

LITTLE MANISTEE WATERSHED MANAGEMENT PLAN

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TABLE OF CONTENTS

Executive Summary	Page 1
Geographic Scope & Watershed Description	Page 2
Designated & Desired Uses	Page 3
Threatened Uses	Page 3
Pollutants	Page 5
Action Plan	Page 6
Estimated Improvement Costs	Page 10
Water Quality Status	Page 10
Summary of Public Support	Page 11
Evaluation Process & Implementation Plan	Page 12
Other Sources of Watershed Information	Page 13
Appendices	Page 15

Executive Summary

The Little Manistee River flows in a northwesterly direction through Lake, Mason, and Manistee Counties in northwest lower Michigan, eventually emptying into Manistee Lake near the city of Manistee. Draining approximately 145,000 acres, this high quality, cold-water fishery is the sole source of eggs for Michigan's steelhead stocking efforts. In addition, approximately half of Michigan's chinook salmon eggs are taken from the Little Manistee River. This important designated Blue Ribbon Trout Stream also supports resident populations of brown and brook trout.

Several factors are currently threatening designated and desired uses on the Little Manistee River system. Sediment loading from eroding streambanks, road crossings, intense recreational use, and development is of primary concern. With these facts in mind, the Little Manistee Watershed Conservation Council (LMWCC) was formed in July of 1996, and currently consists of approximately 168 concerned entities in its membership. That same year, the former Northwest Michigan Resource Conservation and Development Council, Inc. (now Conservation Resource Alliance) drafted a Partnership Agreement (see Appendix) to address natural resource concerns on a watershed scale. Seventeen organizations signed the agreement, committing various resources for the protection and improvement of the watershed. Through the Partnership, an active Steering Committee was formed of representatives from those entities signing the partnership. This "Restoration Committee" set out to prioritize solutions for current watershed problems, focusing primarily on reducing sediment delivery to the system. These problems could then be addressed as funding allowed.

Since its inception, the committee has worked with the Conservation Resource Alliance and the Watershed Council to complete an inventory of stream bank erosion on the main river channel. In addition, an inventory of all road stream crossings in the watershed is completed and the work compiled in the *Pine River and Little Manistee Watersheds: Road/Stream Crossing Inventory*. To date, approximately 36 stream banks have been restored utilizing various sources of funding from the public and private sectors. Improvements were implemented at the Six Mile Bridge crossing, funded by the U.S. Forest Service. Work continues to find further funding to address erosion at remaining stream banks and road crossings. In addition, the restoration committee seeks to be proactive in addressing concerns before threats to desired uses worsen and become prohibitively expensive to resolve.

Generally, the current water quality of the Little Manistee system is good, with Department of Environmental Quality (DEQ) surveys indicating "excellent" macroinvertebrate communities at three sampling locations, and "good" at other stations. No chemicals were found in the water that exceeded Michigan Water Quality Standards, according to the 2001 survey published by DEQ. However, sediment, pollutants, increased recreational use, and development are threatening many designated uses. Protecting the current high quality of the system is a priority for resource managers and landowners within the watershed, and it is with these intentions that this plan is drafted,

with the long-term protection and use of the Little Manistee River and its tributaries of primary concern.

Geographic Scope and Description of the Watershed

The Little Manistee River originates in Lake County's Ellsworth Township approximately four miles east of the village of Luther in section 27. The river is impounded by the stream's only dam in Luther, and then flows the remaining 64 miles before emptying into Manistee Lake in Manistee County.

A small section of the river's main stem passes through northern Mason County's Meade Township along its northwesterly course. The Little Manistee watershed encompasses just three counties, draining a surface area of approximately 145,000 acres, or 227 square miles. Watershed maps showing land cover types, soils, and topography are included in the Appendix. Public lands are plentiful in the watershed and are noted on county maps and plat books. Public access can be found at many locations, including the Carrieville Campground, Old Grade Campground, Fox Bridge crossing near Irons, and Nine Mile Bridge crossing. Other access sites are also noted on county maps. Important villages along the river's route include Luther and Irons, while notable tributaries include Fairbanks Creek, Twin Creek, Clancy Creek, Stronach Creek, and Cool Creek. There are an estimated 31 miles of tributaries to the Little Manistee below Luther Dam.

Michigan's Department of Natural Resources (DNR) Fisheries Division classifies the Little Manistee River as a Blue Ribbon Trout Stream. This classification indicates that its water temperatures are cold enough to support trout throughout the year, and its waters are shallow enough for anglers to wade. The river supports resident populations of wild brown and brook trout, as well as healthy runs of chinook salmon and steelhead. A DNR operated weir located in Manistee County approximately four miles upstream from Manistee Lake harvests as many as seven million chinook salmon eggs, half of the state's annual harvest, each year. In addition, all of the state's steelhead eggs are harvested from the Little Manistee at the weir. These eggs are used as wild brood stock to support the hatchery system in Michigan, and are shipped to twenty-two other states and two other countries as well. It is safe to say that this fishery is priceless, and accounts for over one hundred thousand angler hours annually. No stockings of resident trout or steelhead are currently taking place on the Little Manistee. See the Appendix for fish data collected at the weir since 1968.

The Little Manistee watershed is composed primarily of forested land with the majority of the soils being sand. Erosion in the watershed can therefore be a detriment to water quality, as excessive sediment can enter the river from eroding banks and road crossings located throughout the watershed. These sand soils are particularly susceptible to human induced erosion. Human causes of erosion can include poor logging practices, angler foot traffic on banks, failing road crossings, and failing water control structures.

Notable examples of human caused erosion include the massive failure of Luther Dam on the main channel in both 1986 and 1992, and the impoundment failure near Rockwell Lake that devastated Fairbanks Creek in 1999. These failures contributed sediments from

the impoundments to the river downstream, burying woody debris and spawning gravel in the riverbed, as well as causing property damage. Large woody debris and spawning gravel are very important habitat components in terms of fish reproduction, growth, and survival.

Logging activities around Manistee County in the mid 1800's negatively impacted high quality waters such as the Little Manistee. Although it was not used as heavily as the neighboring Big Manistee, the Little Manistee was used to transport logs to Manistee to feed mills providing lumber for building. The first mills began operation on the Little Manistee River in 1840, and damming of the mainstream and tributaries to float logs began. The use of any stream as a logging stream typically led to erosion, as high banks were used as "rollways" to roll logs down the slopes into the water. Damage to these high banks can still be seen today at various locations along the river's course.

Designated and Desired Uses

The following are existing *designated* uses in the Little Manistee Watershed:

1. Coldwater fishery
2. Agricultural
3. Total body contact recreation
4. Industrial water supply
5. Public water supply at point of intake
6. Indigenous aquatic life and wildlife
7. Warm water fishery
8. Navigation

The following are the *desired* uses of the Little Manistee Watershed:

1. Coldwater fishery with emphasis on increasing natural reproduction of trout populations through the use of habitat improvements and erosion control.
2. Agricultural (with implementation of best management practices)
3. Total body contact recreation
4. Timber (harvest with implementation of minimum buffer strips in the riparian corridor and near tributaries)
5. Maintaining recreational uses without negative impacts to the watershed (uses include canoeing, fishing, recreation, hunting, wildlife viewing, etc)
6. Wildlife habitat, with an emphasis on identifying and improving ecological corridors through voluntary private land management
7. Wetland preservation
8. Public water supply

The following uses are currently threatened in the watershed:

Threatened Uses

Pollutants

Coldwater fishery

sediments, thermal pollution, nutrients,
toxic substances

Indigenous aquatic life/wildlife

sediments, thermal pollution, nutrients
toxic substances

Threatened Uses**Pollutants**

Navigation

sediment

Total body contact

coliform bacteria

Pollutants

The pollutants, sources, and causes are listed and prioritized in Table 1. Sites known to be contributing sediment to the Little Manistee River system are detailed in the *Little Manistee Streambank Erosion Inventory* and the *Pine River and Little Manistee River Watershed Road/Stream Crossing Inventory*. These documents are available for reference at the Cadillac MDEQ office or from the Conservation Resource Alliance in Traverse City.

Goals for Addressing Threatened Uses**Threatened Use****Goal**

Coldwater fishery

Improve fish habitat and reduce thermal pollution through sediment reduction and removal programs, in-stream habitat enhancement projects, road crossing improvements, and by developing appropriate fishing regulations.

Wildlife habitat

Improve wildlife habitat through erosion and sediment reduction, riparian corridor protection, reduction of toxin introduction, and by mapping critical wildlife corridors.

Navigation

Improve navigation through sediment reduction and in stream removal programs.

Total body contact

Limit unrestricted livestock access to streams, locate faulty septic systems and replace, encourage municipal sewers.

The following are water quality improvement and protection goals established by the Little Manistee Partnership. If implemented as outlined, these goals will assure the desired uses will continue to be met in the watershed, and will address threatened uses at the same time.

1. Protect and improve the water quality of the Little Manistee and its tributaries.
2. Improve the fish habitat of the Little Manistee and its tributaries.
3. Improve and protect wildlife habitat in the Little Manistee watershed.
4. Develop and increase public awareness and appreciation of the unique attributes of the watershed.
5. Preserve the character and aesthetic qualities of the watershed.
6. Maintain the Little Manistee Partnership as the most effective means for accomplishing watershed improvement and protection goals.

Action/Next Step

Please refer to the attached Summary Action Plan that outlines the objectives, tasks, estimated costs, milestones, timeline and responsible parties for each of the improvement

Little Manistee Watershed Prioritized Pollutants, Sources, and Causes

POLLUTANTS (listed in order of importance)	SOURCES (listed in order of importance)	CAUSES (listed in order of importance)
Sediment	<ol style="list-style-type: none"> 1. poorly designed or failing road/stream crossings 2. eroding streambanks 3. poor livestock practices 4. oil, gas & water well development 5. Dredging 	<p>(1a) Poor engineering, (1b) inadequately sized culverts, (1c) lack of erosion and surface run-off control, (1d) steep approaches, (1e) culverts not aligned to original streambed. (2a) 19th century logging practices, (2b) deforestation, (2c) human access and recreational pressures, (2d) sandy soils. (3a) Unlimited access by livestock to mainstream and tributaries. (4a) Resulting stream crossings from well development, (5a) Spoils released from failed containment ponds</p>
Nutrients	<ol style="list-style-type: none"> 1. Poor livestock practices 2. Poor agricultural practices 3. Mismanaged or improperly placed septic systems 4. Lawn fertilization 	<p>(1) unlimited access of livestock to tribs and mainstem. (2a) over-use of chemicals, (2b) removal of streambank vegetation for crops, (2c) lack of control of run-off, (2d) inappropriate fertilizer and manure use in the riparian corridor. (3a) overflow and poor maintenance of septic systems, (3b) aging systems, (3c) poor design/placement. (4) lawn fertilization in the riparian corridor.</p>
Thermal pollution	<ol style="list-style-type: none"> 1. deforestation 2. development and impervious surfaces 3. Luther impoundment & other man-made impoundments on the mainstream and tributaries 4. beaver dams 	<p>(1a) removal of riparian canopy, (1b) poor BMPs in logging practices. (2a) sprawl due to lack of planning, (2b) lack of stormwater drainage management, (2c) poor construction practices, (2d) lack of appropriate zoning (3a) private dam construction on tributaries, (3b) old dam structures. (4a) lack of control of the beaver population.</p>
Toxic substances	<ol style="list-style-type: none"> 1. poorly designed or failing road/stream crossings 2. Improper ORV access 3. potential parking lots 4. refuse dumped near or in the stream and tributaries 5. Agricultural chemicals 	<p>(1a) Poor engineering, (1b) lack of erosion and surface run-off control, (1c) steep approaches, (1d) steep, bare or non-existent embankments. (2a) lack of enforcement and education of ORV users. (3a) improper stormwater management, (3b) improper placement of parking areas in riparian corridor. (4,5) lack of enforcement and education for people who dump garbage or chemicals in the watershed.</p>
Hydrologic flow	<ol style="list-style-type: none"> 1. failing or poorly designed road/stream crossings 2. impervious surfaces and development 3. Deforestation 4. Dams/impoundments 5. Deposition areas 6. Global warming trends 	<p>(1a) Poor engineering, (1b) inadequately sized culverts, (1c) culverts not aligned to original streambed. (2a) lack of planning, (2b) lack of stormwater management. (3a) removal of trees and vegetation in the riparian corridor and floodplain areas that help curtail the erosive effects of flooding. (4) man made and animal impoundments alter free flowing characteristics and habitat (5) sediment deposition interferes with navigation (6) combustion of fossil fuels</p>
Bacteria	<ol style="list-style-type: none"> 1. Septic systems 2. Agriculture and livestock 3. Wildlife 	<p>(1) Failing septic systems (2) Poor agricultural practices (3) Other direct fecal contamination</p>

Summary Management Plan for Little Manistee Watershed
Conservation Resource Alliance 1-5-00

<div> <div>GOAL #1</div> <div>Protect and improve water quality</div> </div> <div>See Table 1 for pollutants, causes and sources.</div>					
Water Quality Objective	Task	Estimated Cost	Milestones	Timeline	Responsible Party
Reduce excessive sedimentation, nutrient loading, and thermal pollution to the Little Manistee and its tributaries.	1. Repair moderate and severe road/stream crossings to curtail sedimentation.	\$3.2 million	a. Road/stream inventory completed, b. Prioritize and seek funding for road crossings in need of repair, c. Crossing repairs.	Inventory completed, seek additional funding for remaining sites.	Little Manistee Restoration Committee, LMWCC, Lake County Road Commission, CRA
Tasks 1, 2, and 3 address sedimentation, hydrology, and toxic pollution.	2. Complete streambank stabilization at approximately 35 moderate and severe sites to prevent excessive sedimentation.	\$240,000	a. Inventory of erosion sites is complete, b. Site plans and permits as needed, c. Continue to seek funding for repair work (36 sites completed to date). Continue to monitor for additional erosion.	Activities on-going.	Conservation Resource Alliance (CRA), Little Manistee Restoration Committee, LMWCC
	3. Incorporate sand traps to control sedimentation.	\$12,000 for first year & up to \$8,000/year on-going per basin	a. The sites have been chosen for 2 sand traps, b. Seek funding for sand removal activities, c. Acquire permits and easements as necessary, with additional sites likely in the future.	Select first site by Spring 2001, seek funding and apply for permits/easements in 2001	Conservation Resource Alliance (CRA), Little Manistee Restoration Committee, LMWCC
Addresses nutrient loading and bacterial pollution.	1. Engage landowner education on septic system management and fertilizer use to help control excessive nutrient inputs. Also educate agricultural community on livestock access to streams and fertilizer and manure applications.	\$2,500/year for materials and distribution expenses	a. Utilize the Mason-Lake Conservation District/MSU Extension septic education program for base material, b. Utilize Mitchell Creek handbook for reference material, c. Promote Conservation District Forester services, d. Establish materials outreach.	Summer 2001, on-going thereafter	Little Manistee Watershed Conservation Council, County Health Departments
Addresses thermal pollution.	1. Promote reforestation in buffer zones to protect water temperatures and reduce sedimentation. Minimize impervious surfaces and dam installations.	\$1,000	a. Utilize the Mason-Lake Conservation District/MSU Extension education programs for base material, b. Utilize Mitchell Creek handbook for reference material, c. Promote Conservation District Forester services, d. Establish materials outreach.	Summer 2001, on-going thereafter	Little Manistee Watershed Conservation Council, MSU Extension, Conservation District Foresters.
<div> <div>GOAL #2</div> <div>Improve the fish habitat of the Little Manistee and its tributaries</div> </div>					
Water Quality Objective	Task	Estimated Cost	Milestones	Timeline	Responsible Party
Enhance instream habitat by providing additional fish cover opportunities.	1. Enhance woody debris through installation of LUNKERs when suitable on streambank repair projects, and incorporation of cover structures in stream.	\$200,000 for mainstream	a. Obtain funding for bank stabilization, b. Select sites for installation, c. Obtain permits/easements, d. Build LUNKERs, e. Installation will be on-going.	Seek funding in 2001, other tasks will follow thereafter	Little Manistee Watershed Conservation Council, CRA, USFS, MDNR Fisheries

Summary Management Plan for Little Manistee Watershed
Conservation Resource Alliance 1-5-00

Enhance instream habitat by removing artificial barriers and garbage materials.	2. Conduct annual junk clean-ups on Little Manistee and tributaries where appropriate.	\$1,000/yr with volunteer labor	a. Identify stretch for clean-up, b. Organize volunteers, c. Schedule and complete clean-ups.	Identify first clean-up stretch by June 2001, conduct clean-up July 2001, continue annual clean-ups thereafter.	Little Manistee Watershed Conservation Council
Continue with sediment reduction and removal programs listed above for improving water quality					
GOAL #3 Improve and protect wildlife habitat in the Little Manistee watershed.					
Water Quality Objective	Task	Estimated Cost	Milestones	Timeline	Responsible Party
Promote sensible stewardship among private landowners in riparian and ecological corridor areas.	1. Private lands management among landowners on a voluntary basis. This can include restricted livestock access to streams, proper application of herbicides/fertilizer, etc	\$30,000/year on-going	a. Promote reforestation efforts, b. Provide and advertise nesting boxes, c. Utilize CD forester/wildlife biologist, d. seek funding for Wild-Link in Lake, Mason, and Manistee Counties, e. complete long-term management plans with landowners on a voluntary basis, f. protect wetlands.	First 3 milestones will be on-going from 2001 on, last 2 milestones will be targeted to begin in 2002 and on.	Manistee Conservation District, Mason-Lake Conservation District, Osceola-Lake Conservation District, CRA, Little Manistee Restoration Committee
GOAL #4 Develop and increase public awareness and appreciation of the watershed.					
Water Quality Objective	Task	Estimated Cost	Milestones	Timeline	Responsible Party
Develop on-going communication about the Little Manistee watershed with riparian landowners, kids, recreational users, and other community members.	1. Develop a list of riparian and tributary landowners in the watershed	\$500 for materials plus volunteer labor	a. Go to equalization and township by township, update landowner list with tax identification information.	Updated periodically, ongoing	Little Manistee Watershed Conservation Council
	2. Incorporate an education program for kids in community schools	\$5,000/year plus volunteer labor	a. Approach school teachers to assess interest and participation, b. Refer to Water Watch program with Grand Traverse Bay Watershed Initiative, c. Complete curriculum and activities with teachers, d. Obtain feedback from kids and parents on program.	2001 and on-going	Lake, Mason, Manistee County School Districts, LMWCC
	3. Enhance recreational access sites and provide for people of all ages and abilities, such as the project completed at Fox Bridge. Also communicate with and educate recreational users	Up to \$200,000 for mainstream	a. Identify formal and informal access sites, b. Determine access, financial and design needs, c. Obtain funding for repair work, d. Implement design and construction needs.	On going	MDNR Parks and Recreation Division, LMWCC, CRA, Conservation Districts.

Summary Management Plan for Little Manistee Watershed
Conservation Resource Alliance 1-5-00

	4. Obtain more local coverage in local and interest group papers and newsletters.	\$500/year for materials plus volunteer labor	a. Invite local media to council meetings, b. Issue on-going news releases of project and partnership successes.	on-going	Little Manistee Watershed Conservation Council, CRA, USFS, MDNR Fisheries
GOAL #5 Preserve the distinctive character and aesthetic qualities of the watershed.					
Water Quality Objective	Task	Estimated Cost	Milestones	Timeline	Responsible Party
<i>Make riparian landowners, potential buyers, and realtors aware of the diverse opportunities in land, water quality and habitat protection and improvement for the Little Manistee.</i>	1. Promote voluntary conservation easements among private landowners	\$10,000/year or volunteer efforts	a. Identify the special qualities of conservation easement, b. Communicate with the local conservancy, c. Do a mailing to riparian landowners informing them about benefits of conservation easements and additional information.	2000 and on-going	CRA, LMWCC, local regional land conservancies.
	2. Conduct some type of outreach to developers and real estate people involved in business in the Little Manistee watershed.		a. Include these people in any type of brochure, news release mailings, and scheduled site visits.	on-going	LMWCC
	3. Develop appropriate zoning and stormwater ordinances for developing areas to prevent additional pollution and protect the watershed.	\$100,000			
	4.. Promote township clean-up days and recycling	volunteer efforts	a. Inform new landowners about clean-up days, b. Support and encourage local efforts for clean-up days.	on-going	LMWCC
<i>At access places where the public can come in contact with the river, promote structures that are designed with rustic and natural influences.</i>	1. Encourage natural type, rustic improvements at access and road contact points	cost included in road xing, access repairs	a. Promote installation of timber box culverts and timber bridges at road crossing sites, b. Maintain on-going communication with Manistee, Lake and Mason County Road Commissions on crossing repairs and financial needs, c. Apply for and obtain matching funding sources.	on-going	LMWCC, CRA
GOAL #6 Maintain the Little Manistee partnership as an effective means for implementing improvements.					
Water Quality Objective	Task	Estimated Cost	Milestones	Timeline	Responsible Party

Summary Management Plan for Little Manistee Watershed
Conservation Resource Alliance 1-5-00

Operate the Little Manistee Watershed Conservation Council and partnership for active management of restoration projects in the Little Manistee watershed.	1. Increase membership of LMWCC, approaching clubs, interest groups, individuals and landowners to become partners.	\$500 in mailing materials, volunteer efforts	a. Identify potential members, b. Recruit members through outreach, c. Produce a brochure on the Little Manistee Watershed Conservation Council.	Spring of 2001 to start gathering brochure materials; members outreach on-going	LMWCC
	2. Seek financial means to accomplish both on-going tasks and establish River Care Working and Endowment Funds for the Little Manistee River	volunteer efforts, undetermined amount of CRA staff/fundraiser time, \$40,000/year	a. Obtain funding for on-going restoration and maintenance activities, b. Establish the Little Manistee River Care Permanent Fund	on-going	CRA, LMWCC
			Little Manistee Estimated Total Costs:	Completed tasks to date: \$125,000 3 yr. proposal tasks: \$300,000 Entire management plan: \$3,953,000 with \$96,500/year maintenance	

and protection goals for the Little Manistee Watershed. This summary is a guideline for implementing management activities in the watershed.

Estimated Costs of Implementation Activities by Category

<u>BMP and Activities Category</u>	<u>Estimated Costs</u>
Road Crossings	\$3,226,000
Streambanks	240,000
Fish cover/habitat structures	200,000
Mapping	15,000
Information/Education Activities	20,000/year
Water Quality Assessment Activities (Volunteer efforts)	10,000/year
Recreational Improvements	200,000
Fundraising and Establishing Endowment	40,000/year
Total	3,951,000

Water Quality Status/Characteristics

In July of 2000, volunteer members of the Little Manistee Watershed Conservation Council conducted water quality sampling at various locations throughout the main stream. Water samples were taken using appropriate procedures and given immediately to a water quality laboratory in Lake Ann. Parameters measured included fecal coliform bacteria, dissolved oxygen, Ammonia Nitrogen, Nitrate Nitrogen, and Phosphorus. A total of seventeen samples were taken throughout the system, and the results are detailed in the Appendix. The most notable results were the relatively high fecal coliform counts found in both Cool Creek and Fairbanks Creek. The counts are given in colonies per 100 ml, and measured 242 for Fairbanks Creek and 271 for Cool Creek. A count of over 200 will typically result in closure of public beaches by local Health Departments. Suspected sources of the bacterial colonies are agricultural sources and failing septic systems in the watershed. A complete report of the water quality samples is included in the Appendix of this document.

In addition to these quantitative measures, qualitative measures were taken using the Department of Environmental Quality's Procedure 51 for measuring water quality. The sampling methods involve noting in-stream habitat conditions, air and water temperature, channel morphology, substrate composition, surrounding land use, and the presence of macroinvertebrates. The results of the invertebrate surveys can then be used as an indicator of water quality, as certain taxa are more susceptible to the presence of pollutants.

Previous water quality measurements have been recorded on the Little Manistee. In 1999, a DEQ sponsored biological survey was conducted at three sampling locations on the river. The results were detailed in a 2001 memo stating "the river supports a good fish community which indicates that the river is achieving its coldwater fisheries designated use; the reaches surveyed contained macroinvertebrate communities rated as excellent; and the habitat (rated excellent) at the lower two stations were of much higher quality than that (rated fair) seen above Luther." These results were supported by the

water chemistry data collected at the three sampling sites. The entire 2001 report is included in the Appendix.

Generally, the current water quality of the Little Manistee system is good, with Department of Environmental Quality (DEQ) surveys indicating "excellent" macroinvertebrate communities at three sampling locations, and "good" at other stations. No chemicals were found in the water that exceeded Michigan Water Quality Standards, according to the 2001 survey published by DEQ. However, sediment, pollutants, increased recreational use, and development are all threatening designated uses.

Summary of Public Support and the Participation Process

The Little Manistee Watershed Management Plan was developed under the Little Manistee watershed partnership. The Partnership Agreement was drafted in 1996 to bring together groups interested in protecting water quality within the watershed. Seventeen entities, public and private, signed the agreement and formed a Steering Committee to prioritize restoration efforts in the watershed. Through regular meetings of the steering committee, input was gathered regarding items to be included in the management plan. Draft copies of the plan were distributed and reviewed by committee attendees, and those not in attendance were invited to request copies for their review and comment. Over 120 individuals were invited to the Partnership meeting to discuss the management plan and give input.

It is important for all involved to understand that this is viewed as a "living" document subject to additions and deletions as the tasks involved in protecting this watershed evolve and certain tasks are accomplished. In addition, new priorities currently not identified may arise as additional threats to the water quality of the Little Manistee River and its tributaries are realized. Future threats such as increased development or changes in land ownership could pose concerns currently not considered. These issues will be incorporated into this document as necessary to ensure the future of this quality resource. Other components of this plan, such as the Road Crossing Inventory and the Streambank Erosion Inventory were completed using public input and volunteer efforts. In the case of the Road Crossing Inventory, the following steering committee members assisted in reviewing and developing the data collection, severity ranking, and reporting techniques used to prepare the inventory: Amy Beyer, CRA; Les Kolk, Manistee County Road Commission; Ben Loosemore, Manistee Conservation District; Fred Kirchner, Mason-Lake Conservation District; Fay Wilson, Osceola-Lake Conservation District; Ted Wheeler, Lake County Road Commission; Ken Logan, Osceola County Road Commission; Jim Maturen, Osceola County Commissioner; Jim Williams, Wexford Conservation District; Pat McCormick, Wexford County Road Commission; Bob Stuber, Huron-Manistee National Forest; Mike Solomon, Huron-Manistee National Forest; Owen Gusler, Baldwin Ranger District; Gary Cole, Manistee Ranger District; Gloria Boersma, Huron-Manistee National Forest; Ted Borgeld, Pine River Watershed Restoration Committee; Gary Marek, Pine River Area Trout Unlimited; and Brian Myers, MDEQ Surface Water Quality Division. In the case of the stream bank erosion inventory, volunteer members of the Little Manistee Watershed Conservation Council broke the river into stretches and floated the river in segments to find problem spots. Once these

locations were identified, they were compiled into the inventory book by CRA staff. A small grant from the National Fish and Wildlife Foundation helped fund the project costs. Copies of the completed inventory were distributed to interested parties involved in the restoration project.

A Department of Natural Resources funded Watershed Assessment is planned for the Little Manistee River within the next two years, and a U.S. Forest Service sponsored assessment is planned for the next year. These assessments will contain public input portions with management options for the future benefit of the watershed. In addition, throughout the drafting of this document, draft copies were made available for review by interested partners at the Steering Committee meetings. A press release announcing the writing of this plan and highlighting water quality activities planned for the watershed was submitted to multiple media outlets. The release solicited public input into the plan by contacting the Conservation Resource Alliance. In this way, the committee was able to track progress on the document and changes could be made and incorporated along the way rather than after the entire document was completed. These techniques helped smooth the process and allowed public input into the plan.

Information dissemination and education are also components of this plan. Current efforts to construct sediment basins in the watershed include education as a major component of basin installation and maintenance. Channel conditions and invertebrate communities will be studied before, during, and after trap installation. Information dissemination continues to be a priority of both CRA and the LMWCC. Project activities on the Little Manistee are highlighted in the *Little River News*, and the *Catalyst Northwest* newsletters. These publications reach an estimated 4700 individuals combined, and offer updates and contact information for those with questions regarding any concerns they may have regarding the Little Manistee.

Evaluation Process for Plan Implementation and Goal Achievement

Long-term monitoring and evaluation is a continuing effort under this plan. Currently, there are several goals that ensure this important objective is met.

First, maintaining the Little Manistee Partnership Steering Committee as a means of implementing watershed improvements will ensure that a process for prioritizing and completing biologically important projects will be in place. Maintaining the partnership is a water quality protection goal under this plan. Constant feedback by the partnership steering committee serves as a stakeholder survey when meetings are held each quarter. Agendas for those meetings are sent to approximately 120 individual stakeholders, even if they are not actively involved in the partnership.

Second, continued water quality monitoring of the main stream and several tributaries is a priority for the Little Manistee Watershed Conservation Council (LMWCC) and the Michigan Department of Environmental Quality (MDEQ). The MDEQ and the LMWCC will continue to work together to obtain funds to be spent on water quality monitoring through grant programs offered for volunteer water quality monitoring programs. Members of the LMWCC have been trained by MDEQ personnel to collect water quality

samples and evaluate water quality based on macroinvertebrate populations present in the stream. Interest in maintaining the current efforts is high among LMWCC members.

Third, a current effort also by the LMWCC incorporates research opportunities with the construction of a sediment basin in the main stream. This project addresses several goals under this plan. In addition to removing excessive sand bedload from the river, the trap will provide opportunities to compare the conditions both before construction and after several years of operation. Characteristics to be compared under this project would include changes in channel morphology, visible substrate, and changes in the macroinvertebrate communities both above and below the location of the trap. These results can be relayed to the public after they are compiled.

Fourth, the completed erosion inventories include photos documenting site conditions at all stream banks and road crossings. As sediment sources are addressed, photos documenting before and after conditions are taken and maintained for reference. This documentation is often required of grant recipients by agencies charged with administering grant funds and allows progress to be evaluated.

Finally, as was noted in the summary of public participation portion above, the Little Manistee Partnership views this document as an evolving guide to direct natural resource restoration and protection in the watershed. By understanding that changes and additions will be made to this plan, feedback and modification throughout the implementation efforts is expected and welcome. This sort of feedback will be critical to the success of the continued protection of the water quality of one of Michigan's most important cold-water fisheries.

Other Sources of Information

Several other sources of information are available regarding the Little Manistee Watershed. The U.S. Forest Service is currently completing a comprehensive ecological assessment for the watershed. This assessment differs from the management plan in that it characterizes watershed processes, determines issues and questions, establishes the current conditions represented in the watershed, and makes recommendations based upon key questions. The management plan focuses more upon water quality issues and protection and the health of the fishery. Efforts to develop both this plan and the assessment were coordinated between the Conservation Resource Alliance and the USFS to avoid duplication of effort and incorporate information gathered from various sources.

A second future source of information regarding the Little Manistee will be the Michigan Department of Natural Resources Fisheries Division sponsored fisheries assessment. This assessment is scheduled to be written in 2002 and 2003 and will be similar in format to the already completed Big Manistee River Fisheries Assessment authored by fisheries biologist Tom Rozich. This assessment contains historical information, fish population analysis, and in-depth analysis of general habitat conditions. These assessments are used to evaluate stocking programs, the effectiveness of habitat restoration programs, and the general health of the watershed and fishery.

A wealth of information is included as attachments to this document, and more is available from files located in the Cadillac offices of the Departments of Environmental Quality and Natural Resources. The U.S. Forest Service also has information and copies of their watershed assessment available for review. This information includes additional water quality data, information on past management activities, recreational access sites, and fishery statistics. Contact information for these offices is given below.

Michigan Department of Natural Resources
Cadillac District Office
80125 Mackinaw Trail
Cadillac, MI 49601
(231) 775-9727

Michigan Department of Environmental Quality
Cadillac District Office
120 W. Chapin St.
Cadillac, MI 49601
(231) 775-3960

USDA Forest Service
Manistee National Forest
1755 S. Mitchell St.
Cadillac, MI 49601
(231) 775-2421

APPENDICES

(listed as they appear in appendix)

Little Manistee Partnership Agreement

Little Manistee Streambank Erosion Inventory (abbreviated)

Little Manistee Watershed Road/Stream Inventory
(abbreviated)

Little Manistee weir data for anadromous fish since 1968

Little Manistee Watershed Conservation Council water quality
sampling results

Little Manistee Watershed Conservation Council invertebrate
survey results

Department of Environmental Quality Biological Survey of the
Little Manistee River

Little Manistee Watershed maps

PARTNERSHIP AGREEMENT



LITTLE MANISTEE RIVER WATERSHED RESTORATION PROJECT

This document serves as a Partnership Agreement between various units of government, business and private sector organizations interested in the future of the Little Manistee River Watershed.

The parties committed to this partnership are united by a mutual concern for the conservation and improvement of the water quality, fisheries, wildlife, forestry and free flowing characteristics of the Little Manistee River; along with the belief that the restoration of this river will provide aesthetic, recreational and economic benefits for the region and the state.

BACKGROUND

The Little Manistee River has approximately 67 miles of mainstream with numerous miles of tributaries. The watershed drains approximately 145,000 acres. The river originates in the south part of Ellsworth Township in Lake County and then flows westerly towards Manistee Lake where it outlets.

The Little Manistee River is recognized as a high-quality, Blue Ribbon trout stream. For a Michigan stream it has a relatively high gradient. Gravel bottom types are present in the numerous riffle areas found in the middle reaches of the river. Shifting sand is the predominant stream bottom type in the upper and lower reaches. Spring seepage is present along most of the mainstream. The stream is especially important as a Steelhead fishery, since it is the only Michigan stream where eggs are taken for the state's hatchery system. The river fishery is sustained by natural reproduction of wild steelhead.

Unfortunately, water quality and fish habitat are being degraded due to excessive sand bedload within the stream. Sources of sand include streambank erosion, road crossings and recreational access points within the watershed. Historic land uses (19th century logging), subsequent home and road development and present day recreational use have all contributed to the resource degradation problems.

PROPOSED ACTION

The purpose of this partnership agreement is to launch an initiative to improve the water quality, fish and wildlife habitat and protect the scenic and natural resources that make this watershed unique.

We, the undersigned, concur to provide technical and financial assistance, as available, to support the Little Manistee River Watershed Project. Coordination will be accomplished jointly through the Little Manistee Watershed Steering Committee.

This steering committee will be composed of the organizations signing this partnership agreement. This committee will recommend the proposed actions within the project.

Little Manistee Watershed Conservation Council

John P. Bouys
President

12-20-96
Date

Conservation Resource Alliance, Inc.

Daniel A. Giffell
Chairman

12-30-96
Date

Lake County Riverside Property Owners Association

James F. Hines
President

12-26-96
Date

Osceola-Lake Conservation District

L. W. Hesselink
Chairman

1-23-97
Date

Manistee Conservation District

John Usher
Chairman

1-9-97
Date

Mason-Lake Conservation District

William Staben
Chairman

1-7-97
Date

Chief

Date

Indian Club

President

Date

Huron-Manistee National Forest

Supervisor

Date

Pine River Area Trout Unlimited

President

Date

Lake County Board of Commissioners

Chairman

Vice.
Chair

Date

Manistee County Board of Commissioners

Chairman

Date

Lake County Road Commission

Chairman

Date

Manistee County Road Commission

Chairman

Date

Michigan Council of Trout Unlimited

President

Date

Little River Band of Ottawa Indians

Robert G. ...
Tribal Chairman

8/14/98

Date

Michigan United Conservation Clubs

Director

Date

MDEQ - Surface Water Quality Division

Michael Stifler
Director Cadillac District Supervisor

July 6, 1998

Date

Cool Lake Property Owner's Association

Thomas M. Houting
Thomas M. Houting President
Jacquelyn R. McKellar
Jacquelyn R. McKellar Secretary

5-26-01

Date

5-26-01

Date

Michigan Steelheader's Association, Manistee Chapter

Robert W. Ecker
Chairman CHAPTER PRESIDENT

06-11-01

Date

LITTLE MANISTEE STREAMBANK EROSION INVENTORY

**M-37, Lake County, Michigan, to
Little Manistee fish weir, Manistee County, Michigan**

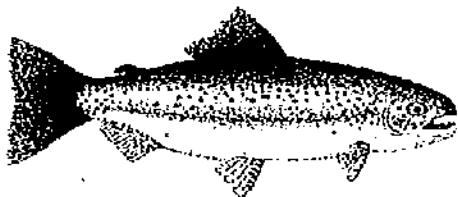


PREPARED BY:

**Conservation Resource Alliance
Grandview Plaza Building
10850 Traverse Highway, Suite 2204
Traverse City, MI 49684**

PREPARED FOR:

**Little Manistee Watershed Conservation Council
P.O. Box 52
Irons, MI 49644**



August 30, 1998



TABLE 1: SITE SUMMARY
LITTLE MANISTEE STREAMBANK EROSION INVENTORY

August-98

Location				Inventoried Bank				Recommended Treatment		
Site	Severity	Section	Landowner	Side (L/R)	Height (ft.)	Length (ft.)	Depth (ft.)	Treatment#	Rock (cu.yds.)	Est. Cost \$
Lake County										
Peacock Twp. T19N R13W										
1	Mod	3	USA	R	10	150	2	RR	130	11,700
2	Mod	9	Breindenstein?	L	6	80	1	RR	40	3,600
3	Mod	9		R	7	45	2	RR	40	3,600
4	Mod	9		R	9	75	3	RR	75	6,750
5	Mod	5	State	R	15	100	2	RR	100	9,000
6	Mod	5	State	L	15	20	2	RR	20	1,800
7	Severe	5	Indian Club	R	10	70	2	RR	70	6,300
Eden Twp. T20N R13W										
8	Minor	32	Indian Club	R	2	50	2	BR	0	500
9	Severe	32	Indian Club	R	20	125	2	RR, BR	125	11,250
10	Mod	30	Indian Club	R	15	90	3	RR	90	8,100
11	Severe	30	Dander?	R	30	60	5	RR, BR	60	5,400
12A	Minor	30	USA	L	10	20	3	RR, BR	20	1,800
12B	Mod	30	USA	L	20	120	3	RR, BR	120	10,800
13	Minor	30	USA	L	15	10	3	RR, BR	10	900
14	Minor	30	USA	R	30	25	3	RR, BR	25	2,250
15	Mod	25		L	8	40	3	RR	40	3,600
Elk Twp. T20N R14W										
16	Minor	24		R	4	20	5	RR	20	1,800
17	Minor	24	Wayward	R	5	40	3	RR	40	3,600
18	Minor	24		L	5	30	5	RR	30	2,700
19	Minor	24		L	6	60	2	RR	60	5,400
20	Mod	23		L	12	60	3	CS, RR	60	5,400
21	Minor	23		L	4	30	2	OR	30	2,700
22	Severe	22		L	20	60	4	RR	60	5,400
23	Minor	22		L	12	40	3	BR	0	500
24	Minor	22		R	15	75	3	BR, TR	0	6,750
25	Minor	22	Tad Lane?	L	15	40	2	CS, RR	40	3,600
26	Mod	15		R	35	100	3	RR, BR	100	9,000
27	Minor	15	State	R	25	25	2	BR	0	500
28	Severe	15	State	L	30	30	3	RR, BR	30	2,700
29	Severe	16		L	35	150	3	RR	150	13,500
30	Minor	16	Schwalm?	R	4	130	4	RR	130	11,700
31	Mod	16		R	10	60	2	RR, BR	60	5,400
32	Mod	8		L	30	150	1	BR	0	1,000
33	Minor	8		L	15	80	1	BR	0	500
34	Severe	8	Veneklassen	R	50	150	4	RR, BR	150	13,500

RR=rock riprap BR=bank revegetation CS=cover structure OR=obstruction removal TR=tree revetment
 CA=constructed access

Location				Inventoried Bank				Recommended Treatment		
Site	Severity	Section	Landowner	Side (L/R)	Height (ft.)	Length (ft.)	Depth (ft.)	Treatment#	Rock (cu.yds.)	Est. Cost \$

continued

Elk Twp. T20N R14W

35	Severe	8	USA	R	50	60	3	RR, BR	60	5,400
36	Mod	8	USA	R	40	60	2	RR, BR	60	5,400
37	Severe	8	USA	R	50	100	3	RR, BR	100	9,000
38	Mod	8	Judas	R	40	75	3	RR, BR	75	6,750
39	Minor	8	VanFleet?	R	3	25	2	RR, BR	25	2,250
40	Mod	7		R	5	40	3	RR, BR	40	3,600
41	Mod	7		L	5	125	2	RR, CA	125	11,250
42	Severe	6		R	30	80	2	CS, RR	80	7,200
43	Severe	7		L	30	80	4	RR, BR	80	7,200
44	Minor	1		L	25	75	2	BR	0	500
45	Severe	1		L	20	100	2	RR, BR	100	9,000

Mason County

Meade Twp. T20N R15W

46	Mod	1		R	30	60	1	BR	0	500
47	Severe	1		R	30	80	2	RR, BR	80	7,200
48	Mod	1		R	40	200	1	BR	0	1,000
49	Mod	1		L	20	130	1	RR, TR	130	11,700
50	Severe	2		L	35	100	2	RR, BR	100	9,000
51	Severe	2		L	50	100	2	RR, TR	100	9,000
52	Mod	2		L	50	75	6	RR, BR	75	6,750
53	Severe	2		L	20	70	2	RR, BR	70	6,300
54	Mod	2		R	50	40	2	BR	0	500
55	Severe	2		L	40	100	2	RR, BR	100	9,000
56	Severe	2		L	40	100	3	RR, BR	100	9,000
57	Severe	3		L	25	75	3	BR, RR	75	6,750
58	Mod	3		R	20	40	2	RR, BR	40	3,600
59	Mod	3		R	15	60	2	CA, BR	0	1,000
60	Mod	3	J. McLaughlin?	R	20	60	2	BR	0	500
61	Severe	3		L	30	100	3	RR, BR	100	9,000

Manistee Co

Stronach Twp. T21N R15W

62	Severe	35	Subdivision	L	40	60	2	RR	60	5,400
63	Mod	35	Subdivision	L	8	20	2	TR	0	500
64	Mod	34		L	25	125	2	RR	125	11,250
85	Mod	34		R	50	75	2	CS, RR	75	6,750
66	Mod	34		L	5	30	3	TR	0	500
67	Mod	34		L	50	50	3	RR	50	4,500
68	Mod	34		L	45	50	3	CS, RR	50	4,500
69	Mod	34		R	3	80	4	CS, RR	80	7,200
70	Severe	34		R	40	75	3	RR, BR	75	6,750
71	Mod	34		L	8	50	2	TR, BR	0	1,000
72	Severe	34		R	40	50	4	RR	50	4,500
73	Severe	34		R	12	100	2	RR	100	9,000
74	Severe	34		L	30	200	2	RR, BR	200	18,000

RR=rock riprap BR=bank revegetation CS=cover structure OR=obstruction removal TR=tree revetment
CA=constructed access

Location				Inventoried Bank				Recommended Treatment		
Site	Severity	Section	Landowner	Side (L/R)	Height (ft.)	Length (ft.)	Depth (ft.)	Treatment#	Rock (cu.yds.)	Est. Cost \$

continued

Manistee Co.

Stronach Twp. T21N R15W

75	Severe	33		R	50	150	4	RR	150	13,500
76	Minor	33		R	50	75	2	BR	0	500
77	Severe	33		L	10	60	4	CS, RR	60	5,400
78	Mod	*		L	50	75	3	RR, CA	75	6,750
79	Mod	*		R	25	75	4	RR, BR	75	6,750
80	Severe	*		R	30	75	4	TR, BR	0	1,000
81	Severe	*		L	12	75	4	CS, RR	75	6,750
82	Minor	*		L	4	40	2	CA, BR	0	500
83	Severe	*		R	12	125	3	RR	125	11,250
84	Severe	*		R	15	75	3	CS, RR	75	6,750
85	Mod	*		L	50	100	2	BR	0	1,000

TOTAL 481,350

* Exact location unrecorded due to poor weather during the inventory

\$ Costs are estimates used for planning purposes and subject to change

SITE LOCATIONS BY STRETCH

Sites 1-4 are located between M-37 and Spencer Bridge

Sites 5-9 are located between Spencer and Indian Bridge

Sites 10-15 are located between Indian and Johnson's Bridge

Sites 16-23 are located between Johnson's and DeWitt Bridge

Sites 24-28 are located between DeWitt and Fox Bridge

Sites 29-39 are located between Fox and 18 Mile Bridge

Sites 40-63 are located between 18 Mile and 9 Mile Bridge

Sites 64-85 are located between 9 Mile and 6 Mile Bridge

No sites were found from 6 Mile Bridge to the weir

RR=rock riprap BR=bank revegetation CS=cover structure OR=obstruction removal TR=tree revetment
CA=constructed access



**Pine River & Little Manistee
River Watershed:
Road/Stream Crossing
Inventory Report**

Volume 1

Final - July 1994

TABLE 1B
NUMBER OF CROSSINGS AND ESTIMATED COSTS TO IMPROVE VARIOUS CATEGORIES
--Little Manistee River Watershed--

Severity Category	Lake Co.	Manistee Co.	Total Number of Crossings
Severe	23	0	23
Moderate	48	8	56
Minor	4	0	4
Total Number	75	8	83(b)

Total of Estimated Costs for Improving Severe and Moderate Sites (b)	\$2,952,800	\$273,500	\$3,226,300
---	-------------	-----------	-------------

Total of Estimated Costs Including Minor Sites	\$2,952,800	\$273,500	\$3,226,300
--	-------------	-----------	-------------

Note: Cost estimates are independent from the severity ranking (see discussion in text).

- (a) The higher end of the cost estimate range (i.e., \$2,500 - ~~\$4,000~~) was used to calculate a total.
- (b) Includes two pair of county line crossings (i.e., 81 unique locations).

TROUT & SALMON

Number of trout and salmon counted at the Little Manistee River weir, spring and fall, 1968-99.					
	Spring			Fall	Fall
Year	Steelhead	Chinook	Coho	Steelhead	Brown Trout
1968	1,640	11,230	60,248	1,322	28
1969	996	26,288	25,186	3,043	36
1970	1,405	34,190	108,400	7,411	123
1971	5,031	21,213	59,123	7,622	69
1972	7,403	24,994	2,314	3,561	5
1973	6,588	16,476	11,872	1,926	48
1974	3,684	24,156	6,129	3,488	161
1975	7,183	29,228	15,863	6,121	238
1976	1,874	16,159	24,505	578	106
1977	10,480	11,136	25,255	2,031	98
1978	7,240	20,230	23,696	320	51
1979	3,540	22,925	27,925	640	100
1980	4,505	15,761	50,004	1,111	28
1981	6,307	11,811	14,656	849	101
1982	4,100	14,358	18,458	347	62
1983	5,091	39,359	26,968	3,100	43
1984	7,950	32,632	33,982	1,909	141
1985	6,517	34,006	15,256	6,356	177
1986	7,036	22,131	16,724	4,720	99
1987	6,315	31,841	15,101	1,450	48
1988	8,432	12,519	4,467	1,050	27
1989	5,102	18,338	14,023	1,130	29
1990	4,411	19,499	10,030	1,521	55
1991	6,109	21,067	12,300	3,666	113
1992	4,597	15,866	13,441	3,054	104
1993	6,156	12,911	18,096	1,702	118
1994	4,411	11,886	562	2,849	126
1995	3,553	13,004	394	351	31
1996	9,057	17,090	2,572	5,249	174
1997	7,096	15,433	781	915	123
1998	4,005	7,170	1,463	888	28
1999	4,324	18,621	519	662	39
2000	3,789	13,029	600	289	41
TOTAL	175,927	643,528	660,313	80,942	2,729
Average	5,331	20,110	20,635	2,529	85

STEELHEAD & WEIR DATES

Number of steelhead counted at the Little Manistee River Weir and dates the weir gates installed and removed, fall and spring, 1967-00.							
Year	Fall Operation			Spring Operation			Total
Fall/Spring	Number	Weir In	Weir Out	Number	Weir In	Weir Out	
67/68	1,048	08/29	02/08	1,640	03/18	04/01	2,888
68/69	1,322	08/30	01/02	996	03/17	04/18	2,318
69/70	3,043	08/15	11/23	1,405	03/16	04/01	4,448
70/71	7,411	08/??	12/15	5,031	03/15	04/26	12,442
71/72	7,622	08/04	01/11	7,403	03/15	04/27	15,025
72/73	3,561	09/01	12/18	6,588	03/05	04/12	10,149
73/74	1,926	09/04	12/10	3,684	03/05	04/22	5,610
74/75	3,488	09/06	12/09	7,183	03/06	04/25	10,671
75/76	6,121	09/09	12/08	1,874	03/09	04/09	7,995
76/77	578	09/09	12/06	10,480	03/09	04/15	11,058
77/78	2,031	09/02	12/09	7,240	03/09	04/21	9,271
78/79	320	08/31	12/01	3,540	03/08	04/27	3,860
79/80	640	09/06	11/14	4,505	03/10	04/28	5,145
80/81	1,111	09/02	11/13	6,307	03/05	04/17	7,418
81/82	849	08/28	11/12	4,100	03/09	04/27	4,949
82/83	347	08/25	11/10	5,091	03/02	03/29	5,438
83/84	3,100	09/06	11/07	7,950	03/02	04/10	11,050
84/85	1,909	09/04	11/05	6,517	03/06	04/12	8,426
85/86	6,356	08/19	11/08	7,036	03/11	04/11	13,392
86/87	4,720	08/22	11/12	6,315	03/04	04/09	11,035
87/88	1,450	09/01	11/12	8,432	03/07	04/07	9,882
88/89	1,050	08/16	11/09	5,102	03/22	04/21	6,152
89/90	1,130	08/14	10/31	4,411	03/12	04/26	5,541
90/91	1,521	08/15	10/29	6,109	03/05	04/08	7,630
91/92	3,666	08/15	11/07	4,597	03/02	04/16	8,263
92/93	3,054	08/14	11/06	6,156	03/08	04/14	9,210
93/94	1,702	08/13	11/10	4,411	03/07	04/18	6,113
94/95	2,849	08/15	11/10	3,553	03/10	04/27	6,402
95/96	351	08/15	11/14	9,057	03/12	04/23	9,408
96/97	5,249	08/15	11/06	7,096	03/12	04/18	12,345
97/98	915	08/15	11/07	4,005	03/02	04/16	4,920
98/99	888	08/17	11/06	4,324	03/12	04/19	5,212
99/00	662	08/18	11/09	3,789	02/28	04/06	4,451
00/01	289	08/17	11/09				
Average	2,493			5,331			7,816

INSTRUCTIONS FOR WATER QUALITY SURVEYORS

There are two sample bottles for each site: a plastic bottle and a glass bottle in a styrafoam shield.

Step 1. Take air and water temperature and record in space below.

Step 2. Fill sample bottles as follows: submerge bottle one foot below surface. If possible, open bottle and fill with water emptying out all air, then seal bottle under water such that there is no air bubble in sample bottle, then do likewise with second bottle. Under no circumstances should bottles be opened in the air.

Step 3. Place samples in cooler as collected to keep cool and deliver to Dick Johnston at Riverwinds on attached map by noon on test day.

Timing: The tentative plan calls for all sampling to be conducted on Friday morning, July 21st. DJ will then deliver to the Great Lakes Lab in Lake Ann in the afternoon. It is vital that samples be delivered promptly so that tests will be accurate.

<u>TEST SITE</u>	<u>AIR TEMP</u>	<u>WATER TEMP</u>	<u>SURVEYOR</u>
1. Luther Dam area	<u>62.0</u>	<u>56.1</u>	Gorys
2. Fairbanks Creek	<u>61.3</u>	<u>60.</u>	"
3. River above Fairbanks	<u>62.6</u>	<u>55.6</u>	"
4. Twin Creek	<u>64.5</u>	<u>51.8</u>	"
5. River above Twin	<u>64.4</u>	<u>53.2</u>	"
6. Sayers Creek	<u>60</u>	<u>55.6</u>	Danders
7. River above Sayers	<u>58</u>	<u>55.3</u>	"
8. Spencer Bridge	<u>60</u>	<u>56</u>	"
9. Johnson Bridge	<u>60</u>	<u>55</u>	"
10. Dewitt Bridge	<u>58</u>	<u>55</u>	Johnston
11. Poggensee Bridge	<u>59</u>	<u>55</u>	"
12. Cool Creek	<u>60</u>	<u>63</u>	"
13. River above Cool	<u>60</u>	<u>56</u>	"
14. Nine Mile Bridge	<u>62</u>	<u>58</u>	Bastion
15. Six Mile Bridge	<u>64</u>	<u>57</u>	"
16. DNR Weir	<u>63</u>	<u>58</u>	"
17. Stronach Bridge	<u>63</u>	<u>59</u>	"
18. (B)	<u>60</u>	<u>50</u>	
19. (D)	<u>?</u>	<u>?</u>	

GREAT LAKES WATER QUALITY LABORATORY, INC.

P.O. BOX 131

LAKE ANN MI 49650

(231) 275-7382

BECCA S. GRAY
LABORATORY MANAGERALAN R. GRAY
TECHNICAL DIRECTOR

04/00

TEST RESULTS AS REQUESTED FOR LMWCC

SAMPLE COLLECTION: DATE: 7/21/00 COLLECTED BY: DICK JOHNSTON

LAB I.D. #00072111 - 29

DATE	COLIFORM (FECAL) PER 100 ml	DISS OXYGEN In Mg/L	AMMONIA NITROGEN In Mg/L	NITRATE NITROGEN In Mg/L	PHOSP TOTAL InMg/L
1	196	7.3	0.10	<0.3	<0.002
2	242	7.7	0.10	<0.3	<0.002
3	172	8.7	0.10	<0.3	<0.002
4	185	8.8	0.10	<0.3	<0.002
5	160	7.5	0.10	<0.3	<0.002
6	164	7.4	0.10	<0.3	<0.002
7	184	7.6	0.10	<0.3	<0.002
8	172	7.3	0.10	<0.3	<0.002
9	143	7.7	0.10	<0.3	<0.002
10	164	7.6	0.10	<0.3	<0.002
11	143	7.5	0.10	<0.3	<0.002
12	271	7.4	0.10	<0.3	0.008
13	148	7.5	0.10	<0.3	<0.002
14	114	8.9	0.10	<0.3	<0.002
15	128	7.6	0.10	<0.3	<0.002
16	100	7.5	0.10	<0.3	<0.002
17	88	7.6	0.10	<0.3	<0.002
Spent	0	7.4	0.10	<0.3	0.003
Spent	0	7.3	0.10	<0.3	<0.002

MARKS: < = LESS THAN

> = GREATER THAN

OG = OVERGROWTH (BACTERIAL GROWTH WAS EXCESSIVE)

IF YOU HAVE ANY QUESTIONS, FEEL FREE TO CALL THE LAB.

RESULTS PREPARED BY:

GREAT LAKES WATER QUALITY LABORATORY, INC.

BECCA S. GRAY
LABORATORY MANAGER

Great Lakes Water Quality Laboratory, Inc.

Alan R. Gray
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Lake Ann, MI 49650-0131
231-275-7382

Rebecca S. Gray
Laboratory Manager

4/4/2000

Richard Johnston
10616 Johnston Rd.
Irons MI 49644

Dear Mr. Johnston

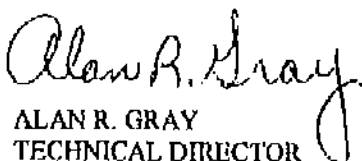
Thank you for your inquiry for laboratory services. Your quote listed below is valid for the continued River Study for the next five years. The prices quoted are for a batch sampling of 15 to 19 samples, all taken by your staff and delivered to our laboratory at the same time. We generally work a turn around time of one week or 7 days for environmental testing. We provide the collection containers.

The following parameters will be tested for each batch of 15 to 19 sites.

<u>PARAMETER</u>	<u>METHOD</u>	<u>DETECTION LIMIT</u>
FECAL COLIFORM	MEMBRANE FILTRATION	COUNT THE COLONIES/100 ml
NITRATE - N	S. M. 4500 - N03 - D	0.1 mg/l or ppm
TOTAL PHOSPHORUS	S. M. 4500 - P - E	0.02 mg/l or ppm
AMMONIA - N	S. M. 4500 - NH3 - F	0.05 mg/l or ppm
DISSOLVED OXYGEN	S. M. 4500 - O - G	0.1 mg/l or ppm

THE TOTAL COST FOR EACH BATCH OF 15 TO 19 IS \$ 750.00

SINCERELY,
GREAT LAKES WATER QUALITY LABORATORY, INC.


ALAN R. GRAY
TECHNICAL DIRECTOR

RECEIVED/ACCEPTED BY: _____

Name

Title

Date

Sheet1

LITTLE MANISTEE MACRO-INVERTEBRATE SURVEY, SPRING 2000									
LOCATION:	Six Mile	Nine Mile	Bear Track	Cool Creek	Johnstons	Pokanssee	Dewitt	Johnsons	
INVERTEBRATE GROUP1	North	South			Above 18mi	Bridge	Bridge	Bridge	
Adult Beetles	R	R		R	C				R
Water Pennies									
Blackfly Larvae	C								
Mayfly Nymphs	R	C	C	C	R	C	C	R	
Gilled Snails	C	C		R	C				
Hellgramites									
Stonefly Nymphs	C	R	R	R	C	C	C	C	R
Caddisfly Larvae	C	C	C	C	C	R	C	C	R
Total Group 1	31.2	25.9	15.6	25.3	26.2	15.6	15.9	20	
Overall Score	34,2G	28,9F	15,6P	34,3G*	27,2F	29F*	41G*	47G*	
R=<11; C=>10	E=Excellent, G=Good, F=Fair, P=Poor								
* R's for Damselflies; Dragonflies; Clams and other Group 11 & 111									
Investigators:	Featherly, Bastion Johnston								
	Sikkenka & McIntire								

Spencer	Old Grade	Browns	
Bridge	Below	Luther	
	R		
R	C	R	
	C	R	
R	R		
C	R	R	
C	C	C	
20.6	30.9	20.3	
40,2G*	52,5E*	34,7*F	
Gorlys, Mosher & Pyle			

MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY
SURFACE WATER QUALITY DIVISION
APRIL 2001

STAFF REPORT

A BIOLOGICAL SURVEY OF THE LITTLE MANISTEE RIVER WATERSHED
MANISTEE AND LAKE COUNTIES
SEPTEMBER 14-15, 1999.

INTRODUCTION

As part of the monitoring activities of Surface Water Quality Division, staff of the Great Lakes and Environmental Assessment Section (GLEAS) investigated the biological integrity and physical habitat at eight stations on the Little Manistee River (LMR) and 1 station on its tributary, Twin Creek. The investigation was comprised of qualitative biological surveys conducted according to GLEAS Procedure #51 (SWQD 1997,1998) (available upon request). Water chemistry samples were also collected at selected stations throughout the watershed.

Biological Survey Objectives

This biological survey of the Little Manistee River and Twin Creek were conducted to:

- 1) Qualitatively evaluate the current biological, physical, and chemical character of selected stations on the LMR and Twin Creek;
- 2) Evaluate general water quality trends;
- 3) Identify possible sources of excessive sediment; and
- 4) Evaluate whether stream segments are attaining Michigan Water Quality Standards.

Watershed History and Background Information

Located in the Northern Lakes and Forest ecoregion, the LMR drains 5,217 square kilometers (Creal and Johnson, 1980) and flows into Manistee Lake which empties into Lake Michigan (Walker, 1997). The LMR and Twin Creek are designated coldwater systems (MDNR, 1994) and their sandy soil watershed includes substantial areas of Pere Marquette State Forest and the Manistee National Forest (MEDC, 2000). Tourism, fishing and forestry are major activities in Lake and Manistee Counties (MEDC, 2000). There is little urban and residential development in this watershed. The agriculture in the upper portion of the watershed is uniform and consists of pine plantations and hay fields.

SUMMARY

1. The location of the sampling stations are shown in Figure 1 and descriptions of each station are provided in Table 1. Fish and macroinvertebrate community, physical habitat, and water chemistry data generated at Stations 1-10 are presented in Tables 2-5, respectively.

REFERENCES

Creal, W., and C. Johnson. 1980. Michigan's Biological Primary Monitoring Program, 1973-1978. MDNR Publication No. 4833-8268, Report No. 03530, April 1980.

Michigan Department of Natural Resources (MDNR). 1994. Director's Order. Designated Trout Streams for the State of Michigan. Report No. DFI-101.94.

Michigan Economic Development Council (MEDC). 2000. Lake and Manistee Counties. World Wide Web http://medc.michigan.org/stats/stats_index.htm

Surface Water Quality Division (SWQD). 1997. GLEAS Procedure 51. Qualitative Biological and Habitat Survey Protocols for Wadable Streams and Rivers.

Surface Water Quality Division (SWQD). 1998. Update of GLEAS Procedure 51. Metric Scoring and Interpretation. Staff Report MI/DEQ/SWQ-96/068.

Walker, B. 1997. A biological survey of the LMR in Manistee and Lake Counties, July 19 and September 14, 1994. Staff Report MI/DEQ/SWQ-97/041.

Field Work by: Bruce Walker, Aquatic Biologist
Nicole M. Vidales, Aquatic Biologist
Water Quality Appraisal Unit North
Great Lakes and Environmental Assessment Section

Report by: Nicole M. Vidales, Aquatic Biologist
Water Quality Appraisal Unit North
Great Lakes and Environmental Assessment Section

Table 2A. Qualitative fish sampling results for the Little Manistee River and Twin Creek in Lake and Manistee Counties, September 14 & 15, 1999.

TAXA	STATION 1 Little Manistee u/s Luther Rd.	STATION 4 Twin Creek End of 2 Track	STATION 6 Little Manistee Indian Bridge Campground
Petromyzontidae (lampreys)			
<i>Ichthyomyzon unicuspis</i> ammocoete (Silver)	2		
Salmonidae (trouts)			
<i>Oncorhynchus mykiss</i> (Rainbow tr.)	2	24	46
<i>Salmo trutta</i> (Brown trout)	4	9	45
<i>Salvelinus fontinalis</i> (Brook trout)	21		
<i>Oncorhynchus kisutch</i> (Coho)			23
Cyprinidae (minnows and carps)			
<i>Semotilus atromaculatus</i> (Creek)		10	
<i>Rhinichthys atratulus</i> (Blacknose dace)		16	
Centrarchidae (sunfish)			
<i>Lepomis gibbosus</i> (Pumpkinseed)	1		
<i>Micropterus salmoides</i> (Lm. bass)	1		
TOTAL INDIVIDUALS	31	59	114
Number of hybrid sunfish	0	0	0
Number of anomalies	0	0	0
Percent anomalies	0	0	0
Percent salmonids	87	56	100
Reach sampled (ft)	115	110	160
Area sampled (sq ft)	1,380	1,540	8,000
Density (# fish/sq ft)	0.022	0.038	0.014
Gear	bps	bps	bps

Table 2B. Fish metric evaluation of the Little Manistee River and Twin Creek in Lake and Manistee Counties, September 14 & 15, 1999.

	STATION 1 Little Manistee	STATION 4 Twin Creek	STATION 6 Little Manistee
METRIC	Value	Value	Value
TOTAL NUMBER OF TAXA	6	4	3
NO. OF DARTER, SCULPIN, MADTOM TAXA	0	0	0
NUMBER OF SUNFISH TAXA	1	0	0
NUMBER OF SUCKER TAXA	0	0	0
Meets Coldwater Designation:	Yes	Yes	Yes

Table 3B. Macroinvertebrate metric evaluation of the Little Manistee River and Twin Creek in Lake and Manistee Counties, September 14 & 15, 1999.

METRIC	Station 1 Little Manistee		Station 4 Twin Creek		Station 6 Little Manistee	
	Value	Score	Value	Score	Value	Score
TOTAL NUMBER OF TAXA	33	1	31	1	33	1
NUMBER OF MAYFLY TAXA	5	1	5	1	6	1
NUMBER OF CADDISFLY TAXA	8	1	8	1	7	1
NUMBER OF STONEFLY TAXA	1	0	3	1	3	1
PERCENT MAYFLY COMP.	15.25	0	13.71	0	17.76	0
PERCENT CADDISFLY COMP.	27.12	0	36.29	1	24.30	0
PERCENT CONTR. DOM. TAXON	16.95	1	16.13	1	12.15	1
PERCENT ISOPOD, SNAIL, LEECH	5.08	0	2.42	1	1.87	1
PERCENT SURF. AIR BREATHERS	4.24	1	4.03	1	0.93	1
TOTAL SCORE		5		8		7
MACROINV. COMMUNITY RATING		EXCELLENT		EXCELLENT		EXCELLENT

Table 4. Habitat evaluation for the Little Manistee River and Twin Creek in Lake and Manistee Counties, September 14 & 15, 1999.

HABITAT METRIC	STATION 7 Little Manistee at Dewitt Bridge	STATION 8 Little Manistee at Fox Bridge	STATION 9 Little Manistee at 18 Mile Bridge	STATION 10 Little Manistee at 9 Mile Bridge
Bottom Substrate Avail. Cover (20):	11	13	8	11
Embeddedness (20):	11	13	9	12
Velocity/Depth (20):	15	14	10	13
Flow Stability (15):	14	14	14	15
Bottom Depos. (15):	9	10	5	8
Pools-Riffles- Runs-Bends (15):	12	12	8	11
Bank Stability (10):	10	10	9	10
Bank Vegetative Stability (10):	10	10	9	9
Stream Cover (10):	9	9	8	7
TOTAL SCORE (135):	101	105	96	80
HABITAT RATING:	GOOD (SLIGHTLY IMPAIRED)	GOOD (SLIGHTLY IMPAIRED)	GOOD (SLIGHTLY IMPAIRED)	GOOD (SLIGHTLY IMPAIRED)
Date:	9/15/99	9/15/99	9/15/99	9/15/99
Weather:	Partly Cloudy	Partly Cloudy	Partly Cloudy	Partly Cloudy
Air Temperature:	68 Deg. F.	0 Deg. F.	Deg. F.	Deg. F.
Water Temperature:	54 Deg. F.	0 Deg. F.	Deg. F.	Deg. F.
Ave. Stream Width:	36 Feet	38 Feet	55 Feet	32 Feet
Ave. Stream Depth:	1.5 Feet	2 Feet	1.5 Feet	1.66 Feet
Surface Velocity:	1.8 Ft./Sec.	2 Ft./Sec.	2 Ft./Sec.	2.3 Ft./Sec.
Estimated Flow:	97.2 CFS	152 CFS	165 CFS	122 CFS
Stream Modifications:	H	H	H	H
Nuisance Plants (Y/N):	N	N	N	N
STORET No.:	430564	430565	510201	430566
Stream Name:	Little Manistee	Little Manistee	Little Manistee	Little Manistee
Road Crossing/Location:	at Dewitt Bridge	at Fox Bridge	at 18 Mile Bridge	at 9 Mile Bridge
County Code:	43	43	51	43
TRS:	T20N R14W S22	T20N R14W S15	T21N R15W S36	T20N R14W S07
Latitude (dd):	44.11544	44.11999	44.17103	44.14524
Longitude (dd):	-85.97257	-85.98254	-86.10261	-86.02412
Ecoregion:	NLAF	NLAF	NLAF	NLAF
Stream Type:	Coldwater	Coldwater	Coldwater	Coldwater
USGS Basin Code:	04060101	04060101	04060101	04060101

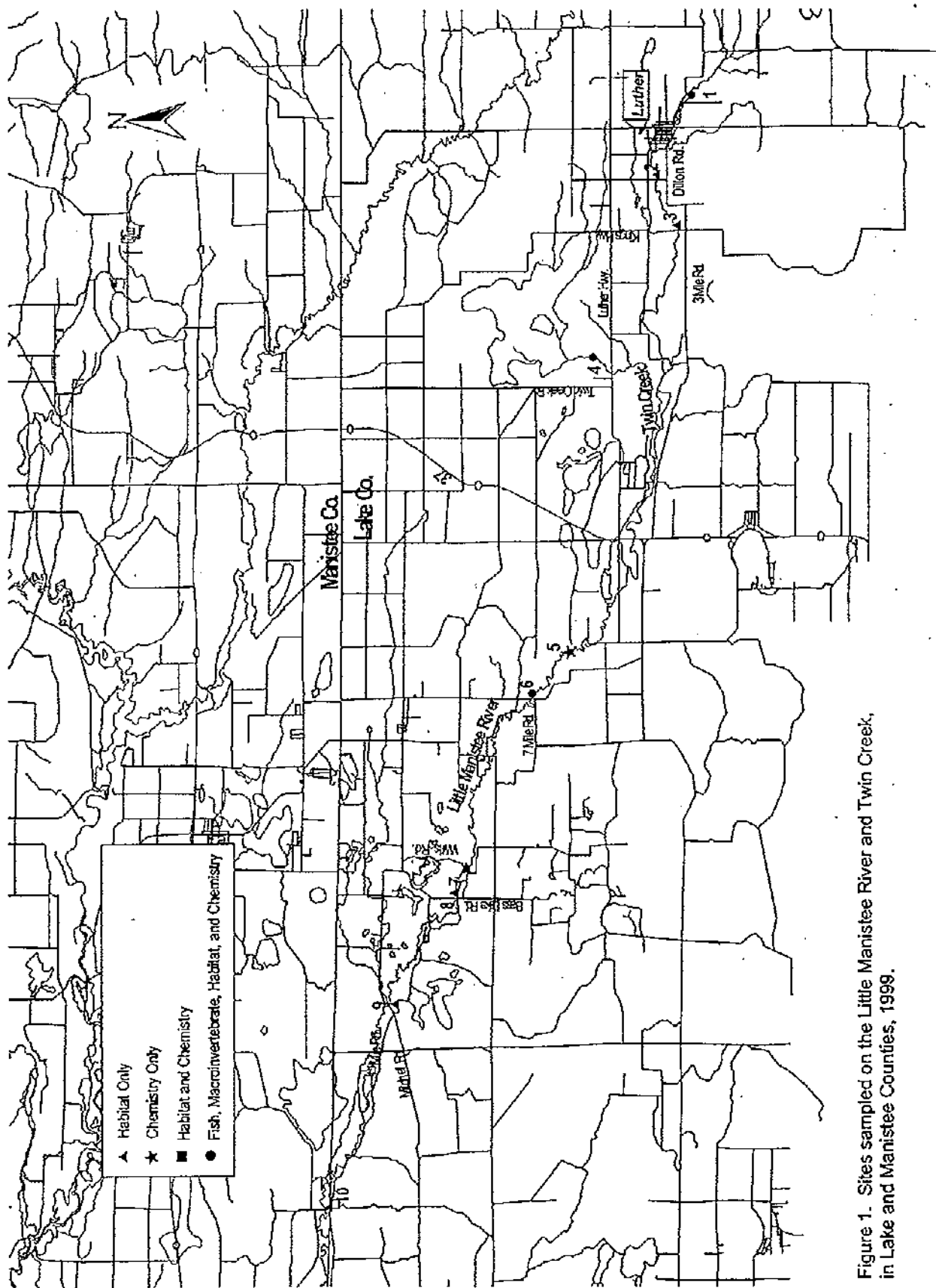


Figure 1. Sites sampled on the Little Manistee River and Twin Creek, in Lake and Manistee Counties, 1999.

Little Manistee River Watershed: Base Map

Manistee County

Wexford County

Mason County

Lake County

Legend

- Damsites
- Transportation
 - County Road
 - State/Federal Hwy
 - Street
 - Two-Track
- Hydrology
 - Lakes
 - Stream
 - River
- Wetlands
 - Aquatic Bed
 - Emergent
 - Scrub-Shrub
 - Forested
 - Open Water/Unknown Bottom
 - Stream Bed
 - Unconsolidated Bottom
- Watershed Boundary
- County Boundary

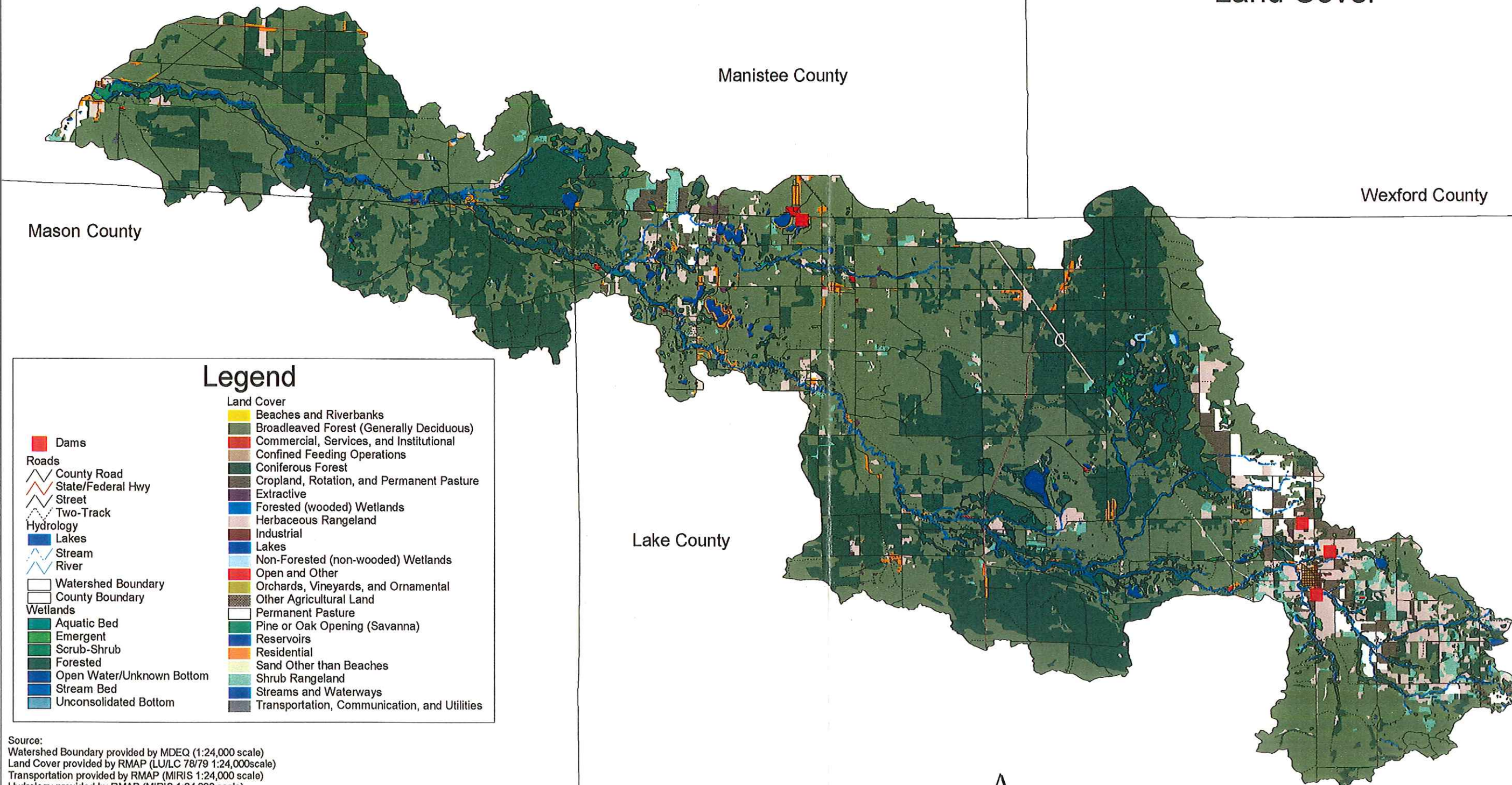
Source:
 Watershed Boundary provided by MDEQ (1:24,000 scale)
 Transportation provided by RMAP (MIRIS 1:24,000 scale)
 Hydrology provided by RMAP (MIRIS 1:24,000 scale)
 County Boundary provided by RMAP (MIRIS 1:24,000 scale)
 Wetlands provided by National Wetlands Inventory,
 U.S. Fish and Wildlife Service (1:24,000 scale)
 Damsites provided by MDNR Fisheries Division (MFINS 1:24,000 scale)
 SIRC Service Number: MT2000S_06



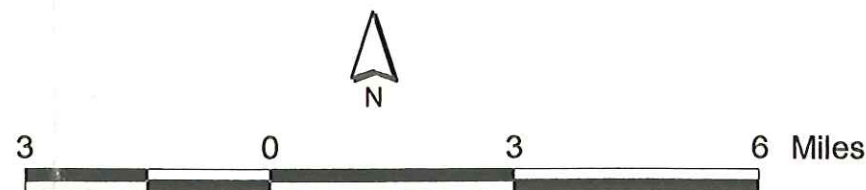
3 0 3 6 Miles



Little Manistee River Watershed: Land Cover



Source:
Watershed Boundary provided by MDEQ (1:24,000 scale)
Land Cover provided by RMAP (LU/LC 78/79 1:24,000 scale)
Transportation provided by RMAP (MIRIS 1:24,000 scale)
Hydrology provided by RMAP (MIRIS 1:24,000 scale)
County Boundary provided by RMAP (MIRIS 1:24,000 scale)
Wetlands provided by National Wetlands Inventory
U.S. Fish and Wildlife Service (1:24,000 scale)
Damsites provided by MDNR Fisheries Division (MFINS 1:24,000 scale)
SIRC Service Number: MT2000S_06



Little Manistee River Watershed: Soils

Manistee County

Wexford County

Mason County

Lake County

Legend

- Damsites
- Transportation
 - County Road
 - State/Federal Hwy
 - Street
 - Two-Track
- Hydrology
 - Lakes
 - Stream
 - River
- Soils
 - Sandy Loam
 - Sand
 - Loamy Sand
 - Muck
- Wetlands
 - Aquatic Bed
 - Emergent
 - Scrub-Shrub
 - Forested
 - Open Water/Unknown Bottom
 - Stream Bed
 - Unconsolidated Bottom
- Watershed Boundary
- County Boundary

Source:
Watershed Boundary provided by MDEQ (1:24,000 scale)
Soils provided by National Resource Conservation Service (STATSGO 1:250,000 scale)
Hydrology provided by RMAP (MIRIS 1:24,000 scale)
County Boundary provided by RMAP (MIRIS 1:24,000 scale)
Wetlands provided by National Wetlands Inventory
U.S. Fish and Wildlife Service (1:24,000 scale)
Damsites provided by MDNR Fisheries Division (MFINS 1:24,000 scale)
SIRC Service Number: MT2000S_06



Little Manistee River Watershed: Topography

Manistee County

Wexford County

Mason County

Lake County

Legend

- Damsites
- Transportation
 - County Road
 - State/Federal Hwy
 - Street
 - Two-Track
- Hydrology
 - Lakes
 - Stream
 - River
- Contours (ft)
 - 623 - 720
 - 721 - 820
 - 821 - 920
 - 921 - 1021
 - 1021 - 1181
- Wetlands
 - Aquatic Bed
 - Emergent
 - Scrub-Shrub
 - Forested
 - Open Water/Unknown Bottom
 - Stream Bed
 - Unconsolidated Bottom
- Watershed Boundary
- County Boundary

Source:
 Watershed Boundary provided by MDEQ (1:24,000 scale)
 Transportation provided by RMAP (MIRIS 1:24,000 scale)
 Hydrology provided by RMAP (MIRIS 1:24,000 scale)
 County Boundary provided by RMAP (MIRIS 1:24,000 scale)
 Contours provided by USGS (DLG 1:100,000 scale)
 Wetlands provided by National Wetlands Inventory,
 U.S. Fish and Wildlife Service (1:24,000 scale)
 Damsites provided by MDNR Fisheries Division (MFINS 1:24,000 scale)
 SIRC Service Number: MT2000S_06

