{Height (ft)} * \text{LRR (ft/year)} * \text{Soil Weight (ton/ft}^3\text{)}$$

The Lateral Recession Rate (LRR) is the thickness of soil eroded from the bank surface (perpendicular to the face) in an average year. For this application, the LRR was estimated by judging the severity of the erosion on each embankment. The following values were used for LRR: Slight = .02, Moderate = .14, Severe = .4 and Very Severe = .5. The total from each equation, the RUSLE and the CEE, was added together for a total sediment loading estimate per site.

The total sediment load for each road/stream crossing was used to calculate the estimated amount of attached phosphorus and nitrogen which are discharged into the water body each year. This process uses information collected by USDA-ARS researchers and starts with a phosphorus concentration of 0.0005 lbP/lb of soil and a nitrogen concentration of 0.001 lbN/lb of soil. The following equations were used to calculate the nutrient loading:

$$\text{Phosphorus Loading} = \text{Sediment Load (ton/yr)} * 0.0005 \text{ (lbs P/lb soil)} * 2000 \text{ (lbs/ton)} * \text{soil correction factor}$$

$$\text{Nitrogen Loading} = \text{Sediment Load (ton/yr)} * 0.001 \text{ (lbs N/lb soil)} * 2000 \text{ (lbs/ton)} * \text{soil correction factor}$$

Soil texture is determined and a correction factor is used to better estimate nutrient holding capacity of the soil (MDEQ, 1999). The predominant soil texture for road/stream crossings was sand so a soil correction factor of 0.85 was used.

Pollutant Reduction Estimates
The sediment reduction estimates for the approaches were calculated using the RUSLE. The recommended BMP is to pave both approaches, which lowers the cover management factor to 0.12. The sediment reduction estimates for the embankments were made using the same approach as with the streambank erosion sites. Installation of vegetative buffers will reduce approximately 75% of sediment loading into a river system. Sediment reduction estimates were calculated using a value of 0.75 for the BMP efficiency. The sediment reduction estimates from both methods were added together to get a total sediment reduction estimate.

Because the nutrient load estimates are based on the total sediment loading, the load reduction estimates for phosphorus and nitrogen are based on the amount of sediment reduction.

Phosphorus Reduction = Sediment Reduction (ton/yr) ∗ 0.0005 (lbs P/lb soil) ∗ 2000 (lbs/ton) ∗ soil correction factor

Nitrogen Reduction = Sediment Reduction (ton/yr) ∗ 0.001 (lbs N/lb soil) ∗ 2000 (lbs/ton) ∗ soil correction factor

Results
A total of 78 road/stream crossing sites were inventoried (See **Map 2 – Road-Stream Crossings**). The Alcona Black River watershed accounted for 50 of these, while the coastal watersheds accounted for the remaining 28. The sites were ranked as *Minor, Moderate* or *Severe* contributors of sediments to the river system. Fifty-four sites were ranked *Minor,* including all 28 road/stream crossing sites on the coastal watersheds. Twenty-four sites were identified as *Moderate*, and no sites were ranked as *Severe*. All twenty-four of the sites ranked *Moderate* were found on the Alcona Black River Watershed.

Using the methods stated above, the total pollutant loadings for all identified road/stream crossings were calculated.

Road/stream crossings are contributing approximately 220 tons/year of sediment, 187 lbs/year Phosphorus and 374 lbs/year of Nitrogen.

Five sites were identified as priorities for implementation of Best Management Practices. The sites were chosen based on the amount of sediment they contribute to the river system and their impact to the cold water fishery. These five priority sites are contributing approximately 105 tons of sediment per year to the river system, 48% of the total sediment loading for road/stream crossings. **Table 3-3** lists the selected road/stream crossings and their apparent resource issues, suggested BMPs, and estimated costs. **Table 3-4** lists the estimated pollutant loads and reductions for the sites. When implementing BMPs, priority should be give to the sites listed in Table 2-3 as they are contributing the largest amounts of sediment to the river system of the sites identified which have BMP recommendations. Improvement at these five sites, just 6% of the identified sites, would result in a 42% reduction in sediment and nutrient loading from road/stream crossings. However, additional factors ma be considered, including the

availability of funding, location in the watershed, and partner involvement. These factors may contribute to the selection of a site other than those listed in Table 3-3.

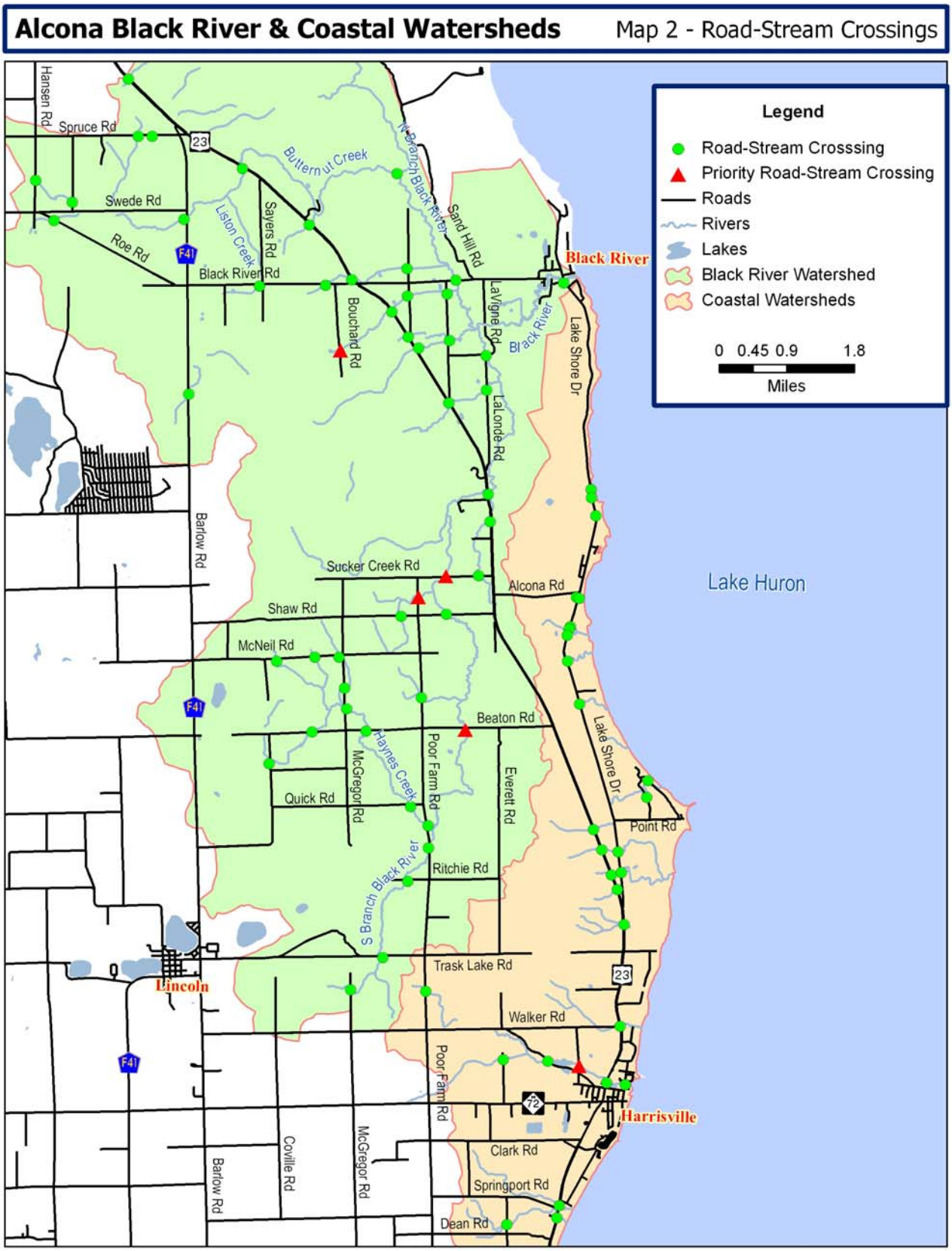
Table 3-3
Selected Road/Stream Crossings

Site ID	Justification	Suggested BMPs		Estimated Cost
AB06A	Fish passage issue Pool formation at culvert outlet	Harden approaches Replace culvert Install diversion outlets Erosion control structure Revegetate	1,050′ 3′ x 45′ 3 1 600 sq ft	$23,158
AB18	Fish passage issue Embankment erosion Pool formation at culvert outlet Undersize culverts Long steep approaches	Harden approaches Replace: bottomless arch Install diversion outlets Add rock rip rap Revegetate	1,500′ 12′ x 62′ 4 3 cu yds 800 sq ft	$53,893
AB20	Embankment erosion Stream bank erosion Pool formation at culvert outlet Stream flows over road at spring runoff	Harden approaches Replace: squash culvert Revegetate	250′ 6′ x 32′ 600 sq ft	$8,915
AB30	Embankment erosion Pool formation at culvert outlet Undersize culverts	Harden approaches Replace: bottomless arch Add rock rip rap Revegetate	2,000′ 12′ x 55′ 5 cu yds 700 sq ft	$52,644
MC03	Embankment erosion Pool formation at culvert outlet Undersize culverts Sand over crossing	Harden approaches Replace: squash culvert Add rock rip rap Revegetate	800′ 10′ x 44′ 2 cu yds 500 sq ft	$10,500
Totals		Harden approaches Replace culverts Add rock rip rap Install diversion outlets Erosion control structures Revegetate	5,600′ 5 15 cu yds 7 1 3,200 sq ft	**$149,110**

Table 3-4:
Selected Road/Stream Crossing Pollutant Loading & Estimated Reductions

Site ID	Sediment (tons/year)		Phosphorus (lbs/year)		Nitrogen (lbs/year)	
	Current Load	Estimated Reduction	Current Load	Estimated Reduction	Current Load	Estimated Reduction
AB06A	4.02	3.53	3.42	3.00	6.84	6.00
AB18	71.58	62.76	60.85	53.35	121.69	106.70
AB20	1.63	1.27	1.38	1.08	2.77	2.16
AB30	23.51	20.54	19.98	17.46	39.96	34.91
MC03	4.26	3.74	3.62	3.18	7.24	6.36
Total	**105.00**	**91.84**	**89.25**	**78.07**	**178.50**	**156.13**

Detailed site descriptions of road/stream crossing sites can be found in **Appendix C: Road-Stream Crossing Inventory.**


Alcona Black River & Coastal Watersheds
Map 2 - Road-Stream Crossings
Legend
Road-Stream Crosssing
Priority Road-Stream Crossing
Roads
Rivers
Lakes
Black River Watershed
Coastal Watersheds
0 0.45 0.9 1.8
Miles
Lake Huron
Black River
Lincoln
Harrisville
Hansen Rd
Spruce Rd
Swede Rd
Roe Rd
Black River Rd
Liston Creek
Sayers Rd
Buttern ut Creek
N Branch Black River
Sand Hill Rd
Bouchard Rd
LaVigne Rd
Brack River
Lake Shore Dr
LaLonde Rd
Barlow Rd
Sucker Creek Rd
Alcona Rd
Shaw Rd
McNeil Rd
Beaton Rd
McGregor Rd
Haynes Creek
Poor Farm Rd
Everett Rd
Quick Rd
Point Rd
Ritchie Rd
S Branch Black River
Trask Lake Rd
Walker Rd
Coville Rd
Clark Rd
Springport Rd
Dean Rd
23
F41
72

Agriculture Inventory

Agricultural practices on the land near riparian corridors may negatively influence water quality. Sediment is often one of the most significant sources of pollution in a watershed. Wind and water flowing across the land allows sediment to detach and provides transportation of sediment into a watershed. The over-application of fertilizers or manure to the water's edge can introduce an excessive amount of nutrients such as nitrogen and phosphorus into the river system. Livestock that have unrestricted access to streams can erode streambanks, destroy substrate and aquatic habitat, and add to sedimentation of the waterway. In addition, animal manure from livestock in streams or feedlots located close to waterways can add nutrients and pathogens to the river system.

Methodology

Members of the ABRWAC and NEMCOG staff conducted the Agricultural Inventory during the summer and fall of 2009. Agricultural sites were identified using a variety of maps, including aerial photos and plat maps. Field inventories were conducted by roadside observations. Each agricultural site was evaluated on an Agricultural Inventory Field Data Form, shown in **Appendix A**. The sites were also photographed and a combined form with photos and field data are available in a separate document, **Appendix D: Agricultural Inventory**. A map (**Map 3 – Agricultural Sites**) of agricultural sites inventoried was developed and is also included with this document.

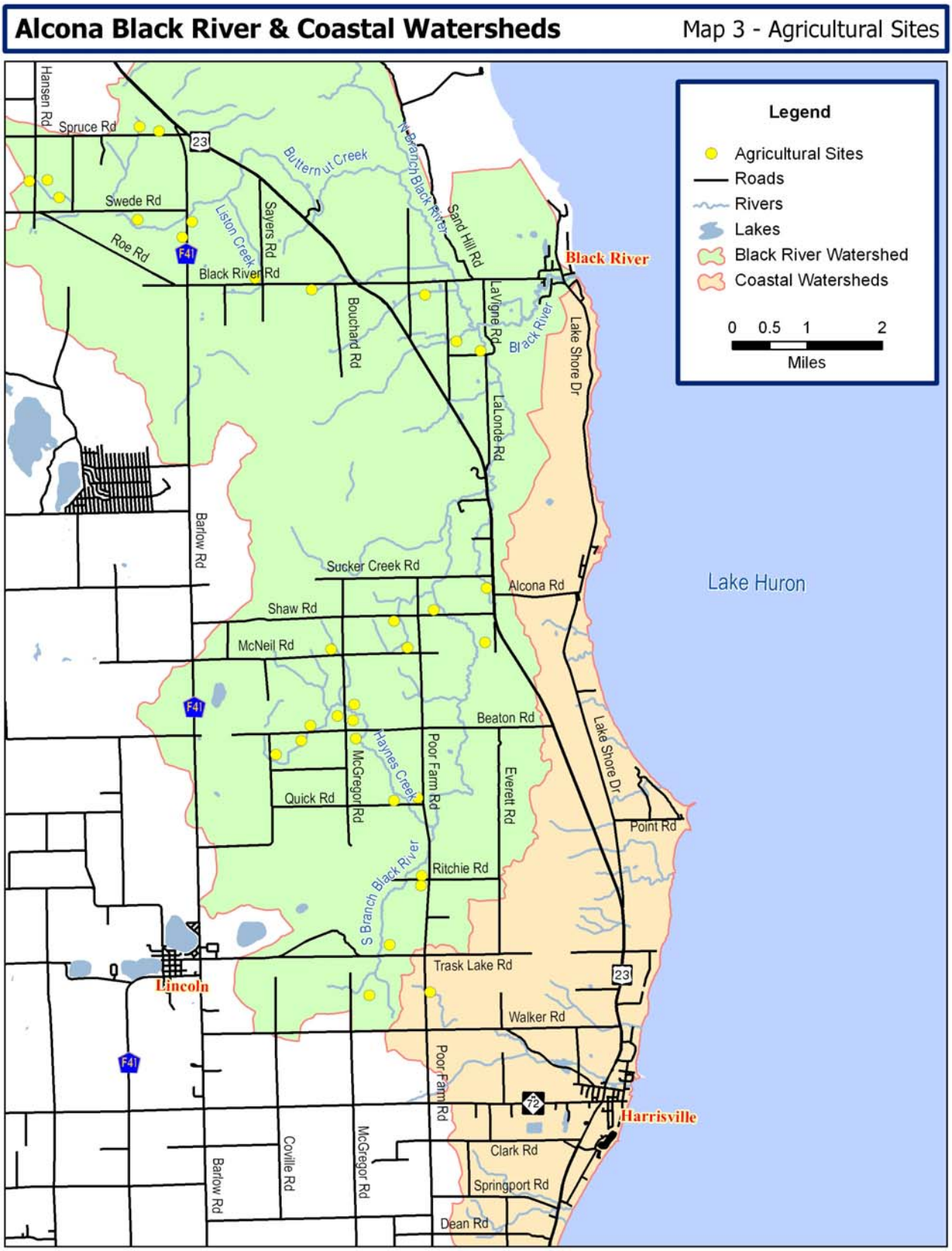
Results

A total of thirty-two agricultural sites were identified. However, none of the identified sites were considered to be a significant source of pollutants. All of the sites had adequate conservation buffers and livestock exclusion fencing in place. In addition, many appeared to no longer be actively farmed. It is possible that many of the agricultural areas appearing inactive could be enrolled in natural resource protection programs such as the Conservation Reserve Program (CRP). Since the lands could return to active farming once the CRP contract expires, periodically updating the agricultural inventory should be considered.

Stormwater Inventory

All substances that find their way onto impervious surfaces (streets, roofs, sidewalks, etc.) are likely to be washed into nearby waterbodies by rainfall or snowmelt. In addition to sediment and nutrients, stormwater may also contribute other pollutants such as oil, salt, bacteria, and other potentially toxic substances. Increased development creates more impermeable surfaces, thus leading to more runoff. Theoretically, any type of development on a site will increase the amount of runoff, as well as its velocity and pollutant concentration. A small development on a large tract of land will generally result in an insignificant increase in runoff, unless it is adjacent to a water body or linked by a storm sewer.

Luckily, the Alcona Black River and Coastal Watersheds do not suffer from the level of development as many other watersheds throughout the state. Throughout the watersheds, stormwater runoff simply flows across the land, or is controlled by roadside ditches. The only developed areas are the community of Black River, at the mouth of the Black River, and the City of Harrisville in the Coastal Watershed. Runoff in Black River is controlled by roadside ditches. Only US-23 and Main Street in Harrisville have storm sewers. As of the time of this plan, storm sewer plans were not available for review. Due to private property along both Mill Creek and Lake Huron, no storm sewer outlets were located. For the remainder of streets and surface area in Harrisville, runoff simply flows over land or in roadside ditches. The US-23 corridor has intermittent storm drains throughout the watersheds. However, they discharge to roadside ditches and not directly to streams. They are primarily used to prevent erosion of high, steeply sloped road embankments.


Alcona Black River & Coastal Watersheds
Map 3 - Agricultural Sites
Legend
Agricultural Sites
Roads
Rivers
Lakes
Black River Watershed
Coastal Watersheds
0 0.5 1 2
Miles
Lake Huron
Black River
Lincoln
Harrisville
Hansen Rd
Spruce Rd
Swede Rd
Roe Rd
Black River Rd
Liston Creek
Sayers Rd
Buttern ut Creek
W Branch Black River
Sand Hill Rd
Bouchard Rd
LaVigne Rd
Black River
Lake Shore Dr
LaLonde Rd
Barlow Rd
Sucker Creek Rd
Alcona Rd
Shaw Rd
McNeil Rd
Beaton Rd
McGregor Rd
Haynes Creek
Poor Farm Rd
Everett Rd
Quick Rd
Point Rd
Ritchie Rd
S Branch Black River
Trask Lake Rd
Walker Rd
Clark Rd
Springport Rd
Dean Rd
Coville Rd
McGregor Rd
F41
23
72

Water Quality Sampling

The sampling of biological, physical and chemical parameters is performed to gauge water quality, and to monitor and track changes over time. Biological sampling is a survey of the Macroinvertebrate community present in a water body. Chemical sampling includes parameters such as: Dissolved Oxygen, Conductivity, pH, and nutrients like Nitrogen and Phosphorus. A physical assessment provides an indication of overall stream habitat.

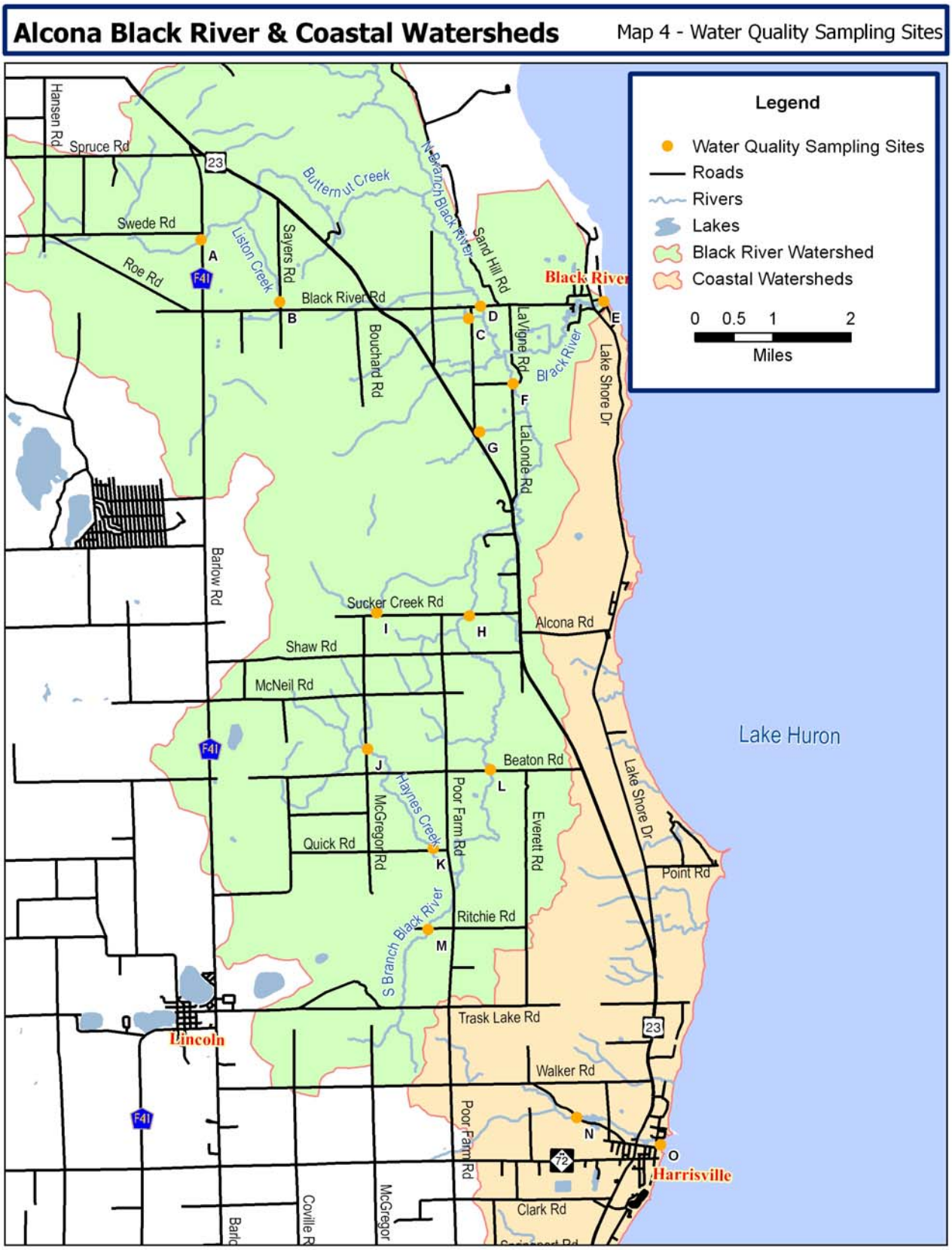
Protecting and monitoring high quality waters is vitally important. Just as important, is engaging and encouraging the next generation of water quality stewards. The watershed planning project presented an opportunity to do just that. Through the Northeast Michigan Great Lakes Stewardship Initiative (NEMI GLSI) Alcona Community Schools (ACS) has a place-based education program.

Place-Based Education (PBE) or Community Based Education (CBE), brings students into closer contact with their communities, through youth-led stewardship projects that enhance their environment and community. This education strategy allows schools to enrich the learning and lives of their students. Hands-on, place-based education is a proven method for developing knowledgeable and active stewards of the environment. When schools and communities work together, they produce powerful partnerships that are beneficial to all.

With assistance from Michigan Sea Grant, MDEQ Coastal Management Program, NEMI GLSI, and the 4-H2O Water Quality Education Program funded through Toyota, the ACS Environmental Science Class was able to conduct physical, biological and chemical sampling throughout the Alcona Black River and Coastal Watersheds. In addition to ACS, two high school science classes from Hillman Community Schools (HCS) were able to participate. All together, approximately 90 students were able to engage in some hands-on learning.

The ABRWAC and NEMCOG staff determined locations around the watersheds where sampling would take place. The locations were chosen based on having good coverage of the watershed, and having enough sites to provide all students with the opportunity to perform testing. Refer to the list below, or **Map 4 – Water Quality Sampling Sites**, for the locations chosen.

Site A: Butternut Creek / F-41 (Barlow Road)
Site B: Liston Creek / Sayers Road
Site C: Gauthier Creek / Fontaine Road
Site D: North Branch Black River / Black River Road
Site E: Black River / Alcona Township Huron Park boat launch
Site F: South Branch Black River / LaVergne Road
Site G: Silver Spring Creek / US-23
Site H: South Branch Black River / Sucker Creek Road
Site I: Un-named Tributary / two track off Sucker Creek Road
Site J: Haynes Creek / McGregor Road
Site K: Haynes Creek / Quick Road
Site L: South Branch Black River / Beaton Road
Site M: South Branch Black River / Ritchie Road
Site N: Mill Creek / Swamp Road
Site O: Mill Creek / Harrisville Harbor Park (Lake Street)


Alcona Black River & Coastal Watersheds
Map 4 - Water Quality Sampling Sites
Legend
Water Quality Sampling Sites
Roads
Rivers
Lakes
Black River Watershed
Coastal Watersheds
0 0.5 1 2
Miles
Lake Huron
Black River
Lincoln
Harrisville
Hansen Rd
Spruce Rd
Swede Rd
Roe Rd
Liston Creek
Sayers Rd
Buttermut Creek
W Branch Black River
Sand Hill Rd
Black River Rd
Bouchard Rd
LaVigne Rd
Black River
Lake Shore Dr
LaLonde Rd
Barlow Rd
Sucker Creek Rd
Alcona Rd
Shaw Rd
McNeil Rd
Beaton Rd
Haynes Creek
McGregor Rd
Poor Farm Rd
Everett Rd
Quick Rd
Point Rd
Ritchie Rd
S Branch Black River
Trask Lake Rd
Walker Rd
Clark Rd
Coville Rd
McGregor
A
B
C
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E
F
G
H
I
J
K
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M
N
O
23
F41
72

Biological Survey

The aquatic macroinvertebrate community present in a water body paints a picture of stream ecosystem health. The diversity of that community and the sensitivity of each species are key factors in determining water quality. A variety of pollution-sensitive stoneflies, mayflies, and caddisflies for example portrays a healthy ecosystem with good diversity and high water quality. A sample with only pollution-tolerant aquatic worms and midges reveals a stream ecosystem that is likely suffering.

Methodology

Macroinvertebrate and physical stream habitat surveys were conducted using the MiCorps Volunteer Stream Monitoring Procedures. The students received a classroom introduction to the MiCorps Procedures, proper sampling tecniques, and instruction on completing the field data forms prior to performing any surveys in the field. The students collected samples, and performed the initial identification of macroinvertebrates on site with assistance from participating teachers, Michigan Sea Grant and NEMCOG staff. Samples were collected for follow up identification in the classroom.

Results

A total of six sites were surveyed for macroinvertebrate communities and physical parameters. ACS sampled two locations in June 2010 and another in November 2010. In May 2011, HCS conducted macroinvertebrate and physical surveys at three more locations. Five other sites received physical surveys by HCS in May 2011, however, time constraints related to school schedules did not allow for a complete macroinvertebrate survey. ACS conducted a second physical survey at one location in September 2011. As can be seen in **Table 3-5**, all six sites surveyed received a score of Good or Excellent. The physical habitat surveys all revealed stream habitat was good with only minor habitat degradation noted. For ease of access, all of the sampling sites are located at road-stream crossings, and thus, any stream habitat degradation noted was related to road-stream crossing issues. The completed data collection forms for all of the surveys can be found in **Appendix E – Biological and Physical Habitat Surveys**.

Table 3-5
Biological Sampling Results

Site ID	Sample Date	Site Score	Site Score
E	5/16/2011	47.4	Good
F	5/18/2011	41.9	Good
G	5/18/2011	40.2	Good
J*	11/4/2010	49.9	Excellent
M	6/15/2010	37.3	Good
N	6/15/2010	36.6	Good

*Sampling location was changed to Haynes Creek at Beaton Road on this day due to easier access and less road traffic

Water Chemistry Sampling

The testing of physical parameters such as, temperature, dissolved oxygen, pH, conductivity and nutrient levels is performed to track changes in water quality over time. These parameters can be measured to determine the quality of the water in a particular waterbody. Maintaining good water chemistry determines the ability of a water body to support a healthy fish population. It also has a direct and strong impact on the wildlife and plant community found in a watershed.

Methodology

Water quality test kits were purchased from Ward's Natural Science, with funding from the Coastal Management Program, for use by the schools. All of the test kits used either a direct reading titration or colorimetric comparator method. A LaMotte TRACER meter was also purchased. The meter tested for Salinity, Conductivity, Total Dissolved Solids, and Temperature. The test kits and meter were ultimately donated to Alcona Community Schools. Classes from both Hillman and Alcona Schools performed chemical water quality sampling in May and June 2011. As the primary focus of the sampling was to provide students with hands-on learning, no standard sampling protocol was followed. All sampling was performed by students with assistance and oversight from teachers and NEMCOG watershed management staff. For future sampling efforts a more official sampling protocol, and a quality control plan, should be established and followed.

Results

All fifteen sites identified for sampling were tested in the spring 2011. The results of the data can be seen in **Table 3-6**. A few key points should be noted when reviewing the sampling results. First, the kits purchased are meant to be used in an educational setting and are designed to be quick, easy and safe to use. As can be seen in Table 3-6, many of the samples tested were below the lowest threshold of that particular test. While this is good for water quality, a true measure for that parameter is not known. Second, the Coliform test is a simple positive/negative test result and does not provide a level of the fecal coliform present. Finally, Salinity was tested using both a direct reading titration test kit and the TRACER meter. The results from the test kit are recorded in parts per thousand (ppt), and the TRACER meter results are recorded in parts per million (ppm). To convert ppt to ppm you would multiply the ppt results by 1000. The results of the two Salinity tests show a large discrepancy. Salinity levels for fresh water are generally less than .5 ppt. Many of the samples tested with the test kit measured higher than that level. While road salts entering the water during spring snowmelt and runoff could account for the higher levels, it still does not account for the large discrepancy. A review of the students specific testing methods, and correct calibration of the TRACER meter, may reveal the source of the inconsistency.

Table 3-6
Water Chemistry Sampling Results

Site ID	Sampling Date	Alkalinity (ppm)	Ammonia-Nitrogen (ppm)	Coliform (Yes or No)	Dissolved Oxygen (mg/L)	Nitrate-Nitrogen (ppm)	Nitrite-Nitrogen (ppm)	pH	Phosphate (ppm)	Sulfide (ppm)	Salinity (ppt)	Salinity* (ppm)	Conductivity* (µS)	TDS* (ppm)	Temperature* (oF)
A	5/16/2011	122	0.05	Yes	10	1	<.25	7.5	<1	<1	1	150	305	210	46.2
B	5/16/2011	200	0.05	Yes	10	1	<.25	7	<1	<1	0.65	130	258	180	47.8
C	5/16/2011	200	0.1	Yes	10	2	0.25	7	<1	<1	1.2	170	338	230	47.1
D	5/16/2011	105	0.1	Yes	8	2	0.25	7	<1	<1	0.75	150	290	220	47.9
E	5/16/2011	200	0.05	Yes	10	2	<.25	7	1	<1	0.7	130	271	180	48.9
F	5/18/2011	160	0.25	Yes	9	1	<.25	7	<1	<1	0.06	200	345	230	48.2
G	5/18/2011	140	0.05	Yes	10	0	0	7	<1	<1	0.5	150	302	210	44.6
H	5/18/2011	155	0.1	Yes	9	<1	<.25	7	<1	<1	1	140	295	200	51.4
I	5/18/2011	140	0.05	Yes	8	0	0	7	<1	<1	0.4	128	139	90	53.6
J	5/18/2011	100	0.05	Yes	6.5	1	<.25	7	<1	<1	2	150	280	200	54.9
K	6/3/2011	160	0.1	Yes	8.5	1	<.25	7.5	<1	<1	0.45	NT	NT	NT	55.6
L	6/3/2011	170	0	Yes	8	1	<.25	7	<1	<1	0.55	NT	NT	NT	52.9
M	6/3/2011	150	0.25	No	8.2	1	0.25	7.5	<1	<1	1	NT	NT	NT	51.7
N	6/3/2011	260	0	No	8.5	1	0	7.5	<1	<1	0.65	NT	NT	NT	53.2
O	6/3/2011	220	0.05	No	9.1	1	0	7.5	<1	<1	0.8	NT	NT	NT	56.4

* = Tested using LaMotte TRACER meter
NT = Not tested at this location

Chapter 4 - WATERSHED CRITICAL AREA

Critical Area Determination

The Critical Area of a watershed are those areas which now, or may in the future, contribute the largest amounts of pollutants to the watershed. These critical areas are identified for a variety of reasons. Most importantly, it can be used to narrow the scope of the plan and prioritize implementation efforts. There are several methods for determining the critical area of a watershed. One technique is the corridor method, which defines the critical area as a standard distance from the center of the waterbodies. The subwatershed method is another way in determining the critical area. This method uses smaller hydrologically distinct "subwatersheds" that have specific problems, or areas, that can have an effect on overall water quality. Other criteria used to develop watershed critical areas are land use analysis and stakeholder concerns or observations.

The critical area for the Alcona Black River and Coastal Watersheds was determined using a combination of all the methods stated above. First, the corridor method was used to determine an overall Area of Concern. Next, the subwatershed method was used to identify individual stream corridors, lakeshores and wetland areas of concern. Finally, the results of the above two methods were compared with the results of the land use analysis to determine the four critical areas of the watershed. The four critical areas identified were, Riparian Corridor, Lakeshore, Wetlands and Priority Road/Stream and Streambank Sites. Focusing implementation efforts on these critical areas of the watershed will provide the greatest reduction in pollutants for the time and money invested. **Map 5 – Critical Area** displays the four critical areas of the Alcona Black River and Coastal Watersheds.

Definition of Critical Areas

Riparian Corridor
Riparian corridors often have areas of intense residential development. Open areas and public lands along streams and rivers frequently experience high levels of recreational activities. Stream access for activities such as fishing, swimming and canoeing can cause streambank erosion or the introduction of invasive species. Road/stream crossings (anywhere a road and a stream intersect) can be major contributors of sediment and other pollutants. This excessive sedimentation can destroy aquatic habitat and impede navigation, among other things. The riparian corridors critical area encompassed all land within 500 feet of the stream and adjacent areas of steep slopes.

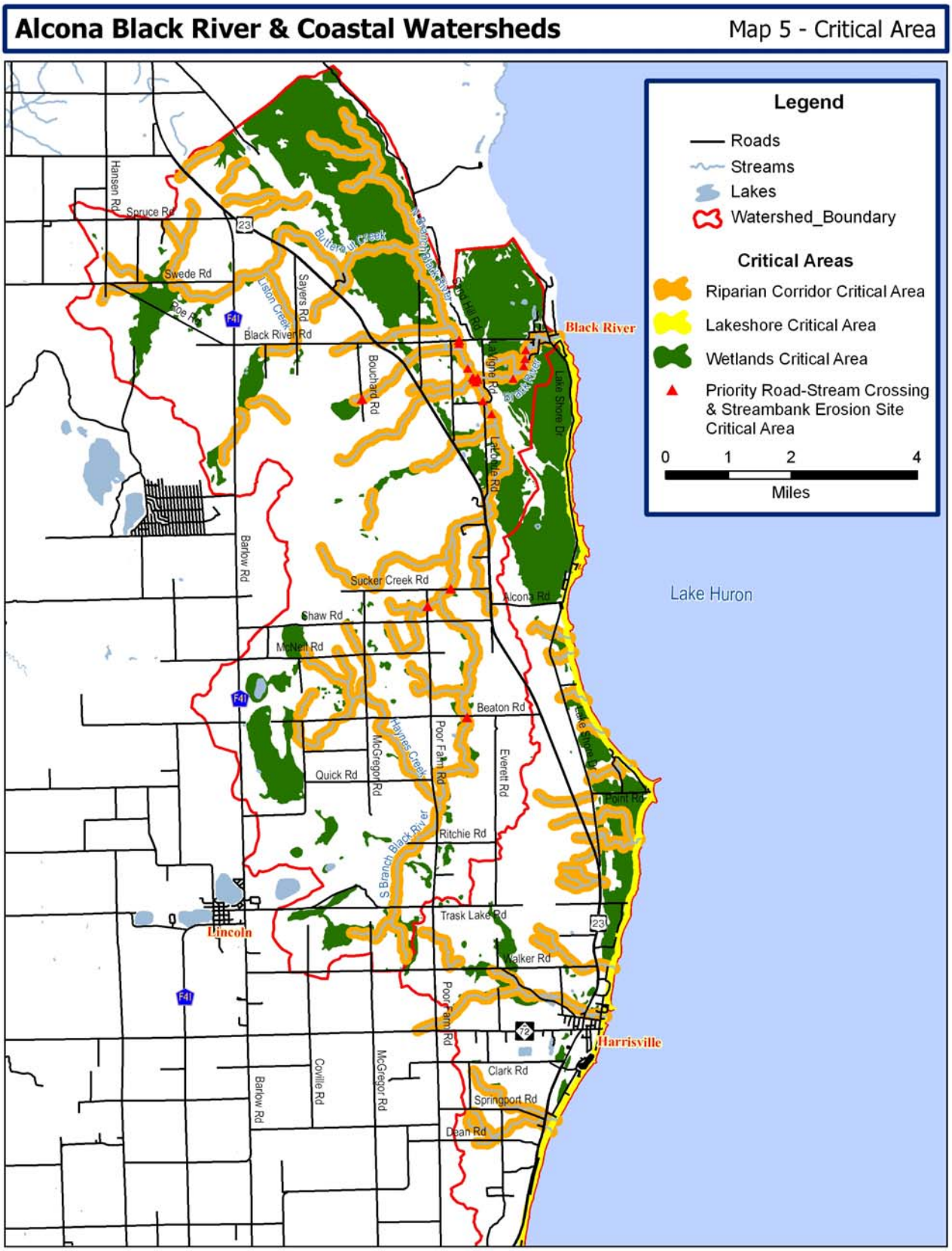
Lakeshore
Lakeshores are often subject to intense residential development, and thus often contribute significant amounts of pollutants to the waterbodies. The high level of development can lead to an increase in impervious surface areas, causing increased and polluted runoff. Improper lawn care activities can contribute excessive nutrients and pesticide contaminates to the water body. Failing septic systems release nutrients, e. coli and other pathogens which can degrade water quality. The lakeshore critical area includes all land within 500 feet of the lakeshore and adjacent areas of dense residential development.

Wetlands

Wetlands are some of the most valuable areas within a watershed and yet are often the first areas sacrificed in development projects. Wetlands act as a "giant sponge" within the watershed. They store excess water from runoff, releasing it slowly or allowing it to enter the groundwater system. This provides valuable natural flood control to a river system. Wetlands trap sediment, and filter out other pollutants. Aquatic organisms in wetlands, such as algae and bacteria, take up minerals and break down organic matter. Wetlands provide excellent habitat and, as a result, greatly contribute to the diversity and abundance of fish and other wildlife. Therefore, the protection of wetlands is critical in maintaining water quality. The wetland critical area includes all land classified as a wetland by the U.S. Fish and Wildlife Service National Wetlands Inventory.

Priority Road/Stream and Streambank Sites

The priority road/stream crossing and streambank erosion sites are areas that have been identified as contributing a significant amount of pollutants to the watersheds. Implementing Best Management Practices at these locations is critical to restoring, protecting and enhancing the water quality of the Alcona Black River and Coastal Watersheds.


Alcona Black River & Coastal Watersheds
Map 5 - Critical Area
Legend
Roads
Streams
Lakes
Watershed_Boundary
Critical Areas
Riparian Corridor Critical Area
Lakeshore Critical Area
Wetlands Critical Area
Priority Road-Stream Crossing & Streambank Erosion Site Critical Area
0 1 2 4
Miles
Lake Huron
Black River
Lincoln
Harrisville
Hansen Rd
Spruce Rd
Swede Rd
Black River Rd
Sayers Rd
Bouchard Rd
Barlow Rd
Sucker Creek Rd
Shaw Rd
McNeil Rd
Alcona Rd
Beaton Rd
Quick Rd
McGregor Rd
Poor Farm Rd
Everett Rd
Point Rd
Ritchie Rd
Trask Lake Rd
Walker Rd
Clark Rd
Springport Rd
Dean Rd
Coville Rd
Lake Shore Dr
Bird Hill Rd
Lake Nip Rd
Haynes Creek
S Branch Black River
Butters Lil Creek
F41
23

Chapter 5 - DESIGNATED AND DESIRED USES

Designated Uses in the State of Michigan

Michigan surface waters are protected by water quality standards for specific designated uses. Part 31 of the Natural Resources and Environmental Protection Act, P.A. 451 of 1994, as amended requires all surface waters of the state of Michigan are designated for and shall be protected for the following uses:

1. Agriculture
2. Navigation
3. Industrial water supply
4. Public water supply at the point of intake
5. Warm water fishery
6. Other indigenous aquatic life and wildlife
7. Partial body contact recreation
8. Total body contact recreation between May 1 and October 31
9. Cold water fishery, if designated as such a waterway
10. Fish consumption

If a waterbody, or portion of a waterbody, does not meet the water quality standards established for a designated use, then it is considered by the state to have "non-attainment" status. Every two years the Michigan Department of Natural Resources and Environment (MDNRE) publishes a "Water Quality in Michigan Integrated Report". The Integrated Report contains a listing titled "Section 303(d) Report" that contains the bodies of water and streams that are not attaining their designated uses.

Water quality is monitored by the MDEQ. At least once every five years, on a rotating basis, the MDEQ monitors the State's 58 major watersheds. Currently, the Alcona Black River, its tributaries and the coastal streams are meeting water quality standards and are not on the non-attainment list.

Designated Uses within the Alcona Black River and Coastal Watersheds

The Designated Uses being protected in the Alcona Black River and Coastal Watersheds are:

1. Agriculture
2. Navigation
3. Warm water fishery
4. Cold water fishery
5. Other indigenous aquatic life and wildlife
6. Partial body contact recreation
7. Total body contact recreation between May 1 and October 31
8. Fish consumption

Public water supply and industrial water supply were omitted from the Alcona Black River and Coastal Watersheds designated use list as there are no public or industrial water supply systems that draw water from surface water within the watersheds.

Impacted Designated Uses

At the present time, the Alcona Black River and Coastal Watersheds are not impaired on a watershed-wide scale. However, as the population within the watersheds continues to grow, impacts from land use changes may threaten the designated uses. Threatened waterbodies are defined as those that currently meet the State's water quality standards but may not in the future.

Table 5-1
Designated Use Status

Designated Use	Status
Agriculture	Meeting Designated Use
Navigation	Threatened
Warm water fishery	Threatened
Cold water fishery	Threatened
Other indigenous aquatic life and wildlife	Threatened
Partial body contact recreation	Threatened
Total body contact recreation	Threatened
Fish Consumption	Threatened

Desired Uses

Desired uses are factors, in addition to state mandated uses mentioned above, deemed important to the watershed community. They help guide watershed restoration and protection efforts that go beyond the state list of designated uses. The desired uses were identified by the Watershed Advisory Committee as those applicable to the watershed based upon the conditions within the Alcona Black River and Coastal Watersheds. The desired uses are listed below.

- Protect the coldwater fishery, especially the trout population, by improving habitat, controlling erosion, and ensuring unhindered fish passage.
- Promote recreational use while protecting water quality and wildlife habitat.
- Protect groundwater and surface water from pollution, diversion and excessive use.
- Encourage wetland and ecological corridor preservation.

Chapter 6 - WATER QUALITY CONCERNS & ISSUES

Threatened Designated Uses: Pollutants, Sources, Causes

The Alcona Black River and Coastal Watersheds river systems are actively utilized for a variety of uses. The designated uses selected for protection in this study directly relate to activities currently ongoing in the watershed, and if left unmanaged may result in the loss of opportunities currently enjoyed today. **Table 6-1** lists the threatened designated use and the known and suspected pollutants that are threatening each use. As can be seen in Table 6-1, several pollutants are threatening each designated use.

Table 6-1
Alcona Black River & Coastal Watersheds Known and Suspected Pollutants

Threatened Use	Pollutant*
Navigation	Sediment (k) Nutrients (s) Invasive Species (s)
Warm water fishery	Sediment (k) Nutrients (s) Invasive species (k) Oils and Greases (s) Pathogens (s) Salts (s) Heavy metals (Mercury and others) (s) Toxins (herbicides, pesticides, and other harmful chemicals) (s)
Cold water fishery	Sediment (k) Nutrients (s) Temperature (s) Invasive species (k) Oils and Greases (s) Hydrologic flow (s) Pathogens (s) Salts (s) Heavy metals (Mercury and others) (s) Toxins (herbicides, pesticides, and other harmful chemicals) (s)
Other indigenous aquatic life and wildlife	Sediment (k) Nutrients (s) Temperature (s) Invasive species (k) Oils and Greases (s) Hydrologic flow (s) Pathogens (k) Salts (s) Heavy metals (Mercury and others) (s) Toxins (herbicides, pesticides, and other harmful chemicals) (s)

Table 6-1: Known and Suspected Pollutants (continued)	
Partial body contact recreation	Nutrients(s) Pathogens(s)
Total body contact recreation	Nutrients(s) Pathogens(s)
Fish Consumption	Heavy metals (Mercury and others) (s) Toxins (herbicides, pesticides, and other harmful chemicals) (s)
*k=known and s=suspected	

Sources and Causes of Pollutants

Addressing the pollutants listed above, requires identifying the source of the problem and the underlying cause of each. The sources and causes of pollutants were determined by input form the watershed Steering Committee, field inventory results and referencing previous watershed assessments. **Table 6-2** lists these pollutants, sources, and causes. The pollutants and their sources were prioritized by the steering committee through direct discussions at meetings, and the use of a web survey.

Table 6-2
Pollutants, Sources and Causes

Pollutant	Sources	Causes
Sediment	Road-stream crossings	Undersized or deteriorating culverts Lack of erosion/runoff controls Steep approaches Poor design/maintenance Culvert and stream alignment
	Streambank/Shoreline erosion	Removal of streambank and shoreline vegetation Lack of shoreline vegetation Boat traffic Foot Traffic (recreational activities) Sandy soils
Nutrients	Fertilizer use	Improper/overuse of lawn fertilizers in riparian corridor Improper/overuse of fertilizers in agricultural operations
	Septic systems	Poorly maintained systems Aging systems Undersized systems
	Runoff	Lack of adequate filter strips
Hydrologic Flow	Runoff	Lack of adequate filter strips
	Deforestation	Removal of vegetation in riparian corridor and floodplain which helps control flooding
Invasive Species	Transport from infested waterbodies	Lack of boater education Apathy
	Migration from Lake Huron	Natural migration of species
Pathogens	Septic systems	Poorly maintained systems Aging systems Undersized systems
	Wildlife	Over population of waterfowl
Salts	Winter road maintenance	Lack of alternatives or funding for alternatives

Table 6-2: Pollutants, Sources and Causes (continued)		
Temperature	Runoff	Impervious surfaces close to water Runoff form impervious surfaces discharging to waterway Lack of adequate filter strips
	Beaver dams	Active beaver population
	Deforestation	Removal of riparian canopy
Oils and Greases	Road-stream crossings	Lack of erosion/runoff controls Steep approaches Poor design/maintenance
	Watercraft & ORV's	Lack of Enforcement and Education Accidental spills Poorly maintained equipment Apathy
	Runoff	Impervious cover – parking lots, roads etc.
Toxins (herbicides, pesticides, and other harmful chemicals)	Improper use and disposal	Lack of awareness regarding impacts Lack of disposal alternatives Apathy
Heavy Metals (mercury and others)	Atmospheric deposition	Natural sources Burning of coal

Chapter 7 - WATERSHED GOALS, OBJECTIVES AND FUNDING

The Alcona Black River and Coastal Watersheds are valued by tourists, seasonal, and year-round residents as an area highly desired for recreation as well as residential living. The water bodies need to be protected and enhanced to ensure the designated uses as defined in this plan continue to be met. The overall mission of the Alcona Black River Watershed Initiative "is to ensure high water quality and provide for the protection of aquatic life and wildlife by reducing non-point source pollutants entering the watershed and raising public awareness of their impacts on the watershed." Working actively towards the achievement of the mission will ascertain that designated and desired uses of the watershed continue to be met for present and future generations to come.

Watershed goals were developed based on Alcona Black River Watershed Advisory Council input, and the results of the watershed inventory and assessment. The goals are aimed at protecting the designated and desired uses, and protecting and enhancing the high quality waters of the Alcona Black River and Coastal Watersheds. Specific objectives are organized under their respective goal, and were developed as a means of achieving the goals by addressing the source of the problem.

The goals and objectives were developed and prioritized at watershed advisory council meetings, and through the use of web surveys. The objectives fall in to one of two main categories: those focused on restoring problem sites such as streambank erosion or road-stream crossings, and, those aimed at protecting and enhancing the high quality water resources.

Watershed Goals

Goal 1: Provide for the protection and enhancement of the water resources by reducing sediment and nutrient loading to the water bodies.

Goal 2: Protect the quality and diversity of habitat within the watershed by monitoring and eradicating invasive species.

Goal 3: Provide for the protection of the watershed through adoption and enforcement of land use policies and regulations.

Goal 4: Identify, protect and enhance significant aquatic and terrestrial ecosystems in the watershed.

Goal 5: Develop a volunteer water quality monitoring program to ensure the water resources remain high quality.

Goal 6: Enhance and protect the water resources by increasing public involvement and awareness, and promoting stewardship and responsible use of the watershed.

Objectives

Under each Objective are the following categories:

- *Lead Organization(s)*: The group(s) responsible for ensuring that the given objective is implemented.
- *Partners Involved*: Other organizations whose assistance will aid in implementation.
- *Tasks*: Sub-tasks needed to achieve implementation of the given objective.
- *Timeline*: A schedule for the completion of each objective.
- *Pollutants Addressed*: The pollutant(s) that will be addressed by implementing the objective.
- *Technical Assistance*: Other assistance that may be needed to properly implement the objective.
- *Cost*: The funding required to implement the objective.
- *Funding Sources*: The potential programs, partners, foundations and grant sources where the needed funding might be sought.
- *Milestones*: Interim milestones for determining whether the objective is being timely and effectively implemented.
- *Evaluation Method*: Methods to determine if the objectives are being implemented and are affective at achieving the goal and/or addressing the pollutant source.

Goal 1
Provide for the protection and enhancement of the water resources by reducing sediment and nutrient loading to the water bodies.

Goal 1: Objective 1	Implement BMPs at road-stream crossings identified as problems for erosion, runoff, fish passage, or flow restriction.
Lead Organization(s)	Huron Pines RC&D, Alcona County Road Commission
Partners Involved	Alcona Black River Watershed Advisory Council (ABRWAC), Alcona Conservation District, Local Townships, MDEQ, Natural Resources Conservation Service (NRCS)
Tasks	Determine sites for BMP implementation Conduct site analysis to determine treatment needed Develop engineering plans Secure funding for implementation
Timeline	Years 1 - 5
Pollutants Addressed	Sediment, Nutrients, Oils & Grease, Salts, Temperature, Hydrologic Flow
Technical Assistance	Engineering Services
Cost	$149,110 for 5 priority sites
Funding Sources	US F&WS, 319 and CMI, Alcona Road Commission, MDEQ Coastal Management Program
Milestones	BMPs implemented at priority road/stream crossings
Evaluation Method	Before and after photos, calculate BMP pollutant load reductions, pre and post implementation stream assessment

Goal 1: Objective 2	Implement BMPs at streambank erosion sites to reduce sediment delivery to rivers.
Lead Organization(s)	ABRWAC, Huron Pines
Partners Involved	Alcona Conservation District, NRCS, Alcona Community Schools Great Lakes Stewardship Initiative School Team (ACS GLSI Team)
Tasks	Determine sites for BMP implementation Conduct site analysis to determine treatment needed Secure funding for implementation
Timeline	Years 1 - 5
Pollutants Addressed	Sediment, Nutrients, Temperature, Hydrologic Flow
Technical Assistance	Engineering Services
Cost	$131,600
Funding Sources	US F&WS, Landowners, 319 and CMI, NRCS
Milestones	BMPs implemented at 3 sites per year
Evaluation Method	Before and after photos, calculate BMP pollutant load reductions, pre and post implementation stream assessment

Goal 1: Objective 3	Develop and distribute to riparian property owners information on: greenbelts, streambank restoration, soil testing, fertilizer application, lawn care practices, septic system maintenance, and stormwater runoff.
Lead Organization(s)	Alcona Black River Watershed Advisory Council, NEMCOG
Partners Involved	Huron Pines, MSU Extension, Health Departments, NRCS, MDEQ, MDNR, MSU Extension, Alcona Conservation District
Tasks	Distribute water quality information packets to homeowners Conduct water quality seminars for homeowners Conduct survey to determine existing level of awareness
Timeline	Bi-Annually
Pollutants Addressed	Sediments, Nutrients, Hydrologic Flow, Pathogens, Temperature, Oils & Grease, Toxins
Technical Assistance	NA
Cost	$10,000
Funding Sources	319 and CMI, Private Foundations
Milestones	One seminar annually Informational packets bi-annually Develop process for distributing information to new homeowners
Evaluation Method	Evaluation of survey for increased awareness

Goal 1: Objective 4	Encourage native vegetation greenbelts on Lake Huron and Black River shorelines by establishing greenbelt demonstration sites.
Lead Organization(s)	NEMCOG, Huron Pines
Partners Involved	ABRWAC, Alcona Conservation District, MSU Extension, Master Gardeners, ACS GLSI Team, Local Landscapers, Boy Scouts/Girl Scouts, 4-H Clubs
Tasks	Determine locations for demonstration sites Evaluate sites to determine BMPs Secure funding for implementation Publicize project to garner support and participation

Timeline	5 years
Pollutants Addressed	Sediments, Nutrients, Pathogens, Temperature, Hydrologic Flow, Toxins
Technical Assistance	NA
Cost	$40,000
Funding Sources	319 and CMI, Private Foundations, MDEQ Coastal Management Program
Milestones	Four greenbelts completed annually
Evaluation Method	Document sites completed, before and after photos

Goal 2
Protect the quality and diversity of habitat within the watershed by monitoring and eradicating invasive species.

Goal 2: Objective 1	Develop and distribute educational materials to the public on measures they can take to reduce invasive species within the watershed.
Lead Organization(s)	ABRWAC
Partners Involved	Huron Pines, NEMCOG, MSU Extension, Michigan Sea Grant
Tasks	Obtain and/or develop informational materials Distribute information through mailings and workshops Conduct survey to determine existing level of awareness
Timeline	Annually
Pollutants Addressed	Invasive Species
Technical Assistance	NA
Cost	$20,000
Funding Sources	319 and CMI, Private Foundations
Milestones	Host invasive species workshop Conduct informational mailing Completion of awareness surveys
Evaluation Method	Evaluation of survey for increased awareness

Goal 2: Objective 2	Work with riparian property owners to conduct annual invasive species monitoring.
Lead Organization(s)	ABRWAC
Partners Involved	Huron Pines, ACS GLSI Team, Boy Scouts/Girl Scouts, 4-H Clubs
Tasks	Record location and extent of invasive species Track spread or reduction of invasive species Keep abreast of treatment methods
Timeline	Annually
Pollutants Addressed	Invasive Species
Technical Assistance	NA
Cost	Volunteer
Funding Sources	NA
Milestones	Tracking system implemented
Evaluation Method	Number of landowners and/or clubs assisting with monitoring effort, track changes over time

Goal 3
Provide for the protection of the watershed through adoption and enforcement of land use policies and regulations.

Goal 3: Objective 1	Develop and present model ordinances and language to local governments within the watershed for an effective and consistent standard for resource protection.
Lead Organization(s)	ABRWAC, NEMCOG
Partners Involved	Local Townships, Alcona County, Local Planning Commissions
Tasks	Develop model ordinance Present ordinance to all townships within watershed
Timeline	2 years
Pollutants Addressed	All
Technical Assistance	NA
Cost	$10,000
Funding Sources	Local Townships, Alcona County, Private Foundations
Milestones	Model ordinance adopted at township level
Evaluation Method	Number of townships adopting model ordinance

Goal 3: Objective 2	Coordinate master planning and zoning efforts among local units of government within the watershed.
Lead Organization(s)	NEMCOG
Partners Involved	County, Township, and City/Village Planning Commissions and Zoning Boards
Tasks	Address watershed management practices within master plans Update master plans for all communities within the watershed
Timeline	Annually
Pollutants Addressed	All
Technical Assistance	NA
Cost	$15,000
Funding Sources	Local Townships, Alcona County, Private Foundations, MDEQ Coastal Management Program
Milestones	All community master plans updated All communities provide input on every master plan within the watershed
Evaluation Method	Conduct pre and post planning and zoning review to track watershed protection ordinances

Goal 3: Objective 3	Provide training and education for local planning and zoning officials.
Lead Organization(s)	NEMCOG Academy
Partners Involved	MSU Extension, Local Townships, Local Planning Commissions and Zoning Boards, Michigan Association of Planning

Tasks	Coordinate training workshops for local officials
Timeline	Bi-annually
Pollutants Addressed	All
Technical Assistance	Land use planning and zoning expert
Cost	$15,000
Funding Sources	MSU Extension, Local Townships, Private Foundations
Milestones	Establishment of an ongoing training program
Evaluation Method	Pre and post survey of workshop participants

Goal 4
Identify, protect and enhance significant aquatic and terrestrial ecosystems in the watershed.

Goal 4: Objective 1	Identify and protect significant wetlands and/or environmentally sensitive parcels through conservation measures.
Lead Organization(s)	Headwaters Land Conservancy
Partners Involved	ABRWAC, NEMCOG, Huron Pines, Landowners, Local Townships, NRCS, Alcona Conservation District
Tasks	Identify key properties to protect Promote conservation easements Work with property owners to secure conservation easements
Timeline	1 – 5 years
Pollutants Addressed	Sediment, Nutrients, Hydrologic Flow, Temperature, Invasive Species
Technical Assistance	NA
Cost	$20,000
Funding Sources	319 and CMI, Private Foundations
Milestones	Three conservation easements established
Evaluation Method	Document acres of wetland/sensitive areas protected

Goal 4: Objective 2	Coordinate the placement of in-stream Large Woody Debris (LWD) structures in conjunction with sites receiving structural BMPs.
Lead Organization(s)	ABRWAC
Partners Involved	Huron Pines, ACS GLSI Team, Alcona Conservation District, Boy Scouts/Girl Scouts, 4-H Clubs
Tasks	Determine locations for LWD structures to be installed Secure funding and needed permits Install LWD structures annually
Timeline	Years 1 - 5
Pollutants Addressed	Sediment, Nutrients
Technical Assistance	NA
Cost	$20,000
Funding Sources	US F&WS, Private Foundations, Local Sponsors
Milestones	LWD locations have been chosen Required permits secured Funding identified and secured
Evaluation Method	Before and after photos, Document number of LWD structures installed

Goal 4: Objective 3	Conduct a Natural Features Inventory to identify and protect unique plant and wildlife, ecosystems, and other significant natural features within the watershed.
Lead Organization(s)	ABRWAC,
Partners Involved	NEMCOG, Huron Pines, Michigan Sea Grant, ACS GLSI Team
Tasks	Develop database to catalog findings Establish committee to coordinate program Secure funding and conduct inventory
Timeline	Years 1 – 2 and Years 9 - 10
Pollutants Addressed	All
Technical Assistance	NA
Cost	$10,000
Funding Sources	Private Foundations, Audubon Society, The Nature Conservancy, Local Sponsors, MDEQ Coastal Management Program
Milestones	Development of tracking database Establishment of coordinating committee Begin conducting survey
Evaluation Method	Use of the inventory to prioritize efforts of Goal 4:Objective 1, and in local planning and decision making

Goal 5
Develop a volunteer water quality monitoring program to ensure the water resources remain high quality.

Goal 5: Objective 1	Develop a water quality database where monitoring results will be stored and analyzed.
Lead Organization(s)	NEMCOG, ABRWAC
Partners Involved	ACS GLSI Team, Alcona Conservation District, Michigan Sea Grant
Tasks	Develop database to store water quality data collected Determine group/agency to host database Update and maintain database annually
Timeline	Annually
Pollutants Addressed	All
Technical Assistance	NA
Cost	$5,000 first year, $1,000 annually to maintain ($15,000 Total)
Funding Sources	319 & CMI, Local Sponsors, NE MI GLSI
Milestones	Location and group or agency to store database chosen Database created
Evaluation Method	Monitor database to be certain it is updated

Goal 5: Objective 2	Develop a volunteer and school-based biological, chemical and physical stream sampling program.
Lead Organization(s)	ABRWAC, ACS GLSI Team
Partners Involved	NEMCOG, Michigan Sea Grant
Tasks	Work with Alcona Schools placed-based education program to establish monitoring protocol and educational curriculum Establish coordinating committee Fifteen sampling locations have been identified (see Chapter 3 and Map 4) Track results in water quality database (see Goal 5:Objective 1)
Timeline	Annually
Pollutants Addressed	Nutrients, Sediment, Pathogens, Temperature
Technical Assistance	MDEQ, MDNR
Cost	$3,000 first year, $1,000 annually to maintain ($13,000 Total)
Funding Sources	319 and CMI, Local Sponsors, NE MI GLSI
Milestones	Coordinating person/committee established Education curriculum developed Monitoring protocol defined Five sites monitored each year so that every site is sampled once every three years
Evaluation Method	Compare water quality data over time

Goal 5: Objective 3	Establish a stream geomorphology protocol to determine the effectiveness of structural BMPs.
Lead Organization(s)	NEMCOG, ABRWAC
Partners Involved	US F&WS, Huron Pines, Michigan Sea Grant, ACS GLSI Team
Tasks	Perform pre assessment on sites slated for structural BMPs Perform post assessments one year after structural BMPs have been installed
Timeline	Annually
Pollutants Addressed	Sediment, Nutrients
Technical Assistance	MDEQ, MDNR, US F&WS, NRCS
Cost	$1,000 per site ($19,000 Total)
Funding Sources	Local Sponsors, US F&WS
Milestones	Pre-assessment performed at all sites slated for BMP installation
Evaluation Method	Compare pre and post assessments to determine level of stream habitat improvements

Goal 5: Objective 4	Update non-point source pollution inventories every five years.
Lead Organization(s)	ABRWAC
Partners Involved	NEMCOG
Tasks	Train volunteers to conduct inventories Revisit all sites where BMPs were implemented to determine if measures are still intact Re-inventory all other sites to assess changes in erosion conditions Prioritize sites based on current conditions
Timeline	Year 5 and Year 10

Pollutants Addressed	Sediment, Nutrients, Hydrologic Flow, Temperature, Oils & Grease, Salts
Technical Assistance	NA
Cost	$5,000
Funding Sources	319 and CMI, US F&WS, MDEQ CMP
Milestones	Establishment of committee to oversee inventory Volunteer training has been conducted
Evaluation Method	Compare to previous inventory results to determine changes in numbers and/or site severity

Goal 6
Enhance and protect the water resources by increasing public involvement and awareness, and promoting stewardship and responsible use of the watershed.

Goal 6: Objective 1	Conduct an annual Black River & Coastal Watershed Day, including a river cleanup activity, to promote the watershed plan, activities completed and actions others can take to improve the watershed.
Lead Organization(s)	ABRWAC
Partners Involved	NEMCOG, Huron Pines, Alcona Conservation District, ACS GLSI Team, Michigan Sea Grant, MSU Extension, Local Boy Scouts/Girl Scouts
Tasks	Plan, promote and host the event
Timeline	Annually
Pollutants Addressed	All
Technical Assistance	Resource professionals
Cost	$3,000 per year ($30,000 Total)
Funding Sources	Local sponsors
Milestones	Annual hosting of a watershed and river cleanup day
Evaluation Method	Number of attendees, Survey attendees

Goal 6: Objective 2	Develop and implement a signage program to increase awareness.
Lead Organization(s)	ABRWAC
Partners Involved	NEMCOG, Huron Pines, Alcona Conservation District, ACS GLSI Team, Michigan Sea Grant, Alcona County Road Commission, MDOT
Tasks	Determine content of signs Secure funding to develop signs Develop signs Determine locations for sign placement
Timeline	Years 1 - 3
Pollutants Addressed	All
Technical Assistance	NA
Cost	$20,000
Funding Sources	Local Sponsors, Private Foundations
Milestones	Sign content determined and funding secured in year 1 Signs developed and placement locations determined by year 2 Placement of signs in year 3
Evaluation Method	Document content, placement location, and number of signs placed

Goal 6: Objective 3	Increase public involvement and membership in the Alcona Black River Watershed Advisory Council to effectively address concerns related to the watershed.
Lead Organization(s)	ABRWAC
Partners Involved	
Tasks	Host regular meetings of the council Seek grant and other funding opportunities Possibly seek 501(c)3 status Complete a promotional mailing to increase involvement
Timeline	Annually
Pollutants Addressed	All
Technical Assistance	NA
Cost	$3,000 per year ($30,000 Total)
Funding Sources	Local Sponsors, Private Foundations
Milestones	Regular meeting schedule established Promotional mailing completed Funding requirement assessed and potential grant sources identified
Evaluation Method	Document changes in council membership, meeting attendance, and fundraising efforts

Implementation Costs and Timeline

In order to achieve the goals and objectives that have been outlined, two things will be required. A defined timeline for implementation efforts and an estimate of the funding needed for implementation. The goals, and specific objectives under each, can be placed into one of five categories: Structural or Vegetative BMPs, Education, Land Protection, Managerial, and Monitoring. **Table 7-1** summarizes the implementation costs for each of the five categories, as well as the number of objectives under each category. **Table 7-2** summarizes the total estimated cost and a timeline for implementing each of the goals and objectives of the Alcona Black River & Coastal Watersheds Management Plan.

Table 7-1
Summary of Costs by Objective Type

Objective Type	Number of Objectives	Total Estimated Cost of Implementation
Structural and Vegetative BMPs	4	$340,710
Education	5	$95,000
Land Protection	2	$30,000
Managerial	3	$55,000
Monitoring	5	$15,000
Total for 10 years	**19**	**$572,710**

Table 7-2
Cost and Timeline for Implementation

	Objective	Cost	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
1:1	Road-stream Crossing BMPs (BMP)*	$149,110	■	■	■	■	■					
1:2	Streambank Erosion BMPs (BMP)	$131,600	■	■	■	■	■					
1:3	Riparian Landowner Education (ED)	$10,000	■		■		■		■		■	
1:4	Native Vegetation Greenbelts (BMP)	$40,000	■	■	■	■	■					
2:1	Invasive Species Education (ED)	$20,000	■	■	■	■	■	■	■	■	■	■
2:2	Invasive Species Monitoring (MO)	Volunteer-no cost	■	■	■	■	■	■	■	■	■	■
3:1	Model Zoning Ordinance (MA)	$10,000	■	■								
3:2	Coordinate Master Planning and Zoning (MA)	$15,000	■	■	■	■	■	■	■	■	■	■
3:3	Planning and Zoning Training (ED)	$15,000	■		■		■		■		■	
4:1	Identify and Protect Sensitive Parcels (LP)	$20,000	■	■	■	■	■					
4:2	Large Woody Debris Enhancement (BMP)	$20,000		■	■	■	■	■				
4:3	Natural Features Inventory (LP)	$10,000	■	■							■	■
5:1	Develop Water Quality Database (MO)	$15,000	■	■	■	■	■	■	■	■	■	■
5:2	Chemical, Biological, and Physical Sampling (MO)	$13,000	■	■	■	■	■	■	■	■	■	■
5:3	Geomorphology Assessment (MO)	$19,000	■	■	■	■	■	■	■	■	■	■
5:4	Update Non-point Source Inventories (MO)	$5,000					■					■
6:1	Watershed Day and River Cleanup (ED)	$30,000	■	■	■	■	■	■	■	■	■	■
6:2	Signage Program (ED)	$20,000	■	■	■							
6:3	Promote Alcona Black River Watershed Advisory Group (MA)	$30,000	■	■	■	■	■	■	■	■	■	■
	Total	**$572,710**	■	■	■	■	■	■	■	■	■	■

*BMP=Structural or Vegetative, ED=Educational, MA=Managerial, LP=Land Protection, MO=Monitoring

Chapter 8 – INFORMATION AND EDUCATION STRATEGY

An Information and Education (I&E) strategy is a tool designed to involve the public in a way that increases their awareness of water quality issues and motivates them to take action. It is a coordinated strategy tailored to both the water quality concerns, and the people who live and recreate in the watershed. Public consciousness about the relationship between their daily activities and water quality is a typical weakness in most citizens, which creates a gap in the implementation of a watershed management plan. To increase this understanding, people need to participate in activities that benefit water quality. Involving the public in the protection of the watershed through education and voluntary stewardship maintains the integrity of the water resources, and reinforces their connection with the natural resources and the watershed. Public participation is extremely important, since the majority of behavioral changes needed to protect the watershed will be voluntary actions from the public. Before people will consider changing their behavior, they need to understand the concerns for the watershed and how their actions can help to protect the quality of the water resources. Increasing awareness of water quality concerns will foster changes in behavior. This change in behavior is a long term strategy for restoring, protecting, and enhancing water quality.

Information and Education Strategy

The I&E activities developed for the Alcona Black River and Coastal Watersheds Management Plan will include a variety of approaches, such as a coordinated outreach campaign, hosting informational workshops or seminars, distributing educational materials, constructing project demonstration sites, delivering project information through social media, and having media coverage at all watershed events. Identifying those groups or individuals, the target audience, whose support and action will be needed to achieve the watershed goals and objectives is key to the successful implementation of the I&E strategy. Listed in **Table 8-1** are the target audiences identified for specific water quality concerns, the key messages that will need to be conveyed, and methods for reaching the target audience.

Table 8-1
I&E Strategy - Target Audiences, Key Messages, and Delivery Mechanisms

Pollutant	Pollutant Source	Target Audience(s)	Key Message(s)	Delivery Mechanism(s)
Sediment	Road-stream crossings	• Road Commission • MDOT	• BMPs at R/S crossings will improve water quality • Upfront cost of BMPs will result in long-term cost savings	• Review inventory with road agencies • Workshop on road maintenance
	Streambank/shoreline erosion	• Riparian landowners • Recreational users	• Sediment is a pollutant • The actions of property owners can reduce or contribute to the problem • BMPs can minimize erosion • Use of greenbelts to reduce erosion	• Meet on site with riparian landowners to discuss problems and solutions • Direct mailing of educational materials • Signage program for recreational users
Nutrients	Fertilizer use	• Riparian landowners • Agricultural operators	• Maintaining greenbelts or conservation buffers is the best method to limit fertilizer runoff • Test soil and apply fertilizer based on needs of soil • Avoid application directly adjacent to the waterway	• Direct mailing of educational materials • Distribute educational materials at watershed seminars
	Septic systems	• Riparian landowners	• Septic systems need to be maintained on a regular basis	• Direct mailing of educational materials • Distribute educational materials at watershed seminars
	Runoff	• Riparian landowners	• Maintaining greenbelts is the best method to limit runoff to waterways	• Direct mailing of educational materials • Distribute educational materials at watershed seminars
Hydrologic Flow	Runoff	• Riparian landowners	• Maintaining greenbelts is the best method to limit runoff to waterways	• Direct mailing of educational materials • Distribute educational materials at watershed seminars
	Deforestation	• Riparian landowners • Developers • Logging operators	• Deforestation increases runoff causing flow fluctuations • Maintaining buffers is the best tool for protecting water resources	• Direct mailing of educational materials • Workshops or seminars for developers and logging operators

Table 8-1 (Continued)
I&E Strategy - Target Audiences, Key Messages, and Delivery Mechanisms

Pollutant	Pollutant Source	Target Audience(s)	Key Message(s)	Delivery Mechanism(s)
Invasive Species	Transport from infested water bodies and migration from Lake Huron	• Boaters and other recreational users	• The danger invasive species pose to native species and water quality • Methods to control the spread of invasive species	• Signage and information at recreational access points
Pathogens	Septic systems	• Riparian landowners	• Septic systems need to be maintained on a regular basis	• Direct mailing of educational materials • Distribute educational materials at watershed seminars
	Wildlife	• Riparian landowners • Recreational users	• Feeding wildlife and waterfowl leads to over population	• Signage and information at recreational access points
Salts	Winter road maintenance	• Road Commission • MDOT	• Water quality concerns related to excessive chlorides • Proper application near waterways can improve water quality • Alternatives are available	• Seminar on proper application and/or alternatives
Temperature	Runoff	• Riparian landowners • Developers	• Elevated and fluctuating temperatures are detrimental to the cold water fishery • Runoff from impervious surfaces increases temperature	• Direct mailing of educational materials • Workshops or seminars for developers and logging operators
	Beaver dams	• Riparian landowners • Fisheries and wildlife resource professionals	• Effects of beaver dams on cold water fishery • Striking a balance between cold water fishery and wildlife habitat	• Direct discussion with resource professionals
	Deforestation	• Riparian landowners • Developers • Logging operators	• Elevated and fluctuating temperatures are detrimental to the cold water fishery • Deforestation and removal of riparian canopy increases runoff causing increased temperatures • Maintaining buffers is the best tool for protecting water resources	• Direct mailing of educational materials • Workshops or seminars for developers and logging operators

Table 8-1 (Continued)
I&E Strategy - Target Audiences, Key Messages, and Delivery Mechanisms

Pollutant	Pollutant Source	Target Audience(s)	Key Message(s)	Delivery Mechanism(s)
Oils and Greases	Road-stream crossings	• Road Commission • MDOT	• R/S crossing designs and maintenance methods to reduce runoff	• Seminar on R/S crossing designs, maintenance methods, and erosion controls to protect water quality
	Watercraft & ORV use	• Watershed landowners • Recreational users including boaters and ORV users	• The effects petroleum products have on watershed resources • Properly maintained equipment is first step to alleviate problem • Use caution and be aware of environmental impacts when operating recreational equipment	• Signage and information at recreational access points • Distribute informational brochures at watershed events
	Runoff	• Riparian landowners • Developers • Local planning and zoning officials	• Impervious surfaces near waterway increase runoff • Buffers and zoning set backs protect water quality, do not decrease property values • Methods and practices for incorporating Low Impact Development	• Direct mailing to riparian landowners on greenbelts • Host workshop for developers and local officials
Toxins (herbicides, pesticides, and other harmful chemicals)	Improper use and disposal of chemicals	• All watershed landowners	• Proper use and disposal of harmful chemicals • Alternatives to chemical herbicides and pesticides	• Direct mailing to landowners
Mercury and other heavy metals	Atmospheric deposition	• All watershed landowners	• How mercury and other metals enter our waters • Stay informed on state and federal clean air standards	• Distribute informational materials and discuss issues at watershed events

Chapter 9 – EVALUATION

The purpose of the Alcona Black River and Coastal Watersheds Project is to protect, restore and enhance the quality of the watershed resources. While a worthwhile and rewarding pursuit, it is often deemed successful without a factual measure of that success. Gauging a true level of that success is an often overlooked part of watershed management. It is important to evaluate the implementation of the objectives outlined in the watershed management plan to determine: whether the projects are being implemented in a timely manner, and, whether the projects being implemented are truly successful in protecting, restoring, and enhancing the water resources.

Evaluating the timeliness of project implementation is a much easier task than evaluating whether a given task is successful in protecting or restoring water quality. For example, it is easy to document the timely implementation of streambank erosion BMPs. However, this does not indicate that the BMPs effectively improved water quality or in-stream habitat. As another example, it is easy to document local townships having adopted model zoning language, but again, it does not evaluate any benefit to the watershed. So how do you evaluate the effectiveness of project implementation? For the first example above you may perform a stream geomorphology and biological assessment to evaluate whether implementing streambank BMPs effectively improved stream habitat. And for the second example, monitoring the waterfront setback and greenbelts left in place for new developments would truly evaluate a model zoning ordinances benefit to the watershed resources.

Possible methods for evaluating timely and effective implementation efforts are things such as: before and after photos of physical BMPs, biological and fishery surveys, stream geomorphology assessments, before and after surveys of landowner awareness, periodically updating the non-point source field inventories, and documenting water quality changes through a long-term monitoring program.

Evaluating Project Implementation Efforts

Table 9-1 provides a summary of evaluation methods for the individual objectives being implemented.

Table 9-1
Evaluation Methods by Implementation Objective

Objective	Evaluation Method
1:1 Road-stream Crossing BMPs	Before and after photos, calculate BMP pollutant load reductions, pre and post implementation stream assessment
1:2 Streambank Erosion BMPs	Before and after photos, calculate BMP pollutant load reductions, pre and post implementation stream assessment
1:3 Riparian Landowner Education	Property owner survey for awareness
1:4 Native Vegetation Greenbelts	Document number of sites completed, before and after photos
2:1 Invasive Species Education	Property owner survey for increased awareness, inventory of areas affected before and after education efforts
2:2 Invasive Species Monitoring	Track number of landowners and/or clubs assisting with monitoring effort, track changes over time in areas affected

Table 9-1 (continued)
Evaluation Methods by Implementation Objective

Objective		Evaluation Method
3:1	Model Zoning Ordinance	Document number of townships adopting model ordinance, calculate watershed wide pollutant runoff
3:2	Coordinate Master Planning and Zoning	Conduct pre and post planning and zoning review to track watershed protection ordinances
3:3	Planning and Zoning Training	Pre and post survey of workshop participants
4:1	Identify and Protect Sensitive Parcels	Document number of conservation easements, acres of wetland/sensitive areas protected, river miles protected
4:2	Large Woody Debris Enhancement	Document number of sites completed, before and after photos, biological surveys pre and post installation
4:3	Natural Features Inventory	Use of the inventory to prioritize efforts of Goal 4:Objective 1, and in local planning and decision making
5:1	Develop Water Quality Database	Monitor database to be certain it is updated
5:2	Chemical, Biological, and Physical Sampling	Compare water quality data over time
5:3	Geomorphology Assessment	Compare pre and post assessments to determine level of stream habitat improvements
5:4	Update Non-point Source Inventories	Compare to previous inventory results to determine changes in numbers and/or site severity
6:1	Watershed Day and River Cleanup	Track number of attendees, survey of attendees, document amount of trash and debris removed from water
6:2	Signage Program	Document content, placement location, and number of signs placed
6:3	Promote Alcona Black River Watershed Advisory Group	Document changes in council membership, meeting attendance, and fundraising efforts

Evaluating the Success of the Watershed Project

The individual evaluation methods above will measure implementation timeliness, and to some degree, the effectiveness. However, to truly gauge the effectiveness of implementation a long-term monitoring program is needed.

Several monitoring procedures that will effectively track the health of the watershed over time have been identified. They are stream geomorphology assessments, biological surveys, chemical water sampling, and periodically updating non-point source inventories. A brief description of each measure is below. **Table 9-2** provides a summary of the water quality monitoring program.

Stream Geomorphology Assessment

A stream geomorphology assessment is used to determine the physical integrity and stability of a stream at a particular location. Repeated assessment at one location, especially locations where BMPs have been implemented, is useful for documenting in-stream changes and habitat improvements. Typically, geomorphology assessment would include measurements of stream dimensions, channel pattern, stream profile, and stream bed material. The assessment paints a picture of the stream characteristics and reveals changes after BMP installation.

Stream geomorphology assessments should be conducted at locations where in-stream BMPs have been implemented.

Biological Survey

A biological survey is used to establish the existing condition of a water body. It includes an assessment of the physical habitat conditions and the macroinvertebrate community. The diversity of that community and the sensitivity of each species are key factors in determining water quality.

Locations for biological surveys were identified during the planning process and can be found in Chapter 3, Page 3-16.

Water Quality Sampling

To effectively track long-term changes in water quality, a volunteer water quality monitoring program needs to be established (See Goal 5). Some testing supplies have been purchased and donated to Alcona Community Schools to begin volunteer monitoring effort. Expanding the program and additional testing parameters are needed. The sampling parameters obtained are: pH, Alkalinity, Ammonia-Nitrogen, Nitrate-Nitrogen, Nitrite, Phosphate, Conductivity, Fecal Coliform, Dissolved Oxygen, Sulfide, Salinity, and Total Dissolved Solids (TDS). Additional tests recommended are: Total Suspended Solids (TSS), a more extensive Fecal Coliform Test, and long-term Temperature Probes.

pH - The acidity of water is expressed by a measurement called pH. The pH scale ranges from 0-14. A pH of 7 is neutral, with levels below 7 indicating acidity, and levels above 7 indicating alkalinity. When pH is outside the range of 5.5 to 8.5, most aquatic organisms become stressed and populations of some species can become depressed or disappear entirely. Rapid pH fluctuations can also stress aquatic organisms. Acidity can aggravate toxic contamination problems.

Alkalinity - Not to be confused with pH, alkalinity is a measure of buffering capacity - that is, the degree to which water can resist changes in pH. Most commonly this capacity is the result of carbonate and bicarbonate ions present in the water. These ions react with, or buffer, incoming hydrogen ions that would otherwise lower the pH of the water. Alkalinity is indicative of the types of soils and underlying rock in the area. Regions rich in limestone will have lakes, ponds, and streams of moderate to high alkalinity. Regions with bedrock primarily of granite will have water of low alkalinity.

Nitrogen - Nitrogen is a major component of all plant and animal matter and a very abundant element throughout the earth's surface. Nitrate and ammonia forms of nitrogen are the most common forms of nitrogen and the most useable by aquatic plants. However, nitrogen can be present in many other forms. Nitrite for example is easily converted to Nitrate.

Phosphate - Phosphorus is an essential nutrient for plants and animals. In most freshwater systems, phosphorus is the *limiting nutrient*. All other essential elements for growth are usually present in relative abundance and by adding only phosphorus a rapid increase in growth can be stimulated. This sudden increase in productivity in a waterbody leads to a rapid buildup of organic material, accelerated rates of decomposition, and a drop in dissolved oxygen levels. This series of events is referred to as cultural, or non-natural, eutrophication.

Conductivity - The ability of water to conduct electricity is termed conductivity. Charged particles called ions, such as chloride, that become dissolved in water, supply the means for water to conduct electricity. As conductivity measures the dissolved ionic content of water, it is also commonly used as a measure of total dissolved solids. Because our lakes and streams generally contain a lot of soluble minerals and high alkalinity, the conductivity is fairly high. Conductivity is an easy and accurate way to measure the level of dissolved substances, but cannot indicate what the substances are. A steady increase of conductivity over a period of years is usually indicative of pollution occurring.

Fecal Coliform – Fecal Coliform are bacteria found in the digestive system of warm-blooded animals. The presence of fecal coliform in water typically indicates possible fecal waste from humans, livestock, pets, and birds. High concentrations can cause health problems.

Dissolved Oxygen - Dissolved Oxygen (DO) is the amount of oxygen present in the water. An adequate DO concentration in water is needed to support fish and other aquatic life. The flow of streams causes water to "capture" oxygen from the air. Oxygen also enters a water body by means of diffusion from the atmosphere and as a by-product of photosynthesis from aquatic plants. Key factors influencing DO levels include excess sediment and nutrient concentrations, intensity of aquatic plant growth, and water temperature. A minimum average DO of 7 mg/L is recommended for a cold-water fishery.

Sulfide – Sulfide occurs in many well water supplies and is sometimes formed in lakes and streams. In a water distribution system it may be formed as a result of bacterial action on organic matter under anaerobic conditions. If found in surface waters, it is usually indicative of sewage or industrial wastes being discharged to the waterbody.

Salinity – Salinity is the number of grams of dissolved salts present in 1,000 grams of water, and is usually expressed in parts per thousand (ppt). Freshwater lakes and streams usually have very low Salinity (less than .5ppt). Elevated Salinity levels are easily possible during spring snowmelt and runoff due to the salts used to melt ice on roadways.

Total Dissolved Solids – Dissolved solids in a waterbody are usually composed of the sulfate, bicarbonate and chlorides of calcium, magnesium and sodium. The amount of dissolved solids in a water body is closely related to conductivity.

Total Suspended Solids – Total Suspended Solids (TSS) refer to the loose particles of clay, silt and sand that suspend in a body of water and eventually settle to the bottom. While suspended solids, or sediment, are a natural part of a watersheds' ecosystem, excessive amounts can be harmful. Excessive sediment can smother benthic (bottom-dwelling) plants and animals, carry high concentrations of nutrients and toxins, impede navigation and cloud the water. Turbid, or cloudy, waters absorb more sunlight raising the temperature more quickly.

Temperature - The temperature of a water body is a key parameter when gauging water quality because many of the physical, biological and chemical characteristics of a river are directly affected by temperature. Water temperature affects: the amount of oxygen that can be dissolved in water, rate of photosynthesis by aquatic plants, sensitivity of organisms to toxins, and the metabolic rates of aquatic organisms.

Locations for water chemistry sampling are the same as those for the biological surveys (See Chapter 3, and Map 5).

Non-Point Source Inventory Update

Periodic updates of the non-point source inventories is an easy method of tracking watershed changes and measuring implementation effectiveness. If implementation efforts are being implemented timely and effectively, the number and overall severity of erosion sites should decrease over time. Since the inventory effort can be performed by volunteers, and requires no expensive equipment, it is also a very cost effective monitoring method. It is recommended that the inventories be updated every five years.

Table 9-2
Water Quality Monitoring Protocol

Monitoring Procedure	Monitoring Location	Monitoring Parameters	Monitoring Frequency	Environmental Target
Stream Geomorphology Assessment	Locations of in-stream BMP installation (streambank erosion, road-stream crossing)	• Stream Channel Characteristics • Sediment	Before and after BMP installation	• Reduction in amount of sediment • Improvements in stream channel characteristics (improved habitat, reduced downcutting, reduced embeddedness)
Biological Survey	Locations listed in Chapter 3, Page 3-16	• Macroinvertebrates • Physical Habitat	Twice a year (spring and fall)	MiCorps protocol macroinvertebrate scores at "Good" or "Excellent" at all locations
Water Quality Sampling	Locations listed in Chapter 3, Page 3-16	• Alkalinity • Ammonia-Nitrogen • Conductivity • Fecal Coliform • Dissolved Oxygen • Nitrate-Nitrogen • Nitrite • pH • Phosphate • Sulfide • Salinity • Total Dissolved Solids (TDS) • Total Suspended Solids (TSS) • Temperature	Annually	• No increase in nutrient levels • DO levels above 7 mg/l • Fecal Coliform not to exceed 130 units/100 ml for a 30-day average • TSS levels below 80 mg/l • Temperature averages in optimal range for Brook Trout Fishery (52-61^{o}F)
Non-Point Source Inventory Update	Watershed wide	• Road-stream crossings • Streambank erosion • Agricultural areas • Stormwater	Once every 5 years	Decrease in number of sites and overall severity of sites

Chapter 10 – FINAL WATER QUALITY SUMMARY

The Alcona Black River and Coastal Watersheds currently maintain high quality waters. The Alcona Black River, and many of its tributaries, are designated by the MDNR as a coldwater fishery. These coldwater streams support reproducing populations of chinook and cohoe salmon, steelhead, brook trout and coaster brook trout. In addition, the watersheds contain portions of Negwegon State Park and Huron National Forest, two of the most unspoiled areas in northeastern Michigan. However, existing erosion problems, increasing development within the region, current land management practices, and inadequate environmental education of watershed residents have the potential to impact the natural resources of the watersheds.

The State of Michigan has designated uses for which all waters in the state are protected, most of which are applicable to the Alcona Black River and Coastal Watersheds. While these uses are currently being met, they are threatened. Although the threat to these uses does not mean that they will be impaired tomorrow, it is a very real danger should land use changes occur within the watershed, especially within the defined critical areas. Navigation, warm and cold water fisheries, aquatic and other wildlife, partial and total body contact recreation and fish consumption are all designated uses considered threatened within the watersheds. Agriculture is a designated use applicable to the watersheds that is currently being supported.

Sediment and nutrients appear to be the two primary pollutants threatening these designated uses. Major sources of sediment include poor road-stream crossings, and streambank erosion sites. The primary sources of nutrients are poorly maintained or old septic systems, and the improper and overuse of fertilizers on residential lawns and agricultural fields within the riparian corridor. Other pollutants known or suspected of affecting water quality include invasive species, pathogens, changes in flow, elevated temperature of coldwater streams, oils and grease, and other toxins.

The overall goal of the Alcona Black River and Coastal Watersheds Planning Initiative is the long-term protection and enhancement of the natural resources, specifically the water resources, within the watersheds. This includes protecting the high quality waters so they continue to support all of their designated uses. To accomplish this, it is imperative that steps are taken to correct existing sources of pollution, improve cold water fish habitat and to prevent future impacts from occurring so that future generations will be assured an ecologically sound, biologically diverse, and sustainable Black River and Coastal Watershed systems. This comprehensive watershed management plan provides a framework for undertaking these steps. With proper planning, resource agencies in the region will be able to address the major sources of pollutants that are now affecting, or will have the potential to affect the Black River Watershed.

Appendix A

Non-Point Source Pollution Inventory
Field Data Collection Forms

STREAMBANK EROSION INVENTORY

Site Number:_____ Date:_____

County:_____ Photo Numbers:_____

Observer:_____

LOCATION

Township Name:_____ Township:_____ Range:_____ Section:_____

GPS Coordinates:_____ _____

Owners: FEDERAL STATE COUNTY PRIVATE _____

Landmarks/Features:_____

SITE INFORMATION

Bank- While looking downstream: RIGHT LEFT

Is there access to the site for equipment: YES NO

If no, distance to nearest road (estimate):_____

CONDITION OF BANK (circle)

A. Toe is undercutting
B. Toe is stable, upper bank is eroding
C. Toe and upper bank eroding
D. Other (describe)_____
E. Percent of vegetative cover on bank: 0-10% 10-50% 50-100%
F. Problem trend: INCREASING DECREASING STABLE

APPARENT CAUSE OF EROSION (circle any applicable)

A. Land use (Mowing, Clearcutting, Development)
B. Foot traffic, Boat access, Fishing site
C. Peaking
D. Surface water entering
E. Bend or obstruction in river
F. Wildlife use
G. Wave action
H. Bank seepage
I. Other_____

AMOUNT OF EROSION AND SLOPE RATIO

A. Sideslope of bank (circle one)
   Vertical 1:1 2:1 3:1 4:1 Flatter
B. Length of eroded bank:_____
C. Average height of eroded bank:_____

RIVER CONDITIONS

A. Approximate width of river:_____
B. Depth of river:_____ at _____ from the bank
C. Current: Slow Moderate Fast
D. Slope of inside depositional bar (circle one):
   Steep (>3:1) Moderate (<3:1 but > 10:1) Slight (<10:1)

SOIL TEXTURE

Sand Clay Loam Gravel Stratified Sand over Clay
Other:_____

Severity of Site: Minor Moderate Severe

RECOMMENDED TREATMENT (circle all that apply)

A. Rock Rip-Rap
B. Biologs/Tree Revetments
C. Tree Revetments
D. Bank Sloping
E. Stairways
F. Bank Seeding or Planting
G. Brush Placement
H. Log Terrace
I. Fencing
J. Other:_____

COMMENTS

Streambank Erosion Severity Index

Condition of bank	Points	Soil type or texture	Points
Toe and upper bank eroding	5	Sand	3
Toe undercutting	3	Gravel	2
Toe stable, upper bank eroding	1	Stratified	2
		Clay, loam	1
Problem trend		**Vegetative cover on bank slope**	
Increasing	5	0-10%	5
Decreasing or stable	1	10-50%	3
		40-100%	1
Side-slope of bank		**Apparent cause of erosion**	
Vertical, 1:1	5	Light access traffic	1
2:1, 3:1	2	Obstruction in river	1
4:1 or flatter	1	Bank seepage	1
		Gullying by side channels	1
		Bend in river	2
		Wave action (impoundments)	2
		Road-stream crossing; grade/shoulder runoff	3
		Moderate access traffic	3
		Heavy access (foot, horse, etc.) traffic	5
Length of eroded bank		**Mean height of eroded bank**	
More than 50 ft.	5	More than 20 ft	7
20 to 50 ft.	3	10 to 20 ft	5
Less than 20 ft.	1	5 to 10 ft	3
		less than 5 ft	1
Depth of river		**Current**	
3 ft or over	2	Fast	2
Less than 3 ft	1	Slow	1
		Total Points for Site	

Accumulative points indicate extent of erosion, i. e., the site rating, as follows:

More than 36-----Severe
30 to 36----------Moderate
Less than 30------Minor

ROAD STREAM CROSSING FIELD DATA FORM

Collected By:_____ Field ID Number:_____
Date: _____ Site ID: _____

LOCATION

Stream Name:_____County:_____Road Name:_____
Crossing Name:_____Township_____T_____R_____Sec_____

Type of Crossing:
- _____Bridge
- _____Single Culvert
- _____Twin Culvert
- _____Triple Culvert_____
- _____Other_____

Adjacent Land owners:
- _____USA
- _____State
- _____Local Gov't
- _____Private
- _____Other_____

ROAD DATA

Width at Crossing _____ft
Road Surface _____paved
_____gravel
_____sand

Maintenance _____seasonal
_____year around

APPROACHES

	Left		Right
Length	_____ft		_____ft
Slope	_____	0%	_____
	_____	1-5%	_____
	_____	6-10%	_____
	_____	>10%	_____

Location of low point
- _____at stream
- _____other_____
- _____
- _____

Ditch/Shoulder Vegetation
- _____none_____
- _____partial_____
- _____heavy_____

Existing drainage control features
_____None _____Present and functional
_____Need repair_____
_____

Average width of grade, including shoulders and ditches _____ft

Runoff path _____roadway _____ditch

CULVERT DESCRIPTION

Length _____ft
Diameter _____inches
Material _____galvanized
_____concrete
_____other_____

Condition _____good
_____fair
_____poor

Flow through culvert _____clear
_____obstructed

Fish passage problem? _____

	Inlet		Outlet
Fill Depth	_____	ft	_____
Embankment	_____	vertical	_____
	_____	1:1	_____
	_____	1.5:1	_____
	_____	2:1	_____
	_____	>2:1	_____

STREAM CHARACTERISTICS

	Upstream		Downstream
Ave Width	_____	ft	_____
Ave Depth	_____	ft	_____
Ave Current	_____	slow	_____
	_____	moderate	_____
	_____	fast	_____
predominant substrate type	_____	sand	_____
	_____	snd/grav	_____
	_____	gravel	_____
	_____	muck	_____
	_____	other	_____

Adjacent wetlands _____yes _____no

Water Temperature _____

Visible down cutting _____yes _____no _____inches

Comments_____
_____

CONDITIONS AND TREATMENT

Erosion Conditions

_____Streambank erosion beside crossing
_____Embankment erosion
_____Culvert outlet erosion
_____Pool formation at culvert outlet
_____Shoulder/ditch erosion
_____Sand/soil over bridge or crossing
_____Other_____

Recommended Treatment (number)

_____Pavement
_____Paved curb & gutter
_____Erosion control structures ( )
_____Sediment basins ( )
_____Extend culverts ( )
_____Diversion outlets ( )
_____Increase fill
_____Replace culverts ( )
_____Other _____

Extent

_____minor _____moderate _____extreme

Reason for recommendation_____
_____

Cause_____
_____

Photo number(s) _____

SITE SKETCH

ROAD/STREAM CROSSING SEVERITY INDEX

Site ID_____

Factors Contibuting to Severity	Points	Site Score
ROAD SURFACE	Paved: 0 pt Gravel: 3 pt Sand & Gravel: 6 pt Sand: 9 pt	
LENGTH OF APPROACHES	0-40 ft: 1 pt 41-1000 ft: 3 pt 1001-2000 ft: 5 pt >2000 ft: 7 pt	
SLOPE OF APPROACHES	0%: 0 pt 1-5%: 3 pt 6-10%: 6 pt >10%: 9 pt	
WIDTH OF ROAD, SHOULDERS & DITCHES	<15 ft: 0 pt 16-20 ft: 1 pt >20 ft: 2 pt	
EXTENT OF EROSION	Minor: 1 pt Moderate: 3 pt Severe: 5 pt	
EMBANKMENT SLOPE	Bridges: 0 pt >2:1 slope: 1 pt 1:5-2:1 slope: 3 pt Vertical or 1:1 slope: 5 pt	
STREAM DEPTH	0-2 ft: 1 pt >2 ft: 2 pt	
STREAM CURRENT	Slow: 1 pt Moderate: 2 pt Fast: 3 pt	
VEGETATIVE COVER OF SHOULDERS & DITCHES	Heavy: 1 pt Partial: 3 pt None: 5 pt	
TOTAL	**0-15 Minor** **16-29 Moderate** **≥30 Severe**	

Agricultural Inventory for the Alcona Black River Watershed

Date:_____ Observer:_____ Stream:_____

1) LOCATION

County Township No.: Range: Section:
GPS Coordinates:
Property Owner:

2) FARM INFORMATION

Type of operation: □ Livestock □ Crops □ Orchard
Estimated size of farm:_____acres
General topography: □ Flat □Gently rolling □ Moderately rolling □ Steeply rolling
Estimated riparian frontage of farm:_____feet

3) SITE INFORMATION

Soil type: □ Clay □ Organic □ Sand □ Loam
Stream Conditions:

- Approximate width of stream:_____ • Current:____fast ____moderate ____ slow

Are there drains at this site? □ Yes □ No
Are there foreseeable risks to: □ surface water, □ groundwater, or □ wetlands from the farm site?

4) APPARENT POLLUTANT SOURCES

□ Unrestricted Livestock Access to Water

- Approximate length of access:_____

□ Crop production adjacent to water (poor buffer/filter strip)

- Approximate length of production area along waterway:_____
- Distance from crops to water:_____ • Type of crops:_____
- Conservation tillage (reduced till or no till)_____

□ Feedlot runoff

- Size of feedlot:_____ • Proximity to waterway_____ft. • Slope_____

□ Manure Storage area runoff

- Size of area:_____ • Proximity to waterway_____ft. • Slope_____

□ Manure Application within 150 feet of a waterway
□ Poor storage of fertilizer/pesticides
□ Is the land Irrigated Y N
□ Other (please describe, such as oil & gas operation, silage runoff, milking parlor runoff, mining, farm road runoff, etc.):_____

5) RECOMMENDED TREATMENT

a. Exclusion Fencing
   - Total amount of fencing (for both sides of stream, if necessary) needed:_____ft.
b. Livestock crossing/livestock access
c. Alternate water source
d. Riparian buffer/filter strip
   - Width of buffer strip recommended:_____ft. • Length of buffer strip:_____ft.
e. Fertilizer/pesticide storage
f. Erosion control structures:_____
g. Animal waste facility
h. Feedlot diversion and water retention basin
i. Nutrient Management Plan
j. Other:_____

6) SEVERITY OF SITE

□ Slight □ Moderate □ Severe

7) PERCEIVED LEVEL OF COOPERATION FROM LANDOWNER (if known)

□ Very willing to implement BMPs □ Somewhat willing □ Unwilling □ Unknown

Please sketch map of site, showing direction of runoff, proximity to waterbody, and noting any site-specific concerns.

Additional notes for treatment (cost estimate):

Appendix B

Alcona Black River & Coastal Watersheds Streambank Erosion Inventory

Site ID	**SB01**	**Severity Rating:**	**Minor**
County:	Alcona	**Water Feature:**	N Branch Black River
Township:	Alcona T28N 9E Sec 22	**Landowners:**	Private
Condition of Bank:	Toe is undercutting	**Apparent Cause of Erosion:**	Bend in river, log jam
Problem Trend:	Increasing		
Side Slope of Bank:	Vertical		
Length of Eroded Bank:	16 feet		
Depth of River:	1 foot		
Soil Type/Texture:	Loam/Muck	**Recommended Treatment:**	Reposition log jam Brush placement
Vegetation on Bank Slope:	50-100%		
Height of Eroded Bank:	2 feet		
Current:	Slow	**Estimated Cost:**	**$500**

Site ID	**SB02**	**Severity Rating:**	**Severe**
County:	Alcona	**Water Feature:**	N Branch Black River
Township:	Alcona T28N 9E Sec 22	**Landowners:**	Private
Condition of Bank:	Toe & upper bank eroding	**Apparent Cause of Erosion:**	Bend in river Land use Foot traffic
Problem Trend:	Increasing		
Side Slope of Bank:	1:1		
Length of Eroded Bank:	175 feet		
Depth of River:	3 feet		
Soil Type/Texture:	Sand over clay	**Recommended Treatment:**	Bank Sloping Log terrace Biolog/tree revetment Bank seeding & planting
Vegetation on Bank Slope:	0-10%		
Height of Eroded Bank:	7 feet		
Current:	Moderate	**Estimated Cost:**	**$12,250**

Site ID	**SB03**	**Severity Rating:**	**Severe**
County:	Alcona	**Water Feature:**	N Branch Black River
Township:	Alcona T28N 9E Sec 22	**Landowners:**	Private
Condition of Bank:	Toe & upper bank eroding	**Apparent Cause of Erosion:**	Bend in river Land use Foot traffic
Problem Trend:	Increasing		Wildlife use
Side Slope of Bank:	1:1		
Length of Eroded Bank:	200 feet		
Depth of River:	1 foot		
Soil Type/Texture:	Sand over clay	**Recommended Treatment:**	Bank sloping Biolog/tree revetment
Vegetation on Bank Slope:	10-50%		Bank seeding & planting
Height of Eroded Bank:	9 feet		
Current:	Slow	**Estimated Cost:**	**$14,000**

Site ID	**SB04**	**Severity Rating:**	**Moderate**
County:	Alcona	**Water Feature:**	N Branch Black River
Township:	Alcona T28N 9E Sec 22	**Landowners:**	Private
Condition of Bank:	Toe & upper bank eroding	**Apparent Cause of Erosion:**	Bend in river Land use
Problem Trend:	Stable		
Side Slope of Bank:	1:1		
Length of Eroded Bank:	125 feet		
Depth of River:	4 feet		
Soil Type/Texture:	Sand over clay	**Recommended Treatment:**	Bank sloping or log terrace Biolog/tree revetment Bank seeding & planting
Vegetation on Bank Slope:	10-50%		
Height of Eroded Bank:	9 feet		
Current:	Slow	**Estimated Cost:**	**$8,750**

Site ID	**SB05**	**Severity Rating:**	**Moderate**
County:	Alcona	**Water Feature:**	N Branch Black River
Township:	Alcona T28N 9E Sec 22	**Landowners:**	Private
Condition of Bank:	Toe & upper bank eroding	**Apparent Cause of Erosion:**	Bend in river Bank seepage
Problem Trend:	Increasing		
Side Slope of Bank:	1:1		
Length of Eroded Bank:	125 feet		
Depth of River:	2 feet		
Soil Type/Texture:	Sand over clay	**Recommended Treatment:**	Bank sloping or log terrace Biolog/tree revetment Bank seeding & planting
Vegetation on Bank Slope:	50-100%		
Height of Eroded Bank:	9 feet		
Current:	Slow	**Estimated Cost:**	**$6,250**

Site ID	**SB06**	**Severity Rating:**	**Minor**
County:	Alcona	**Water Feature:**	N Branch Black River
Township:	Alcona T28N 9E Sec 22	**Landowners:**	Private
Condition of Bank:	Toe & upper bank eroding	**Apparent Cause of Erosion:**	Bend in river Land use
Problem Trend:	Stable		
Side Slope of Bank:	1:1		
Length of Eroded Bank:	125 feet		
Depth of River:	2 feet		
Soil Type/Texture:	Sand & gravel	**Recommended Treatment:**	Bank sloping or log terrace Biolog/tree revetment Bank seeding & planting
Vegetation on Bank Slope:	50-100%		
Height of Eroded Bank:	8 feet		
Current:	Moderate	**Estimated Cost:**	**$6,250**

Site ID	**SB07**	**Severity Rating:**	**Moderate**
County:	Alcona	**Water Feature:**	Black River
Township:	Alcona T28N 9E Sec 22	**Landowners:**	Private
Condition of Bank:	Toe & upper bank eroding	**Apparent Cause of Erosion:**	Bend/obstruction in river Land use Foot traffic
Problem Trend:	Increasing		
Side Slope of Bank:	1:1		
Length of Eroded Bank:	80 feet		
Depth of River:	2 feet		
Soil Type/Texture:	Sand	**Recommended Treatment:**	Bank sloping Biolog/tree revetment Bank seeding & planting Remove old dock & stairs from river
Vegetation on Bank Slope:	10-50%		
Height of Eroded Bank:	10 feet		
Current:	Slow	**Estimated Cost:**	**$4,000**

Site ID	**SB08**	**Severity Rating:**	**Moderate**
County:	Alcona	**Water Feature:**	Black River
Township:	Alcona T28N 9E Sec 23	**Landowners:**	Private
Condition of Bank:	Toe & upper bank eroding	**Apparent Cause of Erosion:**	Bend/obstruction in river Bank seepage
Problem Trend:	Stable		
Side Slope of Bank:	1:1		
Length of Eroded Bank:	100 feet		
Depth of River:	2 feet		
Soil Type/Texture:	Clay	**Recommended Treatment:**	Bank sloping Biolog/tree revetment Topsoil bank and seed & plant
Vegetation on Bank Slope:	0-10%		
Height of Eroded Bank:	10 feet		
Current:	Moderate	**Estimated Cost:**	**$7,000**

Site ID	**SB09**	**Severity Rating:**	**Moderate**
County:	Alcona	**Water Feature:**	Black River
Township:	Alcona T28N 9E Sec 23	**Landowners:**	Private
Condition of Bank:	Upper bank eroding	**Apparent Cause of Erosion:**	Bend in river Land use Surface water entering
Problem Trend:	Increasing		
Side Slope of Bank:	1:1		
Length of Eroded Bank:	200 feet		
Depth of River:	2 feet		
Soil Type/Texture:	Sand over clay	**Recommended Treatment:**	Bank sloping Biolog/tree revetment
Vegetation on Bank Slope:	10-50%		Bank seeding & planting
Height of Eroded Bank:	6 feet		
Current:	Moderate	**Estimated Cost:**	**$14,000**

Site ID	**SB10**	**Severity Rating:**	**Moderate**
County:	Alcona	**Water Feature:**	Black River
Township:	Alcona T28N 9E Sec 22	**Landowners:**	Private
Condition of Bank:	Upper bank eroding	**Apparent Cause of Erosion:**	Bend/obstruction in river Land use Foot traffic
Problem Trend:	Increasing		Surface water entering Bank seepage
Side Slope of Bank:	1:1		
Length of Eroded Bank:	150 feet		
Depth of River:	3 feet		
Soil Type/Texture:	Sand over clay	**Recommended Treatment:**	Bank sloping Biolog/tree revetment
Vegetation on Bank Slope:	10-50%		Bank seeding & planting Brush placement
Height of Eroded Bank:	6 feet		
Current:	Moderate	**Estimated Cost:**	**$10,500**

Site ID	**SB11**	**Severity Rating:**	**Severe**
County:	Alcona	**Water Feature:**	Black River
Township:	Alcona T28N 9E Sec 23	**Landowners:**	Private
Condition of Bank:	Toe & upper bank eroding	**Apparent Cause of Erosion:**	Bend in river Land use Wave action Surface water entering Bank Seepage
Problem Trend:	Increasing		
Side Slope of Bank:	1:1		
Length of Eroded Bank:	400 feet		
Depth of River:	3 feet		
Soil Type/Texture:	Sand	**Recommended Treatment:**	Bank sloping Biolog/tree revetment Bank seeding & planting Brush placement
Vegetation on Bank Slope:	0-10%		
Height of Eroded Bank:	6 feet		
Current:	Moderate	**Estimated Cost:**	**$28,000**

Site ID	**SB12**	**Severity Rating:**	**Moderate**
County:	Alcona	**Water Feature:**	S Branch Black River
Township:	Alcona T28N 9E Sec 26	**Landowners:**	Private
Condition of Bank:	Toe is undercutting	**Apparent Cause of Erosion:**	Bend/obstruction in river Land use Foot traffic
Problem Trend:	Increasing		
Side Slope of Bank:	Vertical		
Length of Eroded Bank:	120 feet		
Depth of River:	2 feet		
Soil Type/Texture:	Sand (loamy sand)	**Recommended Treatment:**	LUNKER Structure Rock rip rap Biolog/tree revetment Bank seeding & planting
Vegetation on Bank Slope:	50-100%		
Height of Eroded Bank:	4 feet		
Current:	Moderate	**Estimated Cost:**	**$5,225**

Site ID	**SB13**	**Severity Rating:**	**Severe**
County:	Alcona	**Water Feature:**	S Branch Black River
Township:	Alcona T28N 9E Sec 22	**Landowners:**	Private
Condition of Bank:	Toe & upper bank eroding	**Apparent Cause of Erosion:**	Bend/obstruction in river Land use Foot traffic
Problem Trend:	Increasing		
Side Slope of Bank:	1:1		
Length of Eroded Bank:	175 feet		
Depth of River:	2 feet		
Soil Type/Texture:	Sand	**Recommended Treatment:**	Bank sloping or log terrace Biolog/tree revetment Bank seeding & planting
Vegetation on Bank Slope:	0-10%		
Height of Eroded Bank:	10 feet		
Current:	Slow	**Estimated Cost:**	**$12,250**

Site ID	**SB14**	**Severity Rating:**	**Moderate**
County:	Alcona	**Water Feature:**	N & S Branch Black Rv
Township:	Alcona T28N 9E Sec 26	**Landowners:**	Private
Condition of Bank:	Toe is undercutting	**Apparent Cause of Erosion:**	Bend/obstruction in river Land use Foot traffic Confluence of N & S Branches Black River
Problem Trend:	Increasing		
Side Slope of Bank:	Vertical		
Length of Eroded Bank:	100 feet		
Depth of River:	4 feet		
Soil Type/Texture:	Sand (loamy sand)	**Recommended Treatment:**	LUNKER Structure Rock rip rap Bank seeding & planting
Vegetation on Bank Slope:	10-50%		
Height of Eroded Bank:	3 feet		
Current:	Slow	**Estimated Cost:**	**$6,625**

Appendix C

Alcona Black River & Coastal Watersheds Road-Stream Crossing Inventory

Road-Stream Crossing ID: AB-01

Location

County: *Alcona*
Stream Name: *Butternut Creek*
Road Name: *F-41 (Barlow Rd)*
Township: *Alcona*
Adjacent Landowners: *private*

Culvert Description

Crossing Type: *concrete box*
Culvert Length (ft): *54*
Culvert Diameter (in): *36"*
Culvert Condition: *good*
Culvert Flow: *clear*
Fish Passage Problem: *No*
Culvert Fill Depth-inlet, outlet (ft): *11, 11*
Culvert Embankment Slopes: *1:1.5, 1:1.5*
Culvert Material: *concrete*

Erosion

Severity Category: *moderate*
Erosion Extent: *minor*
Erosion Conditions: *none*

Road Data

Average Width at Crossing (ft): *46*
Surface: *paved*
Left Approach Length (ft): *400'*
Right Approach Length (ft): *640'*
Left Approach Slope: *1-5%*
Right Approach Slope: *>10%*
Ditch, Shoulder Vegetation: *heavy, heavy*

Stream Characteristics

Average Upstream Width (ft): *12*
Average Downstream Width (ft): *12*
Average Upstream Depth (ft): *1*
Average Downstream Depth (ft): *1*
Upstream Current: *moderate*
Downstream Current: *moderate*

RECOMMENDED TREATMENTS: *none*

ESTIMATED COST: *na*

Road-Stream Crossing ID: AB-02

Location

County: *Alcona*
Stream Name: *Butternut Creek*
Road Name: *US-23*
Township: *Alcona*
Adjacent Landowners: *private*

Culvert Description

Crossing Type: *concrete box*
Culvert Length (ft): *96*
Culvert Diameter (in): *96''*
Culvert Condition: *good*
Culvert Flow: *clear*
Fish Passage Problem: *No*
Culvert Fill Depth-inlet, outlet (ft): *12, 12*
Culvert Embankment Slopes: *1:1.5, 1:1.5*
Culvert Material: *concrete*

Erosion

Severity Category: *moderate*
Erosion Extent: *minor*
Erosion Conditions: *none*

RECOMMENDED TREATMENTS: *none*

ESTIMATED COST: *na*

Road Data

Average Width at Crossing (ft): *60*
Surface: *paved*
Left Approach Length (ft): *1500*
Right Approach Length (ft): *450*
Left Approach Slope: *>10%*
Right Approach Slope: *1-5%*
Ditch, Shoulder Vegetation: *heavy, heavy*

Stream Characteristics

Average Upstream Width (ft): *7*
Average Downstream Width (ft): *6*
Average Upstream Depth (ft): *1*
Average Downstream Depth (ft): *1*
Upstream Current: *moderate*
Downstream Current: *moderate*

Road-Stream Crossing ID: AB-03

Location

County: *Alcona*
Stream Name: *Trib to Butternut Creek*
Road Name: *US-23*
Township: *Alcona*
Adjacent Landowners: *private*

Culvert Description

Crossing Type: *single culvert*
Culvert Length (ft): *175*
Culvert Diameter (in): *72''*
Culvert Condition: *good*
Culvert Flow: *clear*
Fish Passage Problem: *No*
Culvert Fill Depth-inlet, outlet (ft): *50, 50*
Culvert Embankment Slopes: *1:1.5, 1:1.5*
Culvert Material: *concrete*

Erosion

Severity Category: *moderate*
Erosion Extent: *minor*
Erosion Conditions: *none*

RECOMMENDED TREATMENTS: *none*

ESTIMATED COST: *na*

Road Data

Average Width at Crossing (ft): *60*
Surface: *paved*
Left Approach Length (ft): *2640*
Right Approach Length (ft): *1320*
Left Approach Slope: *1-5%*
Right Approach Slope: *1-5%*
Ditch, Shoulder Vegetation: *heavy, heavy*

Stream Characteristics

Average Upstream Width (ft): *3*
Average Downstream Width (ft): *3*
Average Upstream Depth (ft): *0.5*
Average Downstream Depth (ft): *0.5*
Upstream Current: *slow*
Downstream Current: *slow*

Road-Stream Crossing ID: AB-04

Location

County: *Private land foot bridge*
Stream Name:
Road Name:
Township:
Adjacent Landowners:

Culvert Description

Crossing Type:
Culvert Length (ft):
Culvert Diameter (in):
Culvert Condition:
Culvert Flow:
Fish Passage Problem:
Culvert Fill Depth-inlet, outlet (ft):
Culvert Embankment Slopes:
Culvert Material:

Erosion

Severity Category:
Erosion Extent:
Erosion Conditions:

Road Data

Average Width at Crossing (ft):
Surface:
Left Approach Length (ft):
Right Approach Length (ft):
Left Approach Slope:
Right Approach Slope:
Ditch, Shoulder Vegetation:

Stream Characteristics

Average Upstream Width (ft):
Average Downstream Width (ft):
Average Upstream Depth (ft):
Average Downstream Depth (ft):
Upstream Current:
Downstream Current:

RECOMMENDED TREATMENTS:

ESTIMATED COST:

Road-Stream Crossing ID: AB-05

Location

County: *Alcona*
Stream Name: *Liston*
Road Name: *Black River/Sayers Rd*
Township: *Alcona*
Adjacent Landowners: *private*

Culvert Description

Crossing Type: *single culvert*
Culvert Length (ft): *72*
Culvert Diameter (in): *60''*
Culvert Condition: *good*
Culvert Flow: *clear*
Fish Passage Problem: *No*
Culvert Fill Depth-inlet, outlet (ft): *10, 10*
Culvert Embankment Slopes: *1:1.5, 1:1.5*
Culvert Material: *galvanized*

Erosion

Severity Category: *moderate*
Erosion Extent: *minor*
Erosion Conditions: *none*

Road Data

Average Width at Crossing (ft): *27*
Surface: *paved*
Left Approach Length (ft): *300*
Right Approach Length (ft): *1500*
Left Approach Slope: *>10%*
Right Approach Slope: *6-10%*
Ditch, Shoulder Vegetation: *heavy, heavy*

Stream Characteristics

Average Upstream Width (ft): *4.5*
Average Downstream Width (ft): *3*
Average Upstream Depth (ft): *0.5*
Average Downstream Depth (ft): *0.25*
Upstream Current: *moderate*
Downstream Current: *moderate*

RECOMMENDED TREATMENTS: *none*

ESTIMATED COST: *na*

Road-Stream Crossing ID: AB-06

Location

County: *Alcona*
Stream Name: *DeRocher*
Road Name: *Black River Rd*
Township: *Alcona*
Adjacent Landowners: *private*

Culvert Description

Crossing Type: *single culvert*
Culvert Length (ft): *48*
Culvert Diameter (in): *48''*
Culvert Condition: *fair*
Culvert Flow: *clear*
Fish Passage Problem: *No*
Culvert Fill Depth-inlet, outlet (ft): *1, 1*
Culvert Embankment Slopes: *1:1.5, 1:1.5*
Culvert Material: *galvanized*

Erosion

Severity Category: *moderate*
Erosion Extent: *minor*
Erosion Conditions: *none*

RECOMMENDED TREATMENTS: *none*

ESTIMATED COST: *na*

Road Data

Average Width at Crossing (ft): *20*
Surface: *paved*
Left Approach Length (ft): *2640*
Right Approach Length (ft): *0*
Left Approach Slope: *6-10%*
Right Approach Slope: *0*
Ditch, Shoulder Vegetation: *heavy, heavy*

Stream Characteristics

Average Upstream Width (ft): *0.5*
Average Downstream Width (ft): *0.5*
Average Upstream Depth (ft): *0.25*
Average Downstream Depth (ft): *0.25*
Upstream Current: *slow*
Downstream Current: *slow*

Road-Stream Crossing ID: AB-06A

Location

County: *Alcona*
Stream Name: *Gauthier Creek*
Road Name: *Bouchard Rd*
Township: *Alcona*
Adjacent Landowners: *federal*

Culvert Description

Crossing Type: *single culvert*
Culvert Length (ft): *45*
Culvert Diameter (in): *30''*
Culvert Condition: *good*
Culvert Flow: *perched*
Fish Passage Problem: *Yes*
Culvert Fill Depth-inlet, outlet (ft): *7, 8*
Culvert Embankment Slopes: *1:2, >1:2*
Culvert Material: *galvanized*

Road Data

Average Width at Crossing (ft): *15*
Surface: *sand*
Left Approach Length (ft): *600*
Right Approach Length (ft): *450*
Left Approach Slope: *1-5%*
Right Approach Slope: *1-5%*
Ditch, Shoulder Vegetation: *heavy, heavy*

Stream Characteristics

Average Upstream Width (ft): *3*
Average Downstream Width (ft): *3*
Average Upstream Depth (ft): *0.5*
Average Downstream Depth (ft): *0.5*
Upstream Current: *moderate*
Downstream Current: *moderate*

Erosion

Severity Category: *moderate*
Erosion Extent: *moderate*
Erosion Conditions: *pool formation at culvert outlet, poor culvert alignment*

RECOMMENDED TREATMENTS: *harden approaches, replace with recessed culvert, install 3 diversion outlets, install 1 sediment basin, revegetate, erosion control structure*

ESTIMATED COST: *$23,158*

Road-Stream Crossing ID: AB-07

Location

County: *Alcona*
Stream Name: *DeRocher*
Road Name: *US-23*
Township: *Alcona*
Adjacent Landowners: *private*

Culvert Description

Crossing Type: *single culvert*
Culvert Length (ft): *160*
Culvert Diameter (in): *48''*
Culvert Condition: *good*
Culvert Flow: *clear*
Fish Passage Problem: *No*
Culvert Fill Depth-inlet, outlet (ft): *27, 27*
Culvert Embankment Slopes: *>1:2, >1:2*
Culvert Material: *concrete*

Erosion

Severity Category: *moderate*
Erosion Extent: *minor*
Erosion Conditions: *none*

Road Data

Average Width at Crossing (ft): *60*
Surface: *paved*
Left Approach Length (ft): *1000*
Right Approach Length (ft): *1000*
Left Approach Slope: *1-5%*
Right Approach Slope: *6-10%*
Ditch, Shoulder Vegetation: *heavy, heavy*

Stream Characteristics

Average Upstream Width (ft): *1*
Average Downstream Width (ft): *1*
Average Upstream Depth (ft): *0.25*
Average Downstream Depth (ft): *0.25*
Upstream Current: *slow*
Downstream Current: *moderate*

RECOMMENDED TREATMENTS: *none*

ESTIMATED COST: *na*

Road-Stream Crossing ID: AB-08

Location

County: *Alcona*
Stream Name: *DeRocher*
Road Name: *LaFave Rd*
Township: *Alcona*
Adjacent Landowners: *private*

Culvert Description

Crossing Type: *single culvert*
Culvert Length (ft): *20*
Culvert Diameter (in): *20"*
Culvert Condition: *poor*
Culvert Flow: *obstructed*
Fish Passage Problem: *Yes*
Culvert Fill Depth-inlet, outlet (ft): *.1, 1.3*
Culvert Embankment Slopes: *vertical, vertical*
Culvert Material: *galvanized*

Road Data

Average Width at Crossing (ft): *16*
Surface: *gravel*
Left Approach Length (ft): *0*
Right Approach Length (ft): *0*
Left Approach Slope: *0*
Right Approach Slope: *0*
Ditch, Shoulder Vegetation: *heavy, heavy*

Stream Characteristics

Average Upstream Width (ft): *2*
Average Downstream Width (ft): *0.1*
Average Upstream Depth (ft): *0.5*
Average Downstream Depth (ft): *0.5*
Upstream Current: *moderate*
Downstream Current: *moderate*

Erosion

Severity Category: *moderate*
Erosion Extent: *extreme*
Erosion Conditions: *damaged culvert, embankment erosion, pool formation at culvert outlet, shoulder/ditch erosion*

RECOMMENDED TREATMENTS: *replace with 6x4 box culvert, add rock rip rap, install 1 sediment basin, revegetate*

ESTIMATED COST: *$6,460*

Road-Stream Crossing ID: AB-09

Location

County: *Alcona*
Stream Name: *North Branch Black River*
Road Name: *Black River Rd*
Township: *Alcona*
Adjacent Landowners: *private*

Culvert Description

Crossing Type: *single culvert*
Culvert Length (ft): *48*
Culvert Diameter (in): *120"*
Culvert Condition: *good*
Culvert Flow: *clear*
Fish Passage Problem: *No*
Culvert Fill Depth-inlet, outlet (ft): *2, 1.5*
Culvert Embankment Slopes: *vertical, vertical*
Culvert Material: *galvanized*

Road Data

Average Width at Crossing (ft): *27*
Surface: *paved*
Left Approach Length (ft): *500*
Right Approach Length (ft): *0*
Left Approach Slope: *1-5%*
Right Approach Slope: *0*
Ditch, Shoulder Vegetation: *heavy, heavy*

Stream Characteristics

Average Upstream Width (ft): *15*
Average Downstream Width (ft): *15*
Average Upstream Depth (ft): *1*
Average Downstream Depth (ft): *1*
Upstream Current: *moderate*
Downstream Current: *slow*

Erosion

Severity Category: *moderate*
Erosion Extent: *moderate*
Erosion Conditions: *downstream has obstuctive sandbars and fallen trees, embankment erosion, pool formation at culvert outlet*

RECOMMENDED TREATMENTS: *replace with 40' timber bridge, add rock rip rap, instream sand trap, revegetate*

ESTIMATED COST: *$132,700*

Road-Stream Crossing ID: AB-10

Location

County: *Alcona*
Stream Name: *Black River*
Road Name: *Lakeshore Dr*
Township: *Alcona*
Adjacent Landowners: *local government*

Culvert Description

Crossing Type: *bridge*
Culvert Length (ft): *122*
Culvert Diameter (in): *1,200"*
Culvert Condition: *good*
Culvert Flow: *clear*
Fish Passage Problem: *no*
Culvert Fill Depth-inlet, outlet (ft): *na, na*
Culvert Embankment Slopes: *na, na*
Culvert Material: *concrete*

Erosion

Severity Category: *minor*
Erosion Extent: *minor*
Erosion Conditions: *none*

Road Data

Average Width at Crossing (ft): *35*
Surface: *paved*
Left Approach Length (ft): *0*
Right Approach Length (ft): *0*
Left Approach Slope: *0*
Right Approach Slope: *0%*
Ditch, Shoulder Vegetation: *partial, partial*

Stream Characteristics

Average Upstream Width (ft): *20*
Average Downstream Width (ft): *25*
Average Upstream Depth (ft): *3*
Average Downstream Depth (ft): *5*
Upstream Current: *slow*
Downstream Current: *slow*

RECOMMENDED TREATMENTS: *none*

ESTIMATED COST: *na*

Road-Stream Crossing ID: AB-11

Location

County: *Alcona*
Stream Name: *West Branch Hagerberg River*
Road Name: *US-23*
Township: *Alcona*
Adjacent Landowners: *private*

Culvert Description

Crossing Type: *single culvert*
Culvert Length (ft): *104*
Culvert Diameter (in): *24"*
Culvert Condition: *good*
Culvert Flow: *clear*
Fish Passage Problem: *No*
Culvert Fill Depth-inlet, outlet (ft): *6, 6*
Culvert Embankment Slopes: *1:2, 1:2*
Culvert Material: *concrete*

Erosion

Severity Category: *moderate*
Erosion Extent: *minor*
Erosion Conditions: *none*

Road Data

Average Width at Crossing (ft): *46*
Surface: *paved*
Left Approach Length (ft): *300*
Right Approach Length (ft): *300*
Left Approach Slope: *1-5%*
Right Approach Slope: *1-5%*
Ditch, Shoulder Vegetation: *heavy, heavy*

Stream Characteristics

Average Upstream Width (ft): *1.5*
Average Downstream Width (ft): *2*
Average Upstream Depth (ft): *0.3*
Average Downstream Depth (ft): *0.1*
Upstream Current: *slow*
Downstream Current: *moderate*

RECOMMENDED TREATMENTS: *none*

ESTIMATED COST: *na*

Road-Stream Crossing ID: AB-12

Location

County: *Alcona*
Stream Name: *West Branch Black River*
Road Name: *Fontaine Rd*
Township: *Alcona*
Adjacent Landowners: *private*

Culvert Description

Crossing Type: *single culvert*
Culvert Length (ft): *47.5*
Culvert Diameter (in): *36"*
Culvert Condition: *good*
Culvert Flow: *perched*
Fish Passage Problem: *Yes*
Culvert Fill Depth-inlet, outlet (ft): *2, 2*
Culvert Embankment Slopes: *>1:2, >1:2*
Culvert Material: *galvanized*

Road Data

Average Width at Crossing (ft): *30*
Surface: *paved*
Left Approach Length (ft): *0*
Right Approach Length (ft): *0*
Left Approach Slope: *0*
Right Approach Slope: *0*
Ditch, Shoulder Vegetation: *heavy, heavy*

Stream Characteristics

Average Upstream Width (ft): *3*
Average Downstream Width (ft): *8*
Average Upstream Depth (ft): *1*
Average Downstream Depth (ft): *1*
Upstream Current: *moderate*
Downstream Current: *slow*

Erosion

Severity Category: *minor*
Erosion Extent: *minor*
Erosion Conditions: *pool formation caused by perched culvert*

RECOMMENDED TREATMENTS: *replace with squash culvert, revegetate*

ESTIMATED COST: *$8,180*

Road-Stream Crossing ID: AB-13

Location

County: *Alcona*
Stream Name: *South Branch Black River*
Road Name: *Lavergne Rd*
Township: *Alcona*
Adjacent Landowners: *private*

Culvert Description

Crossing Type: *single culvert*
Culvert Length (ft): *30*
Culvert Diameter (in): *168''*
Culvert Condition: *good*
Culvert Flow: *clear*
Fish Passage Problem: *No*
Culvert Fill Depth-inlet, outlet (ft): *1, .5*
Culvert Embankment Slopes: *vertical, vertical*
Culvert Material: *galvanized*

Road Data

Average Width at Crossing (ft): *22*
Surface: *paved*
Left Approach Length (ft): *0*
Right Approach Length (ft): *100*
Left Approach Slope: *0*
Right Approach Slope: *1-5%*
Ditch, Shoulder Vegetation: *heavy, heavy*

Stream Characteristics

Average Upstream Width (ft): *12*
Average Downstream Width (ft): *12*
Average Upstream Depth (ft): *2*
Average Downstream Depth (ft): *3*
Upstream Current: *slow*
Downstream Current: *moderate*

Erosion

Severity Category: *moderate*
Erosion Extent: *moderate*
Erosion Conditions: *streambank erosion, embankment erosion, shoulder/ditch erosion, pool formation at culvert outlet*

RECOMMENDED TREATMENTS: *replace with 25' timber bridge, add rock rip rap, install 4 diversion outlets, install 1 sediment basin, instream sand trap, revegetate*

ESTIMATED COST: *$134,940*

Road-Stream Crossing ID: AB-14

Location
County: *Alcona*
Stream Name: *Silver Creek*
Road Name: *LaLonde Rd*
Township: *Alcona*
Adjacent Landowners: *private*

Culvert Description
Crossing Type: *single culvert*
Culvert Length (ft): *24*
Culvert Diameter (in): *48''*
Culvert Condition: *poor*
Culvert Flow: *perched*
Fish Passage Problem: *Yes*
Culvert Fill Depth-inlet, outlet (ft): *0, 0*
Culvert Embankment Slopes: *vertical, vertical*
Culvert Material: *galvanized*

Road Data
Average Width at Crossing (ft): *12*
Surface: *sand*
Left Approach Length (ft): *0*
Right Approach Length (ft): *0*
Left Approach Slope: *0*
Right Approach Slope: *0*
Ditch, Shoulder Vegetation: *heavy, heavy*

Stream Characteristics
Average Upstream Width (ft): *6*
Average Downstream Width (ft): *7*
Average Upstream Depth (ft): *0.75*
Average Downstream Depth (ft): *0.75*
Upstream Current: *slow*
Downstream Current: *moderate*

Erosion
Severity Category: *moderate*
Erosion Extent: *moderate*
Erosion Conditions: *perched culvert on inlet side, embankment erosion*

RECOMMENDED TREATMENTS: *replace with 10x6 box culvert, add rock rip rap, revegetate*

ESTIMATED COST: *$18,780*

Road-Stream Crossing ID: AB-15

Location

County: *Alcona*
Stream Name: *Silver Creek*
Road Name: *US-23*
Township: *Alcona*
Adjacent Landowners: *private*

Culvert Description

Crossing Type: *concrete box*
Culvert Length (ft): *62*
Culvert Diameter (in): *96''*
Culvert Condition: *fair*
Culvert Flow: *clear*
Fish Passage Problem: *No*
Culvert Fill Depth-inlet, outlet (ft): *7, 7*
Culvert Embankment Slopes: *1:1.5, 1:1.5*
Culvert Material: *concrete*

Erosion

Severity Category: *moderate*
Erosion Extent: *minor*
Erosion Conditions: *none*

Road Data

Average Width at Crossing (ft): *60*
Surface: *paved*
Left Approach Length (ft): *500*
Right Approach Length (ft): *500*
Left Approach Slope: *1-5%*
Right Approach Slope: *1-5%*
Ditch, Shoulder Vegetation: *heavy, heavy*

Stream Characteristics

Average Upstream Width (ft): *8*
Average Downstream Width (ft): *8*
Average Upstream Depth (ft): *0.5*
Average Downstream Depth (ft): *0.75*
Upstream Current: *fast*
Downstream Current: *moderate*

RECOMMENDED TREATMENTS: *none*

ESTIMATED COST: *na*

Road-Stream Crossing ID: AB-16

Location

County: *Alcona*
Stream Name: *South Branch Black River*
Road Name: *US-23*
Township: *Alcona*
Adjacent Landowners: *private*

Culvert Description

Crossing Type: *concrete bridge*
Culvert Length (ft): *47*
Culvert Diameter (in): *336''*
Culvert Condition: *good*
Culvert Flow: *clear*
Fish Passage Problem: *No*
Culvert Fill Depth-inlet, outlet (ft): *na, na*
Culvert Embankment Slopes: *na, na*
Culvert Material: *concrete*

Erosion

Severity Category: *moderate*
Erosion Extent: *minor*
Erosion Conditions: *none*

Road Data

Average Width at Crossing (ft): *47*
Surface: *paved*
Left Approach Length (ft): *300*
Right Approach Length (ft): *1000*
Left Approach Slope: *1-5%*
Right Approach Slope: *1-5%*
Ditch, Shoulder Vegetation: *heavy, heavy*

Stream Characteristics

Average Upstream Width (ft): *15*
Average Downstream Width (ft): *12*
Average Upstream Depth (ft): *0.75*
Average Downstream Depth (ft): *0.75*
Upstream Current: *moderate*
Downstream Current: *fast*

RECOMMENDED TREATMENTS: *none*

ESTIMATED COST: *na*

Road-Stream Crossing ID: AB-17

Location

County: *Alcona*
Stream Name: *South Branch Black River*
Road Name: *US-23*
Township: *Alcona*
Adjacent Landowners: *private*

Culvert Description

Crossing Type: *concrete box*
Culvert Length (ft): *66*
Culvert Diameter (in): *72"*
Culvert Condition: *poor*
Culvert Flow: *clear*
Fish Passage Problem: *No*
Culvert Fill Depth-inlet, outlet (ft): *4, 4*
Culvert Embankment Slopes: *>1:2, >1:2*
Culvert Material: *concrete*

Erosion

Severity Category: *moderate*
Erosion Extent: *minor*
Erosion Conditions: *none*

RECOMMENDED TREATMENTS: *none*

ESTIMATED COST: *na*

Road Data

Average Width at Crossing (ft): *60*
Surface: *paved*
Left Approach Length (ft): *0*
Right Approach Length (ft): *2000*
Left Approach Slope: *0*
Right Approach Slope: *6-10%*
Ditch, Shoulder Vegetation: *heavy, heavy*

Stream Characteristics

Average Upstream Width (ft): *1*
Average Downstream Width (ft): *1*
Average Upstream Depth (ft): *0.25*
Average Downstream Depth (ft): *0.25*
Upstream Current: *slow*
Downstream Current: *slow*

Road-Stream Crossing ID: AB-18

Location

County: *Alcona*
Stream Name: *South Branch Black River*
Road Name: *Sucker Creek Rd*
Township: *Haynes*
Adjacent Landowners: *private*

Culvert Description

Crossing Type: *twin culverts*
Culvert Length (ft): *50*
Culvert Diameter (in): *60"*
Culvert Condition: *fair*
Culvert Flow: *perched*
Fish Passage Problem: *Yes*
Culvert Fill Depth-inlet, outlet (ft): *6, 4*
Culvert Embankment Slopes: *1:1.5, 1:1.5*
Culvert Material: *galvanized*

Road Data

Average Width at Crossing (ft): *38*
Surface: *gravel*
Left Approach Length (ft): *500*
Right Approach Length (ft): *1000*
Left Approach Slope: *6-10%*
Right Approach Slope: *6-10%*
Ditch, Shoulder Vegetation: *heavy, heavy*

Stream Characteristics

Average Upstream Width (ft): *15*
Average Downstream Width (ft): *10*
Average Upstream Depth (ft): *0.5*
Average Downstream Depth (ft): *1*
Upstream Current: *moderate*
Downstream Current: *moderate*

Erosion

Severity Category: *moderate*
Erosion Extent: *extreme*
Erosion Conditions: *streambank erosion, shoulder/ditch ersosion, embankment erosion, pool formation at culvert outlet*

RECOMMENDED TREATMENTS: *harden approaches, replace with bottomless arch culvert, add rock rip rap, 4 diversion outlets, in stream sand trap, revegetate*

ESTIMATED COST: *$53,893*

Road-Stream Crossing ID: AB-19

Location
County: *Alcona*
Stream Name: *Surface Drain*
Road Name: *Sucker Creek Rd*
Township: *Haynes*
Adjacent Landowners: *private*

Culvert Description
Crossing Type: *single culvert*
Culvert Length (ft): *36*
Culvert Diameter (in): *24"*
Culvert Condition: *fair*
Culvert Flow: *clear*
Fish Passage Problem: *no*
Culvert Fill Depth-inlet, outlet (ft): *2, 2*
Culvert Embankment Slopes: *1:2, 1:2*
Culvert Material: *galvanized*

Erosion
Severity Category: *moderate*
Erosion Extent: *minor*
Erosion Conditions: *none*

RECOMMENDED TREATMENTS: *none*

ESTIMATED COST: *na*

Road Data
Average Width at Crossing (ft): *22*
Surface: *sand*
Left Approach Length (ft): *1000*
Right Approach Length (ft): *500*
Left Approach Slope: *1-5%*
Right Approach Slope: *1-5%*
Ditch, Shoulder Vegetation: *heavy, heavy*

Stream Characteristics
Average Upstream Width (ft): *0*
Average Downstream Width (ft): *0*
Average Upstream Depth (ft): *0*
Average Downstream Depth (ft): *0*
Upstream Current: *na*
Downstream Current: *na*

Road-Stream Crossing ID: AB-20

Location

County: *Alcona*
Stream Name: *South Branch Black River*
Road Name: *Poor Farm Rd*
Township: *Haynes*
Adjacent Landowners: *private*

Culvert Description

Crossing Type: *single culvert*
Culvert Length (ft): *17*
Culvert Diameter (in): *48"*
Culvert Condition: *poor*
Culvert Flow: *clear*
Fish Passage Problem: *No*
Culvert Fill Depth-inlet, outlet (ft): *4, 4*
Culvert Embankment Slopes: *vertical, vertical*
Culvert Material: *galvanized*

Road Data

Average Width at Crossing (ft): *9*
Surface: *sand*
Left Approach Length (ft): *0*
Right Approach Length (ft): *250*
Left Approach Slope: *0*
Right Approach Slope: *1-5%*
Ditch, Shoulder Vegetation: *heavy, heavy*

Stream Characteristics

Average Upstream Width (ft): *3*
Average Downstream Width (ft): *3*
Average Upstream Depth (ft): *0.5*
Average Downstream Depth (ft): *1*
Upstream Current: *moderate*
Downstream Current: *moderate*

Erosion

Severity Category: *moderate*
Erosion Extent: *extreme*
Erosion Conditions: *streambank erosion, embankment erosion, sand soil over crossing, poolformation at culvert outlet*

RECOMMENDED TREATMENTS: *replace with eliptical culvert, harden approaches, revegetate*

ESTIMATED COST: *$8,915*

Road-Stream Crossing ID: AB-21

Location

County: *Alcona*
Stream Name: *South Branch Black River*
Road Name: *Shaw Rd*
Township: *Haynes*
Adjacent Landowners: *private*

Culvert Description

Crossing Type: *single culvert*
Culvert Length (ft): *60*
Culvert Diameter (in): *38"*
Culvert Condition: *good*
Culvert Flow: *clear*
Fish Passage Problem: *No*
Culvert Fill Depth-inlet, outlet (ft): *10, 10*
Culvert Embankment Slopes: *1:2, 1:2*
Culvert Material: *galvanized*

Erosion

Severity Category: *moderate*
Erosion Extent: *minor*
Erosion Conditions: *none*

Road Data

Average Width at Crossing (ft): *22*
Surface: *paved*
Left Approach Length (ft): *200*
Right Approach Length (ft): *200*
Left Approach Slope: *6-10%*
Right Approach Slope: *6-10%*
Ditch, Shoulder Vegetation: *heavy, heavy*

Stream Characteristics

Average Upstream Width (ft): *3*
Average Downstream Width (ft): *3*
Average Upstream Depth (ft): *0.5*
Average Downstream Depth (ft): *0.75*
Upstream Current: *slow*
Downstream Current: *slow*

RECOMMENDED TREATMENTS: *none*

ESTIMATED COST: *na*

Road-Stream Crossing ID: AB-22

Location

County: *Alcona*
Stream Name: *South Branch Black River*
Road Name: *Shaw Rd*
Township: *Haynes*
Adjacent Landowners: *private*

Culvert Description

Crossing Type: *timber bridge*
Culvert Length (ft): *27*
Culvert Diameter (in): *300"*
Culvert Condition: *good*
Culvert Flow: *clear*
Fish Passage Problem: *No*
Culvert Fill Depth-inlet, outlet (ft): *na, na*
Culvert Embankment Slopes: *na, na*
Culvert Material: *wood*

Erosion

Severity Category: *minor*
Erosion Extent: *minor*
Erosion Conditions: *none*

Road Data

Average Width at Crossing (ft): *30*
Surface: *paved*
Left Approach Length (ft): *500*
Right Approach Length (ft): *250*
Left Approach Slope: *1-5%*
Right Approach Slope: *6-10%*
Ditch, Shoulder Vegetation: *heavy, heavy*

Stream Characteristics

Average Upstream Width (ft): *15*
Average Downstream Width (ft): *20*
Average Upstream Depth (ft): *6*
Average Downstream Depth (ft): *6*
Upstream Current: *moderate*
Downstream Current: *moderate*

RECOMMENDED TREATMENTS: *none*

ESTIMATED COST: *na*

Road-Stream Crossing ID: AB-23

Location
County: *Alcona*
Stream Name: *Haynes*
Road Name: *McNeil Rd*
Township: *Haynes*
Adjacent Landowners: *private*

Culvert Description
Crossing Type: *single culvert*
Culvert Length (ft): *54*
Culvert Diameter (in): *24"*
Culvert Condition: *poor*
Culvert Flow: *obstructed/inlet*
Fish Passage Problem: *No*
Culvert Fill Depth-inlet, outlet (ft): *3, 3*
Culvert Embankment Slopes: *>1:2, >1:2*
Culvert Material: *galvanized*

Erosion
Severity Category: *minor*
Erosion Extent: *minor*
Erosion Conditions: *none*

Road Data
Average Width at Crossing (ft): *20*
Surface: *paved*
Left Approach Length (ft): *0*
Right Approach Length (ft): *0*
Left Approach Slope: *0*
Right Approach Slope: *0*
Ditch, Shoulder Vegetation: *heavy, heavy*

Stream Characteristics
Average Upstream Width (ft): *0.5*
Average Downstream Width (ft): *0.5*
Average Upstream Depth (ft): *0.25*
Average Downstream Depth (ft): *0.25*
Upstream Current: *slow*
Downstream Current: *moderate*

RECOMMENDED TREATMENTS: *remove debris*

ESTIMATED COST: *na*

Road-Stream Crossing ID: AB-24

Location
County: *Alcona*
Stream Name: *Haynes*
Road Name: *McNeil Rd*
Township: *Haynes*
Adjacent Landowners: *local government*

Culvert Description
Crossing Type: *single culvert*
Culvert Length (ft): *67*
Culvert Diameter (in): *24"*
Culvert Condition: *good*
Culvert Flow: *clear*
Fish Passage Problem: *No*
Culvert Fill Depth-inlet, outlet (ft): *4, 5*
Culvert Embankment Slopes: *>1:2, >1:2*
Culvert Material: *galvanized*

Erosion
Severity Category: *minor*
Erosion Extent: *minor*
Erosion Conditions: *none*

Road Data
Average Width at Crossing (ft): *20*
Surface: *paved*
Left Approach Length (ft): *0*
Right Approach Length (ft): *0*
Left Approach Slope: *0*
Right Approach Slope: *0*
Ditch, Shoulder Vegetation: *heavy, heavy*

Stream Characteristics
Average Upstream Width (ft):
Average Downstream Width (ft):
Average Upstream Depth (ft):
Average Downstream Depth (ft):
Upstream Current: *na*
Downstream Current: *na*

RECOMMENDED TREATMENTS: *none*

ESTIMATED COST: *na*

Road-Stream Crossing ID: AB-25

Location
County: *Alcona*
Stream Name: *Haynes*
Road Name: *McNeil Rd*
Township: *Haynes*
Adjacent Landowners: *private*

Culvert Description
Crossing Type: *single culvert*
Culvert Length (ft): *41*
Culvert Diameter (in): *32"*
Culvert Condition: *poor*
Culvert Flow: *clear*
Fish Passage Problem: *No*
Culvert Fill Depth-inlet, outlet (ft): *2, 2*
Culvert Embankment Slopes: *>1:2, >1:2*
Culvert Material: *galvanized*

Erosion
Severity Category: *moderate*
Erosion Extent: *minor*
Erosion Conditions: *none*

RECOMMENDED TREATMENTS: *none*

ESTIMATED COST: *na*

Road Data
Average Width at Crossing (ft): *20*
Surface: *paved*
Left Approach Length (ft): *100*
Right Approach Length (ft): *0*
Left Approach Slope: *1-5%*
Right Approach Slope: *0*
Ditch, Shoulder Vegetation: *heavy, heavy*

Stream Characteristics
Average Upstream Width (ft):
Average Downstream Width (ft):
Average Upstream Depth (ft):
Average Downstream Depth (ft):
Upstream Current: *na*
Downstream Current: *na*

Road-Stream Crossing ID: AB-26

Location
County: *Alcona*
Stream Name: *Haynes*
Road Name: *McGregor Rd*
Township: *Haynes*
Adjacent Landowners: *private*

Culvert Description
Crossing Type: *single culvert*
Culvert Length (ft): *55*
Culvert Diameter (in): *48"*
Culvert Condition: *good*
Culvert Flow: *clear*
Fish Passage Problem: *No*
Culvert Fill Depth-inlet, outlet (ft): *2, 2*
Culvert Embankment Slopes: *>1:2, >1:2*
Culvert Material: *galvanized*

Erosion
Severity Category: *minor*
Erosion Extent: *minor*
Erosion Conditions: *none*

Road Data
Average Width at Crossing (ft): *39*
Surface: *paved*
Left Approach Length (ft): *100*
Right Approach Length (ft): *100*
Left Approach Slope: *1-5%*
Right Approach Slope: *1-5%*
Ditch, Shoulder Vegetation: *heavy, heavy*

Stream Characteristics
Average Upstream Width (ft): *0.5*
Average Downstream Width (ft): *0.5*
Average Upstream Depth (ft): *0.5*
Average Downstream Depth (ft): *0.5*
Upstream Current: *slow*
Downstream Current: *slow*

RECOMMENDED TREATMENTS: *none*

ESTIMATED COST: *na*

Road-Stream Crossing ID: AB-27

Location
County: *Alcona*
Stream Name: *Black River*
Road Name: *Poor Farm Rd*
Township: *Haynes*
Adjacent Landowners: *private*

Culvert Description
Crossing Type: *single culvert*
Culvert Length (ft): *50*
Culvert Diameter (in): *36"*
Culvert Condition: *fair*
Culvert Flow: *perched*
Fish Passage Problem: *Yes*
Culvert Fill Depth-inlet, outlet (ft): *1, 1*
Culvert Embankment Slopes: *>1:2, >1:2*
Culvert Material: *galvanized*

Road Data
Average Width at Crossing (ft): *33*
Surface: *paved*
Left Approach Length (ft): *100*
Right Approach Length (ft): *100*
Left Approach Slope: *1-5%*
Right Approach Slope: *1-5%*
Ditch, Shoulder Vegetation: *heavy, heavy*

Stream Characteristics
Average Upstream Width (ft): *2*
Average Downstream Width (ft): *2*
Average Upstream Depth (ft): *0.1*
Average Downstream Depth (ft): *0.1*
Upstream Current: *slow*
Downstream Current: *slow*

Erosion
Severity Category: *minor*
Erosion Extent: *moderate*
Erosion Conditions: *pool formation at culvert outlet, embankment erosion*

RECOMMENDED TREATMENTS: *replace with recessed culvert, revegetate*

ESTIMATED COST: *$9,300*

Road-Stream Crossing ID: AB-28

Location

County: *Alcona*
Stream Name: *Haynes*
Road Name: *McGregor Rd*
Township: *Haynes*
Adjacent Landowners: *private*

Culvert Description

Crossing Type: *single culvert*
Culvert Length (ft): *50*
Culvert Diameter (in): *30"*
Culvert Condition: *good*
Culvert Flow: *clear*
Fish Passage Problem: *No*
Culvert Fill Depth-inlet, outlet (ft): *6, 6*
Culvert Embankment Slopes: *>1:2, >1:2*
Culvert Material: *galvanized*

Erosion

Severity Category: *minor*
Erosion Extent: *minor*
Erosion Conditions: *none*

Road Data

Average Width at Crossing (ft): *26*
Surface: *paved*
Left Approach Length (ft): *100*
Right Approach Length (ft): *0*
Left Approach Slope: *1-5%*
Right Approach Slope: *0*
Ditch, Shoulder Vegetation: *heavy, heavy*

Stream Characteristics

Average Upstream Width (ft): *0.75*
Average Downstream Width (ft): *0.5*
Average Upstream Depth (ft): *1.1*
Average Downstream Depth (ft): *1.5*
Upstream Current: *slow*
Downstream Current: *slow*

RECOMMENDED TREATMENTS: *none*

ESTIMATED COST: *na*

Road-Stream Crossing ID: AB-29

Location
County: *Alcona*
Stream Name: *Haynes*
Road Name: *Beaton Rd*
Township: *Haynes*
Adjacent Landowners: *private*

Culvert Description
Crossing Type: *single culvert*
Culvert Length (ft): *40*
Culvert Diameter (in): *60"*
Culvert Condition: *good*
Culvert Flow: *clear*
Fish Passage Problem: *No*
Culvert Fill Depth-inlet, outlet (ft): *2, 2*
Culvert Embankment Slopes: *>1:2, >1:2*
Culvert Material: *galvanized*

Erosion
Severity Category: *minor*
Erosion Extent: *minor*
Erosion Conditions: *none*

Road Data
Average Width at Crossing (ft): *33*
Surface: *gravel*
Left Approach Length (ft): *0*
Right Approach Length (ft): *0*
Left Approach Slope: *0*
Right Approach Slope: *0*
Ditch, Shoulder Vegetation: *heavy, heavy*

Stream Characteristics
Average Upstream Width (ft): *4*
Average Downstream Width (ft): *4*
Average Upstream Depth (ft): *0.75*
Average Downstream Depth (ft): *0.75*
Upstream Current: *slow*
Downstream Current: *slow*

RECOMMENDED TREATMENTS: *none*

ESTIMATED COST: *na*

Road-Stream Crossing ID: AB-30

Location

County: *Alcona*
Stream Name: *Haynes*
Road Name: *West Branch Black River*
Township: *Haynes*
Adjacent Landowners: *private*

Culvert Description

Crossing Type: *single culvert*
Culvert Length (ft): *40*
Culvert Diameter (in): *120"*
Culvert Condition: *good*
Culvert Flow: *clear*
Fish Passage Problem: *No*
Culvert Fill Depth-inlet, outlet (ft): *2, 2*
Culvert Embankment Slopes: *vertical. Vertical*
Culvert Material: *galvanized*

Road Data

Average Width at Crossing (ft): *33*
Surface: *gravel*
Left Approach Length (ft): *1000*
Right Approach Length (ft): *1000*
Left Approach Slope: *1-5%*
Right Approach Slope: *1-5%*
Ditch, Shoulder Vegetation: *heavy, heavy*

Stream Characteristics

Average Upstream Width (ft): *6*
Average Downstream Width (ft): *12*
Average Upstream Depth (ft): *0.5*
Average Downstream Depth (ft): *1*
Upstream Current: *fast*
Downstream Current: *fast*

Erosion

Severity Category: *moderate*
Erosion Extent: *moderate*
Erosion Conditions: *embankment erosion, sand/soil over crossing*

RECOMMENDED TREATMENTS: *replace with bottomless arch culvert, harden approaches,add rock rip rap, instream sand trap, revegetate*

ESTIMATED COST: *$52,644*

Road-Stream Crossing ID: AB-31

Location

County: *Alcona*
Stream Name: *West Branch Haynes Creek*
Road Name: *Coville Rd*
Township: *Haynes*
Adjacent Landowners: *private*

Culvert Description

Crossing Type: *single culvert*
Culvert Length (ft): *50*
Culvert Diameter (in): *48"*
Culvert Condition: *good*
Culvert Flow: *obstructed*
Fish Passage Problem: *No*
Culvert Fill Depth-inlet, outlet (ft): *4, 4*
Culvert Embankment Slopes: *>1:2, >1:2*
Culvert Material: *galvanized*

Erosion

Severity Category: *minor*
Erosion Extent: *minor*
Erosion Conditions: *debris at culvert inlet*

Road Data

Average Width at Crossing (ft): *33*
Surface: *paved*
Left Approach Length (ft): *0*
Right Approach Length (ft): *0*
Left Approach Slope: *0*
Right Approach Slope: *0*
Ditch, Shoulder Vegetation: *heavy, heavy*

Stream Characteristics

Average Upstream Width (ft): *2*
Average Downstream Width (ft): *2*
Average Upstream Depth (ft): *0.5*
Average Downstream Depth (ft): *0.5*
Upstream Current: *moderate*
Downstream Current: *moderate*

RECOMMENDED TREATMENTS: *remove debris*

ESTIMATED COST: *na*

Road-Stream Crossing ID: AB-32

Location
County: *Alcona*
Stream Name: *Haynes*
Road Name: *Quick Rd*
Township: *Haynes*
Adjacent Landowners: *private*

Culvert Description
Crossing Type: *single culvert*
Culvert Length (ft): *10*
Culvert Diameter (in): *120"*
Culvert Condition: *good*
Culvert Flow: *clear*
Fish Passage Problem: *No*
Culvert Fill Depth-inlet, outlet (ft): *6, 6*
Culvert Embankment Slopes: *vertical, vertical*
Culvert Material: *galvanized*

Erosion
Severity Category: *moderate*
Erosion Extent: *minor*
Erosion Conditions: *none*

Road Data
Average Width at Crossing (ft): *30*
Surface: *paved*
Left Approach Length (ft): *200*
Right Approach Length (ft): *200*
Left Approach Slope: *6-10%*
Right Approach Slope: *6-10%*
Ditch, Shoulder Vegetation: *heavy, heavy*

Stream Characteristics
Average Upstream Width (ft): *6*
Average Downstream Width (ft): *12*
Average Upstream Depth (ft): *1*
Average Downstream Depth (ft): *1*
Upstream Current: *fast*
Downstream Current: *fast*

RECOMMENDED TREATMENTS: *none*

ESTIMATED COST: *na*

Road-Stream Crossing ID: AB-33

Location

County: *Alcona*
Stream Name: *Haynes*
Road Name: *Poor Farm Rd*
Township: *Haynes*
Adjacent Landowners: *private*

Culvert Description

Crossing Type: *single culvert*
Culvert Length (ft): *36*
Culvert Diameter (in): *120"*
Culvert Condition: *good*
Culvert Flow: *clear*
Fish Passage Problem: *No*
Culvert Fill Depth-inlet, outlet (ft): *0, 0*
Culvert Embankment Slopes: *vertical, vertical*
Culvert Material: *galvanized*

Erosion

Severity Category: *minor*
Erosion Extent: *minor*
Erosion Conditions: *crack in headwall*

Road Data

Average Width at Crossing (ft): *30*
Surface: *paved*
Left Approach Length (ft): *100*
Right Approach Length (ft): *100*
Left Approach Slope: *6-10%*
Right Approach Slope: *1-5%*
Ditch, Shoulder Vegetation: *heavy, heavy*

Stream Characteristics

Average Upstream Width (ft): *6*
Average Downstream Width (ft): *12*
Average Upstream Depth (ft): *2*
Average Downstream Depth (ft): *2*
Upstream Current: *moderate*
Downstream Current: *moderate*

RECOMMENDED TREATMENTS: *none*

ESTIMATED COST: *na*

Road-Stream Crossing ID: AB-34

Location

County: *Alcona*
Stream Name: *Haynes*
Road Name: *Poor Farm Rd*
Township: *Haynes*
Adjacent Landowners: *local government*

Culvert Description

Crossing Type: *single culvert*
Culvert Length (ft): *60*
Culvert Diameter (in): *72"*
Culvert Condition: *good*
Culvert Flow: *clear*
Fish Passage Problem: *No*
Culvert Fill Depth-inlet, outlet (ft): *12, 12*
Culvert Embankment Slopes: *vertical, vertical*
Culvert Material: *galvanized*

Erosion

Severity Category: *minor*
Erosion Extent: *minor*
Erosion Conditions: *none*

RECOMMENDED TREATMENTS: *none*

ESTIMATED COST: *na*

Road Data

Average Width at Crossing (ft): *33*
Surface: *paved*
Left Approach Length (ft): *100*
Right Approach Length (ft): *100*
Left Approach Slope: *6-10%*
Right Approach Slope: *1-5%*
Ditch, Shoulder Vegetation: *partial, heavy*

Stream Characteristics

Average Upstream Width (ft): *12*
Average Downstream Width (ft): *12*
Average Upstream Depth (ft): *0.75*
Average Downstream Depth (ft): *2*
Upstream Current: *moderate*
Downstream Current: *moderate*

Road-Stream Crossing ID: AB-35

Location

County: *Alcona*
Stream Name: *Haynes*
Road Name: *Ritchie*
Township: *Haynes*
Adjacent Landowners: *private*

Culvert Description

Crossing Type: *single culvert*
Culvert Length (ft): *36*
Culvert Diameter (in): *72"*
Culvert Condition: *good*
Culvert Flow: *clear*
Fish Passage Problem: *No*
Culvert Fill Depth-inlet, outlet (ft): *3, 3*
Culvert Embankment Slopes: *>1:2, 1:2*
Culvert Material: *galvanized*

Erosion

Severity Category: *moderate*
Erosion Extent: *minor*
Erosion Conditions: *none*

Road Data

Average Width at Crossing (ft): *20*
Surface: *paved*
Left Approach Length (ft): *50*
Right Approach Length (ft): *50*
Left Approach Slope: *>10%*
Right Approach Slope: *>10%*
Ditch, Shoulder Vegetation: *heavy, heavy*

Stream Characteristics

Average Upstream Width (ft): *8*
Average Downstream Width (ft): *8*
Average Upstream Depth (ft): *0.5*
Average Downstream Depth (ft): *1*
Upstream Current: *moderate*
Downstream Current: *moderate*

RECOMMENDED TREATMENTS: *none*

ESTIMATED COST: *na*

Road-Stream Crossing ID: AB-36

Location

County: *Alcona*
Stream Name: *Black River*
Road Name: *Trask Lake Rd*
Township: *Harrisville*
Adjacent Landowners: *private*

Culvert Description

Crossing Type: *twin culverts*
Culvert Length (ft): *32*
Culvert Diameter (in): *36"*
Culvert Condition: *poor*
Culvert Flow: *clear*
Fish Passage Problem: *No*
Culvert Fill Depth-inlet, outlet (ft): *4, 4*
Culvert Embankment Slopes: *1:1.5, 1:1.5*
Culvert Material: *galvanized*

Road Data

Average Width at Crossing (ft): *26*
Surface: *gravel/sand*
Left Approach Length (ft): *100*
Right Approach Length (ft): *50*
Left Approach Slope: *1-5%*
Right Approach Slope: *1-5%*
Ditch, Shoulder Vegetation: *heavy, heavy*

Stream Characteristics

Average Upstream Width (ft): *12*
Average Downstream Width (ft): *12*
Average Upstream Depth (ft): *0.5*
Average Downstream Depth (ft): *1*
Upstream Current: *slow*
Downstream Current: *slow*

Erosion

Severity Category: *moderate*
Erosion Extent: *minor*
Erosion Conditions: *pool formation at culvert outlet, sand soil over crossing*

RECOMMENDED TREATMENTS: *replace with bottomless arch culvert, harden approaches,add rock rip rap, in stream sand trap, revegetate*

ESTIMATED COST: *$24,393*

Road-Stream Crossing ID: AB-37

Location
County: *Alcona*
Stream Name: *Gauthier*
Road Name: *US-23*
Township: *Alcona*
Adjacent Landowners: *private*

Culvert Description
Crossing Type: *concrete box*
Culvert Length (ft): *80*
Culvert Diameter (in): *48"*
Culvert Condition: *fair*
Culvert Flow: *clear*
Fish Passage Problem: *No*
Culvert Fill Depth-inlet, outlet (ft): *4, 4*
Culvert Embankment Slopes: *1:2, 1:2*
Culvert Material: *concrete*

Erosion
Severity Category: *moderate*
Erosion Extent: *minor*
Erosion Conditions: *none*

Road Data
Average Width at Crossing (ft): *46*
Surface: *paved*
Left Approach Length (ft): *700*
Right Approach Length (ft): *300*
Left Approach Slope: *1-5%*
Right Approach Slope: *1-5%*
Ditch, Shoulder Vegetation: *partial, heavy*

Stream Characteristics
Average Upstream Width (ft): *4*
Average Downstream Width (ft): *4*
Average Upstream Depth (ft): *0.25*
Average Downstream Depth (ft): *0.25*
Upstream Current: *moderate*
Downstream Current: *moderate*

RECOMMENDED TREATMENTS: *none*

ESTIMATED COST: *na*

Road-Stream Crossing ID: AB-38

Location

County: *Alcona*
Stream Name: *Gauthier*
Road Name: *Lafave Rd*
Township: *Alcona*
Adjacent Landowners: *private*

Culvert Description

Crossing Type: *single culvert*
Culvert Length (ft): *45*
Culvert Diameter (in): *30"*
Culvert Condition: *good*
Culvert Flow: *clear*
Fish Passage Problem: *No*
Culvert Fill Depth-inlet, outlet (ft): *6, 6*
Culvert Embankment Slopes: *1:2, 1:2*
Culvert Material: *galvanized*

Erosion

Severity Category: *minor*
Erosion Extent: *minor*
Erosion Conditions: *none*

Road Data

Average Width at Crossing (ft): *22*
Surface: *paved*
Left Approach Length (ft): *0*
Right Approach Length (ft): *0*
Left Approach Slope: *0*
Right Approach Slope: *0*
Ditch, Shoulder Vegetation: *heavy, heavy*

Stream Characteristics

Average Upstream Width (ft): *3*
Average Downstream Width (ft): *3*
Average Upstream Depth (ft): *0.75*
Average Downstream Depth (ft): *0.75*
Upstream Current: *moderate*
Downstream Current: *moderate*

RECOMMENDED TREATMENTS: *none*

ESTIMATED COST: *na*

Road-Stream Crossing ID: AB-39

Location

County: *Alcona*
Stream Name: *Gauthier*
Road Name: *Fontaine Rd*
Township: *Alcona*
Adjacent Landowners: *private*

Culvert Description

Crossing Type: *single culvert*
Culvert Length (ft): *36*
Culvert Diameter (in): *36"*
Culvert Condition: *good*
Culvert Flow: *clear*
Fish Passage Problem: *No*
Culvert Fill Depth-inlet, outlet (ft): *3.5, 3*
Culvert Embankment Slopes: *vertical, 1:1.5*
Culvert Material: *galvanized*

Erosion

Severity Category: *minor*
Erosion Extent: *minor*
Erosion Conditions: *none*

Road Data

Average Width at Crossing (ft): *18*
Surface: *paved*
Left Approach Length (ft): *0*
Right Approach Length (ft): *0*
Left Approach Slope: *0*
Right Approach Slope: *0*
Ditch, Shoulder Vegetation: *heavy, heavy*

Stream Characteristics

Average Upstream Width (ft): *3*
Average Downstream Width (ft): *4*
Average Upstream Depth (ft): *0.75*
Average Downstream Depth (ft): *0.25*
Upstream Current: *moderate*
Downstream Current: *moderate*

RECOMMENDED TREATMENTS: *none*

ESTIMATED COST: *na*

Road-Stream Crossing ID: AB-40

Location
County: *Alcona*
Stream Name: *Haynes*
Road Name: *Beaton Rd*
Township: *Haynes*
Adjacent Landowners: *private*

Culvert Description
Crossing Type: *twin culverts*
Culvert Length (ft): *40*
Culvert Diameter (in): *36"*
Culvert Condition: *good*
Culvert Flow: *obstructed*
Fish Passage Problem: *No*
Culvert Fill Depth-inlet, outlet (ft): *10, 10*
Culvert Embankment Slopes: *>1:2, >1:2*
Culvert Material: *galvanized*

Erosion
Severity Category: *moderate*
Erosion Extent: *Moderate*
Erosion Conditions: *impounded due to blockage*

Road Data
Average Width at Crossing (ft): *33*
Surface: *gravel*
Left Approach Length (ft): *100*
Right Approach Length (ft): *150*
Left Approach Slope: *>10%*
Right Approach Slope: *6-10%*
Ditch, Shoulder Vegetation: *heavy, heavy*

Stream Characteristics
Average Upstream Width (ft):
Average Downstream Width (ft):
Average Upstream Depth (ft):
Average Downstream Depth (ft):
Upstream Current: *slow*
Downstream Current: *slow*

RECOMMENDED TREATMENTS: *replace with 10x6 box culvert, harden approaches, revegetate*

ESTIMATED COST: *$25,755*

Road-Stream Crossing ID: AB-41

Location
County: *Alcona*
Stream Name: *Un-named Tributary*
Road Name: *US-23*
Township: *Alcona*
Adjacent Landowners: *private*

Culvert Description
Crossing Type: *single culvert*
Culvert Length (ft): *90*
Culvert Diameter (in): *24*
Culvert Condition: *fair*
Culvert Flow: *clear*
Fish Passage Problem: *no*
Culvert Fill Depth-inlet, outlet (ft): *16,18*
Culvert Embankment Slopes: *2:1, 2:1*
Culvert Material: *galvanized*

Erosion
Severity Category: *minor*
Erosion Extent: *minor*
Erosion Conditions: *none*

RECOMMENDED TREATMENTS: *none*

ESTIMATED COST: *NA*

Road Data
Average Width at Crossing (ft): *40*
Surface: *paved*
Left Approach Length (ft): *0*
Right Approach Length (ft): *0*
Left Approach Slope: *0*
Right Approach Slope: *0*
Ditch, Shoulder Vegetation: *heavy*

Stream Characteristics
Average Upstream Width (ft): *.5*
Average Downstream Width (ft): *.5*
Average Upstream Depth (ft): *.25*
Average Downstream Depth (ft): *.25*
Upstream Current: *slow*
Downstream Current: *slow*

Road-Stream Crossing ID: AB-42

Location
County: *Alcona*
Stream Name: *Un-named Trib to Butternut Ck*
Road Name: *Spruce Rd*
Township: *Caledonia*
Adjacent Landowners: *private*

Culvert Description
Crossing Type: *single culvert*
Culvert Length (ft): *48*
Culvert Diameter (in): *36*
Culvert Condition: *good*
Culvert Flow: *clear*
Fish Passage Problem: *no*
Culvert Fill Depth-inlet, outlet (ft): *10, 10*
Culvert Embankment Slopes: *1:1, 1:1*
Culvert Material: *concrete*

Erosion
Severity Category: *minor*
Erosion Extent: *minor*
Erosion Conditions: *none*

RECOMMENDED TREATMENTS: *none*

ESTIMATED COST: *NA*

Road Data
Average Width at Crossing (ft): *24*
Surface: *paved*
Left Approach Length (ft): *500*
Right Approach Length (ft): *1000*
Left Approach Slope: *1-5%*
Right Approach Slope: *1-5%*
Ditch, Shoulder Vegetation: *heavy*

Stream Characteristics
Average Upstream Width (ft): *dry*
Average Downstream Width (ft): *dry*
Average Upstream Depth (ft):
Average Downstream Depth (ft):
Upstream Current:
Downstream Current:

Road-Stream Crossing ID: AB-43

Location
County: *Alcona*
Stream Name: *Un-named Trib to Butternut Ck*
Road Name: *MacDonald Rd*
Township: *Caledonia*
Adjacent Landowners: *private*

Culvert Description
Crossing Type: *twin culvert*
Culvert Length (ft): *40*
Culvert Diameter (in): *18*
Culvert Condition: *good*
Culvert Flow: *clear*
Fish Passage Problem: *no*
Culvert Fill Depth-inlet, outlet (ft): *1, 1*
Culvert Embankment Slopes: *1.5:1, 1.5:1*
Culvert Material: *galvanized*

Erosion
Severity Category: *minor*
Erosion Extent: *minor*
Erosion Conditions: *none*

RECOMMENDED TREATMENTS: *none*

ESTIMATED COST: *NA*

Road Data
Average Width at Crossing (ft): *20*
Surface: *gravel*
Left Approach Length (ft): *0*
Right Approach Length (ft): *0*
Left Approach Slope: *0*
Right Approach Slope: *0*
Ditch, Shoulder Vegetation: *heavy*

Stream Characteristics
Average Upstream Width (ft): *3*
Average Downstream Width (ft): *3*
Average Upstream Depth (ft): *.25*
Average Downstream Depth (ft): *.25*
Upstream Current: *slow*
Downstream Current: *slow*

Road-Stream Crossing ID: AB-44

Location
County: *Alcona*
Stream Name: *Un-named Trib to Butternut Ck*
Road Name: *Roe Rd*
Township: *Caledonia*
Adjacent Landowners: *private*

Culvert Description
Crossing Type: *single culvert*
Culvert Length (ft): *36*
Culvert Diameter (in): *36*
Culvert Condition: *good*
Culvert Flow: *clear*
Fish Passage Problem: *no*
Culvert Fill Depth-inlet, outlet (ft): *2, 2*
Culvert Embankment Slopes: *1:1, 1:1*
Culvert Material: *galvanized*

Erosion
Severity Category: *minor*
Erosion Extent: *minor*
Erosion Conditions: *none*

RECOMMENDED TREATMENTS: *none*

ESTIMATED COST: *NA*

Road Data
Average Width at Crossing (ft): *22*
Surface: *paved*
Left Approach Length (ft): *0*
Right Approach Length (ft): *0*
Left Approach Slope: *0*
Right Approach Slope: *0*
Ditch, Shoulder Vegetation: *heavy*

Stream Characteristics
Average Upstream Width (ft): *1*
Average Downstream Width (ft): *1*
Average Upstream Depth (ft): *.5*
Average Downstream Depth (ft): *.5*
Upstream Current: *slow*
Downstream Current: *slow*

Road-Stream Crossing ID: AB-45

Location
County: *Alcona*
Stream Name: *intermitent drainage*
Road Name: *Barlow Rd (F-41)*
Township: *Alcona*
Adjacent Landowners: *private*

Culvert Description
Crossing Type: *single culvert*
Culvert Length (ft): *55*
Culvert Diameter (in): *18*
Culvert Condition: *good*
Culvert Flow: *clear*
Fish Passage Problem: *no*
Culvert Fill Depth-inlet, outlet (ft): *5, 5*
Culvert Embankment Slopes: *2:1, 2:1*
Culvert Material: *galvanized*

Erosion
Severity Category: *minor*
Erosion Extent: *minor*
Erosion Conditions: *none*

RECOMMENDED TREATMENTS: *none*

ESTIMATED COST: *NA*

Road Data
Average Width at Crossing (ft): *30*
Surface: *paved*
Left Approach Length (ft): *0*
Right Approach Length (ft): *0*
Left Approach Slope: *0*
Right Approach Slope: *0*
Ditch, Shoulder Vegetation: *heavy*

Stream Characteristics
Average Upstream Width (ft): *1*
Average Downstream Width (ft): *1*
Average Upstream Depth (ft): *.25*
Average Downstream Depth (ft): *1*
Upstream Current: *slow*
Downstream Current: *slow*

Road-Stream Crossing ID: AB-46

Location
County: *Alcona*
Stream Name: *intermitent drainage*
Road Name: *US-23*
Township: *Caledonia*
Adjacent Landowners: *private*

Culvert Description
Crossing Type: *single culvert, concrete box*
Culvert Length (ft): *120*
Culvert Diameter (in): *36*
Culvert Condition: *good*
Culvert Flow: *clear*
Fish Passage Problem: *no*
Culvert Fill Depth-inlet, outlet (ft): *30, 30*
Culvert Embankment Slopes: *1:1, 1:1*
Culvert Material: *concrete*

Erosion
Severity Category: *minor*
Erosion Extent: *minor*
Erosion Conditions: *none*

RECOMMENDED TREATMENTS: *none*

ESTIMATED COST: *NA*

Road Data
Average Width at Crossing (ft): *60*
Surface: *paved*
Left Approach Length (ft): *0*
Right Approach Length (ft): *0*
Left Approach Slope: *0*
Right Approach Slope: *0*
Ditch, Shoulder Vegetation: *heavy*

Stream Characteristics
Average Upstream Width (ft): *dry*
Average Downstream Width (ft): *dry*
Average Upstream Depth (ft):
Average Downstream Depth (ft):
Upstream Current:
Downstream Current:

Road-Stream Crossing ID: AB-47

Location
County: *Alcona*
Stream Name: *South Branch Black River*
Road Name: *McGregor Rd*
Township: *Harrisville*
Adjacent Landowners: *private*

Culvert Description
Crossing Type: *single culvert*
Culvert Length (ft): *24*
Culvert Diameter (in): *24*
Culvert Condition: *fair*
Culvert Flow: *obstructed, perched*
Fish Passage Problem: *yes*
Culvert Fill Depth-inlet, outlet (ft): *1.5, 1.5*
Culvert Embankment Slopes: *vertical*
Culvert Material: *galvanized*

Road Data
Average Width at Crossing (ft): *15*
Surface: *sand*
Left Approach Length (ft): *0*
Right Approach Length (ft): *0*
Left Approach Slope: *0*
Right Approach Slope: *0*
Ditch, Shoulder Vegetation: *partial*

Stream Characteristics
Average Upstream Width (ft): *3*
Average Downstream Width (ft): *3*
Average Upstream Depth (ft): *.5*
Average Downstream Depth (ft): *.5*
Upstream Current: *slow*
Downstream Current: *slow*

Erosion
Severity Category: *minor*
Erosion Extent: *minor*
Erosion Conditions: *pool formation at outlet, sand over crossing*

RECOMMENDED TREATMENTS: *replace culvert, harden approach, revegetate*

ESTIMATED COST: *$8,000*

Road-Stream Crossing ID: AB-48

Location
County: *Alcona*
Stream Name: *Un-named Trib to Butternut Ck*
Road Name: *Spruce Rd*
Township: *Caledonia*
Adjacent Landowners: *private*

Culvert Description
Crossing Type: *single culvert*
Culvert Length (ft): *40*
Culvert Diameter (in): *15*
Culvert Condition: *good*
Culvert Flow: *clear*
Fish Passage Problem: *no*
Culvert Fill Depth-inlet, outlet (ft): *6, 4*
Culvert Embankment Slopes: *1:1, 1:1*
Culvert Material: *concrete*

Erosion
Severity Category: *minor*
Erosion Extent: *minor*
Erosion Conditions: *none*

RECOMMENDED TREATMENTS: *none*

ESTIMATED COST: *NA*

Road Data
Average Width at Crossing (ft): *24*
Surface: *paved*
Left Approach Length (ft): *0*
Right Approach Length (ft): *0*
Left Approach Slope: *0*
Right Approach Slope: *0*
Ditch, Shoulder Vegetation: *heavy*

Stream Characteristics
Average Upstream Width (ft): *.5*
Average Downstream Width (ft): *.5*
Average Upstream Depth (ft): *.25*
Average Downstream Depth (ft): *.25*
Upstream Current: *slow*
Downstream Current: *slow*

Road-Stream Crossing ID: AB-49

Location
County: *Alcona*
Stream Name: *un-named Trib to Butternut Ck*
Road Name: *Hansen Rd*
Township: *Caledonia*
Adjacent Landowners: *private*

Culvert Description
Crossing Type: *single culvert*
Culvert Length (ft): *36*
Culvert Diameter (in): *24*
Culvert Condition: *good*
Culvert Flow: *clear*
Fish Passage Problem: *no*
Culvert Fill Depth-inlet, outlet (ft): *1, 1*
Culvert Embankment Slopes: *1:1, 1:1*
Culvert Material: *galvanized*

Erosion
Severity Category: *minor*
Erosion Extent: *minor*
Erosion Conditions: *none*

RECOMMENDED TREATMENTS: *none*

ESTIMATED COST: *NA*

Road Data
Average Width at Crossing (ft): *24*
Surface: *gravel*
Left Approach Length (ft): *0*
Right Approach Length (ft): *0*
Left Approach Slope: *0*
Right Approach Slope: *0*
Ditch, Shoulder Vegetation: *heavy*

Stream Characteristics
Average Upstream Width (ft): *3*
Average Downstream Width (ft): *3*
Average Upstream Depth (ft): *.5*
Average Downstream Depth (ft): *.5*
Upstream Current: *slow*
Downstream Current: *slow*

Road-Stream Crossing ID: CW-01

Location
County: *Alcona*
Stream Name: *Un-named coastal stream*
Road Name: *US 23*
Township: *Harrisville*
Adjacent Landowners: *private*

Culvert Description
Crossing Type: *single culvert*
Culvert Length (ft): *80*
Culvert Diameter (in): *48*
Culvert Condition: *good*
Culvert Flow: *clear*
Fish Passage Problem: *no*
Culvert Fill Depth-inlet, outlet (ft): *10, 10*
Culvert Embankment Slopes: *1.5:1, >2:1*
Culvert Material: *concrete*

Erosion
Severity Category: *minor*
Erosion Extent: *minor*
Erosion Conditions: *none*

RECOMMENDED TREATMENTS: *none*

ESTIMATED COST: *NA*

Road Data
Average Width at Crossing (ft): *40*
Surface: *paved*
Left Approach Length (ft): *0*
Right Approach Length (ft): *0*
Left Approach Slope: *0*
Right Approach Slope: *0*
Ditch, Shoulder Vegetation: *heavy*

Stream Characteristics
Average Upstream Width (ft): *dry*
Average Downstream Width (ft): *dry*
Average Upstream Depth (ft):
Average Downstream Depth (ft):
Upstream Current:
Downstream Current:

Road-Stream Crossing ID: CW-02

Location
County: *Alcona*
Stream Name: *Un-named coastal stream*
Road Name: *US 23*
Township: *Harrisville*
Adjacent Landowners: *private*

Culvert Description
Crossing Type: *concrete box*
Culvert Length (ft): *80*
Culvert Diameter (in): *72*
Culvert Condition: *fair*
Culvert Flow: *clear*
Fish Passage Problem: *no*
Culvert Fill Depth-inlet, outlet (ft): *15, 15*
Culvert Embankment Slopes: *1:1, 2:1*
Culvert Material: *concrete*

Erosion
Severity Category: *minor*
Erosion Extent: *minor*
Erosion Conditions: *none*

RECOMMENDED TREATMENTS: *none*

ESTIMATED COST: *NA*

Road Data
Average Width at Crossing (ft): *36*
Surface: *paved*
Left Approach Length (ft): *0*
Right Approach Length (ft): *0*
Left Approach Slope: *0%*
Right Approach Slope: *0%*
Ditch, Shoulder Vegetation: *heavy*

Stream Characteristics
Average Upstream Width (ft): *1*
Average Downstream Width (ft): *1*
Average Upstream Depth (ft): *.25*
Average Downstream Depth (ft): *.25*
Upstream Current: *slow*
Downstream Current: *slow*

Road-Stream Crossing ID: CW-03

Location
County: *Alcona*
Stream Name: *Un-named coastal stream*
Road Name: *Everett Rd*
Township: *Harrisville*
Adjacent Landowners: *private*

Culvert Description
Crossing Type: *single culvert*
Culvert Length (ft): *40*
Culvert Diameter (in): *18*
Culvert Condition: *fair*
Culvert Flow: *clear*
Fish Passage Problem: *no*
Culvert Fill Depth-inlet, outlet (ft): *3, 3*
Culvert Embankment Slopes: *1:1, 2:1*
Culvert Material: *galvanized*

Erosion
Severity Category: *minor*
Erosion Extent: *minor*
Erosion Conditions: *none*

RECOMMENDED TREATMENTS: *none*

ESTIMATED COST: *NA*

Road Data
Average Width at Crossing (ft): *21*
Surface: *paved*
Left Approach Length (ft): *600*
Right Approach Length (ft): *400*
Left Approach Slope: *1-5%*
Right Approach Slope: *1-5%*
Ditch, Shoulder Vegetation: *heavy*

Stream Characteristics
Average Upstream Width (ft): *dry*
Average Downstream Width (ft): *dry*
Average Upstream Depth (ft): *dry*
Average Downstream Depth (ft): *dry*
Upstream Current:
Downstream Current:

Road-Stream Crossing ID: CW-04

Location
County: *Alcona*
Stream Name: *Un-named coastal stream*
Road Name: *US 23*
Township: *Harrisville*
Adjacent Landowners: *private*

Culvert Description
Crossing Type: *single culvert*
Culvert Length (ft): *75*
Culvert Diameter (in): *24*
Culvert Condition: *good*
Culvert Flow: *clear*
Fish Passage Problem: *no*
Culvert Fill Depth-inlet, outlet (ft): *5, 5*
Culvert Embankment Slopes: *2:1, 2:1*
Culvert Material: *galvanized*

Erosion
Severity Category: *minor*
Erosion Extent: *minor*
Erosion Conditions: *none*

RECOMMENDED TREATMENTS: *none*

ESTIMATED COST: *NA*

Road Data
Average Width at Crossing (ft): *46*
Surface: *paved*
Left Approach Length (ft): *0*
Right Approach Length (ft): *0*
Left Approach Slope: *0%*
Right Approach Slope: *0%*
Ditch, Shoulder Vegetation: *heavy*

Stream Characteristics
Average Upstream Width (ft): *dry*
Average Downstream Width (ft): *dry*
Average Upstream Depth (ft): *dry*
Average Downstream Depth (ft): *dry*
Upstream Current:
Downstream Current:

Road-Stream Crossing ID: CW-05

Location
County: *Alcona*
Stream Name: *Un-named coastal stream*
Road Name: *US 23*
Township: *Haynes*
Adjacent Landowners: *private*

Culvert Description
Crossing Type: *single culvert*
Culvert Length (ft): *80*
Culvert Diameter (in): *15*
Culvert Condition: *good*
Culvert Flow: *clear*
Fish Passage Problem: *no*
Culvert Fill Depth-inlet, outlet (ft): *3, 3*
Culvert Embankment Slopes: *>2:1, >2:1*
Culvert Material: *galvanized*

Erosion
Severity Category: *minor*
Erosion Extent: *minor*
Erosion Conditions: *none*

RECOMMENDED TREATMENTS: *none*

ESTIMATED COST: *NA*

Road Data
Average Width at Crossing (ft): *36*
Surface: *paved*
Left Approach Length (ft): *0*
Right Approach Length (ft): *0*
Left Approach Slope: *0%*
Right Approach Slope: *0%*
Ditch, Shoulder Vegetation: *heavy*

Stream Characteristics
Average Upstream Width (ft): *dry*
Average Downstream Width (ft): *dry*
Average Upstream Depth (ft): *dry*
Average Downstream Depth (ft): *dry*
Upstream Current:
Downstream Current:

Road-Stream Crossing ID: CW-06

Location
County: *Alcona*
Stream Name: *Un-named coastal stream*
Road Name: *US-23*
Township: *Haynes*
Adjacent Landowners: *private*

Culvert Description
Crossing Type: *single culvert*
Culvert Length (ft): *150*
Culvert Diameter (in): *15*
Culvert Condition: *good*
Culvert Flow: *clear*
Fish Passage Problem: *no*
Culvert Fill Depth-inlet, outlet (ft): *30, 30*
Culvert Embankment Slopes: *2:1, 2:1*
Culvert Material: *concrete*

Erosion
Severity Category: *minor*
Erosion Extent: *minor*
Erosion Conditions: *none*

RECOMMENDED TREATMENTS: *none*

ESTIMATED COST: *NA*

Road Data
Average Width at Crossing (ft): *55*
Surface: *paved*
Left Approach Length (ft): *0*
Right Approach Length (ft): *0*
Left Approach Slope: *0%*
Right Approach Slope: *0%*
Ditch, Shoulder Vegetation: *heavy*

Stream Characteristics
Average Upstream Width (ft): *.5*
Average Downstream Width (ft): *.5*
Average Upstream Depth (ft): *.25*
Average Downstream Depth (ft): *.25*
Upstream Current: *slow*
Downstream Current: *slow*

Road-Stream Crossing ID: CW-07

Location
County: *Alcona*
Stream Name: *Un-named coastal stream*
Road Name: *US 23*
Township: *Haynes*
Adjacent Landowners: *private*

Culvert Description
Crossing Type: *single culvert*
Culvert Length (ft): *175*
Culvert Diameter (in): *15*
Culvert Condition: *good*
Culvert Flow: *clear*
Fish Passage Problem: *no*
Culvert Fill Depth-inlet, outlet (ft): *30, 30*
Culvert Embankment Slopes: *2:1, 2:1*
Culvert Material: *concrete*

Erosion
Severity Category: *minor*
Erosion Extent: *minor*
Erosion Conditions: *none*

RECOMMENDED TREATMENTS: *none*

ESTIMATED COST: *NA*

Road Data
Average Width at Crossing (ft): *55*
Surface: *paved*
Left Approach Length (ft): *0*
Right Approach Length (ft): *0*
Left Approach Slope: *0%*
Right Approach Slope: *0%*
Ditch, Shoulder Vegetation: *heavy*

Stream Characteristics
Average Upstream Width (ft): *.5*
Average Downstream Width (ft): *.5*
Average Upstream Depth (ft): *.25*
Average Downstream Depth (ft): *.25*
Upstream Current: *slow*
Downstream Current: *slow*

Road-Stream Crossing ID: CW-08

Location
County: *Alcona*
Stream Name: *Un-named coastal stream*
Road Name: *US 23*
Township: *Haynes*
Adjacent Landowners: *private*

Culvert Description
Crossing Type: *single culvert*
Culvert Length (ft): *120*
Culvert Diameter (in): *18*
Culvert Condition: *good*
Culvert Flow: *clear*
Fish Passage Problem: *no*
Culvert Fill Depth-inlet, outlet (ft): *25, 25*
Culvert Embankment Slopes: *2:1, 2:1*
Culvert Material: *concrete*

Erosion
Severity Category: *minor*
Erosion Extent: *minor*
Erosion Conditions: *none*

RECOMMENDED TREATMENTS: *none*

ESTIMATED COST: *NA*

Road Data
Average Width at Crossing (ft): *55*
Surface: *paved*
Left Approach Length (ft): *0*
Right Approach Length (ft): *0*
Left Approach Slope: *0%*
Right Approach Slope: *0%*
Ditch, Shoulder Vegetation: *heavy*

Stream Characteristics
Average Upstream Width (ft): *dry*
Average Downstream Width (ft): *dry*
Average Upstream Depth (ft): *dry*
Average Downstream Depth (ft): *dry*
Upstream Current:
Downstream Current:

Road-Stream Crossing ID: CW-09

Location
County: *Alcona*
Stream Name: *Un-named coastal stream*
Road Name: *US 23*
Township: *Haynes*
Adjacent Landowners: *private*

Culvert Description
Crossing Type: *single culvert*
Culvert Length (ft): *120*
Culvert Diameter (in): *18*
Culvert Condition: *good*
Culvert Flow: *clear*
Fish Passage Problem: *no*
Culvert Fill Depth-inlet, outlet (ft): *8, 8*
Culvert Embankment Slopes: *>2:1, >2:1*
Culvert Material: *concrete*

Erosion
Severity Category: *minor*
Erosion Extent: *minor*
Erosion Conditions: *none*

RECOMMENDED TREATMENTS: *none*

ESTIMATED COST: *NA*

Road Data
Average Width at Crossing (ft): *55*
Surface: *paved*
Left Approach Length (ft): *0*
Right Approach Length (ft): *0*
Left Approach Slope: *0%*
Right Approach Slope: *0%*
Ditch, Shoulder Vegetation: *heavy*

Stream Characteristics
Average Upstream Width (ft): *dry*
Average Downstream Width (ft): *dry*
Average Upstream Depth (ft): *dry*
Average Downstream Depth (ft): *dry*
Upstream Current:
Downstream Current:

Road-Stream Crossing ID: CW-10

Location
County: *Alcona*
Stream Name: *Un-named coastal stream*
Road Name: *Lake Shore Dr*
Township: *Haynes*
Adjacent Landowners: *private*

Culvert Description
Crossing Type: *ssingle culvert*
Culvert Length (ft): *48*
Culvert Diameter (in): *18*
Culvert Condition: *fair*
Culvert Flow: *clear*
Fish Passage Problem: *no*
Culvert Fill Depth-inlet, outlet (ft): *3, 3*
Culvert Embankment Slopes: *2:1, 2:1*
Culvert Material: *galvanized*

Erosion
Severity Category: *minor*
Erosion Extent: *minor*
Erosion Conditions: *none*

RECOMMENDED TREATMENTS: *none*

ESTIMATED COST: *NA*

Road Data
Average Width at Crossing (ft): *21*
Surface: *paved*
Left Approach Length (ft): *0*
Right Approach Length (ft): *0*
Left Approach Slope: *0%*
Right Approach Slope: *0%*
Ditch, Shoulder Vegetation: *heavy*

Stream Characteristics
Average Upstream Width (ft): *1*
Average Downstream Width (ft): *1*
Average Upstream Depth (ft): *.5*
Average Downstream Depth (ft): *.5*
Upstream Current: *slow*
Downstream Current: *slow*

Road-Stream Crossing ID: CW-11

Location
County: *Alcona*
Stream Name: *Un-named coastal stream*
Road Name: *McKechnie*
Township: *Haynes*
Adjacent Landowners: *private*

Culvert Description
Crossing Type: *single culvert*
Culvert Length (ft): *30*
Culvert Diameter (in): *24*
Culvert Condition: *poor*
Culvert Flow: *clear*
Fish Passage Problem: *no*
Culvert Fill Depth-inlet, outlet (ft): *.5, .5*
Culvert Embankment Slopes: *vertical*
Culvert Material: *galvanized*

Erosion
Severity Category: *minor*
Erosion Extent: *minor*
Erosion Conditions: *none*

RECOMMENDED TREATMENTS: *none*

ESTIMATED COST: *NA*

Road Data
Average Width at Crossing (ft): *20*
Surface: *gravel*
Left Approach Length (ft): *0*
Right Approach Length (ft): *0*
Left Approach Slope: *0%*
Right Approach Slope: *0%*
Ditch, Shoulder Vegetation: *heavy*

Stream Characteristics
Average Upstream Width (ft): *1*
Average Downstream Width (ft): *1*
Average Upstream Depth (ft): *.25*
Average Downstream Depth (ft): *.25*
Upstream Current: *slow*
Downstream Current: *slow*

Road-Stream Crossing ID: CW-12

Location
County: *Alcona*
Stream Name: *Un-named coastal stream*
Road Name: *Lake Shore Dr*
Township: *Haynes*
Adjacent Landowners: *private*

Culvert Description
Crossing Type: *single culvert*
Culvert Length (ft): *48*
Culvert Diameter (in): *18*
Culvert Condition: *fair*
Culvert Flow: *clear*
Fish Passage Problem: *no*
Culvert Fill Depth-inlet, outlet (ft): *3, 3*
Culvert Embankment Slopes: *vertical, 1:1*
Culvert Material: *galvanized*

Erosion
Severity Category: *minor*
Erosion Extent: *minor*
Erosion Conditions: *none*

RECOMMENDED TREATMENTS: *none*

ESTIMATED COST: *NA*

Road Data
Average Width at Crossing (ft): *21*
Surface: *paved*
Left Approach Length (ft): *0*
Right Approach Length (ft): *0*
Left Approach Slope: *0%*
Right Approach Slope: *0%*
Ditch, Shoulder Vegetation: *heavy*

Stream Characteristics
Average Upstream Width (ft): *1*
Average Downstream Width (ft): *1*
Average Upstream Depth (ft): *.25*
Average Downstream Depth (ft): *.25*
Upstream Current: *slow*
Downstream Current: *slow*

Road-Stream Crossing ID: CW-13

Location
County: *Alcona*
Stream Name: *Un-named coastal stream*
Road Name: *Lake Shore Dr*
Township: *Haynes*
Adjacent Landowners: *private*

Culvert Description
Crossing Type: *single culvert*
Culvert Length (ft): *50*
Culvert Diameter (in): *18*
Culvert Condition: *fair*
Culvert Flow: *perched*
Fish Passage Problem: *yes*
Culvert Fill Depth-inlet, outlet (ft): *4, 4*
Culvert Embankment Slopes: *1:1, 1:1*
Culvert Material: *galvanized*

Erosion
Severity Category: *minor*
Erosion Extent: *minor*
Erosion Conditions: *small pool formation*

Road Data
Average Width at Crossing (ft): *21*
Surface: *paved*
Left Approach Length (ft): *0*
Right Approach Length (ft): *0*
Left Approach Slope: *0%*
Right Approach Slope: *0%*
Ditch, Shoulder Vegetation: *heavy*

Stream Characteristics
Average Upstream Width (ft): *1*
Average Downstream Width (ft): *1*
Average Upstream Depth (ft): *.5*
Average Downstream Depth (ft): *.5*
Upstream Current: *slow*
Downstream Current: *slow*

RECOMMENDED TREATMENTS: *replace culvert*

ESTIMATED COST: *$8,000*

Road-Stream Crossing ID: CW-14

Location
County: *Alcona*
Stream Name: *Un-named coastal stream*
Road Name: *Lake Shore Dr*
Township: *Haynes*
Adjacent Landowners: *private*

Culvert Description
Crossing Type: *single culvert*
Culvert Length (ft): *48*
Culvert Diameter (in): *15*
Culvert Condition: *good*
Culvert Flow: *perched*
Fish Passage Problem: *yes*
Culvert Fill Depth-inlet, outlet (ft): *3,3*
Culvert Embankment Slopes: *1:1, 1:1*
Culvert Material: *galvanized*

Erosion
Severity Category: *minor*
Erosion Extent: *minor*
Erosion Conditions: *small pool formation*

Road Data
Average Width at Crossing (ft): *21*
Surface: *paved*
Left Approach Length (ft): *0*
Right Approach Length (ft): *0*
Left Approach Slope: *0%*
Right Approach Slope: *0%*
Ditch, Shoulder Vegetation: *heavy*

Stream Characteristics
Average Upstream Width (ft): *3*
Average Downstream Width (ft): *3*
Average Upstream Depth (ft): *.5*
Average Downstream Depth (ft): *.5*
Upstream Current: *slow*
Downstream Current: *slow*

RECOMMENDED TREATMENTS: *replace elliptical culvert*

ESTIMATED COST: *$10,000*

Road-Stream Crossing ID: CW-15

Location
County: *Alcona*
Stream Name: *Un-named coastal stream*
Road Name: *Poor Farm Rd*
Township: *Harrisville*
Adjacent Landowners: *private*

Culvert Description
Crossing Type: *single culvert*
Culvert Length (ft): *46*
Culvert Diameter (in): *36*
Culvert Condition: *fair*
Culvert Flow: *clear*
Fish Passage Problem: *no*
Culvert Fill Depth-inlet, outlet (ft): *3, 3*
Culvert Embankment Slopes: *1:1, 1:1*
Culvert Material: *galvanized*

Erosion
Severity Category: *minor*
Erosion Extent: *minor*
Erosion Conditions: *none*

RECOMMENDED TREATMENTS: *none*

ESTIMATED COST: *NA*

Road Data
Average Width at Crossing (ft): *21*
Surface: *paved*
Left Approach Length (ft): *500*
Right Approach Length (ft): *500*
Left Approach Slope: *1-5%*
Right Approach Slope: *1-5%*
Ditch, Shoulder Vegetation: *heavy*

Stream Characteristics
Average Upstream Width (ft): *1*
Average Downstream Width (ft): *1*
Average Upstream Depth (ft): *.25*
Average Downstream Depth (ft): *.25*
Upstream Current: *slow*
Downstream Current: *slow*

Road-Stream Crossing ID: CW-16

Location
County: *Alcona*
Stream Name: *Un-named Trib to Mill Ck*
Road Name: *Everett (private road end)*
Township: *Harrisville*
Adjacent Landowners: *private*

Culvert Description
Crossing Type: *no access - private road*
Culvert Length (ft):
Culvert Diameter (in):
Culvert Condition:
Culvert Flow:
Fish Passage Problem:
Culvert Fill Depth-inlet, outlet (ft):
Culvert Embankment Slopes:
Culvert Material:

Erosion
Severity Category:
Erosion Extent:
Erosion Conditions:

RECOMMENDED TREATMENTS:

ESTIMATED COST:

Road Data
Average Width at Crossing (ft):
Surface:
Left Approach Length (ft):
Right Approach Length (ft):
Left Approach Slope:
Right Approach Slope:
Ditch, Shoulder Vegetation:

Stream Characteristics
Average Upstream Width (ft):
Average Downstream Width (ft):
Average Upstream Depth (ft):
Average Downstream Depth (ft):
Upstream Current:
Downstream Current:

Road-Stream Crossing ID: CW-17

Location
County: *Alcona*
Stream Name: *Un-named coastal stream*
Road Name: *Spruce Trailways (private)*
Township: *Haynes*
Adjacent Landowners: *private*

Culvert Description
Crossing Type: *no access - private road*
Culvert Length (ft):
Culvert Diameter (in):
Culvert Condition:
Culvert Flow:
Fish Passage Problem:
Culvert Fill Depth-inlet, outlet (ft):
Culvert Embankment Slopes:
Culvert Material:

Erosion
Severity Category:
Erosion Extent:
Erosion Conditions:

RECOMMENDED TREATMENTS:

ESTIMATED COST:

Road Data
Average Width at Crossing (ft):
Surface:
Left Approach Length (ft):
Right Approach Length (ft):
Left Approach Slope:
Right Approach Slope:
Ditch, Shoulder Vegetation:

Stream Characteristics
Average Upstream Width (ft):
Average Downstream Width (ft):
Average Upstream Depth (ft):
Average Downstream Depth (ft):
Upstream Current:
Downstream Current:

Road-Stream Crossing ID: CW-18

Location
County: *Alcona*
Stream Name: *Un-named coastal stream*
Road Name: *Lake Shore Dr*
Township: *Alcona*
Adjacent Landowners: *private*

Culvert Description
Crossing Type: *single culvert*
Culvert Length (ft): *60*
Culvert Diameter (in): *36*
Culvert Condition: *good*
Culvert Flow: *perched*
Fish Passage Problem: *yes*
Culvert Fill Depth-inlet, outlet (ft): *2, 2*
Culvert Embankment Slopes: *2:1, 2:1*
Culvert Material: *galvanized*

Erosion
Severity Category: *minor*
Erosion Extent: *minor*
Erosion Conditions: *small pool formation*

Road Data
Average Width at Crossing (ft): *26*
Surface: *paved*
Left Approach Length (ft): *0*
Right Approach Length (ft): *0*
Left Approach Slope: *0%*
Right Approach Slope: *0%*
Ditch, Shoulder Vegetation: *heavy*

Stream Characteristics
Average Upstream Width (ft): *2.5*
Average Downstream Width (ft): *2.5*
Average Upstream Depth (ft): *.5*
Average Downstream Depth (ft): *.5*
Upstream Current: *slow*
Downstream Current: *slow*

RECOMMENDED TREATMENTS: *replace elliptical culvert*

ESTIMATED COST: *$10,000*

Road-Stream Crossing ID: CW-19

Location
County: *Alcona*
Stream Name: *Un-named coastal stream*
Road Name: *Lake Shore Dr*
Township: *Haynes*
Adjacent Landowners: *private*

Culvert Description
Crossing Type: *single culvert*
Culvert Length (ft): *52*
Culvert Diameter (in): *24*
Culvert Condition: *good*
Culvert Flow: *perched*
Fish Passage Problem: *yes*
Culvert Fill Depth-inlet, outlet (ft): *2, 2*
Culvert Embankment Slopes: *1:1, 1:1*
Culvert Material: *galvanized*

Erosion
Severity Category: *minor*
Erosion Extent: *minor*
Erosion Conditions: *small pool formation*

Road Data
Average Width at Crossing (ft): *26*
Surface: *paved*
Left Approach Length (ft): *0*
Right Approach Length (ft): *0*
Left Approach Slope: *0%*
Right Approach Slope: *0%*
Ditch, Shoulder Vegetation: *heavy*

Stream Characteristics
Average Upstream Width (ft): *3*
Average Downstream Width (ft): *3*
Average Upstream Depth (ft): *.5*
Average Downstream Depth (ft): *.5*
Upstream Current: *slow*
Downstream Current: *slow*

RECOMMENDED TREATMENTS: *replace elliptical culvert*

ESTIMATED COST: *$10,000*

Road-Stream Crossing ID: CW-20

Location
County: *Alcona*
Stream Name: *Un-named coastal stream*
Road Name: *Lake Shore Dr*
Township: *Haynes*
Adjacent Landowners: *private*

Culvert Description
Crossing Type: *single culvert*
Culvert Length (ft): *48*
Culvert Diameter (in): *15*
Culvert Condition: *good*
Culvert Flow: *clear*
Fish Passage Problem: *no*
Culvert Fill Depth-inlet, outlet (ft): *1.5, 1.5*
Culvert Embankment Slopes: *>2:1, >2:1*
Culvert Material: *galvanized*

Erosion
Severity Category: *minor*
Erosion Extent: *minor*
Erosion Conditions: *none*

RECOMMENDED TREATMENTS: *none*

ESTIMATED COST: *NA*

Road Data
Average Width at Crossing (ft): *21*
Surface: *paved*
Left Approach Length (ft): *0*
Right Approach Length (ft): *0*
Left Approach Slope: *0%*
Right Approach Slope: *0%*
Ditch, Shoulder Vegetation: *heavy*

Stream Characteristics
Average Upstream Width (ft): *3*
Average Downstream Width (ft): *3*
Average Upstream Depth (ft): *.5*
Average Downstream Depth (ft): *.5*
Upstream Current: *slow*
Downstream Current: *slow*

Road-Stream Crossing ID: CW-21

Location
County: *Alcona*
Stream Name: *Un-named coastal stream*
Road Name: *Lake Shore Dr*
Township: *Haynes*
Adjacent Landowners: *private*

Culvert Description
Crossing Type: *single culvert*
Culvert Length (ft): *45*
Culvert Diameter (in): *24*
Culvert Condition: *good*
Culvert Flow: *clear*
Fish Passage Problem: *no*
Culvert Fill Depth-inlet, outlet (ft): *3, 3*
Culvert Embankment Slopes: *1:1, 1:1*
Culvert Material: *galvanized*

Erosion
Severity Category: *minor*
Erosion Extent: *minor*
Erosion Conditions: *none*

RECOMMENDED TREATMENTS: *none*

ESTIMATED COST: *NA*

Road Data
Average Width at Crossing (ft): *21*
Surface: *paved*
Left Approach Length (ft): *0*
Right Approach Length (ft): *0*
Left Approach Slope: *0%*
Right Approach Slope: *0%*
Ditch, Shoulder Vegetation: *heavy*

Stream Characteristics
Average Upstream Width (ft): *3*
Average Downstream Width (ft): *3*
Average Upstream Depth (ft): *.5*
Average Downstream Depth (ft): *.5*
Upstream Current: *slow*
Downstream Current: *slow*

Road-Stream Crossing ID: CW-22

Location
County: *Alcona*
Stream Name: *Un-named coastal stream*
Road Name: *Dune Ln*
Township: *Haynes*
Adjacent Landowners: *private*

Culvert Description
Crossing Type: *single culvert*
Culvert Length (ft): *48*
Culvert Diameter (in): *36*
Culvert Condition: *good*
Culvert Flow: *perched*
Fish Passage Problem: *yes*
Culvert Fill Depth-inlet, outlet (ft): *2, 2*
Culvert Embankment Slopes: *>2:1, >2:1*
Culvert Material: *galvanized*

Road Data
Average Width at Crossing (ft): *20*
Surface: *paved*
Left Approach Length (ft): *0*
Right Approach Length (ft): *0*
Left Approach Slope: *0%*
Right Approach Slope: *0%*
Ditch, Shoulder Vegetation: *heavy*

Stream Characteristics
Average Upstream Width (ft): *3*
Average Downstream Width (ft): *3*
Average Upstream Depth (ft): *.5*
Average Downstream Depth (ft): *.5*
Upstream Current: *slow*
Downstream Current: *slow*

Erosion
Severity Category: *minor*
Erosion Extent: *minor*
Erosion Conditions: *small pool formation, minor embankment erosion*

RECOMMENDED TREATMENTS: *replace elliptical culvert, revegetate*

ESTIMATED COST: *$10,000*

Road-Stream Crossing ID: CW-23

Location
County: *Alcona*
Stream Name: *Un-named coastal stream*
Road Name: *Lake Shore Dr*
Township: *Haynes*
Adjacent Landowners: *private*

Culvert Description
Crossing Type: *single culvert*
Culvert Length (ft): *40*
Culvert Diameter (in): *18*
Culvert Condition: *good*
Culvert Flow: *clear*
Fish Passage Problem: *no*
Culvert Fill Depth-inlet, outlet (ft): *2.5, 2.5*
Culvert Embankment Slopes: *1:1, 1:1*
Culvert Material: *galvanized*

Erosion
Severity Category: *minor*
Erosion Extent: *minor*
Erosion Conditions: *none*

RECOMMENDED TREATMENTS: *none*

ESTIMATED COST: *NA*

Road Data
Average Width at Crossing (ft): *21*
Surface: *paved*
Left Approach Length (ft): *0*
Right Approach Length (ft): *0*
Left Approach Slope: *0%*
Right Approach Slope: *0%*
Ditch, Shoulder Vegetation: *heavy*

Stream Characteristics
Average Upstream Width (ft): *2*
Average Downstream Width (ft): *2*
Average Upstream Depth (ft): *.5*
Average Downstream Depth (ft): *.5*
Upstream Current: *slow*
Downstream Current: *slow*

Road-Stream Crossing ID: CW-24

Location
County: *Alcona*
Stream Name: *Un-named coastal stream*
Road Name: *Lake Shore Dr*
Township: *Haynes*
Adjacent Landowners: *private (fish hatchery)*

Culvert Description
Crossing Type: *single culvert*
Culvert Length (ft): *50*
Culvert Diameter (in): *24*
Culvert Condition: *fair*
Culvert Flow: *clear*
Fish Passage Problem: *no*
Culvert Fill Depth-inlet, outlet (ft): *2, 2*
Culvert Embankment Slopes: *1:1, 1:1*
Culvert Material: *galvanized*

Erosion
Severity Category: *minor*
Erosion Extent: *minor*
Erosion Conditions: *none*

RECOMMENDED TREATMENTS: *none*

ESTIMATED COST: *NA*

Road Data
Average Width at Crossing (ft): *21*
Surface: *paved*
Left Approach Length (ft): *0*
Right Approach Length (ft): *0*
Left Approach Slope: *0%*
Right Approach Slope: *0%*
Ditch, Shoulder Vegetation: *heavy*

Stream Characteristics
Average Upstream Width (ft): *1*
Average Downstream Width (ft): *1*
Average Upstream Depth (ft): *.25*
Average Downstream Depth (ft): *.25*
Upstream Current: *slow*
Downstream Current: *slow*

Road-Stream Crossing ID: CW-25

Location
County: *Alcona*
Stream Name: *Un-named coastal stream*
Road Name: *Lake Shore Dr*
Township: *Haynes*
Adjacent Landowners: *private*

Culvert Description
Crossing Type: *single culvert*
Culvert Length (ft): *48*
Culvert Diameter (in): *15*
Culvert Condition: *good*
Culvert Flow: *perched*
Fish Passage Problem: *yes*
Culvert Fill Depth-inlet, outlet (ft): *2.5, 3*
Culvert Embankment Slopes: *1:1, 1:1*
Culvert Material: *galvanized*

Erosion
Severity Category: *minor*
Erosion Extent: *minor*
Erosion Conditions: *small pool formation*

Road Data
Average Width at Crossing (ft): *21*
Surface: *paved*
Left Approach Length (ft): *0*
Right Approach Length (ft): *0*
Left Approach Slope: *0%*
Right Approach Slope: *0%*
Ditch, Shoulder Vegetation: *heavy*

Stream Characteristics
Average Upstream Width (ft): *1*
Average Downstream Width (ft): *1*
Average Upstream Depth (ft): *.5*
Average Downstream Depth (ft): *.5*
Upstream Current: *slow*
Downstream Current: *slow*

RECOMMENDED TREATMENTS: *replace culvert*

ESTIMATED COST: *$8,000*

Road-Stream Crossing ID: MC-01

Location
County: *Alcona*
Stream Name: *Mill Creek*
Road Name: *Lake St*
Township: *Harrisville (City)*
Adjacent Landowners: *private, local gov't*

Culvert Description
Crossing Type: *single culvert*
Culvert Length (ft): *48*
Culvert Diameter (in): *48*
Culvert Condition: *good*
Culvert Flow: *perched*
Fish Passage Problem: *yes*
Culvert Fill Depth-inlet, outlet (ft): *10, 10*
Culvert Embankment Slopes: *vertical*
Culvert Material: *galvanized*

Erosion
Severity Category: *minor*
Erosion Extent: *minor*
Erosion Conditions: *none*

RECOMMENDED TREATMENTS: *none*

ESTIMATED COST: *NA*

Road Data
Average Width at Crossing (ft): *24*
Surface: *paved*
Left Approach Length (ft): *0*
Right Approach Length (ft): *0*
Left Approach Slope: *0*
Right Approach Slope: *0*
Ditch, Shoulder Vegetation: *heavy*

Stream Characteristics
Average Upstream Width (ft): *10*
Average Downstream Width (ft): *10*
Average Upstream Depth (ft): *.5*
Average Downstream Depth (ft): *.5*
Upstream Current: *moderate*
Downstream Current: *moderate*

Road-Stream Crossing ID: MC-02

Location
County: *Alcona*
Stream Name: *Mill Creek*
Road Name: *US 23*
Township: *Harrisville (City)*
Adjacent Landowners: *private*

Culvert Description
Crossing Type: *bridge*
Culvert Length (ft): *48*
Culvert Diameter (in): *12 ft span*
Culvert Condition: *good*
Culvert Flow: *clear*
Fish Passage Problem: *no*
Culvert Fill Depth-inlet, outlet (ft): *NA*
Culvert Embankment Slopes: *NA*
Culvert Material: *concrete*

Erosion
Severity Category: *minor*
Erosion Extent: *minor*
Erosion Conditions: *none*

RECOMMENDED TREATMENTS: *none*

ESTIMATED COST: *NA*

Road Data
Average Width at Crossing (ft): *36*
Surface: *paved*
Left Approach Length (ft): *500*
Right Approach Length (ft): *500*
Left Approach Slope: *1-5%*
Right Approach Slope: *1-5%*
Ditch, Shoulder Vegetation: *partial*

Stream Characteristics
Average Upstream Width (ft): *6*
Average Downstream Width (ft): *6*
Average Upstream Depth (ft): *.5*
Average Downstream Depth (ft): *.5*
Upstream Current: *moderate*
Downstream Current: *moderate*

Road-Stream Crossing ID: MC-03

Location
County: *Alcona*
Stream Name: *Mill Creek*
Road Name: *Mill Creek Rd*
Township: *Harrisville (City)*
Adjacent Landowners: *private*

Culvert Description
Crossing Type: *twin culvert*
Culvert Length (ft): *44, 46*
Culvert Diameter (in): *42, 36*
Culvert Condition: *poor*
Culvert Flow: *clear*
Fish Passage Problem: *no*
Culvert Fill Depth-inlet, outlet (ft): *1, 1*
Culvert Embankment Slopes: *1:1, 2:1*
Culvert Material: *galvanized*

Road Data
Average Width at Crossing (ft): *22*
Surface: *gravel*
Left Approach Length (ft): *400*
Right Approach Length (ft): *400*
Left Approach Slope: *1-5%*
Right Approach Slope: *1-5%*
Ditch, Shoulder Vegetation: *heavy*

Stream Characteristics
Average Upstream Width (ft): *6*
Average Downstream Width (ft): *6*
Average Upstream Depth (ft): *.5*
Average Downstream Depth (ft): *.5*
Upstream Current: *slow*
Downstream Current: *slow*

Erosion
Severity Category: *minor*
Erosion Extent: *minor*
Erosion Conditions: *sand over crossing, embankment erosion*

RECOMMENDED TREATMENTS: *replace culverts with elliptical culvert, harden approaches, add rock rip rap, revegetate*

ESTIMATED COST: *$10,500*

Road-Stream Crossing ID: MC-04

Location
County: *Alcona*
Stream Name: *Mill Creek*
Road Name: *Swamp Rd*
Township: *Harrisville*
Adjacent Landowners: *private*

Culvert Description
Crossing Type: *twin culvert*
Culvert Length (ft): *28*
Culvert Diameter (in): *36*
Culvert Condition: *poor*
Culvert Flow: *clear*
Fish Passage Problem: *no*
Culvert Fill Depth-inlet, outlet (ft): *.5, .5*
Culvert Embankment Slopes: *vertical*
Culvert Material: *galvanized*

Road Data
Average Width at Crossing (ft): *14*
Surface: *gravel*
Left Approach Length (ft): *0*
Right Approach Length (ft): *0*
Left Approach Slope: *0*
Right Approach Slope: *0*
Ditch, Shoulder Vegetation: *partial*

Stream Characteristics
Average Upstream Width (ft): *8*
Average Downstream Width (ft): *3*
Average Upstream Depth (ft): *1*
Average Downstream Depth (ft): *.5*
Upstream Current: *slow*
Downstream Current: *slow*

Erosion
Severity Category: *minor*
Erosion Extent: *minor*
Erosion Conditions: *sand on crossing, embankment erosion, culverts too short*

RECOMMENDED TREATMENTS: *replace culverts wit elliptical culvert, harden approaches, add rock rip rap, revegetate*

ESTIMATED COST: *$10,500*

Appendix D

Alcona Black River & Coastal Watersheds Agricultural Inventory

Site ID	Ag 01		Date	8/12/2009
Location			**Farm Information**	
Waterbody:	South Branch Black River		Type of Operation:	Crops (appears inactive)
County:	Alcona		Riparian Frontage (ft):	1000
Township:	Haynes		Distance to Water (ft):	400
Town/Range:	27N / 9E		Soil Type:	Sand
Section(s):	10		Contamination Risks:	None
Natural Resource Concern(s)			**Recommended Treatments(s)**	
None			None	
Severity	Minor		**Cost**	NA

Site ID	Ag 02		Date	8/12/2009
Location			**Farm Information**	
Waterbody:	South Branch Black River		Type of Operation:	Crops
County:	Alcona		Riparian Frontage (ft):	3200
Township:	Haynes		Distance to Water (ft):	60
Town/Range:	27N / 9E		Soil Type:	Sand, Loam
Section(s):	10		Contamination Risks:	None
Natural Resource Concern(s)			**Recommended Treatments(s)**	
None			None	
Severity	Minor		**Cost**	NA

Site ID	Ag 03		Date	11/4/2009
Location			**Farm Information**	
Waterbody:	Liston Creek		Type of Operation:	Crops
County:	Alcona		Riparian Frontage (ft):	2600
Township:	Alcona		Distance to Water (ft):	50
Town/Range:	28N / 9E		Soil Type:	Clay, Loam
Section(s):	18		Contamination Risks:	None
Natural Resource Concern(s)			**Recommended Treatments(s)**	
None			None	
Severity	Minor		**Cost**	NA

Site ID	Ag 04		Date	11/4/2009
Location			**Farm Information**	
Waterbody:	Butternut Creek		Type of Operation:	Crops, Livestock
County:	Alcona		Riparian Frontage (ft):	3000
Township:	Alcona		Distance to Water (ft):	100
Town/Range:	28N / 9E		Soil Type:	Clay, Loam
Section(s):	18		Contamination Risks:	None
Natural Resource Concern(s)			**Recommended Treatments(s)**	
None			None	
Severity	Minor		**Cost**	NA

Site ID	Ag 05		Date	11/4/2009
Location			**Farm Information**	
Waterbody:	Butternut Creek		Type of Operation:	Crops
County:	Alcona		Riparian Frontage (ft):	600
Township:	Caledonia		Distance to Water (ft):	100
Town/Range:	28N / 8E		Soil Type:	Loam
Section(s):	13		Contamination Risks:	None
Natural Resource Concern(s)			**Recommended Treatments(s)**	
None			None	
Severity	Minor		**Cost**	NA

Site ID	Ag 06		Date	11/4/2009
Location			**Farm Information**	
Waterbody:	Butternut Creek Tributary		Type of Operation:	Crops
County:	Alcona		Riparian Frontage (ft):	600
Township:	Caledonia		Distance to Water (ft):	50
Town/Range:	28N / 8E		Soil Type:	Loam
Section(s):	10		Contamination Risks:	None
Natural Resource Concern(s)			**Recommended Treatments(s)**	
None			None	
Severity	Minor		**Cost**	NA

Site ID	Ag 07 & 08		Date	11/4/2009
Location			**Farm Information**	
Waterbody:	Butternut Creek Tributary		Type of Operation:	Crops
County:	Alcona		Riparian Frontage (ft):	5000
Township:	Caledonia		Distance to Water (ft):	50
Town/Range:	28N / 8E		Soil Type:	Loam
Section(s):	11		Contamination Risks:	None
Natural Resource Concern(s)			**Recommended Treatments(s)**	
None			None	
Severity	Minor		**Cost**	NA

Site ID	Ag 09		Date	11/4/2009
Location			**Farm Information**	
Waterbody:	Butternut Creek		Type of Operation:	Crops
County:	Alcona		Riparian Frontage (ft):	1600
Township:	Caledonia		Distance to Water (ft):	75
Town/Range:	28N / 8E		Soil Type:	Loam
Section(s):	13		Contamination Risks:	None
Natural Resource Concern(s)			**Recommended Treatments(s)**	
None			None	
Severity	Minor		**Cost**	NA

Site ID	Ag 10		Date	11/4/2009
Location			**Farm Information**	
Waterbody:	Mill Creek Tributary		Type of Operation:	Crops
County:	Alcona		Riparian Frontage (ft):	6000
Township:	Harrisville		Distance to Water (ft):	50
Town/Range:	26N / 9E		Soil Type:	Loam
Section(s):	3		Contamination Risks:	None
Natural Resource Concern(s)			**Recommended Treatments(s)**	
None			None	
Severity	Minor		**Cost**	NA

Site ID	Ag 11		Date	11/4/2009
Location			**Farm Information**	
Waterbody:	South Branch Black River		Type of Operation:	Livestock, Crops
County:	Alcona		Riparian Frontage (ft):	5000
Township:	Harrisville		Distance to Water (ft):	50
Town/Range:	26N / 9E		Soil Type:	Loam
Section(s):	4		Contamination Risks:	None
Natural Resource Concern(s)			**Recommended Treatments(s)**	
None			None	
Severity	Minor		**Cost**	NA

Site ID	Ag 12		Date	11/4/2009
Location			**Farm Information**	
Waterbody:	South Branch Black River		Type of Operation:	Livestock, Crops
County:	Alcona		Riparian Frontage (ft):	2500
Township:	Haynes		Distance to Water (ft):	75
Town/Range:	27N / 9E		Soil Type:	Loam
Section(s):	33		Contamination Risks:	None
Natural Resource Concern(s)			**Recommended Treatments(s)**	
None			None	
Severity	Minor		**Cost**	NA

Site ID	Ag 13		Date	11/4/2009
Location			**Farm Information**	
Waterbody:	Haynes Creek		Type of Operation:	Crops
County:	Alcona		Riparian Frontage (ft):	2600
Township:	Haynes		Distance to Water (ft):	50
Town/Range:	27N / 9E		Soil Type:	Loam
Section(s):	20		Contamination Risks:	None
Natural Resource Concern(s)			**Recommended Treatments(s)**	
None			None	
Severity	Minor		**Cost**	NA

Site ID	Ag 14		Date	11/4/2009
Location			**Farm Information**	
Waterbody:	Haynes Creek		Type of Operation:	Crops
County:	Alcona		Riparian Frontage (ft):	3000
Township:	Haynes		Distance to Water (ft):	50
Town/Range:	27N / 9E		Soil Type:	Loam
Section(s):	20		Contamination Risks:	None
Natural Resource Concern(s)			**Recommended Treatments(s)**	
None			None	
Severity	Minor		**Cost**	NA

Site ID	Ag 15		Date	11/4/2009
Location			**Farm Information**	
Waterbody:	Haynes Creek		Type of Operation:	Crops
County:	Alcona		Riparian Frontage (ft):	3000
Township:	Haynes		Distance to Water (ft):	25
Town/Range:	27N / 9E		Soil Type:	Loam
Section(s):	17		Contamination Risks:	None
Natural Resource Concern(s)			**Recommended Treatments(s)**	
None			None	
Severity	Minor		**Cost**	NA

Site ID	Ag 16		Date	11/4/2009
Location			**Farm Information**	
Waterbody:	Haynes Creek		Type of Operation:	Crops
County:	Alcona		Riparian Frontage (ft):	4000
Township:	Haynes		Distance to Water (ft):	25
Town/Range:	27N / 9E		Soil Type:	Loam
Section(s):	17		Contamination Risks:	None
Natural Resource Concern(s)			**Recommended Treatments(s)**	
None			None	
Severity	Minor		**Cost**	NA

Site ID	Ag 17		Date	11/4/2009
Location			**Farm Information**	
Waterbody:	Haynes Creek		Type of Operation:	Crops
County:	Alcona		Riparian Frontage (ft):	600
Township:	Haynes		Distance to Water (ft):	25
Town/Range:	27N / 9E		Soil Type:	Loam
Section(s):	16		Contamination Risks:	None
Natural Resource Concern(s)			**Recommended Treatments(s)**	
None			None	
Severity	Minor		**Cost**	NA

Site ID	Ag 18		Date	11/4/2009
Location			**Farm Information**	
Waterbody:	Haynes Creek		Type of Operation:	Crops
County:	Alcona		Riparian Frontage (ft):	4000
Township:	Haynes		Distance to Water (ft):	50
Town/Range:	27N / 9E		Soil Type:	Clay, Loam
Section(s):	16, 21		Contamination Risks:	None
Natural Resource Concern(s)			**Recommended Treatments(s)**	
None			None	
Severity	Minor		**Cost**	NA

Site ID	Ag 19		Date	11/4/2009
Location			**Farm Information**	
Waterbody:	SB Black River Tributary		Type of Operation:	Crops
County:	Alcona		Riparian Frontage (ft):	1300
Township:	Haynes		Distance to Water (ft):	25
Town/Range:	27N / 9E		Soil Type:	Loam
Section(s):	9		Contamination Risks:	None
Natural Resource Concern(s)			**Recommended Treatments(s)**	
None			None	
Severity	Minor		**Cost**	NA

Site ID	Ag 20		Date	11/12/2009
Location			**Farm Information**	
Waterbody:	Butternut Creek Tributary		Type of Operation:	Livestock
County:	Alcona		Riparian Frontage (ft):	
Township:	Caledonia		Distance to Water (ft):	
Town/Range:	28N / 8E		Soil Type:	Loam
Section(s):	1		Contamination Risks:	
Natural Resource Concern(s)			**Recommended Treatments(s)**	
Small feedlot & pasture area drains to intermittent tributary to Butternut Crk. Approx 800' to tributary through wooded area, and 1 mile to Butternut Crk.			None – Unwilling landowner	
Severity	Minor		**Cost**	NA

Site ID	Ag 21		Date	11/12/2009
Location			**Farm Information**	
Waterbody:	Butternut Creek Tributary		Type of Operation:	Crops
County:	Alcona		Riparian Frontage (ft):	1800
Township:	Caledonia		Distance to Water (ft):	50
Town/Range:	28N / 8E		Soil Type:	Loam
Section(s):	1		Contamination Risks:	None
Natural Resource Concern(s)			**Recommended Treatments(s)**	
None			None	
Severity	Minor		**Cost**	NA

Site ID	Ag 22		Date	11/12/2009
Location			**Farm Information**	
Waterbody:	DeRoucher Creek		Type of Operation:	Crops, Livestock
County:	Alcona		Riparian Frontage (ft):	1600
Township:	Alcona		Distance to Water (ft):	200
Town/Range:	28N / 8E		Soil Type:	Loam
Section(s):	20		Contamination Risks:	None
Natural Resource Concern(s)			**Recommended Treatments(s)**	
None			None	
Severity	Minor		**Cost**	NA

Site ID	Ag 23		Date	11/12/2009
Location			**Farm Information**	
Waterbody:	SB Black River		Type of Operation:	Crops
County:	Alcona		Riparian Frontage (ft):	2600
Township:	Haynes		Distance to Water (ft):	200
Town/Range:	27N / 9E		Soil Type:	Loam
Section(s):	27, 28		Contamination Risks:	None
Natural Resource Concern(s)			**Recommended Treatments(s)**	
None			None	
Severity	Minor		**Cost**	NA

Site ID	Ag 24		Date	11/12/2009
Location			**Farm Information**	
Waterbody:	SB Black River		Type of Operation:	Crops
County:	Alcona		Riparian Frontage (ft):	1400
Township:	Haynes		Distance to Water (ft):	100 +
Town/Range:	27N / 9E		Soil Type:	Loam
Section(s):	33, 34		Contamination Risks:	None
Natural Resource Concern(s)			**Recommended Treatments(s)**	
None			None	
Severity	Minor		**Cost**	NA

Site ID	Ag 25		Date	11/12/2009
Location			**Farm Information**	
Waterbody:	Haynes Creek		Type of Operation:	Crops
County:	Alcona		Riparian Frontage (ft):	1000
Township:	Haynes		Distance to Water (ft):	200 +
Town/Range:	27N / 9E		Soil Type:	Loam, Sand
Section(s):	21		Contamination Risks:	None
Natural Resource Concern(s)			**Recommended Treatments(s)**	
None			None	
Severity	Minor		**Cost**	NA

Site ID	Ag 26		Date	11/12/2009
Location			**Farm Information**	
Waterbody:	Haynes Creek		Type of Operation:	Crops
County:	Alcona		Riparian Frontage (ft):	500
Township:	Haynes		Distance to Water (ft):	100 +
Town/Range:	27N / 9E		Soil Type:	Loam
Section(s):	21		Contamination Risks:	None
Natural Resource Concern(s)			**Recommended Treatments(s)**	
None			None	
Severity	Minor		**Cost**	NA

Site ID	Ag 27		Date	11/12/2009
Location			**Farm Information**	
Waterbody:	Haynes Creek Tributary		Type of Operation:	Crops
County:	Alcona		Riparian Frontage (ft):	2600
Township:	Haynes		Distance to Water (ft):	50
Town/Range:	27N / 9E		Soil Type:	Loam
Section(s):	8		Contamination Risks:	None
Natural Resource Concern(s)			**Recommended Treatments(s)**	
None			None	
Severity	Minor		**Cost**	NA

Site ID	Ag 28		Date	11/12/2009
Location			**Farm Information**	
Waterbody:	SB Black River Tributary		Type of Operation:	Crops
County:	Alcona		Riparian Frontage (ft):	2000
Township:	Haynes		Distance to Water (ft):	50
Town/Range:	27N / 9E		Soil Type:	Loam
Section(s):	9		Contamination Risks:	None
Natural Resource Concern(s)			**Recommended Treatments(s)**	
None			None	
Severity	Minor		**Cost**	NA

Site ID	Ag 29		Date	11/12/2009
Location			**Farm Information**	
Waterbody:	SB Black River Tributary		Type of Operation:	Crops
County:	Alcona		Riparian Frontage (ft):	6000
Township:	Haynes		Distance to Water (ft):	50
Town/Range:	27N / 9E		Soil Type:	Loam
Section(s):	10		Contamination Risks:	None
Natural Resource Concern(s)			**Recommended Treatments(s)**	
None			None	
Severity	Minor		**Cost**	NA

Site ID	Ag 30		Date	11/19/2009
Location			**Farm Information**	
Waterbody:	SB Black River		Type of Operation:	Crops
County:	Alcona		Riparian Frontage (ft):	1500
Township:	Alcona		Distance to Water (ft):	50
Town/Range:	28N / 9E		Soil Type:	Loam, Sand
Section(s):	22		Contamination Risks:	None
Natural Resource Concern(s)			**Recommended Treatments(s)**	
None			None	
Severity	Minor		**Cost**	NA

Site ID	Ag 31		Date	11/19/2009
Location			**Farm Information**	
Waterbody:	NB Black River Tributary		Type of Operation:	Crops
County:	Alcona		Riparian Frontage (ft):	2000
Township:	Alcona		Distance to Water (ft):	75
Town/Range:	28N / 9E		Soil Type:	Loam, Sand
Section(s):	22		Contamination Risks:	None
Natural Resource Concern(s)			**Recommended Treatments(s)**	
None			None	
Severity	Minor		**Cost**	NA

Site ID	Ag 32		Date	11/19/2009
Location			**Farm Information**	
Waterbody:	Gauthier Creek		Type of Operation:	Crops
County:	Alcona		Riparian Frontage (ft):	2000
Township:	Alcona		Distance to Water (ft):	100 +
Town/Range:	28N / 9E		Soil Type:	Loam, Sand
Section(s):	22		Contamination Risks:	None
Natural Resource Concern(s)			**Recommended Treatments(s)**	
None			None	
Severity	Minor		**Cost**	NA

Appendix E

Alcona Black River & Coastal Watersheds Biological & Physical Habitat Survey

MiCorps Site ID#:_____

Michigan Clean Water Corps

Stream Macroinvertebrate Datasheet

Stream Name: Black River

Location: at Boat Launch (E) (Circle one: *Upstream* or *Downstream* of road?)

Date: 5/16/11 Collection Start Time:_____ (AM/PM)

Major Watershed: Black River HUC Code (if known):_____

Latitude:_____ Longitude:_____

Monitoring Team:

Name of Person Completing Datasheet:_____

Collector:_____

Other Team Members: 5th Hour Chemistry Class

Stream Conditions:

Average Water Depth: 4 feet

Is the substrate covered with excessive silt? ___ No X Yes (describe:_____)

Substrate Embeddedness in Riffles: ___ 0-25% ___ 25-50% X > 50% ___ Unsure

Did you observe any fish or wildlife? ( ) Yes (X) No If so, please describe:_____

Macroinvertebrate Collection: Check the habitats that were sampled. Include as many as possible.

___ Riffles
___ Cobbles
X Aquatic Plants
___ Runs
X Stream Margins
X Leaf Packs
___ Pools
X Undercut banks/Overhanging Vegetation
X Submerged Wood
___ Other (describe:_____)

Did you see, but not collect, any **live crayfish**? (X Yes ___ No), or **large clams**? (X Yes ___ No)
remember to include them in the assessment on the other side!

Collection Finish Time:_____(AM/PM)

Datasheet checked for completeness by:_____
Data entered into MiCorps database by:_____ Datasheet version 10/08/05
Date:_____

MiCorps Site ID#: E

Michigan Clean Water Corps

IDENTIFICATION AND ASSESSMENT

Use letter codes [**R** (rare) = 1-10, **C** (common) = 11 or more] to record the approximate numbers of organisms in each taxa found in the stream reach.

*** Do NOT count empty shells, pupae, or terrestrial macroinvertebrates***

Group 1: Sensitive

- R Caddisfly larvae (Trichoptera) *EXCEPT Net-spinning caddis*
- ___ Hellgrammites (Megaloptera)
- R Mayfly nymphs (Ephemeroptera)
- ___ Gilled (right-handed) snails (Gastropoda)
- C Stonefly nymphs (Plecoptera)
- C Water penny (Coleoptera)
- ___ Water snipe fly (Diptera)

Group 2: Somewhat-Sensitive

- R Alderfly larvae (Megaloptera)
- C Beetle adults (Coleoptera)
- C Beetle larvae (Coleoptera)
- R Black fly larvae (Diptera)
- R Clams (Pelecypoda)
- R Crane fly larvae (Diptera)
- C Crayfish (Decapoda)
- ___ Damselfly nymphs (Odonata)
- ___ Dragonfly nymphs (Odonata)
- ___ Net-spinning caddisfly larvae (Hydropsychidae; Trichoptera)
- R Scuds (Amphipoda)
- ___ Sowbugs (Isopoda)

Group 3: Tolerant

- ___ Aquatic worms (Oligochaeta)
- ___ Leeches (Hirudinea)
- R Midge larvae (Diptera)
- ___ Pouch snails (Gastropoda)
- R True bugs (Hemiptera)
- ___ Other true flies (Diptera)

STREAM QUALITY SCORE

Group 1:
2 # of R's * 5.0 = 10
2 # of C's * 5.3 = 10.6
Group 1 Total = 20.6

Group 2:
5 # of R's * 3.0 = 15
3 # of C's * 3.2 = 9.6
Group 2 Total = 24.6

Group 3:
2 # of R's * 1.1 = 2.2
___ # of C's * 1.0 = ___
Group 3 Total = 2.7

Total Stream Quality Score = 47.4
(Sum of totals for groups 1-3; round to nearest whole number)

Check one:
- ___ Excellent (>48)
- X Good (34-48)
- ___ Fair (19-33)
- ___ Poor (<19)

Identifications made by: Staci

Rate your confidence in these identifications: Quite confident 5 (4) 3 2 1 Not very confident

Datasheet checked for completeness by: ___ Datasheet version 10/08/05
Data entered into MiCorps database by: ___ Date: ___

STREAM HABITAT ASSESSMENT

Michigan Clean Water Corps

I. Stream, Team, Location Information

Site ID: F Date: _____ Time: _____

Location: Black River at mouth

Name(s): _____

II. Stream and Riparian Habitat

A. General Information *Circle one or more answers as appropriate*						Notes and Observations Give further explanation when needed
1	Average Stream Width (ft)	< 10	10-25	25-50	>50	
2	Average Stream Depth (ft)	<1	1-3	>3	>5	
3	Has this stream been channelized? (Stream shape constrained through human activity- look for signs of dredging, armored banks, straightened channels)	Yes, currently	Yes, sometime in the past	No	Don't know	
4	Estimate of current stream flow	Dry or Intermittent	Stagnant	Low	Medium	High
5	Highest water mark (in feet above the current level)	<1	1-3	3-5	5-10	>10
6	Which of these habitat types are present?	Riffles	Deep Pools	Large woody debris	Large rocks	Undercut bank
		Overhanging vegetation	Rooted Aquatic Plants	Other: sandy	Other:	Other:
7	Estimate of turbidity	Clear	Slightly Turbid (can partially see to bottom)		Turbid (cannot see to bottom)	
8	Is there a sheen or oil slick visible on the surface of the water?	No	Yes			
9	If yes to #8, does the sheen break up when poked with a stick?	Yes (sheen is most likely natural)		No (sheen could be artifical)		
10	Is there foam present on the surface of the water?	No	Yes			
11	Is yes to #10, does the foam feel gritty or soapy?	Gritty (foam is most likely natural)		Soapy (foam could be artifical)		
The following are optional measurements not currently funded by MiCorps						
8	Water Temperature					
9	Dissolved Oxygen					
10	pH					
11	Water Velocity					

MiCorps Site ID#:_____ Date:_____

Michigan Clean Water Corps

II. Stream and Riparian Habitat (continued)

B. Streambed Substrate

Estimate percent of stream bed composed of the following substrate.

If group will take transects and pebble counts (in Section IV), check this box and record the measured percentages. ☐

Substrate type	*Size*	*Percentage*
Boulder	>10" diameter	
Cobble	2.5 - 10" diameter	
Gravel	0.1 - 2.5" diameter	
Sand	coarse grain	75%
Fines: Silt/Detritus/Muck	fine grain/organic matter	20%
Hardpan/Bedrock	solid clay/rock surface	
Artificial	man-made	5%
Other (specify)		

C. Bank stability and erosion.

Summarize the extent of erosion along each bank separately on a scale of 1 through 10, by circling a value below. Left/right banks are identified by looking downstream.

Excellent	Good	Marginal	Poor
Banks Stable. No evidence of erosion or bank failure. Little potential for problems during floods. < 5% of bank affected.	Moderately stable. Small areas of erosion. Slight potential for problems in extreme floods. 5-30% of bank in reach has areas of erosion.	Moderately unstable. Erosional areas occur frequently and are somewhat large. High erosion potential during floods. 30-60% of banks in reach are eroded.	Unstable. Many eroded areas. > 60% banks eroded. Raw areas frequent along straight sections and bends. Bank sloughing obvious.
LEFT BANK 10 - 9	LEFT BANK (8) - 7 - 6	LEFT BANK 5 - 4 - 3	LEFT BANK 2 - 1 - 0
RIGHT BANK 10 - 9	RIGHT BANK 8 - (7) - 6	RIGHT BANK 5 - 4 - 3	RIGHT BANK 2 - 1 - 0

You may wish to take photos of unstable or eroded banks for your records. Record date and location.

Comments:

MiCorps Site ID#:_____ Date:_____

Michigan Clean Water Corps

II. Stream and Riparian Habitat (continued)

D. Plant Community

Estimate the percentage of the stream covered by overhanging vegetation 15 %

Using the given scale, estimate the relative abundance of the following:

Plants in the stream:		*Plants on the bank/riparian zone:*	
Algae on Surfaces of Rocks or Plants	Filamentous Algae (Streamers)	Shrubs	Trees
Macrophytes (Standing, Floating Plants)	0= Absent 1= Rare 2= Common 3= Abundant 4= Dominant	Grasses	0= Absent 1= Rare 2= Common 3= Abundant 4= Dominant
Identified species (optional)		Identified species (optional)	
1	0	2	3
0		4	

E. Riparian Zone

The riparian zone is the vegetated area that surrounds the stream. Right/Left banks are identified by looking downstream.

1. Left Bank

Circle those land-use types that you can see from this stream reach.

(Wetlands) Forest (Residential Lawn) (Park) Shrub, Old Field Agriculture

Construction Commercial Industrial Highways Golf Course Other_____

2. Right Bank

Circle those land-use types that you can see from this stream reach.

Wetlands (Forest) (Residential Lawn) Park (Shrub), Old Field Agriculture

Construction Commercial Industrial Highways Golf Course Other_____

3. Summarize the size and quality of the riparian zone along each bank separately on a scale of 1 through 10, by circling a value below.

Excellent	Good	Marginal	Poor
Width of riparian zone >150 feet, dominated by vegetation, including trees, understory shrubs, or non-woody macrophytes or wetlands; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	Width of riparian zone 75-150 feet; human activities have impacted zone only minimally.	Width of riparian zone 10-75 feet; human activities have impacted zone a great deal.	Width of riparian zone ,10 feet; little or no riparian vegetation due to human activities.
LEFT BANK 10 - 9	LEFT BANK 8 - 7 - (6)	LEFT BANK 5 - 4 - 3	LEFT BANK 2 - 1 - 0
RIGHT BANK 10 - 9	RIGHT BANK (8) - 7 - 6	RIGHT BANK 5 - 4 - 3	RIGHT BANK 2 - 1 - 0

MiCorps Site ID#:_____ Date:_____

Michigan Clean Water Corps

III. Sources of Degradation

1. In what ways is this stream degraded, if any?
There is a bridge over it.
2. Does a team need to come out and collect trash?
Works and boat launch
No
3. Based on what you can see from this location, what are the potential causes and level of severity of this degradation? Only judge what you can see from the site.

(Severity: S=slight M=moderate H=high) (Indicate all that apply)							
Crop Related Sources	S	M	H	Land Disposal	S	M	H
Grazing Related Sources	S	M	H	On-site Wastewater Systems	S	M	H
Intensive Animal Feeding Operations	S	M	H	Silviculture (Forestry)	S	M	H
Highway/Road/Bridge Maintenance and Runoff	(S)	M	H	Resource Extraction (Mining)	S	M	H
Channelization	S	M	H	Recreational/Tourism Activities (general)	(S)	M	H
Dredging	(S)	M	H	• Golf Courses	S	M	H
Removal of Riparian Vegetation	(S)	M	H	• Marinas/Recreational Boating (water releases)	(S)	M	H
Bank and Shoreline Erosion/ Modification/Destruction	(S)	M	H	• Marinas/Recreational Boating (bank or shoreline erosion)	(S)	M	H
Flow Regulation/ Modification (Hydrology)	S	M	H	Debris in Water	(S)	M	H
Invasive Species	S	(M)	H	Industrial Point Source	S	M	H
Construction: Highway, Road, Bridge, Culvert	S	M	H	Municipal Point Source	S	M	H
Construction: Land Development	S	M	H	Natural Sources	(S)	M	H
Urban Runoff	S	M	H	Source(s) Unknown	S	M	H

Additional comments:

MiCorps Site ID#: F

Michigan Clean Water Corps

Stream Macroinvertebrate Datasheet

Stream Name: Black River

Location: Lavern Rd (Circle one: *Upstream* or *Downstream* of road?)

Date: 5-18-11 Collection Start Time: _____ (AM/PM)

Major Watershed: Black Riv HUC Code (if known): _____

Latitude: _____ Longitude: _____

Monitoring Team:

Name of Person Completing Datasheet: Samantha Robertson

Collector: Jessica Butcavage

Other Team Members: Caleb, Austin, Dean, Alexis, Miki

Stream Conditions:

Average Water Depth: 4' 3" feet

Is the substrate covered with excessive silt? ___ No X Yes (describe: _____)

Substrate Embeddedness in Riffles: ___ 0-25% ___ 25-50% ___ > 50% X Unsure

Did you observe any fish or wildlife? X Yes ( ) No If so, please describe: _____

Macroinvertebrate Collection: Check the habitats that were sampled. Include as many as possible.

- X Riffles
- X Cobbles
- ___ Aquatic Plants
- ___ Runs
- X Stream Margins
- ___ Leaf Packs
- X Pools
- X Undercut banks/Overhanging Vegetation
- X Submerged Wood
- ___ Other (describe: _____)

Did you see, but not collect, any **live crayfish**? (___ Yes X No), or **large clams**? (___ Yes X No)

remember to include them in the assessment on the other side!

Collection Finish Time: _____ (AM/PM)

Datasheet checked for completeness by: _____

Data entered into MiCorps database by: _____ Datasheet version 10/08/05

Date: _____

MiCorps Site ID#: F

Michigan Clean Water Corps

IDENTIFICATION AND ASSESSMENT

Use letter codes [**R** (rare) = 1-10, **C** (common) = 11 or more] to record the approximate numbers of organisms in each taxa found in the stream reach.

*** Do NOT count empty shells, pupae, or terrestrial macroinvertebrates***

Group 1: Sensitive

C	Caddisfly larvae *EXCEPT Net-spinning caddis*	(Trichoptera)
___	Hellgrammites	(Megaloptera)
R	Mayfly nymphs	(Ephemeroptera)
___	Gilled (right-handed) snails	(Gastropoda)
R	Stonefly nymphs	(Plecoptera)
R	Water penny	(Coleoptera)
___	Water snipe fly	(Diptera)

Group 2: Somewhat-Sensitive

R	Alderfly larvae	(Megaloptera)
___	Beetle adults	(Coleoptera)
C	Beetle larvae	(Coleoptera)
R	Black fly larvae	(Diptera)
___	Clams	(Pelecypoda)
R	Crane fly larvae	(Diptera)
R	Crayfish	(Decapoda)
___	Damselfly nymphs	(Odonata)
___	Dragonfly nymphs	(Odonata)
___	Net-spinning caddisfly larvae	(Hydropsychidae; Trichoptera)
C	Scuds	(Amphipoda)
___	Sowbugs	(Isopoda)

Group 3: Tolerant

R	Aquatic worms	(Oligochaeta)
___	Leeches	(Hirudinea)
C	Midge larvae	(Diptera)
___	Pouch snails	(Gastropoda)
R	True bugs	(Hemiptera)
___	Other true flies	(Diptera)

STREAM QUALITY SCORE

Group 1:
3 # of R's * 5.0 = 15
1 # of C's * 5.3 = 5.3
Group 1 Total = 20.3

Group 2:
4 # of R's * 3.0 = 12
2 # of C's * 3.2 = 6.4
Group 2 Total = 18.4

Group 3:
2 # of R's * 1.1 = 2.2
1 # of C's * 1.0 = 1
Group 3 Total = 3.2

Total Stream Quality Score = 41.9
(Sum of totals for groups 1-3; round to nearest whole number)

Check one:
___ Excellent (>48)
X Good (34-48)
___ Fair (19-33)
___ Poor (<19)

Identifications made by: _____

Rate your confidence in these identifications: Quite confident 5 (4) 3 2 1 Not very confident

Datasheet checked for completeness by: _____ Datasheet version 10/08/05

Data entered into MiCorps database by: _____ Date: _____

STREAM HABITAT ASSESSMENT

Michigan Clean Water Corps

I. Stream, Team, Location Information

Site ID: F Date: 5-18-11 Time: 10:02a.m.

Location: Black River at Laverne Road

Name(s): Brandon Baur, Audrey Julka, Alissa Clink, Tyler Banks

II. Stream and Riparian Habitat

A. General Information
Circle one or more answers as appropriate

							Notes and Observations: Give further explanation when needed
1	Average Stream Width (ft)	< 10	(10-25)	25-50	>50		
2	Average Stream Depth (ft)	<1	1-3	(<3)	>5		
3	Has this stream been channelized? (Stream shape constrained through human activity- look for signs of dredging, armored banks, straightened channels)	Yes, currently	Yes, sometime in the past	(No)	Don't know		
4	Estimate of current stream flow	Dry or Intermittent	Stagnant	Low	(Medium)	High	
5	Highest water mark (in feet above the current level)	<1	1-3	(3-5)	5-10	>10	
6	Which of these habitat types are present?	(Riffles)	(Deep Pools)	(Large woody debris)	(Large rocks)	Undercut bank	
		(Overhanging vegetation)	Rooted Aquatic Plants	Other:	Other:	Other:	
7	Estimate of turbidity	Clear	(Slightly Turbid (can partially see to bottom))		Turbid (cannot see to bottom)		
8	Is there a sheen or oil slick visible on the surface of the water?	(No)	Yes				
9	If yes to #8, does the sheen break up when poked with a stick?	Yes (sheen is most likely natural)		No (sheen could be artifical)			
10	Is there foam present on the surface of the water?	No	(Yes)				
11	Is yes to #10, does the foam feel gritty or soapy?	Gritty (foam is most likely natural)		(Soapy (foam could be artifical))			
The following are optional measurements not currently funded by MiCorps							
8	Water Temperature						
9	Dissolved Oxygen						
10	pH						
11	Water Velocity						

MiCorps Site ID#:_____ Date:_____

Michigan Clean Water Corps

II. Stream and Riparian Habitat (continued)

B. Streambed Substrate

Estimate percent of stream bed composed of the following substrate.

If group will take transects and pebble counts (in Section IV), check this box and record the measured percentages. ☐

Substrate type	*Size*	*Percentage*
Boulder	>10" diameter	10%
Cobble	2.5 - 10" diameter	10%
~~Gravel~~	~~0.1 - 2.5" diameter~~	~~~~
Sand	coarse grain	
Fines: Silt/Detritus/Muck	fine grain/organic matter	80%
Hardpan/Bedrock	solid clay/rock surface	
Artificial	man-made	
Other (specify)		

C. Bank stability and erosion.

Summarize the extent of erosion along <u>each bank separately</u> on a scale of 1 through 10, by circling a value below. Left/right banks are identified by looking downstream.

Excellent	Good	Marginal	Poor
Banks Stable. No evidence of erosion or bank failure. Little potential for problems during floods. < 5% of bank affected.	Moderately stable. Small areas of erosion. Slight potential for problems in extreme floods. 5-30% of bank in reach has areas of erosion.	Moderately unstable. Erosional areas occur frequently and are somewhat large. High erosion potential during floods. 30-60% of banks in reach are eroded.	Unstable. Many eroded areas. > 60% banks eroded. Raw areas frequent along straight sections and bends. Bank sloughing obvious.
LEFT BANK 10 - 9	LEFT BANK 8 - 7 - 6	LEFT BANK 5 - 4 - (3)	LEFT BANK 2 - 1 - 0
RIGHT BANK 10 - 9	RIGHT BANK 8 - 7 - 6	RIGHT BANK 5 - (4) - 3	RIGHT BANK 2 - 1 - 0

You may wish to take photos of unstable or eroded banks for your records. Record date and location.

Comments:

MiCorps Site ID#:_____ Date:_____

Michigan Clean Water Corps

II. Stream and Riparian Habitat (continued)

D. Plant Community

Estimate the percentage of the stream covered by overhanging vegetation 30 %

Using the given scale, estimate the relative abundance of the following:

Plants in the stream:		*Plants on the bank/riparian zone:*	
Algae on Surfaces of Rocks or Plants 1	Filamentous Algae (Streamers) 0	Shrubs 3	Trees 2
Macrophytes (Standing, Floating Plants) 0	0= Absent 1= Rare 2= Common 3= Abundant 4= Dominant	Grasses 1	0= Absent 1= Rare 2= Common 3= Abundant 4= Dominant
Identified species (optional)		Identified species (optional)	

E. Riparian Zone

The riparian zone is the vegetated area that surrounds the stream. Right/Left banks are identified by looking downstream.

1. Left Bank

Circle those land-use types that you can see from this stream reach.

Wetlands (Forest) (Residential Lawn) Park (Shrub, Old Field) (Agriculture)

Construction Commercial Industrial Highways Golf Course Other Road

2. Right Bank

Circle those land-use types that you can see from this stream reach.

Wetlands (Forest) (Residential Lawn) Park (Shrub, Old Field) (Agriculture)

Construction Commercial Industrial (Highways) Golf Course Other_____

3. Summarize the size and quality of the riparian zone along each bank separately on a scale of 1 through 10, by circling a value below.

Excellent	Good	Marginal	Poor
Width of riparian zone >150 feet, dominated by vegetation, including trees, understory shrubs, or non-woody macrophytes or wetlands; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	Width of riparian zone 75-150 feet; human activities have impacted zone only minimally.	Width of riparian zone 10-75 feet; human activities have impacted zone a great deal.	Width of riparian zone ,10 feet; little or no riparian vegetation due to human activities.
LEFT BANK 10 - 9	LEFT BANK 8 - 7 - 6	LEFT BANK 5 - 4 - (3)	LEFT BANK 2 - 1 - 0
RIGHT BANK 10 - 9	RIGHT BANK 8 - 7 - 6	RIGHT BANK (5) - 4 - 3	RIGHT BANK 2 - 1 - 0

MiCorps Site ID#:_____ Date:_____

Michigan Clean Water Corps

III. Sources of Degradation

1. In what ways is this stream degraded, if any?

2. Does a team need to come out and collect trash?

3. Based on what you can see from this location, what are the potential causes and level of severity of this degradation? Only judge what you can see from the site.

(Severity: S=slight, M=moderate, H=high) (Indicate all that apply)							
Crop Related Sources	(S)	M	H	Land Disposal	S	M	H
Grazing Related Sources	S	M	H	On-site Wastewater Systems	S	M	H
Intensive Animal Feeding Operations	S	M	H	Silviculture (Forestry)	S	M	H
Highway/Road/Bridge Maintenance and Runoff	S	(M)	H	Resource Extraction (Mining)	S	M	H
Channelization	S	M	H	Recreational/Tourism Activities (general)	S	M	H
Dredging	S	M	H	• Golf Courses	S	M	H
Removal of Riparian Vegetation	(S)	M	H	• Marinas/Recreational Boating (water releases)	S	M	H
Bank and Shoreline Erosion/ Modification/Destruction	S	(M)	H	• Marinas/Recreational Boating (bank or shoreline erosion)	S	M	H
Flow Regulation/ Modification (Hydrology)	S	M	H	Debris in Water	(S)	M	H
Invasive Species	S	M	H	Industrial Point Source	S	M	H
Construction: Highway, Road, Bridge, Culvert	S	M	H	Municipal Point Source	S	M	H
Construction: Land Development	S	M	H	Natural Sources	S	M	H
Urban Runoff	S	M	H	Source(s) Unknown	S	M	H

Additional comments:

MiCorps Site ID#: 6

Michigan Clean Water Corps

Stream Macroinvertebrate Datasheet

Stream Name: Silver Spring Creek

Location: U.S 23 (Circle one: *Upstream* or *Downstream* of road?)

Date: 5-18-2017 Collection Start Time: _____ (AM/PM)

Major Watershed: Black River HUC Code (if known): _____

Latitude: _____ Longitude: _____

Monitoring Team:

Name of Person Completing Datasheet: Virginia Robertson

Collector: Chemistry Class

Other Team Members: 6th Hour Chemistry

Stream Conditions:

Average Water Depth: 5 feet

Is the substrate covered with excessive silt? X No ___ Yes (describe: _____)

Substrate Embeddedness in Riffles: ___ 0-25% ✓ 25-50% ___ > 50% ___ Unsure

Did you observe any fish or wildlife? ( ) Yes X No If so, please describe: _____

Macroinvertebrate Collection: Check the habitats that were sampled. Include as many as possible.

- X Riffles
- X Cobbles
- X Aquatic Plants
- ___ Runs
- X Stream Margins
- ___ Leaf Packs
- ___ Pools
- X Undercut banks/Overhanging Vegetation
- X Submerged Wood
- ___ Other (describe: _____)

Did you see, but not collect, any **live crayfish**? (___ Yes ___ No), or **large clams**? (___ Yes ___ No)

remember to include them in the assessment on the other side!

Collection Finish Time: _____(AM/PM)

Datasheet checked for completeness by: _____

Data entered into MiCorps database by: _____ Datasheet version 10/08/05

Date: _____

MiCorps Site ID#: G

Michigan Clean Water Corps

IDENTIFICATION AND ASSESSMENT

Use letter codes [**R** (rare) = 1-10, **C** (common) = 11 or more] to record the approximate numbers of organisms in each taxa found in the stream reach.

*** Do NOT count empty shells, pupae, or terrestrial macroinvertebrates***

Group 1: Sensitive

- C Caddisfly larvae (Trichoptera) *EXCEPT Net-spinning caddis*
- ___ Hellgrammites (Megaloptera)
- C Mayfly nymphs (Ephemeroptera)
- ___ Gilled (right-handed) snails (Gastropoda)
- √ Stonefly nymphs (Plecoptera)
- √ Water penny (Coleoptera)
- ___ Water snipe fly (Diptera)

Group 2: Somewhat-Sensitive

- √ Alderfly larvae (Megaloptera)
- ___ Beetle adults (Coleoptera)
- C Beetle larvae (Coleoptera)
- √ Black fly larvae (Diptera)
- ___ Clams (Pelecypoda)
- √ Crane fly larvae (Diptera)
- √ Crayfish (Decapoda)
- ___ Damselfly nymphs (Odonata)
- ___ Dragonfly nymphs (Odonata)
- ___ Net-spinning caddisfly larvae (Hydropsychidae; Trichoptera)
- C Scuds (Amphipoda)
- ___ Sowbugs (Isopoda)

Group 3: Tolerant

- ___ Aquatic worms (Oligochaeta)
- ___ Leeches (Hirudinea)
- √ Midge larvae (Diptera)
- ___ Pouch snails (Gastropoda)
- √ True bugs (Hemiptera)
- ___ Other true flies (Diptera)

STREAM QUALITY SCORE

Group 1:
2 # of R's * 5.0 = 10
2 # of C's * 5.3 = 10.6
Group 1 Total = 20.6

Group 2:
4 # of R's * 3.0 = 12
2 # of C's * 3.2 = 6.4
Group 2 Total = 18.4

Group 3:
2 # of R's * 1.1 = 2.2
___ # of C's * 1.0 = ___
Group 3 Total = 2.2

Total Stream Quality Score = 40.2
(Sum of totals for groups 1-3; round to nearest whole number)

Check one:
- ___ Excellent (>48)
- X Good (34-48)
- ___ Fair (19-33)
- ___ Poor (<19)

Identifications made by: _____

Rate your confidence in these identifications: Quite confident 5 (4) 3 2 1 Not very confident

Datasheet checked for completeness by: _____ Datasheet version 10/08/05
Data entered into MiCorps database by: _____ Date: _____

STREAM HABITAT ASSESSMENT

Michigan Clean Water Corps

I. Stream, Team, Location Information

Site ID: G Date: 5/18/11 Time: 11:00 AM

Location: Silver spring creek @ Z3

Name(s):

II. Stream and Riparian Habitat

A. General Information *Circle one or more answers as appropriate*						Notes and Observations Give further explanation when needed
1	Average Stream Width (ft)	< 10	10-25	25-50	>50	
2	Average Stream Depth (ft)	<1	1-3	>3	>5	
3	Has this stream been channelized? (Stream shape constrained through human activity- look for signs of dredging, armored banks, straightened channels)	Yes, currently	Yes, sometime in the past	No	Don't know	
4	Estimate of current stream flow	Dry or Intermittent	Stagnant	Low	Medium	High
5	Highest water mark (in feet above the current level)	<1	1-3	3-5	5-10	>10
6	Which of these habitat types are present?	Riffles	Deep Pools	Large woody debris	Large rocks	Undercut bank
		Overhanging vegetation	Rooted Aquatic Plants	Other:	Other:	Other:
7	Estimate of turbidity	Clear	Slightly Turbid (can partially see to bottom)		Turbid (cannot see to bottom)	
8	Is there a sheen or oil slick visible on the surface of the water?	No	Yes			
9	If yes to #8, does the sheen break up when poked with a stick?	Yes (sheen is most likely natural)		No (sheen could be artifical)		
10	Is there foam present on the surface of the water?	No	Yes			
11	Is yes to #10, does the foam feel gritty or soapy?	Gritty (foam is most likely natural)		Soapy (foam could be artifical)		
The following are optional measurements not currently funded by MiCorps						
8	Water Temperature					
9	Dissolved Oxygen					
10	pH					
11	Water Velocity					

MiCorps Site ID#:_____ Date:_____

Michigan Clean Water Corps

II. Stream and Riparian Habitat (continued)

B. Streambed Substrate

Estimate percent of stream bed composed of the following substrate.

If group will take transects and pebble counts (in Section IV), check this box and record the measured percentages. ☐

Substrate type	*Size*	*Percentage*
Boulder	>10" diameter	
Cobble	2.5 - 10" diameter	40%
Gravel	0.1 - 2.5" diameter	10%
Sand	coarse grain	40%
Fines: Silt/Detritus/Muck	fine grain/organic matter	10%
Hardpan/Bedrock	solid clay/rock surface	
Artificial	man-made	
Other (specify)		

C. Bank stability and erosion.

Summarize the extent of erosion along <u>each bank separately</u> on a scale of 1 through 10, by circling a value below. Left/right banks are identified by looking downstream.

Excellent	Good	Marginal	Poor
Banks Stable. No evidence of erosion or bank failure. Little potential for problems during floods. < 5% of bank affected.	Moderately stable. Small areas of erosion. Slight potential for problems in extreme floods. 5-30% of bank in reach has areas of erosion.	Moderately unstable. Erosional areas occur frequently and are somewhat large. High erosion potential during floods. 30-60% of banks in reach are eroded.	Unstable. Many eroded areas. > 60% banks eroded. Raw areas frequent along straight sections and bends. Bank sloughing obvious.
LEFT BANK 10 (9)	LEFT BANK (8) 7 - 6	LEFT BANK 5 - 4 - 3	LEFT BANK 2 - 1 - 0
RIGHT BANK 10 (9)	RIGHT BANK 8 - 7 - 6	RIGHT BANK 5 - 4 - 3	RIGHT BANK 2 - 1 - 0

You may wish to take photos of unstable or eroded banks for your records. Record date and location.

Comments:

MiCorps Site ID#:_____ Date:_____

Michigan Clean Water Corps

II. Stream and Riparian Habitat (continued)

D. Plant Community

Estimate the percentage of the stream covered by overhanging vegetation 85 %

Using the given scale, estimate the relative abundance of the following:

Plants in the stream:		*Plants on the bank/riparian zone:*	
Algae on Surfaces of Rocks or Plants 3	Filamentous Algae (Streamers) 0	Shrubs 3	Trees 3
Macrophytes (Standing, Floating Plants) 3	**0= Absent 1= Rare 2= Common 3= Abundant 4= Dominant**	Grasses 2	**0= Absent 1= Rare 2= Common 3= Abundant 4= Dominant**
Identified species (optional)		Identified species (optional)	

E. Riparian Zone

The riparian zone is the vegetated area that surrounds the stream. Right/Left banks are identified by looking downstream.

1. Left Bank

Circle those land-use types that you can see from this stream reach.

Wetlands Forest Residential Lawn Park Shrub/Old Field Agriculture

Construction Commercial Industrial Highways Golf Course Other_____

2. Right Bank

Circle those land-use types that you can see from this stream reach.

Wetlands Forest Residential Lawn Park Shrub/Old Field Agriculture

Construction Commercial Industrial Highways Golf Course Other_____

3. Summarize the size and quality of the riparian zone along each bank separately on a scale of 1 through 10, by circling a value below.

Excellent	Good	Marginal	Poor
Width of riparian zone >150 feet, dominated by vegetation, including trees, understory shrubs, or non-woody macrophytes or wetlands; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	Width of riparian zone 75-150 feet; human activities have impacted zone only minimally.	Width of riparian zone 10-75 feet; human activities have impacted zone a great deal.	Width of riparian zone ,10 feet; little or no riparian vegetation due to human activities.
LEFT BANK 10 (- 9)	LEFT BANK 8 - 7 - 6	LEFT BANK 5 - 4 - 3	LEFT BANK 2 - 1 - 0
RIGHT BANK 10 - 9	RIGHT BANK 8 - 7 - 6	RIGHT BANK 5 - 4 - 3	RIGHT BANK 2 - 1 - 0

MiCorps Site ID#:_____ Date:_____

Michigan Clean Water Corps

III. Sources of Degradation

1. In what ways is this stream degraded, if any?

NO

2. Does a team need to come out and collect trash?

NO

3. Based on what you can see from this location, what are the potential causes and level of severity of this degradation? Only judge what you can see from the site.

(Severity: S = slight, M = moderate, H = high) (Indicate all that apply)

Crop Related Sources	S	M	H	Land Disposal	S	M	H
Grazing Related Sources	S	M	H	On-site Wastewater Systems	S	M	H
Intensive Animal Feeding Operations	S	M	H	Silviculture (Forestry)	S	M	H
Highway/Road/Bridge Maintenance and Runoff	S	M	H	Resource Extraction (Mining)	S	M	H
Channelization	S	M	H	Recreational/Tourism Activities (general)	S	M	H
Dredging	S	M	H	• Golf Courses	S	M	H
Removal of Riparian Vegetation	S	M	H	• Marinas/Recreational Boating (water releases)	S	M	H
Bank and Shoreline Erosion/ Modification/Destruction	S	M	H	• Marinas/Recreational Boating (bank or shoreline erosion)	S	M	H
Flow Regulation/ Modification (Hydrology)	S	M	H	Debris in Water	S	M	H
Invasive Species	S	M	H	Industrial Point Source	S	M	H
Construction: Highway, Road, Bridge, Culvert	S	M	H	Municipal Point Source	S	M	H
Construction: Land Development	S	M	H	Natural Sources	S	M	H
Urban Runoff	S	M	H	Source(s) Unknown	S	M	H

Additional comments:

MiCorps Site ID#:_____

Michigan Clean Water Corps

Stream Macroinvertebrate Datasheet

Stream Name: Haynes Creek

Location: Haynes Creek at Beaton Rd. (J) (Circle one: *Upstream* or *Downstream* of road?)

Date: 11/5/10 Collection Start Time: 11:50 (AM/PM)

Major Watershed: Black River HUC Code (if known):_____

Latitude:_____ Longitude:_____

Monitoring Team:

Name of Person Completing Datasheet: Environmental Science

Collector: Mr. Matchett

Other Team Members: Class

Stream Conditions: Average Water Depth: 2-5 feet

Is the substrate covered with excessive silt? ____ No __X__ Yes (describe: Muddy)

Substrate Embeddedness in Riffles: ____ 0-25% ____ 25-50% ____ > 50% ____ Unsure

Did you observe any fish or wildlife? (x) Yes ( ) No If so, please describe: Minnows

Macroinvertebrate Collection: Check the habitats that were sampled. Include as many as possible.

- √ Riffles
- √ Cobbles
- √ Aquatic Plants
- ____ Runs
- ____ Stream Margins
- √ Leaf Packs
- √ Pools
- √ Undercut banks/Overhanging Vegetation
- √ Submerged Wood
- ____ Other (describe:_____)

Did you see, but not collect, any **live crayfish**? (X Yes ___ No), or **large clams**? (___ Yes X No)

remember to include them in the assessment on the other side!

Collection Finish Time: 12:06 (AM/PM)

MiCorps Site ID#:_____

Michigan Clean Water Corps

IDENTIFICATION AND ASSESSMENT

Use letter codes [**R** (rare) = 1-10, **C** (common) = 11 or more] to record the approximate numbers of organisms in each taxa found in the stream reach.

*** Do NOT count empty shells, pupae, or terrestrial macroinvertebrates***

Group 1: Sensitive

C	Caddisfly larvae *EXCEPT Net-spinning caddis*	(Trichoptera)
____	Hellgrammites	(Megaloptera)
C	Mayfly nymphs	(Ephemeroptera)
____	Gilled (right-handed) snails	(Gastropoda)
R	Stonefly nymphs	(Plecoptera)
____	Water penny	(Coleoptera)
____	Water snipe fly	(Diptera)

Group 2: Somewhat-Sensitive

C	Alderfly larvae	(Megaloptera)
R	Beetle adults	(Coleoptera)
R	Beetle larvae	(Coleoptera)
____	Black fly larvae	(Diptera)
C	Clams	(Pelecypoda)
R	Crane fly larvae	(Diptera)
C	Crayfish	(Decapoda)
C	Damselfly nymphs	(Odonata)
R	Dragonfly nymphs	(Odonata)
____	Net-spinning caddisfly larvae (Hydropsychidae; Trichoptera)	
C	Scuds	(Amphipoda)
C	Sowbugs	(Isopoda)

Group 3: Tolerant

C	Aquatic worms	(Oligochaeta)
____	Leeches	(Hirudinea)
R	Midge larvae	(Diptera)
C	Pouch snails	(Gastropoda)
____	True bugs	(Hemiptera)
____	Other true flies	(Diptera)

STREAM QUALITY SCORE

Group 1:
1 # of R's * 5.0 = 5
2 # of C's * 5.3 = 10.6
Group 1 Total = 15.6

Group 2:
4 # of R's * 3.0 = 12
6 # of C's * 3.2 = 19.2
Group 2 Total = 31.2

Group 3:
1 # of R's * 1.1 = 1.1
2 # of C's * 1.0 = 2
Group 3 Total = 3.1

Total Stream Quality Score = 49.9
(Sum of totals for groups 1-3; round to nearest whole number)

Check one:

X	Excellent	(>48)
____	Good	(34-48)
____	Fair	(19-33)
____	Poor	(<19)

Identifications made by: Environmental Science Class

Rate your confidence in these identifications: Quite confident 5 (4) 3 2 1 Not very confident

Datasheet checked for completeness by:_____ Datasheet version 10/08/05
Data entered into MiCorps database by:_____ Date:_____

Michigan Clean Water Corps

STREAM HABITAT ASSESSMENT

I. Stream, Team, Location Information

Site ID: _____ Date: 11/5/10 Time: 11:44

Location: Haynes creek @ Beaten Rd crossing

Name(s): Environmental Science class

II. Stream and Riparian Habitat

A. General Information *Circle one or more answers as appropriate*						Notes and Observations: Give further explanation when needed.
1	Average Stream Width (ft)	< 10	10-25	25-50	>50	
2	Average Stream Depth (ft)	<1	1-3	>3	>5	
3	Has this stream been channelized? (Stream shape constrained through human activity- look for signs of dredging, armored banks, straightened channels)	Yes, currently	Yes, sometime in the past	No	Don't know	
4	Estimate of current stream flow	Dry or Intermittent	Stagnant	Low	Medium	High
5	Highest water mark (in feet above the current level)	<1	1-3	3-5	5-10	>10
6	Which of these habitat types are present?	Riffles	Deep Pools	Large woody debris	Large rocks	Undercut bank
		Overhanging vegetation	Rooted Aquatic Plants	Other:	Other:	Other:
7	Estimate of turbidity	Clear	Slightly Turbid (can partially see to bottom)		Turbid (cannot see to bottom)	
8	Is there a sheen or oil slick visible on the surface of the water?	No	Yes			
9	If yes to #8, does the sheen break up when poked with a stick?	Yes (sheen is most likely natural)		No (sheen could be artifical)		
10	Is there foam present on the surface of the water?	No	Yes			
11	Is yes to #10, does the foam feel gritty or soapy?	Gritty (foam is most likely natural)		Soapy (foam could be artifical)		
The following are optional measurements not currently funded by MiCorps:						
8	Water Temperature					
9	Dissolved Oxygen					
10	pH					
11	Water Velocity					

MiCorps Site ID#:_____ Date:_____ Michigan Clean Water Corps

II. Stream and Riparian Habitat (continued)

B. Streambed Substrate

Estimate percent of stream bed composed of the following substrate.
If group will take transects and pebble counts (in Section IV), check this box and record the measured percentages. ☐

Substrate type	*Size*	*Percentage*
Boulder	>10" diameter	0 %
Cobble	2.5 - 10" diameter	0 %
Gravel	0.1 - 2.5" diameter	0 %
Sand	coarse grain	5 %
Fines: Silt/Detritus/Muck	fine grain/organic matter	95 %
Hardpan/Bedrock	solid clay/rock surface	0 %
Artificial	man-made	0 %
Other (specify)		

C. Bank stability and erosion.

Summarize the extent of erosion along <u>each bank separately</u> on a scale of 1 through 10, by circling a value below. Left/right banks are identified by looking downstream.

Excellent	Good	Marginal	Poor
Banks Stable. No evidence of erosion or bank failure. Little potential for problems during floods. < 5% of bank affected.	Moderately stable. Small areas of erosion. Slight potential for problems in extreme floods. 5-30% of bank in reach has areas of erosion.	Moderately unstable. Erosional areas occur frequently and are somewhat large. High erosion potential during floods. 30-60% of banks in reach are eroded.	Unstable. Many eroded areas. > 60% banks eroded. Raw areas frequent along straight sections and bends. Bank sloughing obvious.
LEFT BANK 10 - 9	LEFT BANK 8 - (7) - 6	LEFT BANK 5 - 4 - 3	LEFT BANK 2 - 1 - 0
RIGHT BANK 10 - 9	RIGHT BANK (8) - 7 - 6	RIGHT BANK 5 - 4 - 3	RIGHT BANK 2 - 1 - 0

You may wish to take photos of unstable or eroded banks for your records. Record date and location.

Comments:

MiCorps Site ID#:_____ Date:_____ Michigan Clean Water Corps

II. Stream and Riparian Habitat (continued)

D. Plant Community

Estimate the percentage of the stream covered by overhanging vegetation 30 %

Using the given scale, estimate the relative abundance of the following:

Plants in the stream:		*Plants on the bank/riparian zone:*	
Algae on Surfaces of Rocks or Plants 2	Filamentous Algae (Streamers) 2	Shrubs 1	Trees 1
Macrophytes (Standing, Floating Plants) 2	**0= Absent 1= Rare 2= Common 3= Abundant 4= Dominant**	Grasses 3	**0= Absent 1= Rare 2= Common 3= Abundant 4= Dominant**
Identified species (optional)		Identified species (optional)	

E. Riparian Zone

The riparian zone is the vegetated area that surrounds the stream. Right/Left banks are identified by looking downstream.

1. Left Bank

Circle those land-use types that you can see from this stream reach.

Wetlands Forest Residential Lawn Park Shrub, Old Field Agriculture

Construction Commercial Industrial Highways Golf Course Other_____

2. Right Bank

Circle those land-use types that you can see from this stream reach.

Wetlands Forest Residential Lawn Park Shrub, Old Field Agriculture

Construction Commercial Industrial Highways Golf Course Other_____

3. Summarize the size and quality of the riparian zone along each bank separately on a scale of 1 through 10, by circling a value below.

Excellent	Good	Marginal	Poor
Width of riparian zone >150 feet, dominated by vegetation, including trees, understory shrubs, or non-woody macrophytes or wetlands; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	Width of riparian zone 75-150 feet; human activities have impacted zone only minimally.	Width of riparian zone 10-75 feet; human activities have impacted zone a great deal.	Width of riparian zone ,10 feet; little or no riparian vegetation due to human activities.
LEFT BANK 10 - 9	LEFT BANK 8 - 7 - 6	LEFT BANK 5 - 4 - 3	LEFT BANK 2 - 1 - 0
RIGHT BANK 10 - 9	RIGHT BANK 8 - 7 - 6	RIGHT BANK 5 - 4 - 3	RIGHT BANK 2 - 1 - 0

MiCorps Site ID#:_____ Date:_____ Michigan Clean Water Corps

III. Sources of Degradation

1. In what ways is this stream degraded, if any?

None

2. Does a team need to come out and collect trash?

NO

3. Based on what you can see from this location, what are the potential causes and level of severity of this degradation? Only judge what you can see from the site.

(Severity: S – slight; M – moderate; H – high) (Indicate all that apply)

Crop Related Sources	(S)	M	H	Land Disposal	(S)	M	H
Grazing Related Sources	(S)	M	H	On-site Wastewater Systems	(S)	M	H
Intensive Animal Feeding Operations	(S)	M	H	Silviculture (Forestry)	(S)	M	H
Highway/Road/Bridge Maintenance and Runoff	S	(M)	H	Resource Extraction (Mining)	(S)	M	H
Channelization	(S)	M	H	Recreational/Tourism Activities (general)	(S)	M	H
Dredging	(S)	M	H	• Golf Courses	(S)	M	H
Removal of Riparian Vegetation	(S)	M	H	• Marinas/Recreational Boating (water releases)	(S)	M	H
Bank and Shoreline Erosion/ Modification/Destruction	S	(M)	H	• Marinas/Recreational Boating (bank or shoreline erosion)	(S)	M	H
Flow Regulation/ Modification (Hydrology)	(S)	M	H	Debris in Water	S	(M)	H
Invasive Species	(S)	M	H	Industrial Point Source	(S)	M	H
Construction: Highway, Road, Bridge, Culvert	(S)	M	H	Municipal Point Source	(S)	M	H
Construction: Land Development	(S)	M	H	Natural Sources	S	(M)	H
Urban Runoff	(S)	M	H	Source(s) Unknown	S	M	H

Additional comments:

MiCorps Site ID#:_____

Michigan Clean Water Corps

Stream Macroinvertebrate Datasheet

Stream Name: _____

Location: Mill Creek @ Swamp Rd (Circle one: *Upstream* or *Downstream* of road?)

Date: June 10, 2010

Collection Start Time: 10:00 am (AM/PM)

Major Watershed: Black River

HUC Code (if known):_____

Latitude:_____

Longitude:_____

Monitoring Team:

Name of Person Completing Datasheet:_____

Collector:_____

Other Team Members:_____

Stream Conditions:

Average Water Depth:_____ feet

Is the substrate covered with excessive silt? ____ No ____ Yes (describe:_____)

Substrate Embeddedness in Riffles: ____ 0-25% ____ 25-50% ____ > 50% ____ Unsure

Did you observe any fish or wildlife? ( ) Yes ( ) No If so, please describe:_____

Macroinvertebrate Collection: Check the habitats that were sampled. Include as many as possible.

- ✓ Riffles
- ✓ Cobbles
- ( ) Aquatic Plants
- ✓ Runs
- ✓ Stream Margins
- ( ) Leaf Packs
- ✓ Pools
- ✓ Undercut banks/Overhanging Vegetation
- ✓ Submerged Wood
- ✓ Other (describe: Rocks)

Did you see, but not collect, any **live crayfish**? (___ Yes ✓ No), or **large clams**? (___ Yes ✓ No)

remember to include them in the assessment on the other side!

Collection Finish Time: 10:25 (AM/PM)

MiCorps Site ID#:_____

Michigan Clean Water Corps

IDENTIFICATION AND ASSESSMENT

Use letter codes [**R** (rare) = 1-10, **C** (common) = 11 or more] to record the approximate numbers of organisms in each taxa found in the stream reach.

*** Do NOT count empty shells, pupae, or terrestrial macroinvertebrates***

Group 1: Sensitive

C	Caddisfly larvae *EXCEPT Net-spinning caddis*	(Trichoptera)
	Hellgrammites	(Megaloptera)
C	Mayfly nymphs	(Ephemeroptera)
	Gilled (right-handed) snails	(Gastropoda)
	Stonefly nymphs	(Plecoptera)
	Water penny	(Coleoptera)
	Water snipe fly	(Diptera)

Group 2: Somewhat-Sensitive

R	Alderfly larvae	(Megaloptera)
R	Beetle adults x2	(Coleoptera)
	Beetle larvae	(Coleoptera)
C	Black fly larvae	(Diptera)
R	Clams	(Pelecypoda)
	Crane fly larvae	(Diptera)
	~~Crayfish~~	(Decapoda)
	Damselfly nymphs	(Odonata)
	Dragonfly nymphs	(Odonata)
C	Net-spinning caddisfly larvae (Hydropsychidae; Trichoptera)	
C	Scuds	(Amphipoda)
R	Sowbugs	(Isopoda)

Group 3: Tolerant

C	Aquatic worms	(Oligochaeta)
	Leeches	(Hirudinea)
R	Midge larvae	(Diptera)
R	Pouch snails	(Gastropoda)
R	True bugs Water Striders	(Hemiptera)
	Other true flies	(Diptera)

Identifications made by: Students.

Rate your confidence in these identifications: Quite confident 5 4 3 2 1 Not very confident

STREAM QUALITY SCORE

Group 1:
0 # of R's * 5.0 = 0
2 # of C's * 5.3 = 10.6
Group 1 Total = 10.6

Group 2:
11 # of R's * 3.0 = 33
3 # of C's * 3.2 = 9.6
Group 2 Total = 42.6

Group 3:
1 # of R's * 1.1 = 1.1
0 # of C's * 1.0 = 0
Group 3 Total = 1.1

Total Stream Quality Score = 36.6
(Sum of totals for groups 1-3; round to nearest whole number)

Check one:
- ☐ Excellent (>48)
- ☑ Good (34-48)
- ☐ Fair (19-33)
- ☐ Poor (<19)

Water Striders

MiCorps Site ID#:________________

Michigan Clean Water Corps

Stream Macroinvertebrate Datasheet

Stream Name: ________________

Location: South Branch Black River Richie Road (Circle one: *Upstream* or *Downstream* of road?)

Date: June 10, 2010 Collection Start Time: 1:15 (AM/PM)

Major Watershed: Black River HUC Code (if known):________

Latitude:________ Longitude:________

Monitoring Team:

Name of Person Completing Datasheet:________

Collector: Matchett Team

Other Team Members:________

Stream Conditions: Average Water Depth: Less than 1 ft feet

Is the substrate covered with excessive silt? ____ No ✓ Yes (describe: sand & silt)

Substrate Embeddedness in Riffles: X 0-25% ____ 25-50% ____ > 50% ____ Unsure

Did you observe any fish or wildlife? (X) Yes ( ) No If so, please describe: Wood Frog

Macroinvertebrate Collection: Check the habitats that were sampled. Include as many as possible.

- ✓ Riffles
- ____ Cobbles
- ✓ Aquatic Plants
- ✓ Runs
- ✓ Stream Margins
- ____ Leaf Packs
- ____ Pools
- ✓ Undercut banks/Overhanging Vegetation
- ✓ Submerged Wood
- ✓ Other (describe: SAND)

Did you see, but not collect, any **live crayfish**? (X Yes ____ No), or **large clams**? (____ Yes ____ No)

remember to include them in the assessment on the other side!

Collection Finish Time: 2:00 (AM/PM)

MiCorps Site ID#:_____

Michigan Clean Water Corps

IDENTIFICATION AND ASSESSMENT

Use letter codes [R (rare) = 1-10, C (common) = 11 or more] to record the approximate numbers of organisms in each taxa found in the stream reach.

*** Do NOT count empty shells, pupae, or terrestrial macroinvertebrates***

Group 1: Sensitive

C	Caddisfly larvae *EXCEPT Net-spinning caddis*	(Trichoptera)
R	Hellgrammites	(Megaloptera)
C	Mayfly nymphs	(Ephemeroptera)
___	Gilled (right-handed) snails	(Gastropoda)
___	Stonefly nymphs	(Plecoptera)
___	Water penny	(Coleoptera)
___	Water snipe fly	(Diptera)

Group 2: Somewhat-Sensitive

___	Alderfly larvae	(Megaloptera)
C	Beetle adults	(Coleoptera)
___	Beetle larvae	(Coleoptera)
___	Black fly larvae	(Diptera)
___	Clams	(Pelecypoda)
___	Crane fly larvae	(Diptera)
R	Crayfish //// Nature Conservancy	(Decapoda)
R	Damselfly nymphs	(Odonata)
C	Dragonfly nymphs	(Odonata)
R	Net-spinning caddisfly larvae	(Hydropsychidae; Trichoptera)
C	Scuds	(Amphipoda)
___	Sowbugs	(Isopoda)

Group 3: Tolerant

___	Aquatic worms	(Oligochaeta)
___	Leeches	(Hirudinea)
R	Midge larvae	(Diptera)
C	Pouch snails	(Gastropoda)
C	True bugs	(Hemiptera)
___	Other true flies	(Diptera)

STREAM QUALITY SCORE

Group 1:
1 # of R's * 5.0 = 5
2 # of C's * 5.3 = 10.6
Group 1 Total = 15.6

Group 2:
3 # of R's * 3.0 = 9
3 # of C's * 3.2 = 9.6
Group 2 Total = 18.6

Group 3:
1 # of R's * 1.1 = 1.1
2 # of C's * 1.0 = 2
Group 3 Total = 3.1

Total Stream Quality Score = 37.3
(Sum of totals for groups 1-3; round to nearest whole number)

Check one:

___	Excellent	(>48)
X	Good	(34-48)
___	Fair	(19-33)
___	Poor	(<19)

Identifications made by: Brandon Schroeder

Rate your confidence in these identifications: Quite confident 5 (4) 3 2 1 Not very confident

STREAM HABITAT ASSESSMENT

Michigan Clean Water Corps

I. Stream, Team, Location Information

Site ID: C Date: 5/16/11 Time: 12:45

Location: ~~Bucktail~~ Gauthier creek @ Fountain Rd

Name(s):

II. Stream and Riparian Habitat

A. General Information *Circle one or more answers as appropriate*						Notes and Observations Give further explanation when needed
1	Average Stream Width (ft)	< 10	10-25	25-50	>50	
2	Average Stream Depth (ft)	<1	1-3	>3	>5	
3	Has this stream been channelized? (Stream shape constrained through human activity- look for signs of dredging, armored banks, straightened channels)	Yes, currently	Yes, sometime in the past	No	Don't know	
4	Estimate of current stream flow	Dry or Intermittent	Stagnant	Low	Medium	High
5	Highest water mark (in feet above the current level)	<1	1-3	3-5	5-10	>10
6	Which of these habitat types are present?	Riffles	Deep Pools	Large woody debris	Large rocks	Undercut bank
		Overhanging vegetation	Rooted Aquatic Plants	Other:	Other:	Other:
7	Estimate of turbidity	Clear	Slightly Turbid (can partially see to bottom)		Turbid (cannot see to bottom)	
8	Is there a sheen or oil slick visible on the surface of the water?	No	Yes			
9	If yes to #8, does the sheen break up when poked with a stick?	Yes (sheen is most likely natural)		No (sheen could be artifical)		
10	Is there foam present on the surface of the water?	No	Yes			
11	Is yes to #10, does the foam feel gritty or soapy?	Gritty (foam is most likely natural)		Soapy (foam could be artifical)		
The following are optional measurements not currently funded by MiCorps						
8	Water Temperature					
9	Dissolved Oxygen					
10	pH					
11	Water Velocity					

MiCorps Site ID#:_____ Date:_____

Michigan Clean Water Corps

II. Stream and Riparian Habitat (continued)

B. Streambed Substrate

Estimate percent of stream bed composed of the following substrate.

If group will take transects and pebble counts (in Section IV), check this box and record the measured percentages. ☐

Substrate type	*Size*	*Percentage*
Boulder	>10" diameter	
Cobble	2.5 - 10" diameter	
Gravel	0.1 - 2.5" diameter	
Sand	coarse grain	80%
Fines: Silt/Detritus/Muck	fine grain/organic matter	20%
Hardpan/Bedrock	solid clay/rock surface	
Artificial	man-made	
Other (specify)		

C. Bank stability and erosion.

Summarize the extent of erosion along <u>each bank separately</u> on a scale of 1 through 10, by circling a value below. Left/right banks are identified by looking downstream.

Excellent	Good	Marginal	Poor
Banks Stable. No evidence of erosion or bank failure. Little potential for problems during floods. < 5% of bank affected.	Moderately stable. Small areas of erosion. Slight potential for problems in extreme floods. 5-30% of bank in reach has areas of erosion.	Moderately unstable. Erosional areas occur frequently and are somewhat large. High erosion potential during floods. 30-60% of banks in reach are eroded.	Unstable. Many eroded areas. > 60% banks eroded. Raw areas frequent along straight sections and bends. Bank sloughing obvious.
LEFT BANK 10 (9)	LEFT BANK 8 - 7 - 6	LEFT BANK 5 - 4 - 3	LEFT BANK 2 - 1 - 0
RIGHT BANK 10 (9)	RIGHT BANK 8 - 7 - 6	RIGHT BANK 5 - 4 - 3	RIGHT BANK 2 - 1 - 0

You may wish to take photos of unstable or eroded banks for your records. Record date and location.

Comments:

MiCorps Site ID#:_____ Date:_____

Michigan Clean Water Corps

II. Stream and Riparian Habitat (continued)

D. Plant Community

Estimate the percentage of the stream covered by overhanging vegetation 90 %

Using the given scale, estimate the relative abundance of the following:

Plants in the stream:		*Plants on the bank/riparian zone:*	
Algae on Surfaces of Rocks or Plants	Filamentous Algae (Streamers)	Shrubs 3	Trees 3
Macrophytes (Standing, Floating Plants)	**0= Absent 1= Rare 2= Common 3= Abundant 4= Dominant**	Grasses 3	**0= Absent 1= Rare 2= Common 3= Abundant 4= Dominant**
Identified species (optional)		Identified species (optional)	
6	6		
0	0		

E. Riparian Zone

The riparian zone is the vegetated area that surrounds the stream. Right/Left banks are identified by looking downstream.

1. Left Bank

Circle those land-use types that you can see from this stream reach.

Wetlands Forest Residential Lawn Park Shrub, Old Field Agriculture

Construction Commercial Industrial Highways Golf Course Other_____

2. Right Bank

Circle those land-use types that you can see from this stream reach.

Wetlands Forest Residential Lawn Park Shrub, Old Field Agriculture

Construction Commercial Industrial Highways Golf Course Other_____

3. Summarize the size and quality of the riparian zone along each bank separately on a scale of 1 through 10, by circling a value below.

Excellent	Good	Marginal	Poor
Width of riparian zone >150 feet, dominated by vegetation, including trees, understory shrubs, or non-woody macrophytes or wetlands; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	Width of riparian zone 75-150 feet; human activities have impacted zone only minimally.	Width of riparian zone 10-75 feet; human activities have impacted zone a great deal.	Width of riparian zone ,10 feet; little or no riparian vegetation due to human activities.
LEFT BANK (10) 9	LEFT BANK 8 - 7 - 6	LEFT BANK 5 - 4 - 3	LEFT BANK 2 - 1 - 0
RIGHT BANK (10) 9	RIGHT BANK 8 - 7 - 6	RIGHT BANK 5 - 4 - 3	RIGHT BANK 2 - 1 - 0

MiCorps Site ID#:_____ Date:_____

Michigan Clean Water Corps

III. Sources of Degradation

1. In what ways is this stream degraded, if any?

not really

2. Does a team need to come out and collect trash?

no

3. Based on what you can see from this location, what are the potential causes and level of severity of this degradation? Only judge what you can see from the site.

(Severity: S–slight M–moderate H–high) (Indicate all that apply)							
Crop Related Sources	S	M	H	Land Disposal	S	M	H
Grazing Related Sources	S	M	H	On-site Wastewater Systems	S	M	H
Intensive Animal Feeding Operations	S	M	H	Silviculture (Forestry)	S	M	H
Highway/Road/Bridge Maintenance and Runoff	S	M	H	Resource Extraction (Mining)	S	M	H
Channelization	S	M	H	Recreational/Tourism Activities (general)	S	M	H
Dredging	S	M	H	• Golf Courses	S	M	H
Removal of Riparian Vegetation	S	M	H	• Marinas/Recreational Boating (water releases)	S	M	H
Bank and Shoreline Erosion/ Modification/Destruction	S	M	H	• Marinas/Recreational Boating (bank or shoreline erosion)	S	M	H
Flow Regulation/ Modification (Hydrology)	S	M	H	Debris in Water	S	M	H
Invasive Species	S	M	H	Industrial Point Source	S	M	H
Construction: Highway, Road, Bridge, Culvert	S	M	H	Municipal Point Source	S	M	H
Construction: Land Development	S	M	H	Natural Sources	S	M	H
Urban Runoff	S	M	H	Source(s) Unknown	S	M	H

Additional comments:

STREAM HABITAT ASSESSMENT

Michigan Clean Water Corps

I. Stream, Team, Location Information

Site ID: D Date: 5/16/11 Time: 12:03

Location: N. Branch Black River & Black River Rd

Name(s):

II. Stream and Riparian Habitat

A. General Information *Circle one or more answers as appropriate*						Notes and Observations: Give further explanation when needed
1	Average Stream Width (ft)	< 10	(10-25)	25-50	>50	
2	Average Stream Depth (ft)	<1	1-3	>3	(>5)	
3	Has this stream been channelized? (Stream shape constrained through human activity- look for signs of dredging, armored banks, straightened channels)	Yes, currently	Yes, sometime in the past	(No)	Don't know	
4	Estimate of current stream flow	Dry or Intermittent	Stagnant	Low	Medium	(High)
5	Highest water mark (in feet above the current level)	<1	(1-3)	3-5	5-10	>10
6	Which of these habitat types are present?	(Riffles)	Deep Pools	(Large woody debris)	Large rocks	Undercut bank
		(Overhanging vegetation)	(Rooted Aquatic Plants)	Other:	Other:	Other:
7	Estimate of turbidity	(Clear)	Slightly Turbid (can partially see to bottom)		Turbid (cannot see to bottom)	
8	Is there a sheen or oil slick visible on the surface of the water?	(No)	Yes			
9	If yes to #8, does the sheen break up when poked with a stick?	(Yes) (sheen is most likely natural)		No (sheen could be artifical)		
10	Is there foam present on the surface of the water?	No	(Yes)			
11	Is yes to #10, does the foam feel gritty or soapy?	Gritty (foam is most likely natural)		(Soapy (foam could be artifical)		
The following are optional measurements not currently funded by MiCorps						
8	Water Temperature					
9	Dissolved Oxygen					
10	pH					
11	Water Velocity					

MiCorps Site ID#:_____ Date:_____

Michigan Clean Water Corps

II. Stream and Riparian Habitat (continued)

B. Streambed Substrate

Estimate percent of stream bed composed of the following substrate.

If group will take transects and pebble counts (in Section IV), check this box and record the measured percentages. ☐

Substrate type	*Size*	*Percentage*
Boulder	>10" diameter	
Cobble	2.5 - 10" diameter	
Gravel	0.1 - 2.5" diameter	
Sand	coarse grain	70%
Fines: Silt/Detritus/Muck	fine grain/organic matter	30%
Hardpan/Bedrock	solid clay/rock surface	
Artificial	man-made	
Other (specify)		

C. Bank stability and erosion.

Summarize the extent of erosion along <u>each bank separately</u> on a scale of 1 through 10, by circling a value below. Left/right banks are identified by looking downstream.

Excellent	Good	Marginal	Poor
Banks Stable. No evidence of erosion or bank failure. Little potential for problems during floods. < 5% of bank affected.	Moderately stable. Small areas of erosion. Slight potential for problems in extreme floods. 5-30% of bank in reach has areas of erosion.	Moderately unstable. Erosional areas occur frequently and are somewhat large. High erosion potential during floods. 30-60% of banks in reach are eroded.	Unstable. Many eroded areas. > 60% banks eroded. Raw areas frequent along straight sections and bends. Bank sloughing obvious.
LEFT BANK 10 (9)	LEFT BANK 8 - 7 - 6	LEFT BANK 5 - 4 - 3	LEFT BANK 2 - 1 - 0
RIGHT BANK 10 (9)	RIGHT BANK 8 - 7 - 6	RIGHT BANK 5 - 4 - 3	RIGHT BANK 2 - 1 - 0

You may wish to take photos of unstable or eroded banks for your records. Record date and location.

Comments:

MiCorps Site ID#:_____ Date:_____

Michigan Clean Water Corps

II. Stream and Riparian Habitat (continued)

D. Plant Community

Estimate the percentage of the stream covered by overhanging vegetation 50 %

Using the given scale, estimate the relative abundance of the following:

Plants in the stream:		*Plants on the bank/riparian zone:*	
Algae on Surfaces of Rocks or Plants	Filamentous Algae (Streamers)	Shrubs	Trees
Macrophytes (Standing, Floating Plants)	**0= Absent 1= Rare 2= Common 3= Abundant 4= Dominant**	Grasses	**0= Absent 1= Rare 2= Common 3= Abundant 4= Dominant**
Identified species (optional)		Identified species (optional)	
0	0	1	3
1		3	

E. Riparian Zone

The riparian zone is the vegetated area that surrounds the stream. Right/Left banks are identified by looking downstream.

1. Left Bank

Circle those land-use types that you can see from this stream reach.

(Wetlands) (Forest) Residential Lawn Park Shrub, Old Field Agriculture

Construction Commercial Industrial Highways Golf Course Other_____

2. Right Bank

Circle those land-use types that you can see from this stream reach.

(Wetlands) (Forest) Residential Lawn Park Shrub, Old Field Agriculture

Construction Commercial Industrial Highways Golf Course Other_____

3. Summarize the size and quality of the riparian zone along each bank separately on a scale of 1 through 10, by circling a value below.

Excellent	**Good**	**Marginal**	**Poor**
Width of riparian zone >150 feet, dominated by vegetation, including trees, understory shrubs, or non-woody macrophytes or wetlands; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	Width of riparian zone 75-150 feet; human activities have impacted zone only minimally.	Width of riparian zone 10-75 feet; human activities have impacted zone a great deal.	Width of riparian zone ,10 feet; little or no riparian vegetation due to human activities.
LEFT BANK 10 (9)	LEFT BANK 8 - 7 - 6	LEFT BANK 5 - 4 - 3	LEFT BANK 2 - 1 - 0
RIGHT BANK 10 (9)	RIGHT BANK 8 - 7 - 6	RIGHT BANK 5 - 4 - 3	RIGHT BANK 2 - 1 - 0

MiCorps Site ID#:_____ Date:_____

Michigan Clean Water Corps

III. Sources of Degradation

1. In what ways is this stream degraded, if any?

there is a culvert

2. Does a team need to come out and collect trash?

No

3. Based on what you can see from this location, what are the potential causes and level of severity of this degradation? Only judge what you can see from the site.

(Severity: S=slight M=moderate H=high) (Indicate all that apply)							
Crop Related Sources	S	M	H	Land Disposal	S	M	H
Grazing Related Sources	S	M	H	On-site Wastewater Systems	S	M	H
Intensive Animal Feeding Operations	S	M	H	Silviculture (Forestry)	S	M	H
Highway/Road/Bridge Maintenance and Runoff	S	M	H	Resource Extraction (Mining)	S	M	H
Channelization	S	M	H	Recreational/Tourism Activities (general)	S	M	H
Dredging	(S)	M	H	• Golf Courses	S	M	H
Removal of Riparian Vegetation	S	M	H	• Marinas/Recreational Boating (water releases)	S	M	H
Bank and Shoreline Erosion/ Modification/Destruction	S	M	H	• Marinas/Recreational Boating (bank or shoreline erosion)	S	M	H
Flow Regulation/ Modification (Hydrology)	S	M	H	Debris in Water	S	M	H
Invasive Species	S	M	H	Industrial Point Source	S	M	H
Construction: Highway, Road, Bridge, Culvert	S	M	H	Municipal Point Source	S	M	H
Construction: Land Development	S	M	H	Natural Sources	S	M	H
Urban Runoff	S	M	H	Source(s) Unknown	S	M	H

Additional comments:

STREAM HABITAT ASSESSMENT

Michigan Clean Water Corps

I. Stream, Team, Location Information

Site ID: 4 Date: 5/18/11 Time: 12:30

Location: SB Black River @ Sucker Creek Rd

Name(s):

II. Stream and Riparian Habitat

A. General Information *Circle one or more answers as appropriate*						Notes and Observations Give further explanation when needed
1	Average Stream Width (ft)	< 10	10-25	25-50	>50	
2	Average Stream Depth (ft)	<1	1-3	>3	>5	
3	Has this stream been channelized? (Stream shape constrained through human activity- look for signs of dredging, armored banks, straightened channels)	Yes, currently	Yes, sometime in the past	No	Don't know	
4	Estimate of current stream flow	Dry or Intermittent	Stagnant	Low	Medium	High
5	Highest water mark (in feet above the current level)	<1	1-3	3-5	5-10	>10
6	Which of these habitat types are present?	Riffles	Deep Pools	Large woody debris	Large rocks	Undercut bank
		Overhanging vegetation	Rooted Aquatic Plants	Other:	Other:	Other:
7	Estimate of turbidity	Clear	Slightly Turbid (can partially see to bottom)		Turbid (cannot see to bottom)	
8	Is there a sheen or oil slick visible on the surface of the water?	No	Yes			
9	If yes to #8, does the sheen break up when poked with a stick?	Yes (sheen is most likely natural)		No (sheen could be artifical)		
10	Is there foam present on the surface of the water?	No	Yes			
11	Is yes to #10, does the foam feel gritty or soapy?	Gritty (foam is most likely natural)		Soapy (foam could be artifical)		
The following are optional measurements not currently funded by MiCorps						
8	Water Temperature					
9	Dissolved Oxygen					
10	pH					
11	Water Velocity					

MiCorps Site ID#:_____ Date:_____

Michigan Clean Water Corps

II. Stream and Riparian Habitat (continued)

B. Streambed Substrate

Estimate percent of stream bed composed of the following substrate.

If group will take transects and pebble counts (in Section IV), check this box and record the measured percentages. ☐

Substrate type	*Size*	*Percentage*
Boulder	>10" diameter	10%
Cobble	2.5 - 10" diameter	10%
Gravel	0.1 - 2.5" diameter	
Sand	coarse grain	60%
Fines: Silt/Detritus/Muck	fine grain/organic matter	20%
Hardpan/Bedrock	solid clay/rock surface	
Artificial	man-made	
Other (specify)		

C. Bank stability and erosion.

Summarize the extent of erosion along <u>each bank separately</u> on a scale of 1 through 10, by circling a value below. Left/right banks are identified by looking downstream.

Excellent	Good	Marginal	Poor
Banks Stable. No evidence of erosion or bank failure. Little potential for problems during floods. < 5% of bank affected.	Moderately stable. Small areas of erosion. Slight potential for problems in extreme floods. 5-30% of bank in reach has areas of erosion.	Moderately unstable. Erosional areas occur frequently and are somewhat large. High erosion potential during floods. 30-60% of banks in reach are eroded.	Unstable. Many eroded areas. > 60% banks eroded. Raw areas frequent along straight sections and bends. Bank sloughing obvious.
LEFT BANK 10 - 9	LEFT BANK 8 - 7 - 6	LEFT BANK (5) 4 - 3	LEFT BANK 2 - 1 - 0
RIGHT BANK 10 - 9	RIGHT BANK 8 (7) 6	RIGHT BANK 5 - 4 - 3	RIGHT BANK 2 - 1 - 0

You may wish to take photos of unstable or eroded banks for your records. Record date and location.

Comments:

MiCorps Site ID#:_____ Date:_____

Michigan Clean Water Corps

II. Stream and Riparian Habitat (continued)

D. Plant Community

Estimate the percentage of the stream covered by overhanging vegetation 40 %

Using the given scale, estimate the relative abundance of the following:

Plants in the stream:		*Plants on the bank/riparian zone:*	
Algae on Surfaces of Rocks or Plants 2	Filamentous Algae (Streamers) 1	Shrubs 1	Trees 3
Macrophytes (Standing, Floating Plants) 2	0= Absent 1= Rare 2= Common 3= Abundant 4= Dominant	Grasses 3	0= Absent 1= Rare 2= Common 3= Abundant 4= Dominant
Identified species (optional)		Identified species (optional)	

E. Riparian Zone

The riparian zone is the vegetated area that surrounds the stream. Right/Left banks are identified by looking downstream.

1. Left Bank

Circle those land-use types that you can see from this stream reach.

Wetlands Forest Residential Lawn Park Shrub, Old Field Agriculture
Construction Commercial Industrial Highways Golf Course Other_____

2. Right Bank

Circle those land-use types that you can see from this stream reach.

Wetlands Forest Residential Lawn Park Shrub, Old Field Agriculture
Construction Commercial Industrial Highways Golf Course Other_____

3. Summarize the size and quality of the riparian zone along each bank separately on a scale of 1 through 10, by circling a value below.

Excellent	Good	Marginal	Poor
Width of riparian zone >150 feet, dominated by vegetation, including trees, understory shrubs, or non-woody macrophytes or wetlands; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	Width of riparian zone 75-150 feet; human activities have impacted zone only minimally.	Width of riparian zone 10-75 feet; human activities have impacted zone a great deal.	Width of riparian zone ,10 feet; little or no riparian vegetation due to human activities.
LEFT BANK 10 (9)	LEFT BANK 8 - 7 - 6	LEFT BANK 5 - 4 - 3	LEFT BANK 2 - 1 - 0
RIGHT BANK 10 (9)	RIGHT BANK 8 - 7 - 6	RIGHT BANK 5 - 4 - 3	RIGHT BANK 2 - 1 - 0

MiCorps Site ID#:_____ Date:_____

Michigan Clean Water Corps

III. Sources of Degradation

1. In what ways is this stream degraded, if any?

erosion,

2. Does a team need to come out and collect trash?

no

3. Based on what you can see from this location, what are the potential causes and level of severity of this degradation? Only judge what you can see from the site.

(Severity: S—slight M—moderate H—high) (Indicate all that apply)							
Crop Related Sources	S	M	H	Land Disposal	S	M	H
Grazing Related Sources	S	M	H	On-site Wastewater Systems	S	M	H
Intensive Animal Feeding Operations	S	M	H	Silviculture (Forestry)	S	M	H
Highway/Road/Bridge Maintenance and Runoff	(S)	M	H	Resource Extraction (Mining)	S	M	H
Channelization	S	M	H	Recreational/Tourism Activities (general)	S	M	H
Dredging	S	M	H	• Golf Courses	S	M	H
Removal of Riparian Vegetation	S	M	H	• Marinas/Recreational Boating (water releases)	S	M	H
Bank and Shoreline Erosion/ Modification/Destruction	S	(M)	H	• Marinas/Recreational Boating (bank or shoreline erosion)	S	M	H
Flow Regulation/ Modification (Hydrology)	S	M	H	Debris in Water	S	M	H
Invasive Species	S	M	H	Industrial Point Source	S	M	H
Construction: Highway, Road, Bridge, Culvert	S	M	H	Municipal Point Source	S	M	H
Construction: Land Development	S	M	H	Natural Sources	S	M	H
Urban Runoff	S	M	H	Source(s) Unknown	S	M	H

Additional comments:

STREAM HABITAT ASSESSMENT

Michigan Clean Water Corps

I. Stream, Team, Location Information

Site ID: I Date: 5/18/11 Time: 1:16pm

Location: Unamed trib at sucker creek rd.

Name(s):

II. Stream and Riparian Habitat

A. General Information

Circle one or more answers as appropriate

							Notes and Observations: Give further explanation when needed
1	Average Stream Width (ft)	(<10)	10-25	25-50	>50		
2	Average Stream Depth (ft)	(<1)	1-3	>3	>5		
3	Has this stream been channelized? (Stream shape constrained through human activity- look for signs of dredging, armored banks, straightened channels)	Yes, currently	Yes, sometime in the past	(No)	Don't know		
4	Estimate of current stream flow	Dry or Intermittent	Stagnant	(Low)	Medium	High	
5	Highest water mark (in feet above the current level)	(<1)	1-3	3-5	5-10	>10	
6	Which of these habitat types are present?	Riffles	Deep Pools	(Large woody debris)	Large rocks	Undercut bank	
		Overhanging vegetation	(Rooted Aquatic Plants)	Other:	Other:	Other:	
7	Estimate of turbidity	(Clear)	Slightly Turbid (can partially see to bottom)		Turbid (cannot see to bottom)		
8	Is there a sheen or oil slick visible on the surface of the water?	(No)	Yes				
9	If yes to #8, does the sheen break up when poked with a stick?	Yes (sheen is most likely natural)		No (sheen could be artifical)			
10	Is there foam present on the surface of the water?	(No)	Yes				
11	Is yes to #10, does the foam feel gritty or soapy?	Gritty (foam is most likely natural)		Soapy (foam could be artifical)			

The following are optional measurements not currently funded by MiCorps

8	Water Temperature	
9	Dissolved Oxygen	
10	pH	
11	Water Velocity	

MiCorps Site ID#:_____ Date:_____

Michigan Clean Water Corps

II. Stream and Riparian Habitat (continued)

B. Streambed Substrate

Estimate percent of stream bed composed of the following substrate.

If group will take transects and pebble counts (in Section IV), check this box and record the measured percentages. ☐

Substrate type	*Size*	*Percentage*
Boulder	>10" diameter	
Cobble	2.5 - 10" diameter	
Gravel	0.1 - 2.5" diameter	
Sand	coarse grain	10%
Fines: Silt/Detritus/Muck	fine grain/organic matter	90%
Hardpan/Bedrock	solid clay/rock surface	
Artificial	man-made	
Other (specify)		

C. Bank stability and erosion.

Summarize the extent of erosion along <u>each bank separately</u> on a scale of 1 through 10, by circling a value below. Left/right banks are identified by looking downstream.

Excellent	Good	Marginal	Poor
Banks Stable. No evidence of erosion or bank failure. Little potential for problems during floods. < 5% of bank affected.	Moderately stable. Small areas of erosion. Slight potential for problems in extreme floods. 5-30% of bank in reach has areas of erosion.	Moderately unstable. Erosional areas occur frequently and are somewhat large. High erosion potential during floods. 30-60% of banks in reach are eroded.	Unstable. Many eroded areas. > 60% banks eroded. Raw areas frequent along straight sections and bends. Bank sloughing obvious.
LEFT BANK 10 (9)	LEFT BANK 8 - 7 - 6	LEFT BANK 5 - 4 - 3	LEFT BANK 2 - 1 - 0
RIGHT BANK 10 (9)	RIGHT BANK 8 - 7 - 6	RIGHT BANK 5 - 4 - 3	RIGHT BANK 2 - 1 - 0

You may wish to take photos of unstable or eroded banks for your records. Record date and location.

Comments: there really aren't any banks

MiCorps Site ID#:_____ Date:_____

Michigan Clean Water Corps

II. Stream and Riparian Habitat (continued)

D. Plant Community

Estimate the percentage of the stream covered by overhanging vegetation 15% %

Using the given scale, estimate the relative abundance of the following:

Plants in the stream:		*Plants on the bank/riparian zone:*	
Algae on Surfaces of Rocks or Plants 3	Filamentous Algae (Streamers) 3	Shrubs 1	Trees 3
Macrophytes (Standing, Floating Plants) 4	**0= Absent 1= Rare 2= Common 3= Abundant 4= Dominant**	Grasses 4	**0= Absent 1= Rare 2= Common 3= Abundant 4= Dominant**
Identified species (optional)		Identified species (optional)	

E. Riparian Zone

The riparian zone is the vegetated area that surrounds the stream. Right/Left banks are identified by looking downstream.

1. Left Bank

Circle those land-use types that you can see from this stream reach.

(Wetlands) (Forest) Residential Lawn Park Shrub, Old Field Agriculture

Construction Commercial Industrial Highways Golf Course Other_____

2. Right Bank

Circle those land-use types that you can see from this stream reach:

(Wetlands) (Forest) Residential Lawn Park Shrub, Old Field Agriculture

Construction Commercial Industrial Highways Golf Course Other_____

3. Summarize the size and quality of the riparian zone along each bank separately on a scale of 1 through 10, by circling a value below.

Excellent	Good	Marginal	Poor
Width of riparian zone >150 feet, dominated by vegetation, including trees, understory shrubs, or non-woody macrophytes or wetlands; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	Width of riparian zone 75-150 feet; human activities have impacted zone only minimally.	Width of riparian zone 10-75 feet; human activities have impacted zone a great deal.	Width of riparian zone ,10 feet; little or no riparian vegetation due to human activities.
LEFT BANK (10) 9	LEFT BANK 8 - 7 - 6	LEFT BANK 5 - 4 - 3	LEFT BANK 2 - 1 - 0
RIGHT BANK (10) 9	RIGHT BANK 8 - 7 - 6	RIGHT BANK 5 - 4 - 3	RIGHT BANK 2 - 1 - 0

MiCorps Site ID#:_____ Date:_____

Michigan Clean Water Corps

III. Sources of Degradation

1. In what ways is this stream degraded, if any?

the stream just isn't there

2. Does a team need to come out and collect trash?

no

3. Based on what you can see from this location, what are the potential causes and level of severity of this degradation? Only judge what you can see from the site.

(Severity: S=slight M=moderate H=high) (Indicate all that apply)							
Crop Related Sources	S	M	H	Land Disposal	S	M	H
Grazing Related Sources	S	M	H	On-site Wastewater Systems	S	M	H
Intensive Animal Feeding Operations	S	M	H	Silviculture (Forestry)	S	M	H
Highway/Road/Bridge Maintenance and Runoff	S	M	H	Resource Extraction (Mining)	S	M	H
Channelization	S	M	H	Recreational/Tourism Activities (general)	S	M	H
Dredging	S	M	H	• Golf Courses	S	M	H
Removal of Riparian Vegetation	S	M	H	• Marinas/Recreational Boating (water releases)	S	M	H
Bank and Shoreline Erosion/ Modification/Destruction	S	M	H	• Marinas/Recreational Boating (bank or shoreline erosion)	S	M	H
Flow Regulation/ Modification (Hydrology)	S	M	H	Debris in Water	S	M	H
Invasive Species	S	M	H	Industrial Point Source	S	M	H
Construction: Highway, Road, Bridge, Culvert	S	M	H	Municipal Point Source	S	M	H
Construction: Land Development	S	M	H	Natural Sources	S	M	H
Urban Runoff	S	M	H	Source(s) Unknown	S	M	H

Additional comments:

STREAM HABITAT ASSESSMENT

Michigan Clean Water Corps

I. Stream, Team, Location Information

Site ID: J Date: 5/18/11 Time: 1:57pm

Location: Haynes Creek @ McGregor Rd

Name(s):

II. Stream and Riparian Habitat

A. General Information *Circle one or more answers as appropriate*						Notes and Observations: Give further explanation when needed
1	Average Stream Width (ft)	< 10	10-25	25-50	>50	
2	Average Stream Depth (ft)	<1	1-3	>3	>5	
3	Has this stream been channelized? (Stream shape constrained through human activity- look for signs of dredging, armored banks, straightened channels)	Yes, currently	Yes, sometime in the past	No	Don't know	
4	Estimate of current stream flow	Dry or Intermittent	Stagnant	Low	Medium	High
5	Highest water mark (in feet above the current level)	<1	1-3	3-5	5-10	>10
6	Which of these habitat types are present?	Riffles	Deep Pools	Large woody debris	Large rocks	Undercut bank
		Overhanging vegetation	Rooted Aquatic Plants	Other:	Other:	Other:
7	Estimate of turbidity	Clear	Slightly Turbid (can partially see to bottom)		Turbid (cannot see to bottom)	
8	Is there a sheen or oil slick visible on the surface of the water?	No	Yes			
9	If yes to #8, does the sheen break up when poked with a stick?	Yes (sheen is most likely natural)		No (sheen could be artifical)		
10	Is there foam present on the surface of the water?	No	Yes			
11	Is yes to #10, does the foam feel gritty or soapy?	Gritty (foam is most likely natural)		Soapy (foam could be artifical)		
The following are optional measurements not currently funded by MiCorps						
8	Water Temperature					
9	Dissolved Oxygen					
10	pH					
11	Water Velocity					

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II. Stream and Riparian Habitat (continued)

B. Streambed Substrate

Estimate percent of stream bed composed of the following substrate.

If group will take transects and pebble counts (in Section IV), check this box and record the measured percentages. ☐

Substrate type	*Size*	*Percentage*
Boulder	>10" diameter	
Cobble	2.5 - 10" diameter	
Gravel	0.1 - 2.5" diameter	
Sand	coarse grain	30%
Fines: Silt/Detritus/Muck	fine grain/organic matter	70%
Hardpan/Bedrock	solid clay/rock surface	
Artificial	man-made	
Other (specify)		

C. Bank stability and erosion.

Summarize the extent of erosion along <u>each bank separately</u> on a scale of 1 through 10, by circling a value below. Left/right banks are identified by looking downstream.

Excellent	Good	Marginal	Poor
Banks Stable. No evidence of erosion or bank failure. Little potential for problems during floods. < 5% of bank affected.	Moderately stable. Small areas of erosion. Slight potential for problems in extreme floods. 5-30% of bank in reach has areas of erosion.	Moderately unstable. Erosional areas occur frequently and are somewhat large. High erosion potential during floods. 30-60% of banks in reach are eroded.	Unstable. Many eroded areas. > 60% banks eroded. Raw areas frequent along straight sections and bends. Bank sloughing obvious.
LEFT BANK 10 - 9	LEFT BANK (8) - 7 - 6	LEFT BANK 5 - 4 - 3	LEFT BANK 2 - 1 - 0
RIGHT BANK 10 - 9	RIGHT BANK (8) - 7 - 6	RIGHT BANK 5 - 4 - 3	RIGHT BANK 2 - 1 - 0

You may wish to take photos of unstable or eroded banks for your records. Record date and location.

Comments:

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II. Stream and Riparian Habitat (continued)

D. Plant Community

Estimate the percentage of the stream covered by overhanging vegetation 10 %

Using the given scale, estimate the relative abundance of the following:

Plants in the stream:		*Plants on the bank/riparian zone:*	
Algae on Surfaces of Rocks or Plants 1	Filamentous Algae (Streamers) 3	Shrubs 3	Trees 3
Macrophytes (Standing, Floating Plants) 2	**0= Absent 1= Rare 2= Common 3= Abundant 4= Dominant**	Grasses 4	**0= Absent 1= Rare 2= Common 3= Abundant 4= Dominant**
Identified species (optional)		Identified species (optional)	

E. Riparian Zone

The riparian zone is the vegetated area that surrounds the stream. Right/Left banks are identified by looking downstream.

1. Left Bank

Circle those land-use types that you can see from this stream reach.

(Wetlands) (Forest) Residential Lawn Park Shrub, Old Field Agriculture

Construction Commercial Industrial Highways Golf Course Other_____

2. Right Bank

Circle those land-use types that you can see from this stream reach.

(Wetlands) (Forest) Residential Lawn Park Shrub, Old Field Agriculture

Construction Commercial Industrial Highways Golf Course Other_____

3. Summarize the size and quality of the riparian zone along each bank separately on a scale of 1 through 10, by circling a value below.

Excellent	Good	Marginal	Poor
Width of riparian zone >150 feet, dominated by vegetation, including trees, understory shrubs, or non-woody macrophytes or wetlands; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	Width of riparian zone 75-150 feet; human activities have impacted zone only minimally.	Width of riparian zone 10-75 feet; human activities have impacted zone a great deal.	Width of riparian zone ,10 feet; little or no riparian vegetation due to human activities.
LEFT BANK 10 (9)	LEFT BANK 8 - 7 - 6	LEFT BANK 5 - 4 - 3	LEFT BANK 2 - 1 - 0
RIGHT BANK 10 (9)	RIGHT BANK 8 - 7 - 6	RIGHT BANK 5 - 4 - 3	RIGHT BANK 2 - 1 - 0

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III. Sources of Degradation

1. In what ways is this stream degraded, if any?

2. Does a team need to come out and collect trash?

NO

3. Based on what you can see from this location, what are the potential causes and level of severity of this degradation? Only judge what you can see from the site.

(Severity: S=slight M=moderate H=high) (Indicate all that apply)							
Crop Related Sources	S	M	H	Land Disposal	S	M	H
Grazing Related Sources	S	M	H	On-site Wastewater Systems	S	M	H
Intensive Animal Feeding Operations	S	M	H	Silviculture (Forestry)	S	M	H
Highway/Road/Bridge Maintenance and Runoff	S	M	H	Resource Extraction (Mining)	S	M	H
Channelization	S	M	H	Recreational/Tourism Activities (general)	S	M	H
Dredging	S	M	H	• Golf Courses	S	M	H
Removal of Riparian Vegetation	S	M	H	• Marinas/Recreational Boating (water releases)	S	M	H
Bank and Shoreline Erosion/ Modification/Destruction	S	M	H	• Marinas/Recreational Boating (bank or shoreline erosion)	S	M	H
Flow Regulation/ Modification (Hydrology)	S	M	H	Debris in Water	S	M	H
Invasive Species	S	M	H	Industrial Point Source	S	M	H
Construction: Highway, Road, Bridge, Culvert	S	M	H	Municipal Point Source	S	M	H
Construction: Land Development	S	M	H	Natural Sources	S	M	H
Urban Runoff	S	M	H	Source(s) Unknown	S	M	H

Additional comments: