# Burt Lake Watershed Project
# Nonpoint Source Pollution Watershed Management Plan

## Chapter One: Getting to Know the Burt Lake Watershed

### 1. INTRODUCTION

Burt Lake is one of Michigan's premier inland lakes. The beauty of Burt Lake has attracted visitors for more than a century with its clean water, scenic shoreline, and superb fishing. Burt Lake's tributaries are also a draw with their good water quality and trout fishing opportunities.

In spite of their grandeur, these valuable water resources have not always been appreciated. Impacts to Burt Lake's water quality date back to the late 1800's when lumbering occurred throughout the watershed and associated industries were built along the shores of the lake. Burt Lake was primarily seen as a resource to use for water supply, navigation, and waste disposal. Burt Lake's tributaries experienced a similar fate with damage from erosion and sedimentation from logging.

Although nearly 100 years have passed, water quality concerns still exist for Burt Lake and its tributaries. The pollutants that threaten Burt Lake's health today are not primarily from industrial sources such as tanneries and lumber companies, but from nutrients and sediments generated by different human activities such as shoreline development, recreation, fishing pressure, streambank erosion, and forestry activities.

Inventories completed as part of the Burt Lake Watershed Planning Project have surveyed a variety of land use activities contributing nonpoint source pollution to the lake and its tributaries. Reducing the amount of nonpoint source pollution and preventing future contributions to Burt Lake are essential to protecting the many high quality uses this resource provides, which include swimming, boating, and fishing.

#### *A. Geographic Description*

Burt Lake is a large, deep, high quality lake located just west of I-75 in Cheboygan County. It is entirely contained within Burt and Tuscarora Townships. Burt Lake is part of northeast Michigan's Inland Waterway and is the state's fourth largest lake. The watershed of Burt Lake encompasses more than 250,000 acres. Burt Lake is ranked among Michigan's top 50 fishing lakes.

Cheboygan and Emmet Counties are scenic and are utilized extensively as vacation destinations. Recreational activities are primarily water-based and center on large, clean lakes such as Burt Lake. During periods of high recreational use, both Counties' populations increase by more than three-fold. This tourist trade is vital to the local economy. There is a trend toward converting seasonal cottages to year-round homes. The combined pressure of these trends could result in water quality degradation unless management programs are initiated. The continued recreational attractiveness of the area depends almost exclusively on maintaining high water quality in the area lakes. It

has been shown in areas such as Lake St. Clair that a decline in lake water quality can severely hurt a local economy by reducing tourist trade and by causing a decline in property values, which directly affect local tax revenues.

**Geology**

The geology of the region is variable due to its glacial origin. As the glaciers advanced and retreated across the landscape, they deposited the debris scraped from the land surface. In many areas of northern Michigan this glacial drift is hundreds of meters thick. It is composed of a mixture of sand, gravel, and rocks in a matrix of silt and clay.

In the Burt Lake Watershed these deposits overlay limestone bedrock. Bedrock is found near the surface in a few areas, but is generally more than 100 meters below the surface throughout most of the watershed.

**Burt Lake Shoreline**

Burt Lake has approximately 32 miles of shoreline. Eighteen miles (57%) of lakeshore frontage is in residential development and 13.6 miles (43%) are currently undeveloped. Eleven miles (57%) of the undeveloped frontage is characterized by wetland vegetation and soils. Forty-five percent (8.1 miles) of the residential development around the lake has occurred in areas that are considered to have been wetlands.

Numerous resorts, the Burt Lake State Park, and a state forest campground help to serve the recreational demands on the lake. Burt Lake's location in the middle of the Inland Waterway makes it an ideal point from which to explore the rest of the Waterway. Loons are often seen on the lake, and some of the shoreline cedar swamps are known to be winter White-tailed deer yards. The lake's high water quality supports brown and rainbow trout, as well as healthy populations of walleye and smallmouth bass. Muskellunge are also occasionally taken from the lake.

The shoreline topography ranges from low, flat, wetlands to extremely steep (45%+) banks that rise more than 100 feet above the lake. However, most of the shoreline is fairly level to rolling. The soils of the Burt Lake shoreline are extremely variable. They range from very poorly drained to excessively drained; from muck to sand. All of the soil series contiguous to the shoreline have severe limitations for on-site septic systems. A large forested wetland known as Carp Creek Wetland exists at the north end of Burt Lake. The soils are of the Tawas and Roscommon series. They are characteristically very poorly drained with a high water table.

Burt Lake's eastern and southeastern shorelines have soils of the AuGres, Lupton, Roscommon, Angelica, and Brevort series. These soils generally are poorly to very poorly drained with high water tables. Some well-drained soils such as the Cheboygan and Eastport series are scattered along the shoreline. At the south end of Burt Lake, the shoreline is extremely steep and rises in some places to 80-100 feet above the lake. Development at this end of the lake occurs at the top of this steep bank on the excessively drained soils of the Rubicon series. Along the southwest shoreline, the bank is somewhat lower. In this area, the Rubicon series are separated from the lake by a zone of the very poorly-drained soils of the Tawas soils series, extending from the bottom of the steep bank to the lakeshore. Further north along the southwestern lakeshore, the steep bank disappears and the soils are dominated by the Rudyard series that is

somewhat poorly drained, with a high water table and poor percolation. North of this area lies an extensive wetland at the mouths of the Crooked and Maple Rivers. The soils here are very poorly drained Tawas, Lupton, and Roscommon series.

Colonial Point, a peninsula of land containing approximately 800 acres, projects into Burt Lake from its western shore just north of the Crooked and Maple River wetlands. The shoreline of the south side of the point is characterized by the well-drained soils of the Cheboygan series. However, fine textured subsurface horizons cause this soil to have poor percolation. The well-drained Blue Lake series is prevalent along the end of the point. This soil is well-drained but is considered to be too permeable to be a good septic system filter. The north shore of the point has soils of the AuGres-Roscommon Complex, which is somewhat poorly drained to very poorly drained with a high water table. As the shoreline continues north from Colonial Point, the soil grades from the somewhat poorly drained, high water table, Brimely series into the very poorly drained Roscommon and Pinconning mucks. The northwest shoreline is composed of the somewhat poorly drained to very poorly drained, high water table soils of the AuGres and Roscommon series. These soils grade into the Tawas series-dominated soils of the wetland at the north end of the lake.

**Sturgeon River**

The Sturgeon River is one of northern Michigan's most scenic rivers and has an excellent trout fishery. It is also important to the anadromous fish of Burt Lake which migrate up the river to spawn. The Sturgeon River Watershed is home to a variety of wildlife. Northern Michigan's elk herd inhabits portions of the watershed as do black bear, bobcat, and bald eagles. The river is also very popular for canoeing and innertubing. Two canoe liveries exist in the town of Indian River to serve this recreational demand. The stretch from the village of Wolverine to Indian River is the most popular for innertubing. South of Wolverine, many reaches of the river are impassable to canoes due to downfalls from the bordering cedar swamps.

The Sturgeon River is Burt Lake's largest tributary with an average annual discharge of 7.6 cms (270 cfs). It is a high quality river and is known for its excellent trout fishery. The river flows in a northerly direction and discharges into the south end of Burt Lake. In the early 1900's, the flow of the Sturgeon River was diverted to Burt Lake from its natural confluence with the Indian River that discharges to Mullett Lake. Since diversion, a delta has been developing at the mouth of the Sturgeon River. In recent years, this delta has caused ice jams that result in the flooding of residential areas near the river's mouth.

The Sturgeon River has two branches that merge at the village of Wolverine to form the mainstem of the river. Topography within the watershed is rolling hills with some nearly level areas near the river channel. The upland portion of the watershed commonly supports a mixture of pine and hardwoods, while cedar, balsam fir, and alders are common along the river channel. The watershed of the West Branch is composed largely of State Forest Land and is therefore subject to very little cultural impact. Some timber harvesting occurs within the watershed. However, this occurs on upland areas and the undisturbed cedar swamps that border the river provide an adequate buffer strip. The main branch of the Sturgeon River begins near the city of Gaylord in Otsego County. Its watershed is also largely forested; however, a small amount of agriculture does exist. The immediate streambank area is well protected by dense cedar swamp wetlands.

Even though the streambanks of the river are mostly forested, some streambank erosion does occur. It is evidenced by steep, sandy cut-banks at river bends. They are suspected of adversely affecting benthic fish habitat and causing a delta to form at the river's mouth. This has prompted the Department of Natural Resources and Trout Unlimited to undertake certain protection and improvement measures to mitigate the source and delivery of the sand. These measures include streambed sand traps to reduce downstream delivery of sand, and streambank stabilization with riprap and logs.

The soils of the Sturgeon River Watershed are similar to those of the Maple and Crooked River Watersheds. The soils adjacent to the river are of the nearly level, very poorly drained Carbondale-Lupton-Tawas Association. The adjacent steep to rolling uplands are characterized by well-drained soils of the Leelanau-Emmet-Kalkaska Association series.

**Crooked River**

The Crooked River is about 10 km long and connects Crooked Lake with Burt Lake. The river channel is dredged to provide recreational boating access between the two lakes. A lock and dam operated by the Army Corps of Engineers is located in the village of Alanson near the river's outlet from Crooked Lake. It is used primarily to regulate the water level of Crooked Lake. The average annual discharge of the Crooked River is 3.8 cms (133 cfs). Several small streams discharge to the river in the vicinity of Alanson.

Most of the Crooked River's Watershed is forested or grasslands except for the village of Alanson, and small farm plots north of Alanson. The village of Alanson is serviced by a sanitary sewer, while a small residential area along the river, known locally as Devil's Elbow, relies on on-site disposal methods.

Some agricultural land exists within the watershed, but it is primarily in hay, with very little land devoted to row crops. Soils under row crops are generally subject to more erosion than soils under grass and hay. The agricultural land is separated from the river by extensive forested areas. The topography of the watershed is gently rolling, with level wetland areas adjacent to the river.

The soils of the Crooked River Watershed are wetland soils of the Carbondale-Tawas-Roscommon Association series. Beyond the river bottom wetlands lies a zone of nearly level, well-drained sandy soils of the East Lake-Blue Lake-Kalkaska Association soils. In some areas, poorly-drained sandy to loamy soils of the Thomas-Brevort-Iosco Association lie between the wetland soils and those of the East Lake-Blue Lake-Kalkaska Association. The upland soils areas are well-drained sandy soils of the Blue Lake-Leelanau Association.

The Crooked River is an integral part of Michigan's historic Inland Waterway which connects Lake Huron to Crooked Lake near Little Traverse Bay on Lake Michigan in Emmet County. The Inland Waterway was used by the Native Americans and trappers as a fast route across northern Michigan instead of the longer, more dangerous passage through the Straits of Mackinac. Today, the Inland Waterway provides recreational boaters with over 40 miles of navigable waters, plus direct access to four of Michigan's most beautiful and popular lakes.

**Maple River**
The Maple River, a tributary to Burt Lake, is almost entirely in Emmet County and flows through the townships of Friendship, Readmond, Pleasantview, Carp Lake, Center, and Maple River. The topography is steeply rolling to nearly level. Hardwoods dominate the upland portions of the watershed while pines and pine-hardwood associations are common on more level, sandy areas. Cedar, balsam firm, and alders frequently occur adjacent to the river channel.

The Maple River is a high-quality river that is known for its excellent trout fishery. It has an average annual discharge of 2.7 cms (95 cfs) below the confluence of its two branches. Lake Kathleen, a 139-acre impoundment, has been created by a dam at the confluence of the two branches. The East Branch discharges from Douglas Lake and flows southwesterly to its confluence with the West Branch. The watershed of the East Branch is gently rolling to nearly level, and is largely forested. A considerable portion of the East Branch watershed is owned by the University of Michigan and is used as a forest research area. The West Branch of the Maple River originates in a large wetland called the Pleasantview Swamp, and is supplemented by the inflow of Brush Creek which drains from Lark's Lake. The watershed is mostly forested, but some agriculture exists. A beef cattle farm near the headwaters may be of local concern, especially during storm events and snowmelt.

The soils of the Maple River Watershed are variable with topography. The upland regions of the watershed are dominated by the Emmet Association and the Blue Lake-Leelanau Association. Both associations are deep and well-drained, but the Blue Lake-Leelanau Association is sandy while the Emmet Association tends to be more loamy. Most of the river channel occurs on soils of the Carbondale-Tawas-Roscommon Association. These soils are deep, poorly to very poorly drained, and range from organic to sandy. Near the village of Pellston, the river flows through an area of well-drained sandy soils of the Rubicon Association.

**Land Use Within the Burt Lake Watershed**
The dominant land use within the Burt Lake Watershed is forest land which occupies 62% of the area. The second greatest land use category is non-forested land which occupies 12% of the watershed. The non-forested land is primarily old agricultural land which has reverted to grasses and shrubs. Only 11% of the watershed is agricultural land. The Cheboygan County Soil Conservation Service estimates that about 10% of the agricultural land is in crop or animal production and the remaining 90% is either permanent pasture or hay. Therefore, only about 1% (or 2,700 acres) of the watershed is in agricultural land use that is a potential threat to water quality. Urban/residential areas occupy just 2% of the watershed acreage.

Wetlands occupy about 4% of the watershed. The majority of the wetlands are forested and are typically characterized by white cedar, balsam fir, red maple, balsam poplar, and black ash soil associations. Forested wetlands are common along tributary streams and the Burt Lake shoreline. There is no significant industrial or municipal use of or discharge to Burt Lake or any of its tributaries.

The only known agricultural use of surface water of the watershed occurs within the Maple River Watershed. A beef cattle farm has been known in the past to allow cattle access to the west branch of the Maple River. This has the potential to affect the water quality and fishery of the Maple River, but is unlikely to have a significant impact on the water quality of Burt Lake. This portion of the river supports a healthy trout population indicating that water quality impacts to date have been minor. The farm lies approximately seven miles upstream from a 139-acre impoundment, Lake Kathleen, which is about six miles upstream from the river's mouth. The impoundment serves as a sediment and nutrient trap for both branches of the Maple River. Downstream from the impoundment, the river channel becomes indistinct as the river enters a wetland spreads about one mile from the Burt Lake shoreline. It is believed that this wetland provides additional sediment and nutrient retention, reducing potential adverse water quality impacts on Burt Lake. The spreads are owned by the State of Michigan and are therefore protected from future development.

**Local Governmental Agencies Within the Burt Lake Watershed**

The Burt Lake Watershed lies within the jurisdiction of three county governments: Cheboygan, Emmet, and Otsego Counties and two regional government agencies -- the Northeast Michigan Council of Governments and the Northwest Michigan Council of Governments. All three counties have county planning commissions.

***B. Water Quality Review***

The trophic status of Burt Lake is based on its level of nutrient enrichment. Since Burt Lake is considered to be phosphorus limited, it is the nutrient of primary concern and is the primary trophic status indicator. A lake trophic status can be determined from secchi disc depth and chlorophyll-a concentration. Recent data from the Watershed Council's yearly monitoring of secchi disc depth and chlorophyll-a indicates that Burt Lake is borderline mesotrophic-oligotrophic.

The dividing line between mesotrophic and oligotrophic on Carlson's Trophic Status Index (TSI) scale is 38. TSI numbers below 38 are oligotrophic while numbers from 39-50 are mesotrophic. Federal Storet System data from 1979 and 1981 show spring total phosphorus concentration of 6 ug/l, also indicating oligotrophic conditions. Although Burt Lake has high water quality, data recorded in the Storet System shows that hypolimnetic oxygen depletion does occur after several months of stratification This indicates that enough organic matter is accumulating and decomposing to depress dissolved oxygen levels. The more nutrient enrichment a lake receives, the more common this phenomenon becomes. Burt Lake's water quality is controlled in part by the physical characteristics of the lake and its watershed.

Morphometric Features of Burt Lake and Its Watershed

| | |
|---|---|
| Lake surface area | 6,928 ha (17,120 acres) |
| Watershed area | 102,192 ha (252,520 acres) |
| Maximum depth | 22 m (73 ft.) |
| Mean depth | 12 m (40 ft.) |
| Maximum length | 15.6 km (9.7 miles) |
| Maximum width | 7.7 m (4.8 miles) |
| Volume | 632,173,568 cubic meters (512,512 ac. ft.) |
| Shoreline development factor | 1.8 |
| Shoreline length of lake | 51.5 km (32 miles) |
| Watershed area: lake area | 14:8:1 |
| Water retention time | 1.04 years |

The Lake's low shoreline development factor limits the amount of shoreline influence on water quality and its short water retention time helps to prevent nutrients from concentrating in the lake water. Lakes that have a large watershed relative to lake size are generally more susceptible to nutrient enrichment from nonpoint source than lakes with proportionally smaller watersheds. Burt Lake has a very large watershed-to-lake size ratio of 14:8:1. Fortunately, more than 90% of the watershed is currently in land uses that characteristically don't export excessive levels of nutrients.

**2. Designated Uses and Water Quality Summary**

The Water Resources Commission Act (P.A. 451 of 1994, Part 31, Chapter 1 requires all waters of the State of Michigan to be of the quality to meet seven designated uses: (1) agriculture; (2) navigation; (3) industrial water supply; (4) public water supply; (5) warm water fishery; (6) habitat for indigenous aquatic life and wildlife; and (7) partial or total body contact recreation. An eighth designated use -- cold water fishery -- is applicable for many rivers and lakes in Michigan.

Burt Lake has excellent water quality and currently meets all eight of the designated uses. Active designated uses include agriculture, navigation, industrial water supply, warm water fishery, habitat for aquatic life, and total body contact recreation. Although Burt Lake's water quality is good enough for public water supply it is not being used for this purpose. Burt Lake's major tributaries -- the Maple, Crooked, and Sturgeon Rivers – also meet all eight of the designated uses. Some of the small tributaries, such as Carp and Hassler Creeks, meet seven of the designated uses, with the exception of navigation due to their small size.

A variety of activities and changing land uses in the watershed threaten some of the designated uses (Table 1).

| Table 1: Burt Lake Watershed Threatened Uses |
|---|
| • Navigation (N) |
| • Habitat for indigenous aquatic life and wildlife (H) |
| • Partial or total body contact recreation (R) |
| • Cold water fishery (C) |

### *A. Watershed Concerns*

In the spring of 2001 a series of meetings were held with local government officials, conservation groups, environmental organizations, regional planning agencies, and other stakeholders within the Burt Lake Watershed to discuss concerns about water quality. The group identified many different issues and committed to working together in a partnership to develop a watershed management plan. The group also prioritized the main issues of concern summarized in Table 2.

Navigation (N) • Habitat for indigenous aquatic life and wildlife (H) • Partial or total body contact recreation (R) • Cold water fishery (C)

| Table 2: Priority Concerns and Threats to Designated Uses | N | H | R | C |
|---|---|---|---|---|
| Loss of forest lands, agricultural lands to development, and increasing impervious surface | | ♦ | ♦ | ♦ |
| Urban runoff directly discharging to lakes and streams | ♦ | ♦ | ♦ | ♦ |
| Lakeshore and streambank erosion | ♦ | ♦ | ♦ | ♦ |
| Shoreline septic systems | | ♦ | ♦ | ♦ |
| Impacts from lawns and golf courses | | ♦ | | ♦ |
| Erosion from recreational uses on the Sturgeon and Maple Rivers | ♦ | ♦ | | ♦ |
| Impacts to fisheries from erosion and habitat destruction | | ♦ | | ♦ |
| Agricultural impacts livestock in streams, manure application, pesticide use | ♦ | ♦ | ♦ | ♦ |
| Erosion and stream habitat destruction from logging activities | ♦ | ♦ | | ♦ |
| Shoreline algae | | ♦ | | ♦ |
| Erosion and runoff from road/stream crossings | ♦ | ♦ | | ♦ |

### *B. Known and Suspected Pollutants in the Burt Lake Watershed*

Sediment, nutrients, and toxics such as oils, grease, and heavy metals were identified as the main pollutants of concern that threaten the designated uses in the Burt Lake Watershed. Table 3 lists the known and suspected pollutants.

| Table 3: Known and Suspected Pollutants | |
|---|---|
| ***Impaired Use*** | ***Pollutants**** |
| Navigation | Sediment (k) |
| Aquatic life/wildlife | Sediment (k)<br>Nutrients (s)<br>Oils, grease, heavy metals (s) |
| Partial and total body contact recreation | Nutrients (s)<br>Bacteria (s) |
| Cold water fishery | Sediment (k)<br>Nutrients (s)<br>Oils, grease, heavy metals (s)<br>Pesticides (s) |

* k = known s = suspected

### *C. Sources of Pollutants in the Burt Lake Watershed*

The diversity of land uses is extensive in the Burt Lake Watershed. Table 4 identifies the main sources for each primary pollutant of concern.

| Table 4: Sources of Pollutants in the Burt Lake Watershed | |
|---|---|
| ***Pollutant*** | ***Sources*** |
| Sediment | Lakeshore and streambank erosion (k)<br>Road/stream crossings (k)<br>Livestock in streams (s)<br>New construction (s)<br>Logging activities (s) |
| Nutrients | Lawn care on shoreline properties (k)<br>Septic systems (s)<br>Livestock in streams (s)<br>Road/stream crossings (k)<br>Lakeshore and streambank erosion (k)<br>Stormwater discharges in urban areas (k)<br>Manure applications and management (s)<br>Golf courses (s)<br>New construction (s) |
| Oils, grease, and heavy metals | Stormwater discharges in urban areas (k)<br>Road/stream crossings (k) |
| Pesticides | Lawn care on shoreline properties (s)<br>Agricultural fields (s)<br>Golf courses (s) |
| Bacteria | Failing septic systems (s)<br>Stormwater discharges in urban areas (k)<br>Livestock waste (s) |

* k = known s = suspected

### *D. Causes for Each Pollutant Source in the Burt Lake Watershed*

Understanding the potential causes of the pollution is essential in developing goals and action strategies. Below (Table 5) is a list of the causes connected to each pollutant source.

Table 5: Pollutant Information Following the Inventory

| ***Pollutants*** | ***Pollutant Source*** | ***Cause*** |
|---|---|---|
| Nutrients (P and N) (k) | Agricultural fields (s) | Use of fertilizers (s) |
| | Septic systems (s) | Outdated, poorly maintained, and improperly designed systems (s) |
| | Manure applications and management (s) | Over-application of manure (s), lack of proper storage for manure (s), inadequate testing of soil properties (s) |
| | Stormwater discharges in urban areas (k) | Inadequate treatment of stormwater that may contain oils, grease, heavy metals, pet waste, etc. (s) |
| | Lawn care on shoreline properties (k) | Use of phosphorus fertilizer (s), over-application of fertilizers (s), misuse and overuse of pesticides (s), removal of native shoreline vegetation (k) |
| Sediment (k) | Agricultural fields (s) | Plowing on slopes with erodable soils(s) |
| | Lakeshore and streambank erosion (k) | Shoreline development and removal of shoreline vegetation (k), angler and canoeist access (k), road/stream crossings (k) |
| | Livestock in streams (s) | Unrestricted access and no alternative water source (s) |
| | Logging activities (s) | Inadequate buffer strips near streams (s) |
| | New construction (s) | Lack of proper erosion control and stormwater management measures (s) |
| | Road/stream crossings (k) | Undersized and short culverts (k), lack of runoff diversions (k), inadequate fill on road surface (k), lack of vegetation |
| | Stormwater discharges in urban areas (k) | Inadequate treatment of stormwater that may contain oils, grease, heavy metals, pet waste, etc. (s) |
| *E. coli* bacteria (k) | Septic systems (s) | Outdated, poorly maintained, and improperly designed systems (s) |
| | Livestock in streams (s) | Unrestricted access and no alternative water source (s) |
| Oils, grease and metals (k) | Stormwater discharges in urban areas (k) | Inadequate treatment of stormwater that may contain oils, grease, heavy metals, pet waste, etc. (s) |

* k = known s = suspected

### *E. Watershed Goals*

The mission of the Burt Lake Watershed Planning Project is to protect and enhance the water quality of Burt Lake and its tributaries by reducing current and future polluted runoff. The planning committee was composed of a variety of local stakeholders, some of which included the Burt Lake Preservation Association, Tip of the Mitt Watershed Council, Cheboygan County Road Commission, Conservation Resource Alliance, Little Traverse Conservancy, and Northeast Michigan Council of Governments. In addition to those that regularly the planning meetings there was a wider range of stakeholders who were invited to the meetings but did not show up. These included township officials,

health departments, the local tribe and county commissions. The meetings were posted in local papers. The goals of the project are to address each designated use in Table 6.

| Table 6: Watershed Goals to Address Threatened Uses | |
|---|---|
| Navigation | Maintain navigation in the rivers and lake by reducing any sediment inputs. |
| Aquatic life/wildlife | Protect the diversity of aquatic life within the Burt Lake Watershed by reducing the contribution of sediment, nutrients, and toxic pollutants. |
| Partial or total body contact | Maintain the excellent recreational opportunities in the rivers and lake by reducing sediment and nutrient contributions. |
| Cold water fishery | Reduce sediment and nutrient loads that threaten to harm habitat conditions for the cold water fishery in Burt Lake and its tributaries. |

### *F. Water Quality Summary*

The Burt Lake Watershed has four designated uses that are threatened: (1) navigation; (2) aquatic life/wildlife; (3) partial or total body contact; and (4) cold water fishery.

**Project Goals**
The mission of the Burt Lake Watershed Planning Project is to protect and enhance the water quality of Burt Lake and its tributaries by reducing current and future polluted runoff. Specific goals are as follows:

(1) Maintain navigation in the rivers and lake by reducing any sediment inputs.

(2) Protect the diversity of aquatic habitats within the Burt Lake Watershed by reducing the contribution of sediment, nutrient, and toxic pollutants (warm water fishery and other aquatic species and wildlife).

(3) Maintain the excellent recreational partial and total body contact opportunities in the rivers and lake by reducing sediment and nutrient contributions.

(4) Reduce sediment and nutrient loads which threaten to harm habitat conditions for the cold water fishery in Burt Lake and its tributaries.

**Navigation**
Navigation is threatened in the Sturgeon River and Maple River and locations in Burt Lake from increasing sediment. Lakeshore and streambank erosion along with road/stream crossings are known sources of sediment pollution. Suspected sources of sediment include livestock in streams, new construction, and logging activities.

Lakeshore and streambank erosion is often a result of the removal of shoreline vegetation. Angler and canoeing access points are another source of erosion on the Sturgeon and Maple Rivers. Improperly sized culverts and lack of runoff diversions are the main reason for erosion and sedimentation associated with road/stream crossings.

Livestock access to streams for a watering source can destroy the bank and cause sedimentation. New construction in the shoreline area can contribute sediment, particularly if inadequate erosion controls are used. Not maintaining buffer strips during logging is also suspected of contributing to erosion and sedimentation.

**Habitat Protection for Aquatic Life/Wildlife**
Aquatic habitat is threatened throughout the watershed from sediment, nutrients, and toxic chemicals such as oils, grease, heavy metals, and pesticides. Sediment impacts aquatic habitat by covering fish spawning areas, which makes feeding difficult and clogs gills. Nutrients harm wildlife by encouraging excessive aquatic plant growth that can deplete oxygen supplies when the plants decompose. Toxic chemicals harm aquatic life by weakening immune systems and making organisms more susceptible to disease. They can also harm reproduction, and, if concentrations of the toxic materials are high enough, they can kill aquatic life.

Sources of sediment pollution are the same as mentioned above under threats to navigation. Known sources of nutrient pollution include lakeshore and streambank erosion, road crossings, and lawn care on residential properties. Suspected sources of nutrient pollution include septic systems, livestock in streams, stormwater discharges in urban areas, manure application and management, golf courses, and new construction. Oils, grease, and heavy metals are known to originate from stormwater discharges in urban areas and road/stream crossings. Pesticides may be contributed from agricultural fields and residential lawns.

Nutrients often attach to sediment particles. So when erosion from lakeshores, streambanks, and road/stream crossings occurs, it contributes not only sediment pollution but also nutrient pollution. Residential properties are possible sources of fertilizers with phosphorus which can contribute nutrients that encourage nuisance plant and algae growth.

**Recreation (Partial and Total Body Contact)**
Nutrient pollution can stimulate nuisance levels of aquatic plant and algae growth that disrupt recreational activities and make swimming and boating undesirable.

Additionally, high bacteria counts can make it *unsafe* for swimming. Although these scenarios currently do not exist for Burt Lake and its tributaries, preventative measures are essential to maintain the diversity and quality of recreational opportunities in this watershed.

Sources and causes of nutrients have been described previously. Suspected sources of bacteria include stormwater discharges in urban areas, manure application and storage, and livestock access to streams. Stormwater discharge in urban areas can collect and deposit pet and wildlife waste into Burt Lake. Agricultural areas are also possible sources of bacteria. Excessive application of manure, runoff from manure piles, or livestock access to streams can all be causes of bacteria pollution.

**Cold Water Fishery**
Burt Lake is fortunate to be able to support both a warm- and cold-water fishery. The majority of the rivers and streams in the watershed also support a cold-water fishery.

Sediment, nutrient, and toxic pollution (oils, grease, heavy metals, and pesticides) can all be harmful to a cold-water fishery.

In the lake, nutrients are potentially the most harmful. Excessive aquatic plant growth as a result of nutrient pollution can decrease the oxygen available in the bottom of the lake (hypolimnion) during the summer months. In rivers, sediment may be the most harmful pollutant to the cold-water fishery. As mentioned previously, it destroys habitat and can harm the health of fish.

## Chapter Two: Priority Area

The "priority area" is that portion of the watershed which is most sensitive to environmental impacts, and which has the greatest likelihood to affect water quality and aquatic habitat. USGS topographic maps were used as a base for delineating the priority area for Burt Lake. Supplemental information was used to identify sensitive areas. Other sources used included USDA Soil Surveys, Groundwater Education in Michigan (GEM) ground water studies, the Farrand map of surficial geology, and a Tip of the Mitt Watershed Council survey of shoreline wetlands.

The priority area for Burt Lake includes the following areas:

1. Areas within 1000 feet of the following features:
    A. Burt Lake
    B. Other inland lakes in the watershed
    C. Tributary streams (including intermittent drainages)
    D. Contiguous wetlands. (For the Burt Lake Watershed, a contiguous wetland is defined as a wetland within 500 feet of streams or other lakes within the watershed)
    E. Urban areas which drain to surface waters via storm sewers and/or drainage ditches.

2. Areas of steep slopes contiguous with any priority perimeter described above. Regarding water resources, the definition of a steep slope seems to range widely in the literature (from 8 to 25%). For this priority area determination, a 10% slope (or 1:10 ratio, or 6 degrees) or greater is recommended.

## Chapter Three: Nonpoint Source Pollution Inventories

The inventories conducted to document nonpoint source pollution included field data collecting inventories to identify current sources and causes of pollution as well as potential sources. Below are summaries of the inventories conducted and their results.

**1. Burt Lake Shoreline Inventory**
A shoreline survey to identify locations of nutrient pollution (using Cladophora as an indicator), shoreline erosion, bottom sediment type, and shoreline development characteristics was performed by the Tip of the Mitt Watershed Council (Watershed

Council) during the spring of 2001.

Cladophora is a branched, filamentous, green algae that occurs naturally in small amounts in Northern Michigan lakes. Its occurrence is governed by specific environmental requirements for temperature, substrate, and nutrients. It is found most commonly in the wave splash zone and shallow shoreline areas of lakes, and can also be found in streams. It grows best on stable substrates such as rocks and logs. Artificial substrates such as concrete or wood seawalls are also suitable. The preferred water temperature is 50 to 70 degrees Fahrenheit. This means that late May to early July, and September and October are the best times for its growth in Northern Michigan lakes.

The nutrient requirements for Cladophora to achieve large, dense growths are greater than the nutrient availability in lakes with high water quality, such as Burt Lake. Therefore, the presence of Cladophora can indicate locations where relatively high concentrations of nutrients, particularly phosphorus, are entering a lake. Sources of these nutrients can be due to natural conditions, including springs, streams, and artesian wells that are naturally high in nutrients due to the geologic strata they encounter; as well as wetland seepages which may discharge nutrients at certain times of the year. However, the majority of Cladophora growths can be traced to cultural sources such as lawn fertilization, septic systems, poor agricultural practices, soil erosion, and wetland destruction. These nutrients can contribute to an overall decline in lake water quality. Additionally, failing septic systems can pose a potential health risk due to bacterial and viral contamination.

Periodic repetition of shoreline algal surveys are important for identifying chronic problem sites as well as recent occurrences. They are also valuable for determining long-term trends of nearshore nutrient inputs associated with land use changes, and for assessing the success of remedial actions.

Erosion, the wearing away of the land surface by physical forces, is a natural, although slow, process along shorelines. However, erosion can be accelerated (often by human activities) and result in environmental problems and property damage. Oftentimes, erosion control projects are not based on current best management practices, and they can be ineffective or even result in more water quality impacts or habitat loss. This survey noted areas of visible, accelerated erosion, including gullies or rills on the land surface, undercut, slumping, or receding banks or shorelines, or bare soil on slopes or steep banks. In addition, ill-conceived or ineffective erosion control projects were noted, as was the widespread (and often illegal and environmentally damaging) practice of beach sanding.

As previously mentioned the type of shoreline or nearshore bottom type (termed substrate) is a critical factor in the occurrence of Cladophora. It also has great implications for the erodability of the shoreline, recreational activities, and the lake's ecology (for instance, many fish only spawn in gravelly or rocky substrates).

A database containing numerous information fields (tax identification number, description of the property or development as viewed from the water, and names and addresses of property owners) was developed by the Watershed Council. The database and maps were intended to facilitate repeat shoreline surveys. When used in conjunction with the

parcel maps, the location of Cladophora growths are revealed.

The shoreline was visually surveyed by traveling in a small boat (mostly by kayak) as close to the shoreline as possible (usually 5 to 20 feet). The locations of significant Cladophora growths, sites of erosion concern, bottom substrate, and property description were recorded on a printout of the 1995 parcel maps and/or the 1996 database.

When Cladophora growth was observed, it was described by estimating the length (feet) of shoreline it covered and the density or amount of available substrate that was utilized. The density description was divided into three categories, Light (L) 0-25%, Medium (M) 25-75%, or Heavy (H) 75-100%. For example, if Cladophora covered half the rocks along a 25-foot length of shoreline, it would be described 25 x M. Cladophora growths smaller or less dense than 5 x L were considered to be insignificant, and were not recorded. When an algal growth occurred between two houses and could not be affirmatively associated with either one, the growth was indicated as occurring at both locations on the shoreline database.

Although the size of the growth on an individual basis is important in helping to interpret the cause of the growth, quantitative descriptions of Cladophora are greatly influenced by such factors as current patterns, shoreline topography, size and distribution of substrate, and the amount of wave action the shoreline is subject to. Therefore, the description has limited value when making year-to-year comparisons at a single location or estimating the relative amount of shoreline nutrient input. Rather, the presence or absence of any significant growth at a single site over several years is the most valuable comparison. It can reveal the existence of chronic nutrient loading problems, help interpret the cause of the problems, and assess the effectiveness of any remedial actions. Comparisons of the total number of algal growths can reveal trends in nutrient input due to changing land use.

Among other things, the distribution and size of each Cladophora growth is dependent on the amount of suitable substrate present. The extent of suitable substrate should therefore be taken into account when interpreting the occurrence of individual growths, and assessing the overall distribution of Cladophora along a particular stretch of shoreline. A description of the type of substrate present at each homesite was recorded during the survey (e.g., sand, rocks, riprap, logs, etc.).

Many species of filamentous green algae are commonly found growing in the nearshore regions of lakes. Positive identification of these species usually requires the aid of a microscope. However, Cladophora usually has an appearance and texture that is quite distinct to a trained surveyor, and these were the sole criteria upon which identifications were based.

Other species of filamentous green algae can respond to an external nutrient source in much the same way as Cladophora, although their value as an indicator species is not thought to be as reliable. When other species occurred in especially noticeable, large, dense growths, they were recorded on the survey maps and described the same as those of Cladophora.

The bottom substrate (or sediment) survey was conducted in that area of the lake where

the bottom was visible. Where a wide, shallow nearshore area was present, the focus of the data collection was generally within about 50 feet of shore. Sediments were assessed visually, by probing with a paddle or oar to judge texture, or by closer examination in a few cases.

Approximately 983 property parcels were identified along Burt Lake's shoreline. The number is approximate because property boundaries were not always evident. Cladophora growths were associated with 200 property parcels (Table 7). The complete shoreline survey can be found in Appendix I.

| Table 7: Burt Lake Cladophora Survey Summary | |
|---|---|
| | ***Inventory Date: 2001*** |
| Shoreline Property Parcels | **983** |
| Cladophora Growths | **200** |

**A. Cladophora and Septic Systems**

A septic system that is carefully designed, built, and maintained can be an effective, environmentally safe means of disposing of household wastewater, but misuse, neglect, overuse, inadequate soils, etc. may lead to overflow of solids and overloading of the capacity of the bacterial system or the oxygen supply needed for the decay process in the drain field. The tile may then become clogged causing the odorous effluent to seep up to the surface. Soils, too, can become overloaded with waste by accumulating particles or slime from the wastewater. Nutrient absorption sites on soil particles can also become saturated. Structural damage to the system can also occur from compaction caused by driving vehicles over the drain tile. These situations can all lead to septic system failure. Health hazards may develop if bacteria, viruses, or certain chemical compounds reach the surface or ground water that is used for drinking, fishing, or body contact recreation. Nutrients from the wastewater may reach the lake and cause excessive growth of algae and acceleration of the eutrophication process.

The management of unsewered development throughout the Burt Lake Watershed occurs at the local government level. The governmental structure which regulates individual land use decisions is composed of the following: local elected officials, planning commissions, district boards of health, appeals boards, and civil servants (Health Department and code enforcement officials).

Water quality protection is indirectly reflected through the District's Sanitary Code, which specifies septic system isolation distances, and through the County and Burt Township zoning ordinances which also specify isolation distances and standards. The District Health Department, operating under the Sanitary Code, enforces onsite wastewater treatment design and construction standards. The Health Department's responsibility is to insure that proposed onsite systems are allowed in locations which will provide adequate wastewater treatment and public health protection.

The first step in evaluating septic system suitability under the district sanitary code is the soil evaluation. Test borings are required to at least five feet below the finished grade to

determine ground water table and soil formation. Percolation tests are then conducted to determine the porosity of the soil at a 3- to 4-foot depth. Minimum depth to the high ground water table must be at least four feet below finished grade. Isolation distances are also specified in the District #4 Sanitary Code (the code that applies to Burt Lake) and are shown in the following Table.

Minimum Isolation Distances

| | Septic Tank | Tile Field | Absorption Bed |
|---|---|---|---|
| Lake or Stream | 75’ | 100’ | 100’ |
| Drop Off – Sheer Cliff | 10’ | 15’ | 20’ |
| Foundation Wall | 5’ | 10’ | 10’ |
| Property Line | 10’ | 10’ | 10’ |
| Water Pressure Lines | 10’ | 10’ | 10’ |
| All Wells or Suction Lines | 50’ | 50’ | 50’ |

If the physical conditions of the site meet the requirements within the sanitary code, then a construction permit may be issued by the sanitarian. If the soil evaluation indicates that the soil will not support a standard septic system designed using the criteria established in the sanitary code, then design modifications are considered to determine if an alternative type of system can be designed to meet sanitary code requirements. In the majority of the sites that do not meet the minimum isolation distance to the high ground water table in District #4, mound systems are recommended.

If the soil evaluation and/or construction permit is denied, a formal appeals procedure is available. In Cheboygan County, the Appeals Board is composed of elected officials. In most cases in Cheboygan County, if the denied permit is appealed, the decision of the Cheboygan County Health Department staff is almost always overturned and the permit is approved with design modifications.

Once the septic system is installed, the role of the Health Department is largely to disseminate information and advice -- and usually only if problems occur. Problems can range from clogging of drainfields with sewage effluent ponding on the surface to contamination of a lake, stream, or ground water. If a septic system is not functioning properly the Health Department can rectify the problem by recommending construction of an alternative system. If adequate space is available and isolation distance to the groundwater table is not a problem, then a second drainfield would be constructed. Around Burt Lake, mound systems are the most common replacement systems used.

Currently, there is no periodic water quality monitoring of the impact of septic systems on ground or surface water quality. One exception is that certain lending institutions are requiring well water to be sampled and minimal septic inspections conducted prior to real estate closings.

The full value of a shoreline survey is only achieved when the information is used to educate riparians about preserving water quality, and to help them rectify any problem situations. A "follow-up" effort of this nature has occurred on several other lakes where the Tip of the Mitt Watershed Council has conducted shoreline surveys.

Follow-up actions recommended include:

1. Send a general summary of the survey results to all shoreline residents, along with a packet of informational brochures. Provide information about practical, feasible, effective actions to protect water quality.

2. Keep the specific results of the survey confidential--in other words, do not publish a list of sites where filamentous algae or high conductivity readings were found.

3. Inform those owners of properties with either filamentous algae growths or a high conductivity reading of the specific results for their property, ask them to fill out a questionnaire in a attempt to interpret causes of the growth or reading, and offer individualized recommendations for water quality protection. Following the questionnaire survey, site visits coupled with ground water testing are sometimes performed in an effort to gain more insight into the nature of the findings.

4. Repeat some version of the survey periodically (every five years or so), coupled with follow-up mailings in order to promote water quality awareness and good management practices on an ongoing basis. During each subsequent survey, more information about shoreline features should be added to the database.

**2. Streambank Erosion Inventory**

Burt Lake's three largest tributaries, the Crooked, Maple, and Sturgeon Rivers are good quality fisheries. All three of the systems have been impacted to an extent by streambank erosion, but for the purposes of the lake management plan, the focus is on the Maple and the Sturgeon. The omission of the Crooked River is due to the recognition that most of the erosion sites on the Crooked are classified as minor and that they are largely a result of boat wake.

Table 8: Burt Lake Streambank Erosion Survey Results

| ***Subwatershed*** | ***Severe*** | ***Moderate*** | ***Minor*** |
|---|---|---|---|
| Maple River | 2 | 9 | 9 |
| Sturgeon River | 8 | 29 | 27 |

**3. Road/Stream Crossing Inventory**

The Road/Stream Crossing Inventory was coordinated by the Conservation Resource Alliance and the Tip of the Mitt Watershed Council. The Conservation Resource Alliance, with support from the Frey Foundation for their River Care program, conducted the inventory for the Maple River sub-watershed. They also provided training and coordinated the inventory for the remaining sub-watersheds. The Tip of the Mitt

Watershed Council and the Burt Lake Protection Association coordinated the surveys for the Sturgeon River and the smaller tributary streams. All of the data was collected into an Access database and was utilized to compile the final report.

The purpose of the inventory was to comprehensively identify and document all of the crossing sites on the tributaries in the Burt Lake Watershed. Potential road/stream crossings were identified using a variety of map sources and field exploration. Each crossing that appeared to have regular flow connected to Burt Lake was inventoried. With the exception of private drives, all vehicle access roads were included. All potential sites were investigated. In some instances, no crossing was present, or there appeared to be no significant flow (and therefore no significant pollutant contribution) during any time of the year. These locations were not identified as numbered crossings and do not appear in the inventory.

Each site was visited to assess potential impacts and problems. Data collected at the crossings included detailed information about the location: road characteristics (width, shoulder, drainage, surface); culvert condition; and erosion and runoff problems. Basic stream characteristics such as width, depth, current, and substrate were also recorded. Field data was collected by both resource professionals and trained volunteers.

In order to help prioritize road/stream crossings for improvement, a severity ranking index was used. The severity ranking system used is identical to that used on a number of previous road/stream inventories completed by the Conservation Resource Alliance and other agencies throughout Michigan. Three classifications are used in the severity ranking: SEVERE (30 points or more); MODERATE (15-29 points); and MINOR (less than 15 points).

The inventory information is organized by sub-watershed (Maple River – Appendix II, Crooked River – Appendix III, and the Sturgeon River and remaining Burt Lake sites – Appendix IV). The inventories contain maps of compiled sites and site-specific plates with individual location maps, a photograph, and key information for each crossing. Also included in the inventories are the field data forms with site sketches, site severity scoring worksheets, and the cost estimating worksheets used to record all inventory information. The table below summarizes the crossings by each sub-watershed.

Table 9: Burt Lake Road/Stream Crossing Survey Results

| ***Subwatershed*** | ***Severe*** | ***Moderate*** | ***Minor*** |
|---|---|---|---|
| Maple River | 3 | 13 | 9 |
| Sturgeon River & Burt | 14 | 88 | 8 |
| Crooked River | 1 | 2 | 2 |

**4. Recreational Impact Assessment**

The Sturgeon River is known throughout Michigan as an excellent trout stream and a great canoeing river. The rail corridor pathway, recently acquired by the Michigan Department of Natural Resources (MDNR), crosses the Sturgeon and follows its banks in many locations. The trail is becoming a popular hiking spot, biking, and snowmobiling

destination. These activities are important for fostering an appreciation of natural resources and supporting the local economy that depends on nature-based tourism. However, recreational activities can be a source of nonpoint source pollution. An assessment of the impacts of canoeing and canoe access sites, fishing and angler access sites, and hiking was conducted.

**A. Canoeing**

The majority of canoeing on the river is through two liveries. On the Sturgeon River there is one primary launch site at Wolverine. There are two primary take-out points: Rondo Road and South White Road. Because of the heavy use, there is erosion occurring at some of these locations.

**B. Fishing**

Fishing access to the Sturgeon River largely consists of "pullover" spots off the gravel roads. Access sites, including the MDNR access sites, were inventoried and assessed. Some of these sites are linked to short trails to access the river. Some of these sites had campfire circles and small piles of trash. Although most people who fish take responsibility for their actions, there are those who may leave litter behind. This was one main problem with such sites. The other main problem was that of bank erosion at heavily used sites. Since most of the sites are not official access locations, maintenance is not managed by any governmental entity or organization. On the Maple River the Miller Van-Winkle Chapter of Trout Unlimited has taken an active interest for years in improving access locations and maintaining a sand trap in the Brutus Road area.

**C. Non-Motorized Trail**

A railway corridor crosses the Sturgeon River and travels through many wetland areas. After years of use, the cumulative impact of multiple uses has led to resource degradation in some sensitive areas. There are several locations where the rail corridor crosses spring-fed seeps or feeder streams in wet, mucky areas that are eroding or washing out. In other areas there is erosion from the impact of users. There are a few other minor repairs needed along the trail to reduce erosion and runoff into the Sturgeon River.

**5. Land Protection**

Burt Lake is a high quality resource. To preserve this status it is essential to work towards reducing future sources of pollution as well as addressing known sources. Protecting valuable shoreline wetlands and maintaining the ecological integrity of the uplands and wetlands in the priority area are particularly important. The Little Traverse Conservancy works to identify which parcels of land, if protected, would help to maintain and/or improve the water quality of lakes and rivers in the Burt Lake Watershed. The Burt Lake Preservation Association is co-coordinating with the Little Traverse Conservancy in this important effort.

The primary criteria used to identify key parcels for protection included:

- Size -- over 40 acres in size
- Lands adjacent to protected land
- Lands containing high value wetlands as inventoried by the Tip of the Mitt Watershed Council
- Land containing at least 1/4 mile of lake, river, or stream frontage

Maps were produced that identify parcels that meet these criteria. Properties that had three or four of the criteria were classified as priority. Secondary properties included those that were 40 acres or greater and met one other criteria. The maps are to be used as a planning document only. A database with information on ownership of the parcels has been developed. The database will be used to contact property owners and inform about voluntary stewardship efforts for land protection and watershed management.

**A. Forestry**

Forestlands make up the majority of the Burt Lake Watershed. Like other large watersheds in Northern Michigan (e.g., Black and Mullett Lakes), the Burt Lake Watershed contains a significant amount of state land and land owned by the University of Michigan. The Tip of the Mitt Watershed Council conducted an assessment of forest lands. The assessment included site visits and a road-side review. The drive-by road survey was also conducted throughout the entire watershed. State forest management activities were inventoried.

Table 10: Causes for Each Pollutant Source

| ***Pollutant Source*** | ***Cause*** |
|---|---|
| Lakeshore and streambank erosion (k) | Shoreline development and removal of shoreline vegetation (k), angler and canoeist access (k), road/stream crossings (k) |
| Road/stream crossings (k) | Undersized and short culverts (k), lack of runoff diversions (k), inadequate fill on road surface (k), lack of vegetation |
| Livestock in streams (k) | Unrestricted access and no alternative water source (k) |
| New construction (s) | Lack of proper erosion control and stormwater management measures (s) |
| Logging activities (s) | Inadequate buffer strips near streams (s) |
| Lawn care on shoreline properties (k) | Use of phosphorus fertilizer (s), over application of fertilizers (k), misuse and over use of pesticides (s), removal of native shoreline vegetation (k) |
| Septic systems (k) | Outdated, poorly maintained, and improperly designed systems (k) |
| Stormwater discharges in urban areas (k) | Inadequate treatment of stormwater that may contain oils, grease, heavy metals, pet waste, etc. (k) |
| Manure applications and management (k) | Over application of manure (k), lack of proper storage for manure (k), inadequate testing of soil properties (s) |
| Golf courses (s) | Heavy applications of fertilizers and pesticides (s)<br>Lack of buffer strips in riparian areas (s) |
| Agricultural fields (s) | Heavy use of pesticides(s) |

* k = known s = suspected

**B. Land Use Controls**

Zoning is the principal means of land use control in the watershed. Land use around Burt Lake is under two different zoning ordinances depending upon the township. Tuscarora Township is under Cheboygan County Zoning while Burt Township is under its own ordinance. Historically, zoning was devised to avoid conflicting land uses in urban areas with only minimal concern given to water quality and environmental concerns. Historically, a lack of local land use controls allowed lakeshore development to occur which may affect water quality. This includes dense shoreline development on small lots, funnel development, and inadequate setbacks. All of these have the potential to increase nutrient loading to the lake. In addition to zoning, other similar land use control measures include: critical area protection, property acquisition, taxation, and charges.

Zoning and land use controls are applicable to areas that are in the process of development and can be effective in controlling nonpoint pollution. Zoning methods that serve to diminish water resource impacts are:

a) Large lot zoning whereby minimum lot size requirements are imposed
b) Zoning for protection of open space, which can be used for limiting the extent of impervious areas
c) Anti-funneling, which restricts extensive back-lot development
d) Greenbelt Requirements
e) Setback Requirements

The existing Cheboygan County Ordinance attempts to provide water resource protection through the Lake and Stream Overlay District and Resource Conservation District.

## Chapter Four: Ranking of Pollution Causes and Sources

Based on the preceding inventories and analyses the follow pollutants found in Table 11 were determined to be of priority.

Table 11: Burt Lake Priority Pollutants

| ***Pollutants*** | ***Priority Ranking*** |
|---|---|
| Sediment | 1 |
| Nutrients | 2 |
| Oil, grease and metals | 3 |
| Bacteria | 4 |

Table 12 outlines how each of the priority pollutants impacts designated water uses.

| Table 12: Pollutant Priorities for Each Designated Use | | |
|---|---|---|
| ***Designated Uses*** | ***Pollutant*** | ***Priority Ranking*** |
| Habitat | Sediment<br>Nutrients<br>Oil, grease, and metals | 1<br>2<br>3 |
| Coldwater | Sediment<br>Nutrients<br>Oils<br>Pesticides | 1<br>2<br>3<br>4 |
| Recreation | Nutrients<br>Bacteria | 1<br>2 |
| Navigation | Sediment | 1 |

After prioritizing the pollutants, the pollution sources and causes were prioritized. In large part the rank of both the source and the cause corresponded.

| Table 13: Burt Lake Priority Sources and Causes | | | |
|---|---|---|---|
| ***Pollutant Source*** | ***Rank*** | ***Cause*** | ***Rank*** |
| Agricultural fields (s) | 9 | Uses of fertilizers and pesticides (s) | 9 |
| Septic systems (s) | 5 | Outdated, poorly maintained, and improperly designed systems (s) | 5 |
| Lawn care on shoreline properties (k) | 2 | Use of phosphorus fertilizer (s), over-application of fertilizers (s), misuse and over-use of pesticides (s), removal of native shoreline vegetation (k) | 2 |
| Lakeshore and streambank erosion (k) | 3 | Shoreline development and removal of shoreline vegetation (k), angler and canoeist access (k), road/stream crossings (k) | 3 |
| Livestock in streams (s) | 8 | Unrestricted access and no alternative water source (s) | 8 |
| Logging activities (s) | 7 | Inadequate buffer strips near streams (s) | 6 |
| New construction (s) | 4 | Lack of proper erosion control and stormwater management measures (s) | 4 |
| Road/stream crossings (k) | 1 | Undersized and short culverts (k), lack of runoff diversions (k), inadequate fill on road surface (k), lack of vegetation | 1 |
| Stormwater discharges in urban areas (k) | 6 | Inadequate treatment of stormwater that may contain oils, grease, heavy metals, pet waste, etc. (s) | 7 |

## Chapter Five: Goals and Objectives

Goal 1: Aquatic life and wildlife. Protect the diversity of aquatic habitats within the Burt Lake Watershed by reducing the contribution of sediment, nutrient, and toxic pollutants.

Goal 2: Cold water fishery. Reduce sediment and nutrient loads which threaten to harm habitat conditions for the cold water fishery in Burt Lake and its tributaries.

Goal 3: Partial or total body contact. Maintain the excellent recreational opportunities in the rivers and lake by reducing sediment and nutrient contributions.

Goal 4: Navigation. Maintain navigation in the rivers and lake by reducing any sediment inputs.

Table 14 lists the main objectives to accomplish the above four primary goals.

**Table 14: Goals and Objectives of the Burt Lake Plan**

| *Goals* | *Objectives* |
|---|---|
| **Aquatic life**<br>**Cold-water fishery**<br>**Recreation**<br>**Navigation** | ***Reduce the amount of sediment by:***<br>Stabilizing erosion at road/stream crossings.<br>Correcting most severe lakeshore erosion sites.<br>Restoring streambank erosion from recreational access.<br>Reducing the pollutant load from stormwater in the urban areas.<br>Restricting livestock from streams. |
| **Aquatic life**<br>**Cold-water fishery**<br>**Recreation** | ***Reduce the amount of nutrients by:***<br>Reducing the pollutant load from stormwater in the urban areas.<br>Reducing the amount of fertilizer used on residential lawns.<br>Educating about manure application rates and improving manure storage.<br>Stabilizing the erosion at road/stream crossings.<br>Restricting livestock from streams.<br>Educating about septic system maintenance. |
| **Aquatic life**<br>**Cold-water fishery**<br>**Recreation** | ***Reduce the amount of toxics (oils, grease, heavy metals) by:***<br>Reducing the pollutant load from stormwater in urban areas.<br>Restoring erosion and diverting runoff at road/stream crossings. |
| **Aquatic life**<br>**Cold-water fishery** | ***Reduce the amount of pesticides by:***<br>Reducing the amount of pesticides used on residential lawns. |
| **Recreation** | ***Reduce the amount of bacteria by:***<br>Reducing the pollutant load of stormwater in urban areas.<br>Restricting livestock from streams.<br>Improving the maintenance of septic systems. |

## Chapter Six: Selecting the Most Appropriate Best Management Practices (BMPs) for the Burt Lake Watershed

Today there exists a wide variety of sources of information on BMPs for water quality protection and restoration. Selecting which BMP is most appropriate for the problem is a critical component of any watershed management plan. Based on the aforementioned findings and a review of existing literature on BMPs, the management systems found in Table 15 were selected for the Burt Lake Watershed.

Table 15: Burt Lake Watershed Best Management Practices

| ***Source*** | ***BMP Manual*** | ***Potential Systems of BMPs*** |
|---|---|---|
| Road/Stream Crossings | Guidebook of BMPs | water course crossings<br>detention basin |
| Streambank Lakeshore | Guidebook<br>U,L,C-SE | Streambank - biotechnical |
| Stormwater | Stormwater Mgt., I/E*, Guidebook, Center for Watershed Protection | Retrofitting drainage systems with BMPs to improve water quality |
| Recreation | I/E | Create brochures for marinas and boat launches |
| Lawn/Shoreline Care | Guidebook, I/E | Newsletter, brochures, and one-on-one site assessments |
| Agriculture-Livestock | Guidebook, Michigan Agriculture BMP | Cattle exclusion fencing, streambank restoration, alternative water supplies |
| Agriculture-Manure | Guidebook, Michigan Agriculture BMP | Alternative waste storage systems |
| Septic | I/E | Newsletter, brochures, and one-on-one site assessments |

*I/E = Information and education

# Chapter 7: Information and Education Strategy

The long-term protection of Burt Lake's water quality will depend on the values and actions of future generations. Educating Burt Lake Watershed residents about how their actions impact water quality is a priority. Increasing awareness and ultimately changing behaviors is the long-term antidote for water quality protection. Target audiences for education programs are identified in the table below.

Table 16: Target Audiences

| *Sources* | *Target Audiences* | *Specific Target Audiences* | *Priority* |
|---|---|---|---|
| Urban stormwater | Homeowners<br>Local government officials | Urban homeowners and residents, riparian property owners, and local government officials (townships bordering cities) | 2 |
| Lakeshore erosion | Homeowners | Riparian property owners | 5 |
| Streambank erosion | Recreational groups | Canoe liveries, canoeists, hikers, anglers | 4 |
| Livestock in streams | Agricultural landowners | Agricultural landowners with livestock (cattle, horses, sheep, etc.) | 6 |
| Lawn care | Homeowners | Riparian property owners, urban homeowners, and all watershed residents in priority area | 1 |
| Manure management | Agricultural landowners | Agricultural landowners with livestock (cattle, horses, sheep, etc.) | 9 |
| Septic systems | Homeowners | Riparian property owners | 7 |
| Shoreline development | Contractors, Realtors, Homeowners | Shoreline property builders/contractors, realtors, homeowners | 8 |
| Road/stream crossings | Road Commissions | Road Commission managers, crew workers | 3 |

The Information and Education Strategy was developed using our existing knowledge of the target audiences. Consideration of the targeted audiences perspectives was used to create the message and identify delivery mechanisms. Additional review of the message will be done prior to the implementation of any education programs.

The information and education activities will use a variety of approaches including installing demonstration sites, building partnerships, sponsoring seminars, and distributing education materials. Information and Education Strategy for Burt Lake Watershed.

| Table 17: I/E Strategy | | | | | |
|---|---|---|---|---|---|
| ***Pollutant*** | ***Source/Cause*** | ***Target Audience*** | ***Messages*** | ***Delivery Mechanism*** | ***Potential Evaluation*** |
| **SEDIMENT** | Lakeshore erosion | Homeowners, riparian property owners | Protect lake water quality for future generations and your investment | Use model biotechnical erosion control site to demonstrate restoration, newsletters and brochures. | Photographic and survey to homeowners with erosion |
| | Streambank erosion | Canoeists, anglers, canoe liveries | Protect the Sturgeon and Maple Rivers | Build partnership with local canoe liveries, involve local groups with restoration and other creative education approaches. | Interviews |
| | Livestock in streams | Agricultural landowners | Help protect water quality and save money | Conservation District and NRCS to meet with contacts and provide assistance. | Photographic and interviews |
| | Road/stream crossings | Road Commissions | Help protect water quality and save money | Work with Road Commissions for standard designs that reduce pollution and are cost effective. | Photographic and interviews |
| | Lakeshore development-construction | Contractors, Realtors, Local Government Officials, Homeowners | Protect water quality and property values | Give presentations at contractors workshop, work with local governments to standardize setback distances, and using print media educate riparians about the importance of setbacks. | Focus group |
| **NUTRIENTS** | Lawn maintenance | Landscaping and lawn care companies, homeowners, riparian property owners | Protect water quality and marketing (for lawn care companies) | Sponsor seminars for landscaping companies to learn more about water quality friendly yard maintenance. Sponsor workshops and use print media to reach riparians. | Survey |
| | Septic systems | Riparian property owners | Protect water quality and keep the water safe for swimming | Meet one-on-one with property owners that may have potential septic system problems. Provide assistance to address problems. | Interview |
| | Manure application management | Agricultural landowners with livestock | Protect water quality and save money | Conservation District and NRCS to meet with contacts and provide assistance. | Photographic and interview |
| **TOXICS--oil, heavy metals, grease, etc**. | Urban stormwater | Homeowners | We are all lakefront property owners (via drains) | Media campaign with local newspapers, radio, and TV. Mail residents information on reducing nonpoint source pollution. Storm drain stenciling in Alanson and Indian River | Survey |
| **PESTICIDES** | Lawn maintenance | Homeowners, riparian property owners | Protect lake water quality for future generations and your investment | Sponsor seminars for landscaping companies to learn more about water quality friendly yard maintenance. Sponsor workshops and use print media to reach riparians. | Focus group and survey |
| | Agricultural fields | Agricultural landowners | Protect water quality and save money | Conservation District and NRCS to meet with contacts and provide assistance. | Photographic and interview |
| **BACTERIA** | Stormwater | Shorelline and urban pet owners | Keep the water safe for swimming and protect water quality | Implement media campaign about proper disposal of pet waste and storm drain stenciling. | Survey |

## Chapter Eight: Framework of Actions to Protect the Burt Lake Watershed

The Burt Lake Watershed Planning Project developed an integrative approach to reduce existing sources of sediment and nutrient pollution and prevent future contributions. Integrating the use of (1) systems of best management practices (BMPs); (2) partnerships, community consensus building, and work with local governments, and (3) information and education components.

**Action Steps:**
Reduce sediment, nutrient, and toxic pollution to Burt Lake and its tributaries by implementing systems of best management practices on identified priority problem sites and by conducting a program of information and education for targeted audiences.

**Evaluation**
Conduct an evaluation of the project to assess whether the goals were met.

| | |
|---|---|
| Responsible Organizations: | Tip of the Mitt Watershed Council<br>Conservation Resource Alliance |
| Milestones: | Design evaluation method |
| Timeline: | Years 1 |
| Estimated Cost: | $1,000 |

Document each structural site before with multiple pictures, physical measurements, engineering plan if necessary, and a written description.

| | |
|---|---|
| Responsible Organizations: | Tip of the Mitt Watershed Council,<br>Conservation Resource Alliance |
| Milestones: | Document before and after BMPs of priority road stream crossings |
| Timeline: | Years 1-5 |
| Estimated Cost: | $1,000 |

Select and implement methods to properly evaluate the construction, operation, and effectiveness, of each best management practice.

| | |
|---|---|
| Responsible Organizations: | Tip of the Mitt Watershed Council,<br>Conservation Resource Alliance<br>Cheboygan and Emmet County Road Commissions |
| Milestones: | Design and evaluate success of priority road stream crossings BMPs |
| Timeline: | Years 1-5 |
| Estimated Cost: | $1,000 |

Select and implement methods to evaluate the success of the information and outreach components of the program

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|---|---|
| Responsible Organizations: | Tip of the Mitt Watershed Council |
| Milestones: | Design and conduct selected evaluation |

| | |
|---|---|
| | methods |
| Timeline: | Years 1-5 |
| Estimated Cost: | $1,000 |

**ROAD/STREAM CROSSINGS:**

Restore priority road/stream crossings.

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|---|---|
| Responsible Organizations | Cheboygan and Emmet County Road Commissions, Conservation Resource Alliance, Tip of the Mitt Watershed Council, Burt Lake Preservation Association, Huron Pines Resource Conservation and Development |
| Milestones: | Design and repair priority road stream crossings using BMPs |
| Timeline: | Years 1-5 |
| Estimated Cost: | $400,000 |

Develop long-term strategy to work with Emmet and Cheboygan Road Commissions and others to restore sites/periodic reassessment.

| | |
|---|---|
| Responsible Organizations: | Cheboygan and Emmet County Road Commissions, Conservation Resource Alliance, Tip of the Mitt Watershed Council |
| Milestones: | Establish steering committee. Develop long-term strategy |
| Timeline: | Year 3 |
| Estimated Cost: | $1,000 |

Develop database method to keep track of repairs/records of culverts and problems.

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|---|---|
| Responsible Organizations: | Cheboygan and Emmet County Road Commissions, Conservation Resource Alliance, Tip of the Mitt Watershed Council |
| Milestones: | Develop database. Install database at necessary agencies. Train staff in use and upkeep of the database. |
| Timeline: | Year 3 |
| Estimated Cost: | $1,500 |

Work with road commissions to use BMPs on all road maintenance/work.

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|---|---|
| Responsible Organizations: | Cheboygan and Emmet County Road Commissions, Conservation Resource Alliance, Tip of the Mitt Watershed Council |
| Milestones: | Identify suitable road-related BMPs. Compile graphics and written material on the BMPs. |
| Timeline: | Years 2-3 |
| Estimated Cost: | $1,000 |

**SHORELINE INVENTORY RECOMMENDATIONS:**

Develop remedial guidelines for redevelopment of lakeshore properties to protect/improve shoreline from nonpoint source pollution.

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|---|---|
| Responsible Organizations: | Burt Lake Preservation Association, Tip of the Mitt Watershed Council |
| Milestones: | Repeat a version of the survey periodically coupled with follow-up mailings in order to promote water quality awareness and good management practices on an ongoing basis. |
| Timeline: | Years 1-5 |
| Estimated Cost: | $1,500 |

Send a general summary of the survey results and water quality info to all shoreline residents. (Specific results will be kept confidential.)

| | |
|---|---|
| Responsible Organizations: | Burt Lake Preservation Association, Tip of the Mitt Watershed Council |
| Milestones: | Complete the survey and mail results |
| Timeline: | Years 1-2 |
| Estimated Cost: | $2,000 |

Inform property owners that have Cladophora w/questionnaire. Conduct site visits with property owners (perform ground water testing if necessary) to gain more insight on the nature of findings in the results.

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|---|---|
| Responsible Organizations: | Burt Lake Preservation Association, Tip of the Mitt Watershed Council |
| Milestones: | Mail questionnaire and conduct site visits |
| Timeline: | Years 1-3 |
| Estimated Cost: | $12,000 |

Develop guidelines for zoning to build a modest deck or other similar structures in a shoreline area.

| | |
|---|---|
| Responsible Organizations: | Burt Lake Preservation Association, Tip of the Mitt Watershed Council, Northeast Michigan Council of Governments |
| Milestones: | Complete draft of proposed waterfront standards. Present model standards to County and Townships. |
| Timeline: | Years 2-4 |
| Estimated Cost: | $2,000 |

Create and distribute educational packages to realtors, contractors, landscapers, nurseries and other whose clients are shoreline property clients. Develop/sponsor education program (certification) for lake/river realtors on special regulations and management for lake properties.

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| Responsible Organization: | Tip of the Mitt Watershed Council, Burt Lake |

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|---|---|
| | Preservation Association |
| Milestones: | Design certification program and certify no fewer then five realtors |
| Timeline: | Years 2-3 |
| Estimated Cost: | $5,000 |

Educate shoreline residents and local government officials on nearshore habitat impact from beach sand, living in mucky areas, shoreline vegetation

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|---|---|
| Responsible Organizations: | Burt Lake Preservation Association, Tip of the Mitt Watershed Council |
| Milestones: | Develop and disseminate educational materials and hold seminars on "environmentally friendly lakefront living" |
| Timeline: | Years 1-3 |
| Estimated Cost: | $5,000 |

Establish a "keeper" program on the lake that would serve as a visible ombudsman on the water that would assist in education and water resource enforcement activities.

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|---|---|
| Responsible Organizations: | Burt Lake Preservation Association, Tip of the Mitt Watershed Council |
| Milestones: | Acquire boat for Keeper and hire and train volunteer Keeper |
| Timeline: | Years 1-2 |
| Estimated Cost: | $2,000 |

**LAKE AND STREAMBANK EROSION INVENTORY:**

Repair priority streambank erosion sites on a cost/share basis along the Sturgeon River and Maple River.

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|---|---|
| Responsible Organizations: | Tip of the Mitt Watershed Council, Conservation Resource Alliance, Huron Pines RC&D, Conservation Resource Alliance |
| Milestones: | Design and implement streambank erosion BMPs for priority erosion sites. |
| Timeline: | Years 1-5 |
| Estimated Cost: | $150,000 |

Repair 15 lakeshore erosion sites on a cost-share basis along the Burt Lake Shoreline.

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|---|---|
| Responsible Organizations: | Tip of the Mitt Watershed Council, Burt Lake Preservation Association |
| Milestones: | Design and implement lakeshore erosion BMPs for 15 erosion sites. |
| Timeline: | Years 1-5 |
| Estimated Cost: | $100,000 |

Look at possible erosion on smaller streams.

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| Responsible Organizations: | Tip of the Mitt Watershed Council, |

| | |
|---|---|
| | Conservation Resource Alliance |
| Milestones: | Complete inventory of erosion sites on smaller streams. |
| Timeline: | Year 3 |
| Estimated Cost: | $2,000 |

**FORESTRY RECOMMENDATIONS:**

Establish private road standards to improve construction of forestry roads.

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|---|---|
| Responsible Organization: | Northeast Michigan Council of Governments, County Conservation Districts |
| Milestones: | Set up appropriate meetings with governmental units to attempt to establish private road standards for forestry roads. |
| Timeline: | Year 2 |
| Estimated Cost: | $2,000 |

Send information packet on forestry best management practices to key property owners in the critical areas of the watershed. Offer cost-share for development of forest management plans for private landowners in the critical area that emphasize BMPs to protect water quality.

| | |
|---|---|
| Responsible Organization: | Northeast Michigan Council of Governments, County Conservation Districts |
| Milestones: | Disseminate information and hold at least 10 meetings with private landowners. |
| Timeline: | Years 1-5 |
| Estimated Cost: | $4,000 |

**RECREATION RECOMMENDATIONS:**

Develop partnerships with area liveries; inform and involve them in efforts to improve water quality. Encourage liveries to keep track of number of users to assess overall use. Address boat wake implications on the Sturgeon River from personal watercraft use on the river.

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|---|---|
| Responsible Organizations: | Tip of the Mitt Watershed Council, local canoe liveries, Michigan Department of Natural Resources |
| Milestones: | Establish recreation committee and hold series of meetings on river management. |
| Timeline: | Year 2 |
| Estimated Cost: | $800 |

Establish rules for rivers and No-Wake Zone for Crooked River.

| | |
|---|---|
| Responsible Organizations: | Tip of the Mitt Watershed Council, Marinas, |

| | |
|---|---|
| | Michigan Department of Natural Resources |
| Milestones: | Develop a set of rules and educational materials for river uses. Establish a "No-Wake Zone for entire Crooked River. |
| Timeline: | Year 2 |
| Estimated Cost: | $2,000 |

Educate boaters and PWC users about ecologically sound boating practices (use existing materials and cooperation of Coast Guard Auxiliary).

| | |
|---|---|
| Responsible Organization: | Burt Lake Preservation Association |
| Milestones: | Compile information and establish most effective mechanisms for dissemination. |
| Timeline: | Years 1-5 |
| Estimated Cost: | $1,000 |

Reduce nonpoint source pollution from the Sturgeon River Pathway by planting vegetation, rerouting of trail, and adding educational signage.

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|---|---|
| Responsible Organizations: | Tip of the Mitt Watershed Council, Top of Michigan Trails Council |
| Milestones: | Implement BMPs in high usage areas. Determine appropriate signage areas and place educational signage. |
| Timeline: | Years 2-3 |
| Estimated Cost: | $5,000 |

**ZONING ASSESSMENT RECOMMENDATIONS:**

Provide training program to townships and planning commissions to promote conservation planning to protect water resources.

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|---|---|
| Responsible Organization: | Northeast Michigan Council of Governments, Tip of the Mitt Watershed Council |
| Milestones: | Hold series of training workshops for county and township officials on conservation planning. |
| Timeline: | Years 2-5 |
| Estimated Cost: | $20,000 |

Promote better enforcement of greenbelt regulations

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|---|---|
| Responsible Organizations: | Tip of the Mitt Watershed Council, Burt Lake Preservation Association |
| Milestones: | Set up and hold a series of meetings with Township and County officials to discuss better enforcement of greenbelt provisions. |
| Timeline: | Year 2-4 |
| Estimated Cost: | $1,200 |

Collect photos of shoreline to document the "before/after" conditions.

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|---|---|
| Responsible Organizations: | Burt Lake Preservation Association, Tip of the Mitt Watershed Council |
| Milestones: | Create photo inventory of shoreline |
| Timeline: | Year 1, Year 5 |
| Estimated Cost: | $1,000 |

Develop a yearly summary of variances of sanitary code/zoning to determine if there are water quality impacts.

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|---|---|
| Responsible Organization: | Tip of the Mitt Watershed Council |
| Milestones: | Develop and disseminate yearly summaries |
| Timeline: | Years 1-5 |
| Estimated Cost: | $800 |

Publish (more widely) time and place of appeals sanitary appeals to get more citizen involvement in decision making process.

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|---|---|
| Responsible Organization: | Tip of the Mitt Watershed Council |
| Milestones: | Work with local newspapers and Township and County officials to create mechanism for dissemination |
| Timeline: | Year 2 |
| Estimated Cost: | $500 |

**STORMWATER RECOMMENDATIONS:**

Install a series of BMPs to address stormwater problems in the Indian River area.

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|---|---|
| Responsible Organization: | Tip of the Mitt Watershed Council, Cheboygan County Road Commission, local governments, local landowners |
| Milestones: | Prioritize stormwater problem sites. Retrofit three of the highest priority sites with improved BMPs |
| Timeline: | Years 2 and 3 |
| Estimated Cost: | $20,000 |

Government official education to help with stormwater management.

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|---|---|
| Responsible Organization: | Tip of the Mitt Watershed Council |
| Milestones: | Conduct two training sessions for local government officials on good stormwater management techniques |
| Timeline: | Year 3 |
| Estimated Cost: | $2,000 |

Sample stormwater runoff as part of a school age education program.

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|---|---|
| Responsible Organization: | Tip of the Mitt Watershed Council |
| Milestones: | Offer to three area school systems a two-day curriculum on water quality and stormwater runoff |

Timeline: Years 2 and 3
Estimated Cost: $2,100

Educate businesses/places of worship about housekeeping to reduce nonpoint source pollution.

Responsible Organization: Tip of the Mitt Watershed Council
Milestones: Reproduce and distribute nonpoint pollution education materials to 100 businesses and institutions
Timeline: Years 2-4
Estimated Cost: $2,000

**LAND PROTECTION:**

Develop a Burt Lake watershed newsletter on land protection.

Responsible Organization: Little Traverse Conservancy, Burt Lake Preservation Association
Milestones: Design, layout, and distribute landowner newsletter
Timeline: Year 2
Estimated Cost: $4,000

Send follow-up letter to priority parcels identified.

Responsible Organization: Little Traverse Conservancy, Burt Lake Preservation Association
Milestones: Send letters to identified landowners
Timeline: Year 2
Estimated Cost: $1,000

Make personal contacts with landowners to properties adjacent to existing preserves.

Responsible Organization: Little Traverse Conservancy, Burt Lake Preservation Association
Milestones: Establish personal contacts with 20 landowners
Timeline: Year 2
Estimated Cost: $4,000

Continue to work with MDNR on potential assist and transfer projects.

Responsible Organization: Little Traverse Conservancy, Burt Lake Preservation Association
Milestones: Phone consultations with MDNR on potential transfer priorities
Timeline: Years 1-3
Estimated Cost: $0.00

Long-term follow up with interested landowners

Responsible Organization: Little Traverse Conservancy, Burt Lake

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|---|---|
| | Preservation Association |
| Milestones: | Continue to track interested landowners and follow up on a regular basis. |
| Timeline: | Year 3-5 |
| Estimated Cost: | $2,000 |

Work with BLPA to look at all the undeveloped properties on Burt Lake and include in inventory)

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|---|---|
| Responsible Organizations: | Burt Lake Preservation Association, Little Traverse Conservancy |
| Milestones: | Complete inventory of undeveloped properties on Burt Lake shoreline. Establish acquisition priorities. |
| Timeline: | Years 1-3 |
| Estimated Cost: | $3,000 |