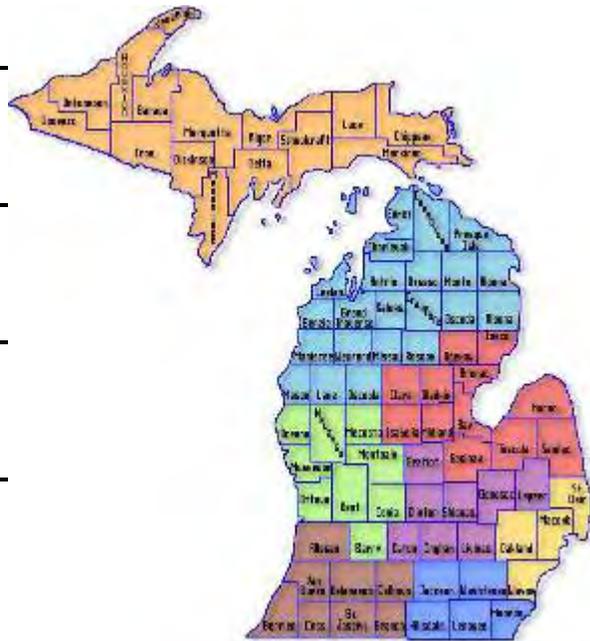


CITY OF GRAND HAVEN
NORTH OTTAWA WATER FACILITIES
SOURCE WATER INTAKE PROTECTION PROGRAM
APRIL 2010

DNRE Guidance

Department of Natural Resources & Environment

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**MICHIGAN DEPARTMENT OF NATURAL RESOURCES & ENVIRONMENT
WATER BUREAU (DRINKING WATER & ENVIRONMENTAL HEALTH SECTION)**

**GUIDANCE FOR SOURCE WATER PROTECTION PROGRAMS
SURFACE WATER INTAKE PROTECTION PLAN (SWIPP)**

Since the source water assessments have been completed, the state is developing guidance for communities for development of Surface Water Intake Protection Programs (SWIPP). Michigan has a SWIPP protection program (WHPP) that has been approved by the USEPA. The Michigan Department of Natural Resources & Environment is developing the Surface Water Intake Protection Programs for surface water systems using that same logic. A Surface Water Intake Protection Program should have the same basic seven elements as the SWIPP Protection Programs.

These are:

- ___ Defining roles and duties of government units and water supply agencies
- ___ Delineating a source water protection area for each water supply source based on the state's defined source water area.
- ___ Identifying potential contaminant sources within each source water protection area.
- ___ Utilizing management approaches for protection of source water, including but not limited to Education and regulatory approaches.
- ___ Creating contingency plans for public water supply sources including the location of alternate drinking water sources.
- ___ Assuring proper siting on new water sources to minimize potential contamination.
- ___ Encouraging public participation.

This guidance document is intended to assist communities with surface water systems in developing an approvable SWIPP program. Communities may add other items as appropriate, and are encouraged to submit a work plan for review before proceeding with development of their SWIPP program.

PROGRAM ELEMENTS

Basic information about the water supply system and community

- ___ Community location and population
- ___ Present service area (geographic area and population served)
- ___ System capacity
- ___ Local program goals for SWIPP program

Defining roles and duties of government units and water supply agencies

- ___ Identification of all people, local, county, or state agencies, or public water supply agencies that have significant responsibilities for carrying out the local SWIPP program
- ___ Brief description of the roles and responsibilities for each person or agency
- ___ Intergovernmental agreements, memoranda, or ordinances which set forth procedures or responsibilities related to SWIPP (COUNTY)
- ___ Agency, person and/or team responsible for the periodic update of the local SWIPP program
- ___ Schedule for quarterly meetings of SWIPP team

Delineating a source water protection area for each water supply source based on the state's defined source water area

- ___ Map that shows or describes the area that contributes water to your source. This is described in your source water assessment that was completed by the state. This will be very site specific and may be very general for some systems, i.e. a Great Lake source extending far into the lake versus an inland river intake with a defined watershed (Use of a U.S. Geological Survey quadrangle map as a base is recommended)
- ___ Small watershed boundaries and/or surface water runoff patterns, if appropriate for SWIPP
- ___ Storm water drainage system and facilities, including storm water basins if relevant to the SWIPP

Identifying potential sources of contamination within the SWIPP area

NOTE: This will take some judgment since there may be numerous potential contamination sources. It may be necessary to describe them both specifically for significant ones and generally for those that are relatively common. For example; there are numerous underground tanks, but fewer large industrial complexes.

- ___ Record searches to identify potential sources of contamination and land uses that have a potential to impact the surface water source
- ___ General surveys to identify potential sources of contamination and land uses that have a potential to impact the surface water source
- ___ Record searches to identify historical land uses that have a potential to impact the surface water source
- ___ Map which displays potential sources of contamination within the SWIPP
- ___ Description of the process used to identify potential sources of contamination, including the sources of information
- ___ Comprehensive listing of potential sources of contamination within the SWIPP area

Utilizing management approaches for protection of source water, including but not limited to education and regulatory approaches

- ___ Description of the local management program for SWIPP. Examples of local management program elements include:
 - Zoning ordinance provisions for SWIPP
 - Facility inspection or hazardous material survey program
 - Information to businesses concerning state and county requirements
 - Environmental permits checklist for new businesses
 - Strategic monitoring within the SWIPP area
 - Inter-agency coordination and communication
 - Other SWIPP protection program elements developed by the local agency
 - Identification of partnerships or agreements with county or state agencies which will help implement the local SWIPP program
 - Development and implementation of best management practices that reduce the risk of surface water contamination
 - On-site inspections for the purpose of improving facility management of potential sources of contamination
 - Incorporation of SWIPP into a municipality's master plan or other regional land use planning program
- ___ Timetable for management plan implementation

Creating contingency plans for public water supply sources including the location of alternative drinking water sources

- ___ Plans for how the community would deal with a major threat to the intake
- ___ Response protocol in the event of a hazardous substance spill or other emergency
- ___ Emergency water supplies (bottled, bulk, etc.)
- ___ Policies and procedures related to water supply replacement

Assuring siting of new water sources to minimize potential contamination

- ___ General procedure that would be employed if a new source was developed
- ___ Proposed method for incorporating new sources into SWIPP program

Encouraging public participation

- ___ Description of the methods used to involve and educate the public during the SWIPP planning and implementation process, examples include:
 - Local meetings
 - Newsletters
 - Newspaper articles
 - School presentations
 - Brochures
 - Website
 - SWIPP signage
 - Hazardous waste collection activities
 - Other_____

This is general guidance and each program will be site specific. It is suggested the community develop a draft outline for review before any detailed SWIPP program is developed.

Source Water Protection

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City of Grand Haven-North Ottawa Water Facilities
Ottawa, County



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Source Water Protection

General Program Description

City of Grand Haven-North Ottawa Water Facilities

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1.1 BACKGROUND INFORMATION

For many years, there have been major discussions over the issue of protecting the nation's drinking water sources. This issue was eventually addressed in 1996 when the federal Safe Drinking Water Act was reauthorized adding legislation that requires source water assessments be performed on all sources of public drinking water supplies.

A source water assessment provides not only an understanding of current conditions, but also serves as a predictive tool for source water management and protection efforts. This information will be used as a basis for building voluntary, community-based barriers to drinking water contamination (i.e., Surface Water Intake Protection Programs).

The Michigan Department of Natural Resources & Environment has completed assessments on almost 12,000 public water supplies with an estimated 18,000 sources. Of these, approximately 10,650 are non-community public water supplies with groundwater as the source. There are approximately 1,250 community systems, including 650 systems using groundwater sources and supplies that purchase water. These assessments are of the raw water quality, not the finished water compliance. Departments of Agriculture, agricultural extension programs, soil and water conservation boards, local governments, water systems and the Michigan Rural Water Association were all key partners in completing the source water assessment program.

Michigan has 60 water supplies that use surface-water sources. These supplies provide drinking water to over 55 percent of the State's population, or about 6 million people. Inland lake and river intake assessments show eight (8) municipal supplies in Michigan. Great Lakes and Great Lakes Connecting Channels intake assessments account for the remaining 52 surface water supplies.

The United States Geological Survey (USGS) prepared a Source Water Assessment Program (SWAP) for the City of Grand Haven under contract to the Michigan Department of Environmental Quality (MDNRE). The final report was completed in April 2004 and is included as Section 2.



The Michigan Surface Water Intake Protection Program (SWIPP) is a voluntary effort encouraged by the USEPA and Michigan Department of Natural Resources & Environment (MDNRE). Its purpose is to utilize the information provided by the mandatory Source Water Assessment Program in order to allow regional participation of communities to protect their drinking water sources. Once potential contaminant sources are identified, the communities can then implement measures to safeguard against future contamination. The Source Water Intake Protection Plan will outline the implementation

measures that each community can perform. The plan will also outline a contingency plan in order to assure adequate drinking water is available to the communities in case of a contamination event or a disruption of their normal water supply.

1.2 OVERVIEW OF THE SOURCE WATER ASSESSMENT AND PROTECTION PROGRAM

To expand the benefits realized from WHP efforts, 1996 Safe Drinking Water Act reauthorization requires (under Section 1453 P.L. 104-182) States to develop a Source Water Assessment and Protection (SWAP) Program. The SWAP program requires complete assessments for all Public Water Systems (PWS^s). By definition, public water systems in Michigan are separated into three classifications, Type I, II, and III:

- Type I systems serve 15 or more homes, or other residential living units
- Type II systems serve 25 or more people a day for 60 or more days a year
- Type III systems are any public water systems that do not meet the definition of Type I or II.

The SWAP program requires complete assessments for all Public Water Systems (PWS^s) utilizing ground and/or surface water which include:

- Designating of the **Intake Protection Area** (SWIPPA), the portion of a watershed or ground water area that may contribute pollution to the water supply.
- Identification of all significant potential sources of drinking water contamination within the SWIPPA. The resulting **contamination source inventory** must describe the sources (or categories of sources) of contamination either by specific location or by area.
- Determination of the water supply's susceptibility to contamination from identified sources. The **susceptibility determination** can be either an absolute measure of the potential for contamination of the PWS or a relative comparison between sources within the SWIPP Areas.

Distribution of the source water assessment results to the public. Assessments are not considered completed until results are communicated to the public.

The Michigan Department of Natural Resources & Environment established the plan to assess Intake Protection Areas. These assessments are of the raw water quality, not the finished water compliance. Michigan Rural Water Association, Departments of agriculture, agricultural extension programs, soil and water conservation boards, local governments and water systems were all key partners in completing the source water assessment program.

A source water assessment provides not only an understanding of current conditions, but also serves as a predictive tool for source water management and protection efforts. This information will be used as a basis for building voluntary, community-based barriers to drinking water contamination (i.e., source water protection program).

1.3 OVERVIEW OF THE SOURCE WATER PROTECTION PROGRAM

The Michigan Source Water Protection Program is a voluntary effort encouraged by the USEPA and Michigan Department of Natural Resources & Environment (MDNRE). Its purpose is to utilize the information provided by the mandatory source water assessment program in order to allow regional participation of communities to protect their drinking water sources. Once potential contaminant sources are identified, the communities can then implement measures to safeguard against future

contamination. The Source Water Protection Plan will outline the implementation measures that each community can perform. The plan will also outline a contingency plan in order to assure adequate drinking water is available to the communities in case of a contamination event or a disruption of their normal water supply.

The Drinking Water and Radiological Protection Division of the MDNRE have established guidelines for the Source Water Protection Program. The Source Water Protection Program being developed for the City of Grand Haven is based on these MDNRE Guidelines.

- Defining roles and duties of government units and water supply agencies.
- Designating an Intake Protection Area for each water supply source based on the state's defined source water area.
- Identifying potential contaminant sources within each Intake Protection Area.
- Utilizing management approaches for protection of source water, including but not limited to education and regulatory approaches.
- Creating contingency plans for public water supply sources including the location of alternate drinking water sources.
- Assuring proper siting on new water sources to minimize potential contamination.
- Encouraging public participation and education.

This written Source Water Intake Protection Plan (SWIPP) details the above-mentioned seven elements for the City of Grand Haven Plan. This document was developed, with the input by members of the Grand Haven Source Water Protection Management Team, for approval by the Michigan Department of Natural Resources & Environment.

The purpose of the Source Water Protection Plan is to protect the long-term viability of City of Grand Haven drinking water supply by reducing the potential risk of surface and subsurface contamination from influencing the Source Water Intake Protection Areas (SWIPP Areas). The Grand Haven SWIPP Areas are defined as the current area that contributes surface water to Grand Haven's water treatment plant intake and extended areas to include potential new drinking water sources. As such, the City of Grand Haven recognizing the need to protect the long-term use of this drinking water resource, has implemented long-term source water protection efforts.

Implementation of this SWIPP will help to raise public awareness regarding source water protection and will assist the City of Grand Haven in giving appropriate future consideration for zoning and land use activities located within the SWIPP Areas.

As part of the SWIPP, the City of Grand Haven, City of Ferrysburg, Village of Spring Lake, Grand Haven Charter Township, Spring Lake Township and Ottawa County should consider drafting resolutions and environmental impact reviews authorizing local zoning authorities to consider source water protection when issuing new building permits or recommending changes in land use within the SWIPP Areas. Sample resolutions and review forms are presented in [<Ordinance and Resolution Section>](#) of this program. Upon approval by the MDNRE, the SWIPP will be managed by City of Grand Haven under intergovernmental cooperation with the City of Ferrysburg, Village of Spring Lake, Grand Haven Charter Township, Spring Lake Township and Ottawa County.

1.4 Introduction

This document presents the Surface Water Intake Protection Program (SWIPP) for the City of Grand Haven (Ottawa County, Michigan). This document was developed, in accordance with the Michigan Department of Natural Resources & Environment's Water Bureau guidance dated August 5, 2004. This document was developed using a watershed protection approach with input by members of the Grand Haven Source Water Protection Steering Committee, for approval by the Michigan Department of Natural Resources & Environment (MDNRE).

The Purpose of the SWIPP is to protect the long-term viability of Grand Haven's drinking water supply by reducing the potential risk of surface and subsurface contamination from affecting the Intake Protection Areas (SWIPP Areas). The Grand Haven SWIPP Areas are divided into three distinct zones (1) the Critical assessment zone (CAZ), (2) buffer zone and (3) watershed district. These current areas are defined by using geographic information system (GIS) software to map parts of the Lower Grand Watershed that have the potential to affect source water at the Grand Haven water plant intake. The Critical Assessment Zone has been defined as a 1000-foot radius around the water plant intake in the upstream watershed.

Implementation of this SWIPP will help to raise public awareness regarding surface water protection and will assist the City of Grand Haven under intergovernmental cooperation with the City of Ferrysburg, Village of Spring Lake, Grand Haven Charter Township, Spring Lake Township and Ottawa County and Ottawa County in giving appropriate future consideration for zoning and land use activities located within the SWIPP Areas. Sample resolutions and ordinances have been provided as part of the SWIPP.

Due to the prolific and extensive nature of this water source, a watershed protection approach will be utilized. Using a watershed protection approach is a strategy for effectively protecting and restoring aquatic ecosystems and protecting human health. This strategy has as its premise that many water quality and ecosystem problems are best solved at the watershed level rather than at the individual water body or discharger level. Major features of a watershed protection approach are targeting priority problems, promoting a high level of stakeholder involvement, integrated solutions that make use of the expertise and authority of multiple agencies, and measuring success through monitoring and other data gathering.

1.5 Purpose and Scope

The City of Grand Haven under intergovernmental cooperation with the City of Ferrysburg, Village of Spring Lake, Grand Haven Charter Township, Spring Lake Township and Ottawa County recognize the possibility of potential threats to Grand Haven's water supply. In an effort to address, the potential problems that could affect the source water, the City of Grand Haven, with guidance from the Michigan Department of Natural Resources & Environment (MDNRE) and the Michigan Rural Water Association (MRWA) established a Source Water Protection Management Team. This team will make recommendations to the City of Grand Haven under intergovernmental cooperation with the City of Ferrysburg, Village of Spring Lake, Grand Haven Charter Township, Spring Lake Township and Ottawa County and other major stakeholders within the SWIPP Areas

1.5.1 Source Water Protection Plan Development

Surface Water Intake Protection plans are necessary for the protection of the system's drinking water source from contaminants that are difficult and costly to treat through normal means. The plan clearly identifies actual and potential sources of contamination to the source. Secondly, it will effectively allow City of Grand Haven to educate the public on the importance of their drinking water source. Third, the plan serves as the first step for long-term sustainable planning for the future of the community. Finally, it provides a comprehensive action plan in case of an emergency.

The Grand Haven SWIPP Areas are divided into three distinct zones (1) the Critical assessment zone (CAZ), (2) buffer zone and (3) watershed district. These current areas are defined by using geographic information system (GIS) software to map parts of the Lower Grand River Watershed that have the potential to affect source water at the Grand Haven Water Treatment Plant intake. The Critical Assessment Zone has been defined as a 1000-foot radius around the intake in the upstream watershed.

The Grand Haven SWIPP Areas are shown relative to nearby roads, major topographical features, and in relationship to the SWIPP Areas. Taking into consideration, the anticipated future growth and land uses around the SWIPP Areas and how that may affect water quality in the future; the City of Grand Haven recognizes the need to protect the long-term use of this drinking water resource. As such, it is implementing long-term source water protection efforts.

1.5.2 Source Water Protection Plan Affiliation

This Surface Water Intake Protection program was developed in partnership with the City of Grand Haven under intergovernmental cooperation with the City of Ferrysburg, Village of Spring Lake, Grand Haven Charter Township, Spring Lake Township and Ottawa County, Ottawa County District Health Department, Ottawa County Conservation District, Lower Grand River Watershed Council, Grand Valley State University Extension, 911/Emergency Management, Ottawa County Road Commission, Grand Haven Community Schools, the Michigan Department of Natural Resources & Environment and the Michigan Rural Water Association.

1.5.3 SWIPP Steering Committee and Public Participation

Contacts for the Grand Haven SWIPP Steering Committee consist of several key individuals possessing a wide variety of background, education and experience. Individuals who are community residents, educators, local business owners and local government officials are encouraged to volunteer their time and efforts as members of the SWIPP team.

1.5.4 SWIPP Steering Committee Goals

The main goal of the Grand Haven SWIPP is to provide a continuously safe and clean supply of drinking water to residents. This will be accomplished in large part through maintaining regulatory compliance with the Michigan Safe Drinking Water Act, 1976 P.A. 399, as amended. To ensure compliance with drinking water standards, the SWIPP Steering Committee will meet on a regular basis to promote and raise public awareness of source water protection, to provide public education regarding source water protection, and to periodically update the elements of the Source water protection plan (such as the contingency plan, contaminant source inventory, SWIPP Areas, etc.). SWIPP Steering Committee progress reports are presented in the Management Section. These forms can be utilized to report and record the periodic progress of the SWIPP team to the MDNRE and others.

This SWIPP was developed in partnership with the City of Grand Haven under intergovernmental cooperation with the City of Ferrysburg, Village of Spring Lake, Grand Haven Charter Township, Spring Lake Township and Ottawa County, Ottawa County District Health Department, Ottawa County Conservation District, Lower Grand Raisin Watershed Council, Grand Valley State University Extension, 911/Emergency Management, Ottawa County Road Commission, Grand Haven Community Schools, the Michigan Department of Natural Resources & Environment and the Michigan Rural Water Association. This SWIPP was developed to be a flexible, working document that allows for the easy assimilation of future data and information.

1.5.4.a Present Source Water Protection Steering Committee

* Depicts additional duties and/or responsibilities

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Julie Beaton	City of grand Haven	(616) 847-3493	jbeaton@grandhaven.org
Pat McGinnis	City of Grand Haven	(616) 847-4888	pmginnis@grandhaven.org
John Stuparits	City of Grand Haven	(616) 842-3215	jstuparits@grandhaven.org
Denny Edwards	City of Grand Haven	(616) 842-3460	dedwards@grandhaven.org
Peggy Weick	O.C Conservation District	(616) 846-8770	peggy.weick@mi.nacdnet.net
Linda Brown	O.C. Drain Commission	(616) 994-4530	
Adeline Hambley	O.C. Health Department	(616) 846-8360	
Pat Staskiewics	O.C. Road Commission	(616) 850-7208	pstaskiewics@ottawacorrc.co
Shannon Mitchell	Grand Haven School District	(616) 850-6671	Mitchels@ghaps.org

1.5.4.b Lists the additional responsibilities and/or duties

NAME	ROLE	TITLE	REPRESENTING
Joseph VanderStel	Committee Chair	Facilities Manager	City of Grand Haven
	Contingency Planning		
	Program Management		
	Public Education		
Jim Dupont	Secretary/Vice Chair	WTP Crew-Leader	City of Grand Haven
Dennis Edwards	Contingency Planning		City of Grand Haven
Julie Beaton	Contaminant Source Inventory	Acting-DPW Director	City of Grand Haven
Kristin Keery	GPS/GIS Mapping	Planning Div. Mngr.	City of Grand Haven
Dennis Stuparits	Point/Non-Point Inventory	WWTP Director	City of Grand Haven
Adeline Hambley	Private Well/Septic Systems		Ottawa County
	Private Well Abandonment		Health Department
	Septic System Inspections		
Peggy Weick	Agriculture		Ottawa County
	Farm-A-Syst Program		Conservation Dist.
	Private Well Abandonment		
Linda Brown	Storm Water Management		Ottawa County
			Drain Commission

1.5.4.c SWIPP Steering Committee Meeting Dates

Date	Location	Purpose
11/18/09	Grand Haven City Hall	Initial SWIPP Team meeting
3/11/10	Grand Haven City Hall	SWIPP Draft Review

1.5.4d Steering Committee Roles & Responsibilities

Management Strategy	Responsible Agency/Individual	Role
Convene WHP Advisory	City Manager	Has chief responsibility
Administer zoning ordinance	City of Grand Haven – Zoning Officer	Implements ordinances
Implement education program	City of Grand Haven – Joe Vanderstel	Has chief responsibility
Participate in education program	Grand Haven Township Participating Entities (<i>planned</i>)	Coordinates with City
Administer FFRTK inspections	Grand Haven Fire Dept –	Has chief responsibility
Inform businesses about ground water protection requirements	Grand Haven Fire Dept – City DPS – Joe Vanderstel	Has chief responsibility
Emergency response	Grand Haven Fire Dept – City DPS – Joe Vanderstel	Fire Dept has chief responsibility
Update inventory	City DPS – Joe Vanderstel	Has chief responsibility
Assist with inventory update	Grand Haven Fire Dept – Grand Haven Township –	Coordinates with City
Share WHP experiences with other municipalities	Whole committee	
Participate in Advisory Committee	Grand Haven, Ottawa County Fire Dept	
Provide advice on groundwater education and intergovernmental coordination	Grand River Watershed Council Ottawa County Conservation District	
Inform new businesses about floor drain prohibition	Ottawa County Health Division	
Maintain well log data	Ottawa County Health Division	
Provide technical asst. regarding environmental health, planning, emergency response	Ottawa County Health Division	
Provide advice regarding WHP	Wellhead Protection Unit, DNRE	
Keep City updated in water quality monitoring requirements	Wellhead Protection Unit, DNRE	
Provide inspections upon request from Fire Dept.	Environmental Response Division, DNRE	
Inform potentially responsible parties regarding contaminated sites	Environmental Response Division, DNRE	

1.5.4e Steering Committee Objectives

The main goal of the Grand Haven SWPP is to assist the City of Grand Haven to provide a continuously safe and clean supply of drinking water to residents. This will be accomplished in large part through maintaining regulatory compliance with the Michigan Safe Drinking Water Act, 1976 P.A. 399, as amended. To ensure compliance with drinking water standards, the SWPP Steering Committee will meet on a regular basis to promote and raise public awareness of source water protection, to provide public education regarding source water protection, and to periodically update the elements of the Source water protection plan (such as the contingency plan, contaminant source inventory, SWPAs, etc.). SWPP Steering Committee

progress reports will be presented in the Management Section. These forms can be utilized to report and record the periodic progress of the SWPP team to the DNRE and others.

Mission Statement for Grand Haven's Surface Water Intake Protection Program: Grand Haven will ensure a safe drinking water source for residents by identifying historical, existing, and future threats; by formulating appropriate strategies to those threats, by educating residents by encouraging support and participation in the creation and implementation of the program; and by promoting intergovernmental cooperation to assure protection of water resources.

1.6 Goals and Objectives

This section presents the mission statement and goals for the City of Grand Haven Source Water Intake Protection (SWIPP) Areas, which are to be considered and used as guidelines when making decisions concerning matters affecting the SWIPP Areas.

1.6.1 Goal #1 Promote the identification, prevention and cleanup of contamination within the Source Water Intake Protection Areas.

Ways to Accomplish Goal #1

1. Identify sites of historical environmental significance through periodic update to the contaminant source inventory.
2. Encourage recycling and proper storage of chemicals through the use of best management practices (BMPs).
3. Encourage fast, effective remediation of contaminated sites discovered within SWIPP Areas.
4. Support redevelopment of Brownfield sites within the SWIPP Areas.

1.6.2 Goal #2 Educate the public on the need to protect surface water and groundwater sources within the SWIPP Areas.

Ways to Accomplish Goal #2

1. Produce and distribute education materials.
2. Offer special demonstrations, seminars and other activities that promote source water protection to the public.
3. Place road signs at the SWIPP Areas points of entry.

1.6.3 Goal #3 Promote and facilitate intergovernmental cooperation to ensure protection of the water resources within the SWIPP Areas.

1. Seek, review and evaluate information from local government agencies to identify issues that may potentially affect the SWIPP Areas.
2. Seek active participation of local government officials as part of the SWIPP.
3. Schedule regular SWIPP management team meetings and invite local representatives of government and other entities that have a stake in SWIPP Areas.
4. Incorporate SWIPP Areas in local and regional planning and zoning.

1.7 Water Supply Profile Overview

Surface water obtained from Lake Michigan in Grand Haven, Michigan is currently the exclusive water resource for the community. At this time, Surface water is the only economically feasible source of water for the community. Because of the prolific and extensive nature of the formation, there is an abundance of surface water with the capability to meet the present and future demands. Grand Haven's municipal water supply will eventually be extended into areas that may include new drinking water sources.

1.8 Intake Protection Area

The United States Geological Survey (USGS) defined the Source Water Assessment area for the City of Grand Haven under contract to the Michigan Department of Natural Resources & Environment (MDNRE) who completed the assessment. The final report was completed in April 2004 and is included as Section 2.

1.8.1 Source Water

Our source of raw Lake Michigan water is delivered to the filtration plant pre-filtered using submerged intakes as described in "Plant History." The average turbidity level for our raw water is 0.09 NTU's. At the filtration plant, the treatment technique is "Direct Filtration"; there are no sedimentation basins after flocculation.

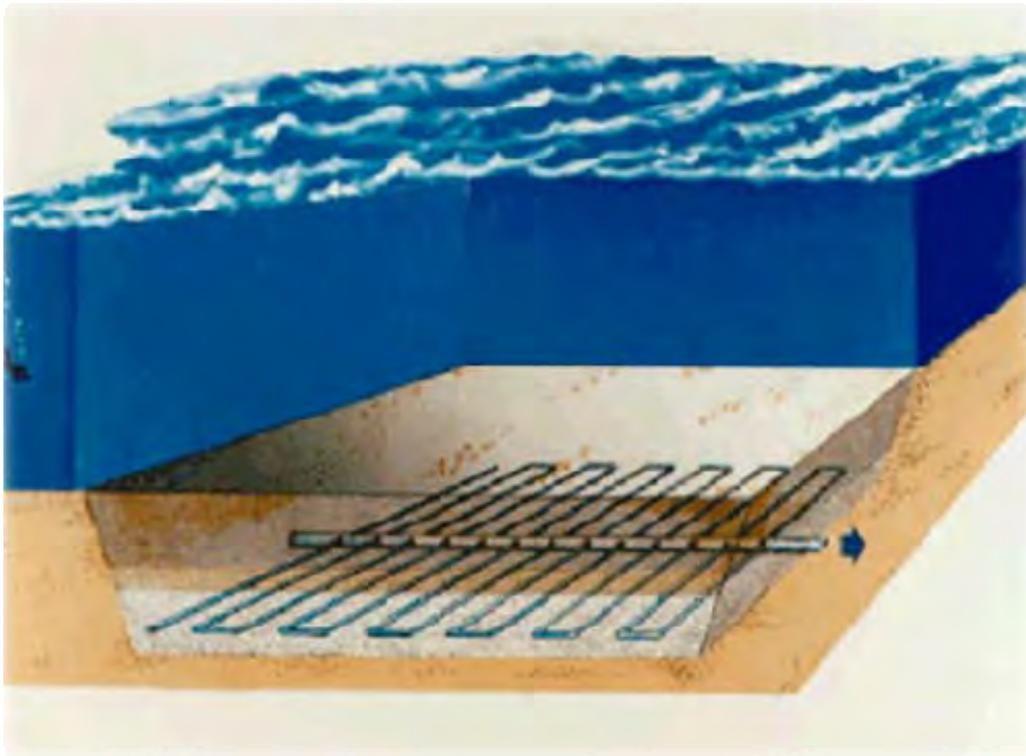
The water is filtered through eight General Filter cells, each with a filtration area of 304.5 square feet and designed for a filtration rate of 4.5 gallons per minute per square foot. Each filter cell contains 30 inches of dual media, 12 inches of sand, and 18 inches of anthracite. Pre-treatment at the plant consists of chlorination, an aluminum sulfate (alum) precipitation. Suspended particles and alum (precipitate) are trapped on the filter bed. After approximately 100 hours, the filter is removed from service and then backwashed. Backwashing is completed in 10 minutes, which is enough time to break up and remove all impurities that were trapped on top of the filter. Our filters have the capability of using water and air (multi-wash) during backwashing; although, we have found that water alone is sufficient to remove particles.

Turbidity for filtered water remains below 0.10 NTU (nephelometric turbidity unit) during normal filtration conditions. As with any filter that has been backwashed and put back into service, an increase in turbidity usually follows (ripening period). During this period, an individual filter cell's turbidity may increase to a level between 0.20 and 0.30 NTU's for 10 to 15 minutes before settling back to normal conditions. Filters are also affected by raw water turbidity and temperature variations throughout the year. Our operators consistently provide clean, clear water to our customers 24 hours a day by monitoring turbidity levels, temperatures, and other chemical and physical parameters. Our turbidity levels, on a monthly average, never exceed 0.10 NTU.

With the completion of the deep-bed high-rate, mono-media direct filtration study, we now have the Department of Environmental Quality's approval to provide high quality drinking water at a faster rate. Deep-bed high-rate, mono-media direct filtration consists of 52 inches of anthracite, eliminating the 12 inches of sand that was used in our existing dual-media filters. We're anticipating the completed filter and facility expansion by 2011; this will provide the surrounding communities with safe and reliable drinking water over the next 10 to 15 years.

1.8.2 Water Treatment Plant History

Through the late 1800's and early 1900's, the City of Grand Haven used various wells from the east and west sides of Grand Haven. During that time, a private company and the City's municipality provided water from both locations. The Wiley Water Works pumping station was located on the east end of Grand Haven near the area of East End Park. The municipal pumping station was located near the Power Plant, which is now the location of the BLP's Diesel Plant. The City's first water filtration plant was constructed in 1927; it had a 2 million gallon per day capacity and provided safe potable drinking water to a relatively small community. Following World War II, increasing population expanded the existing water supply to incorporate a unique well system. The Ranney Collectors (wells), which utilize the lake bottom sand as pre-filtration before plant filtration, were constructed at the Grand Haven State Park; and in 1961 a submerged intake (the crowsfoot) was installed below Lake Michigan, again using the sand as a natural barrier for impurities. This system provided water to the surrounding communities until 1983.



With an existing plan in place since 1978, the governing bodies approved an expansion project that would build a new facility capable of supplying water at 12 million gallons per day. In 1986, the first true "direct filtration" facility in Michigan was constructed. In 1990, a third intake structure was constructed at the Grand Haven State Park in conjunction with a new Lake Pumping Station. This new structure was an intermediate submerged intake system that enhanced the overall quality of raw Lake Michigan water to our existing filtration plant. In the spring of 2001, we expanded the submerged intake system by installing a second similar intermediate intake south of the existing intake. The new south intake, with the existing north intake, will be capable of delivering up to 28 MGD of pre-filtered Lake Michigan water. To complete the south intake project, the crowsfoot intake and the Ranney Collectors were removed, due to poor raw water quality and increased maintenance costs.

The Northwest Ottawa Water System (NOWS) is planning for the future with a project that will expand our existing facility to accommodate our new intake system. In 2004, the Michigan Department of Environmental Quality approved a study for “deep-bed high-rate, mono-media direct filtration” as our primary filtration technique. The current facility has an approved rated capacity of 15.5 million gallons per day.

The daily average is 5.4 million gallons/day with total pumpage was over 1.9 billion gallons.

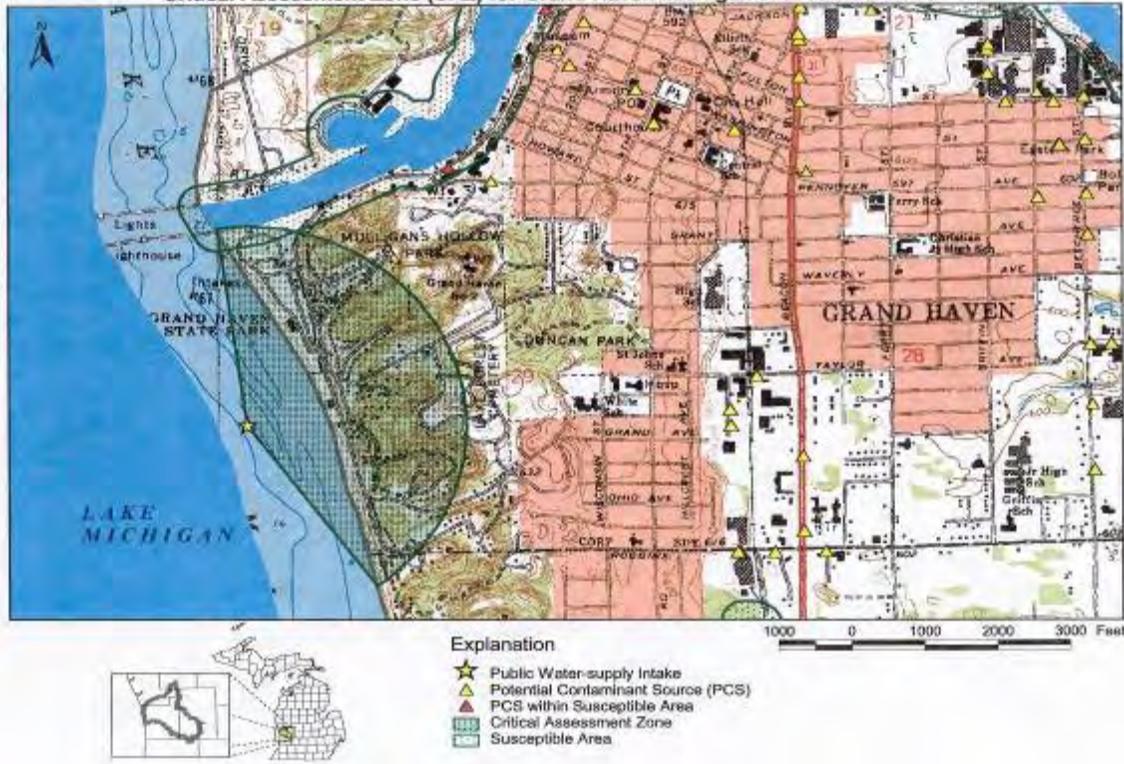
The Northwest Ottawa Water Treatment Plant and its operators are certified and approved for microbiological analysis on Total Coliform, Fecal Coliform, and Heterotrophic Bacteria. Our laboratory has an operator available 24 hours a day. There are five shift operators that perform laboratory analysis and monitor water pumpages for all of Northwest Ottawa's customers.

We perform other analyses on raw Lake Michigan water, as well as on filtered and tap water. These routine tests are part of the requirements of supplying high quality drinking water to our community. Our laboratory is well equipped with the latest instrumentation. Our inline turbidimeters and particle counters are complimenting our bench results with real time filtration information

Our customers of Northwest Ottawa Water Systems (NOWS) include City of Grand Haven, Grand Haven Charter Township, Village of Spring Lake, Spring Lake Township, City of Ferrysburg, Crockery Township

1 & 4 Source Water Assessment Area

Critical Assessment Zone (CAZ) for Grand Haven Michigan source-water area



stern
W falls

1.8.5 Source Water Area Geology and Hydrology

The study area for evaluating the extent of the Grand Rapids WTP SWA includes a portion of the Grand River watershed, in addition to Lake Michigan (Fig.1 Sect.2). The SWA consists of end moraines of fine-textured till, end moraines of coarse-textured till, fine-textured glacial till, coarse-textured glacial till, lacustrine sand and gravel, post-glacial alluvium, and sand dunes. These landforms are underlain by Coldwater shale, Marshall sandstone, Bayport limestone, the Red Beds shales, and the mixed shales, limestone and sandstone of the Michigan Formation (Martin, 1955; Milstein, 1987). Soils in the Grand Rapids SWA are primarily from these soil associations: Grattan-Pipestone-Granby, Perrinton-Ithaca-Coloma, Boyer-Fox-Wasepi, Plainfield-Spinks-Metea, and Ithaca-Ziegenfuss-Pewamo. They include sand, loamy sand, loam, and muck (BASINS, 1998).

Soil permeability is based on the calculated time of travel, in inches per hour (in/hr), for water to move vertically through a saturated soil zone. Soil thickness and permeability values are available in soil survey reports published by the National Cooperative Soil Survey and U.S. Department of Agriculture (1986). Permeability ranges from less than 0.06 in/hr, rated as very slow, to more than 20 in/hr, rated as very rapid.

Very slowly permeable soils significantly reduce the movement of water through the soil zone and, as a result, allow greater time for natural degradation of contaminants. However, such soils also provide for rapid overland transport of contaminants directly to receiving waters, which in turn may affect the water supply intake. In contrast, very rapidly permeable soils allow for rapid infiltration and passage through the soil zone from the surface. Such soils potentially allow rapid transport of contaminants with minimal contact-time available for contaminant breakdown. Erosion and transport of soils by surface waters can cause an increase in turbidity.

Mean, area-weighted, depth-integrated permeabilities for the Grand Rapids SWA range from 0.9 to as much as 12.7 in/hr. The mean permeability is 8.1 in/hr (Schneider and Erickson, undated, series of 5 maps; BASINS, 1998;). Soils are predominantly rapidly permeable over highly sensitive drift lithology throughout the SWA (fig. 2; Sect.2 BASINS, 1998), with some small areas of moderate and moderately rapid permeability in the south and central of the SWA. Soils with rapid permeability are close to the Grand River, and Lake Michigan (Lusch and others, 1992; BASINS, 1998).

1.8.6 Topography

The topography within the Lower Grand River Watershed (LGRW) is influenced by glacial deposition of sediment and the effect of water deposition and drainage over time. Watershed topography is undulating and dissected by water courses with occasional small plains studded with bogs and small lakes.

Critical Assessment Zone (CAZ) for Grand Haven Michigan source-water area

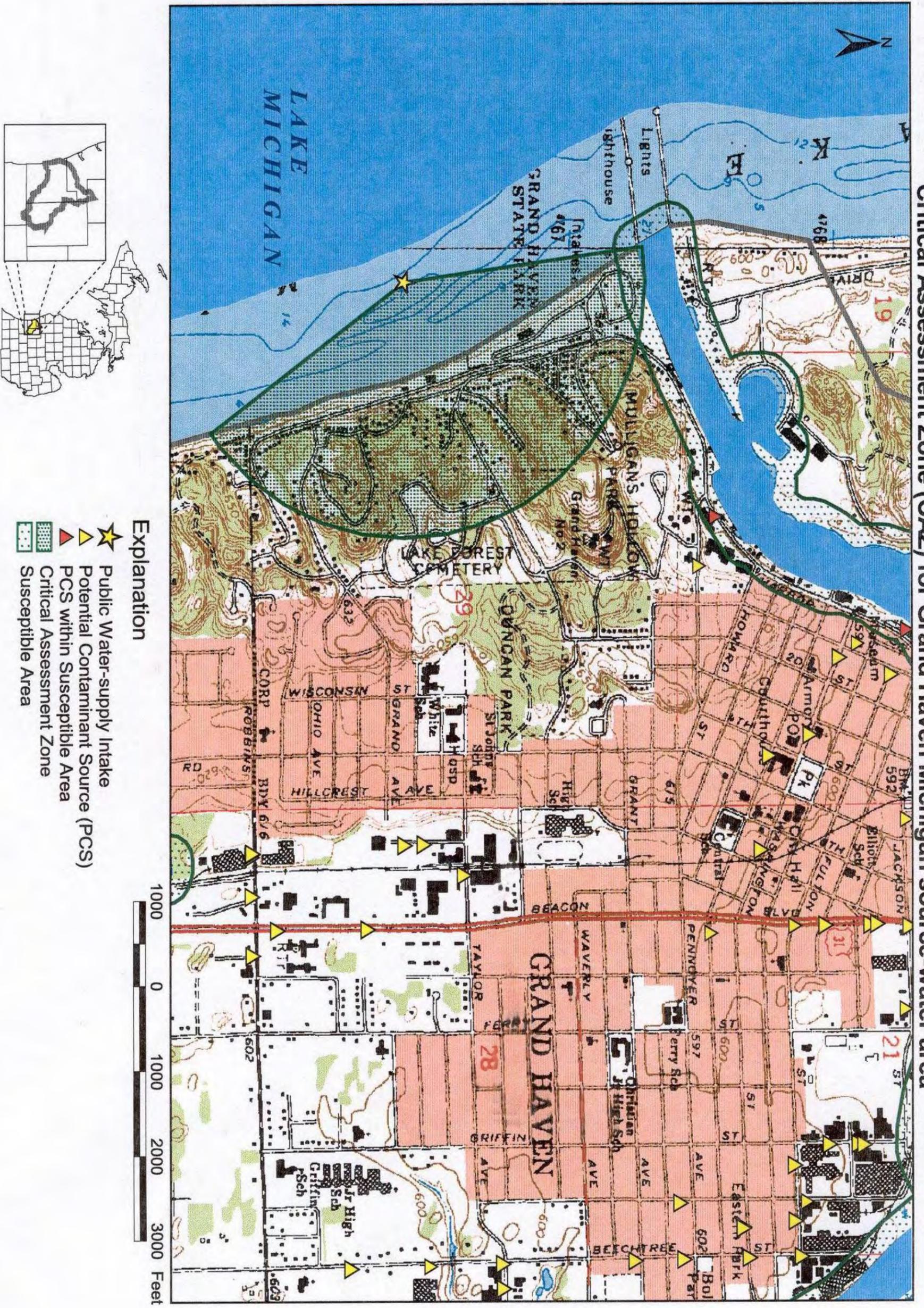


Figure 3. Critical Assessment Zone for the Northwest Ottawa water supply, Grand Haven, Michigan.



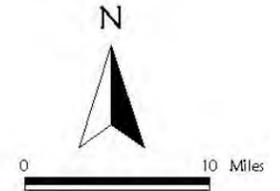
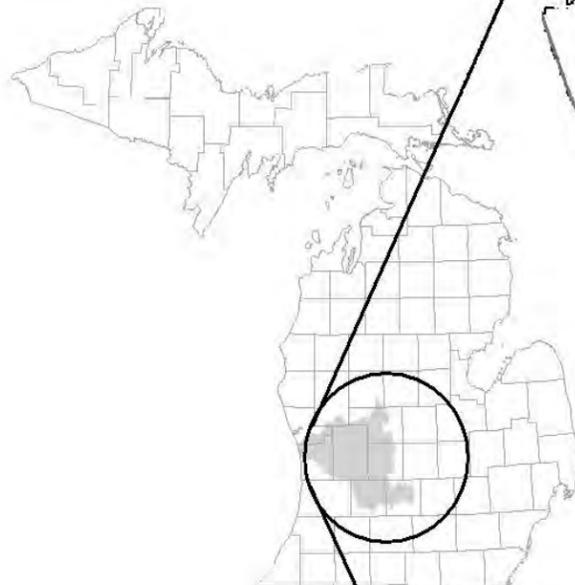
Lower Grand River Watershed Project



frcsh
fish, food, forests, and fibers
Michigan's natural resources

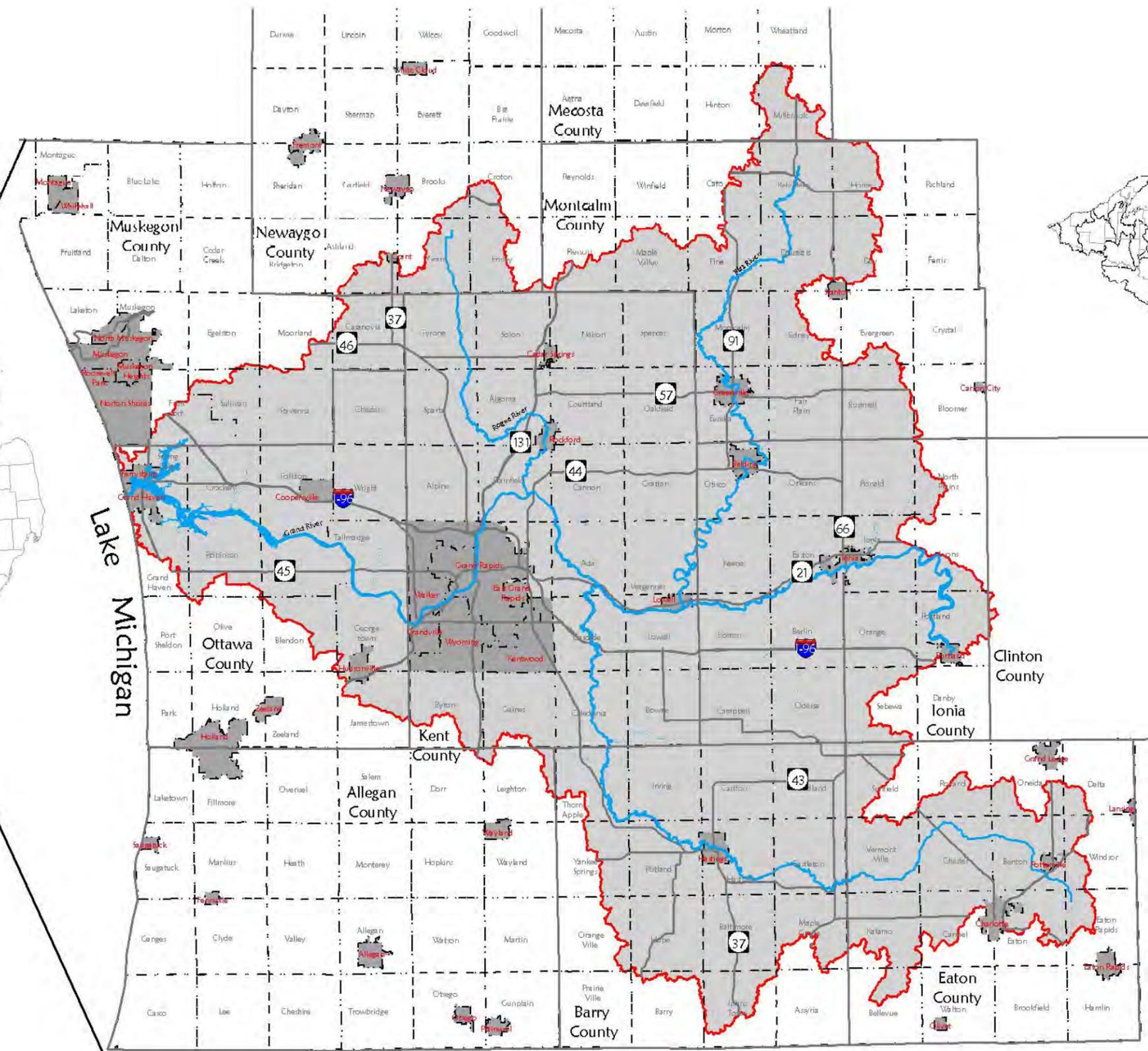
Information Services Center
Annis Water Resources Institute
Grand Valley State University

Map Prepared August, 2004



Base Information

- Interstate/Highway
- Major Watercourses
- County Boundary
- Watershed Boundary
- City/Village
- Township



Data Source:
Base Information: Framework V3B, Michigan
Center for Geographic Information, Department
of Information Technology, 2004.

Location
Lower Grand
River Watershed
Figure 1



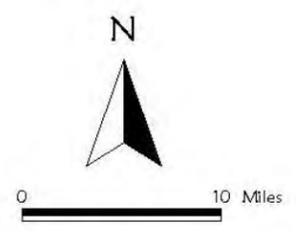
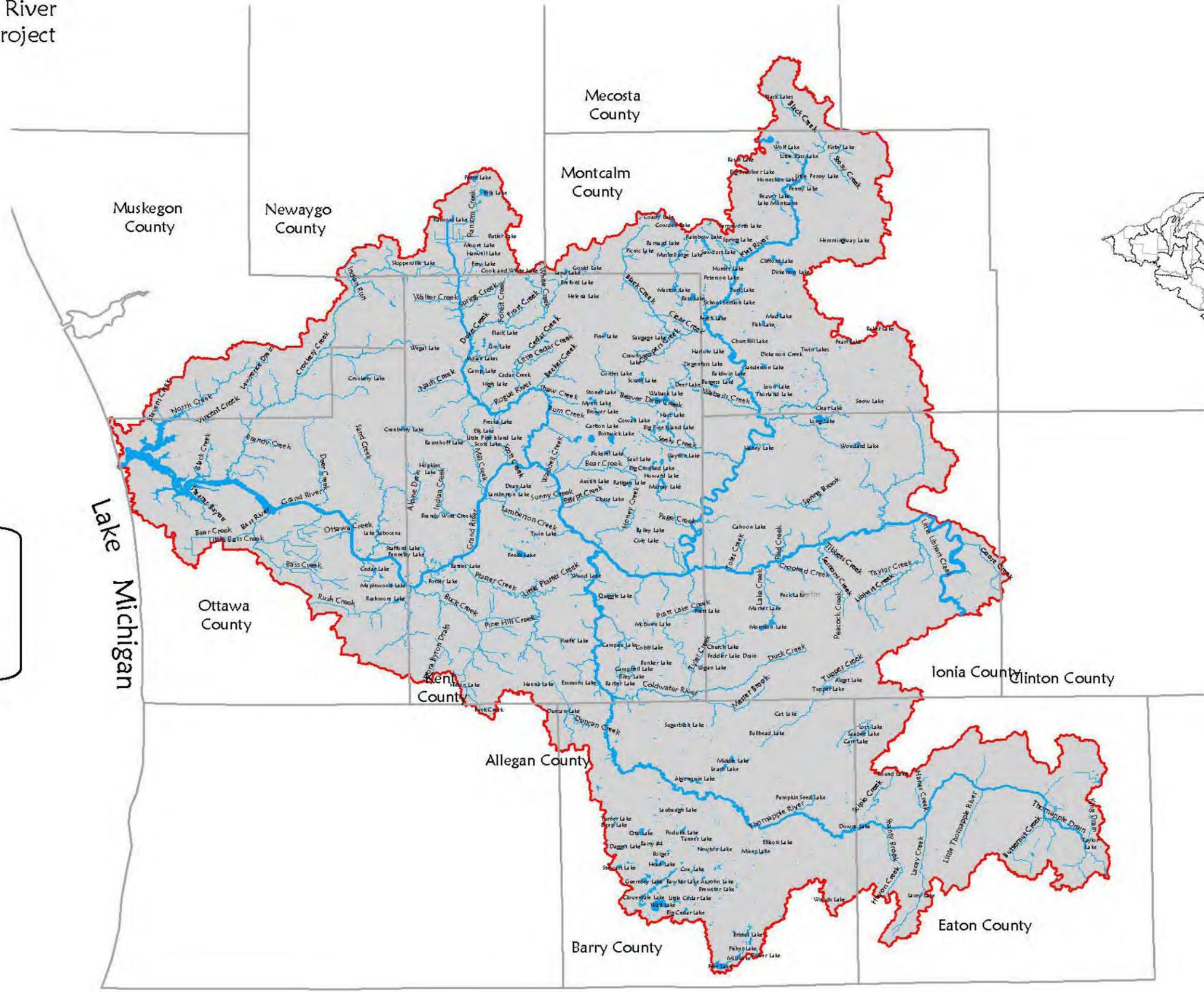
Lower Grand River Watershed Project



Information Services Center
 Annis Water Resources Institute
 Grand Valley State University
 Map Prepared August, 2004

Base Information

- River/Stream
- Lake/Pond
- County Boundary
- Watershed Boundary



Hydrology Lower Grand River Watershed

Figure 4

Data Source:
 Base Information:
 Framework V3B, Michigan Center
 for Geographic Information, Department
 of Information Technology, 2004.



Lower Grand River Watershed Project



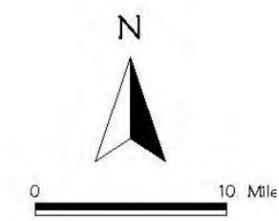
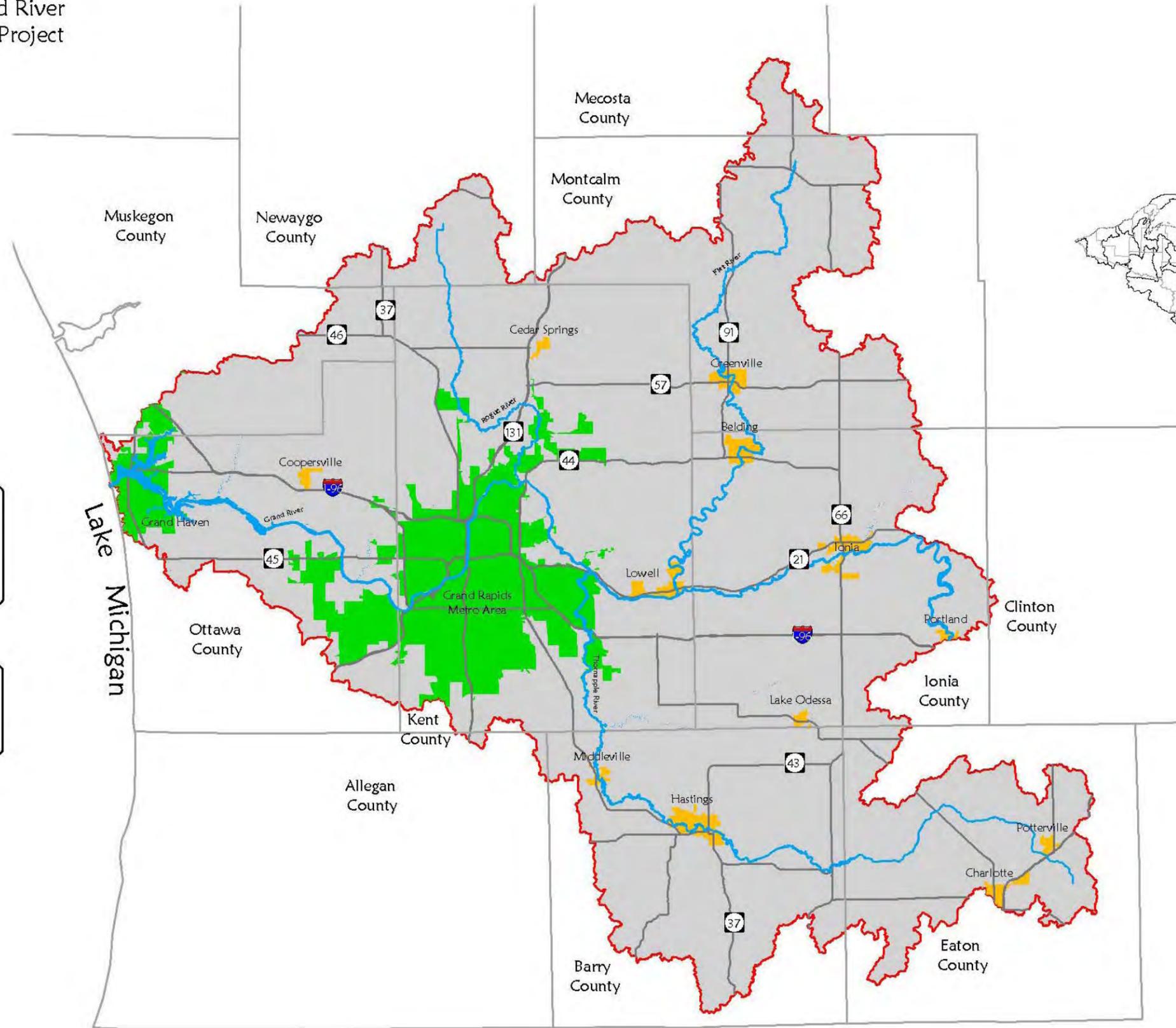
Information Services Center
Annis Water Resources Institute
Grand Valley State University
Map Prepared August, 2004

Base Information

- Interstate/Highway
- Major Watercourse
- County Boundary
- Watershed Boundary

Urban Areas

- Urban Area
- Urban Cluster



Data Source:
Base Information and Urban Areas:
Framework V3B, Michigan Center
for Geographic Information, Department
of Information Technology, 2004.

Urban Areas Lower Grand River Watershed

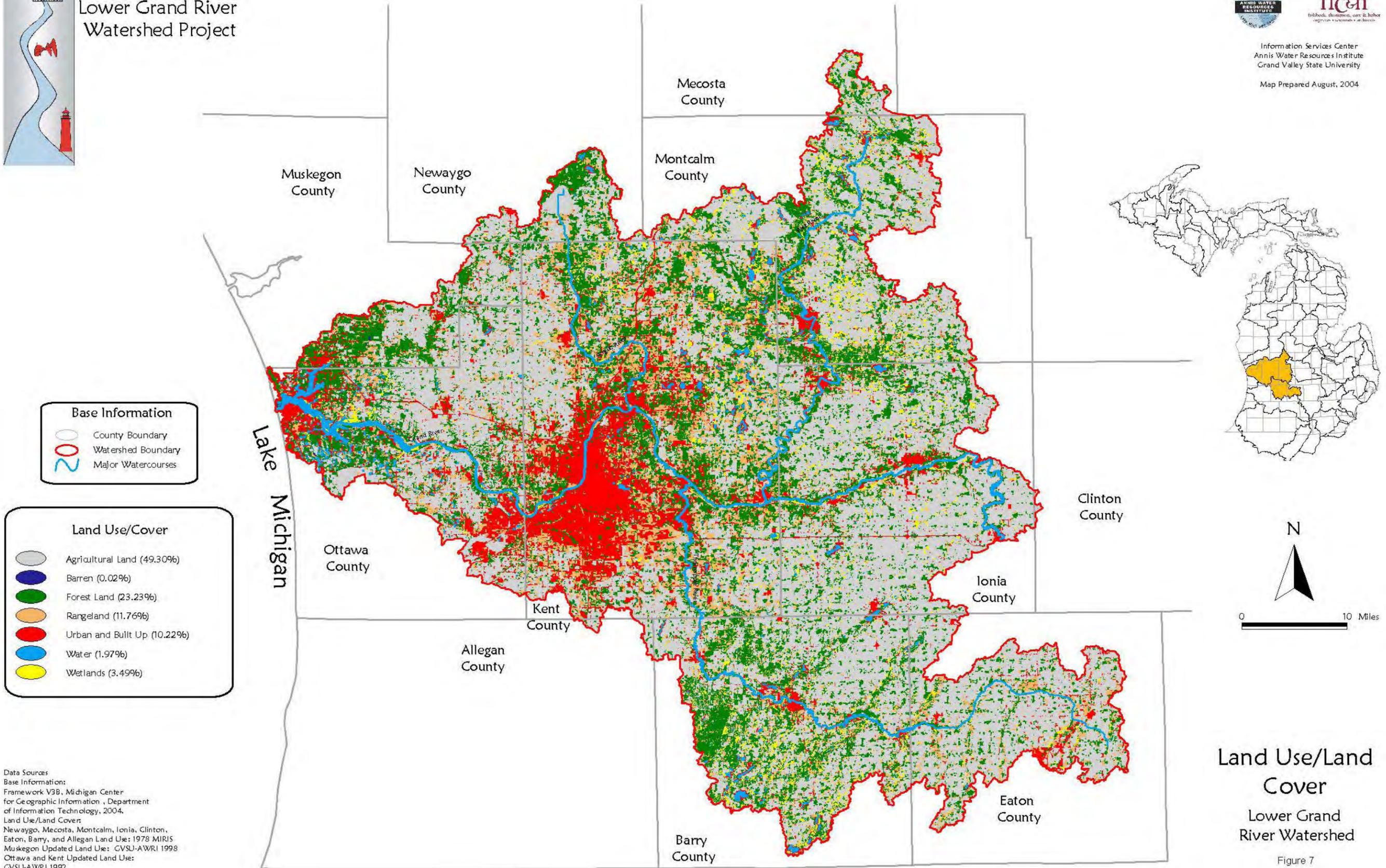
Figure 2



Lower Grand River Watershed Project



Information Services Center
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 Map Prepared August, 2004

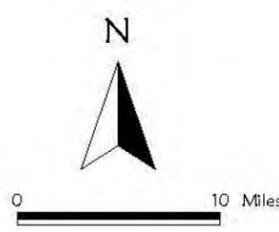


Base Information

- County Boundary
- Watershed Boundary
- Major Watercourses

Land Use/Cover

- Agricultural Land (49.30%)
- Barren (0.02%)
- Forest Land (23.23%)
- Rangeland (11.76%)
- Urban and Built Up (10.22%)
- Water (1.97%)
- Wetlands (3.49%)



Land Use/Land Cover
 Lower Grand River Watershed

Figure 7

Data Sources
 Base Information:
 Framework V3B, Michigan Center for Geographic Information, Department of Information Technology, 2004.
 Land Use/Land Cover:
 Newaygo, Mecosta, Montcalm, Ionia, Clinton, Eaton, Barry, and Allegan Land Use: 1978 MIRIS
 Muskegon Updated Land Use: GVSU-AWRI 1998
 Ottawa and Kent Updated Land Use: GVSU-AWRI 1992.



Lower Grand River Watershed Project



Information Services Center
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 Grand Valley State University
 Map Prepared August, 2004

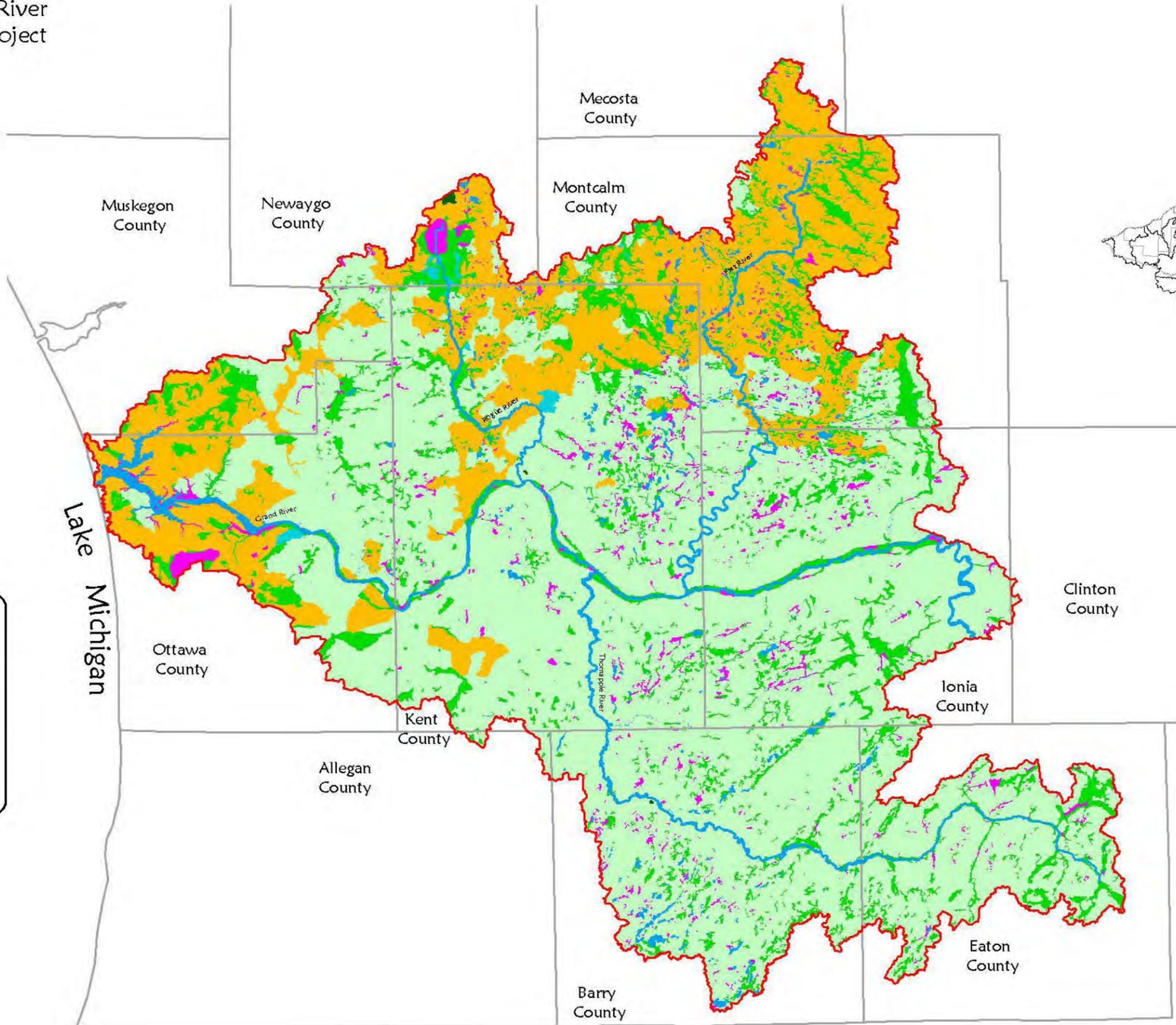


Base Information

- County Boundary
- Watershed Boundary
- Major Watercourses

Presettlement Vegetation

- Conifer Forest and Barrens (0.25%)
- Forested Wetlands (11.20%)
- Grassland (0.04%)
- Hardwood Forest and Savanna (63.99%)
- Lake/River (1.64%)
- Mixed Hardwood/Conifer Forest and Barrens (20.52%)
- Sand Dune (0.005%)
- Unforested Wetlands (2.37%)



N

0 10 Miles

Presettlement Vegetation
 Lower Grand River Watershed

Figure 6

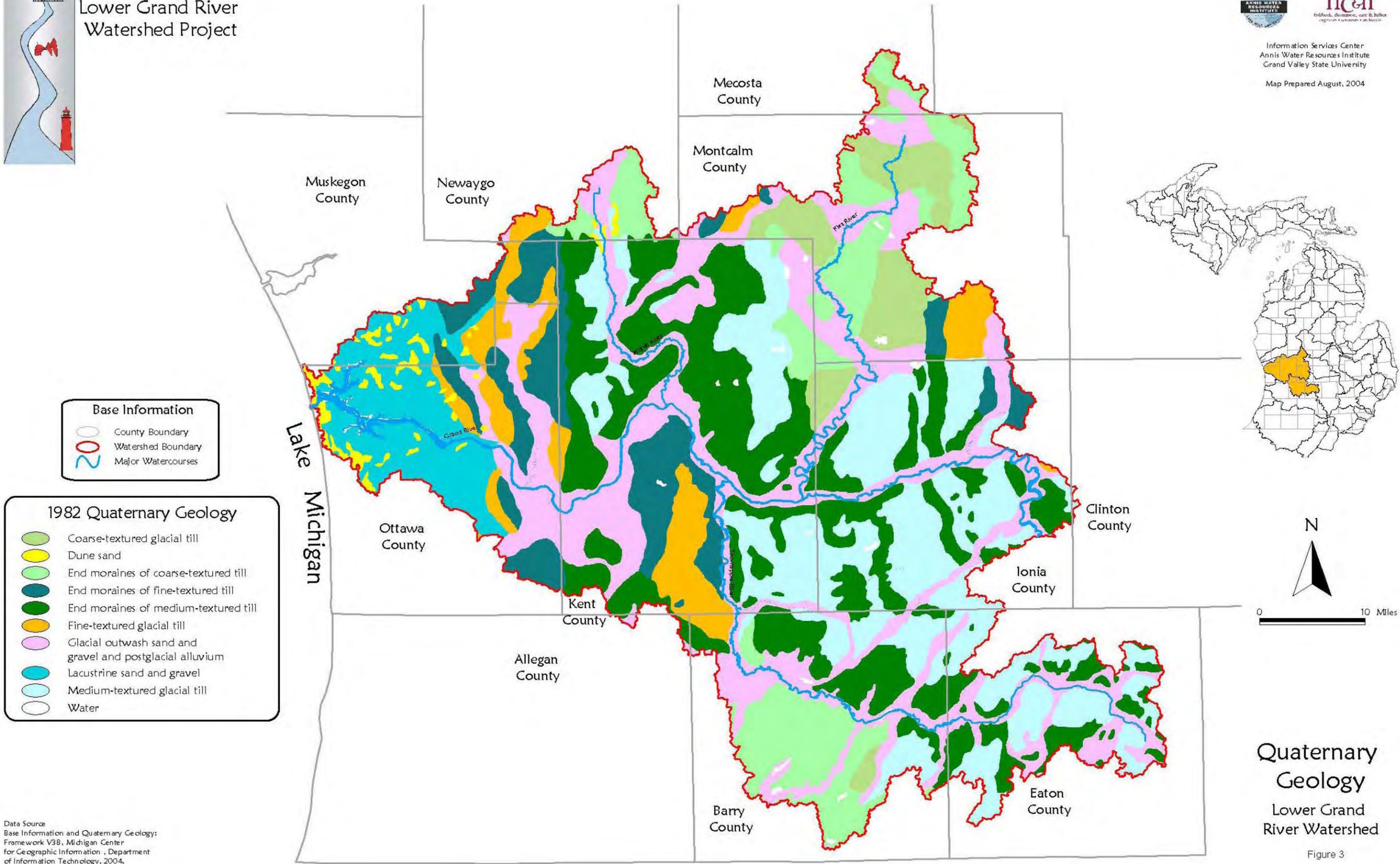
Data Source:
 Base Information and Presettlement Vegetation:
 Framework V3B, Michigan Center
 for Geographic Information, Department
 of Information Technology, 2004.



Lower Grand River Watershed Project



Information Services Center
Annis Water Resources Institute
Grand Valley State University
Map Prepared August, 2004

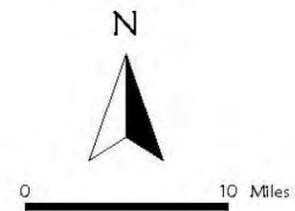


Base Information

- County Boundary
- Watershed Boundary
- Major Watercourses

1982 Quaternary Geology

- Coarse-textured glacial till
- Dune sand
- End moraines of coarse-textured till
- End moraines of fine-textured till
- End moraines of medium-textured till
- Fine-textured glacial till
- Glacial outwash sand and gravel and postglacial alluvium
- Lacustrine sand and gravel
- Medium-textured glacial till
- Water



Data Source
Base Information and Quaternary Geology:
Framework V3B, Michigan Center
for Geographic Information, Department
of Information Technology, 2004.

Quaternary Geology
Lower Grand River Watershed

Figure 3

Topography within the LGRW varies. The Flat River and Rogue River sub-basins contain rolling hills and highlands above deep valleys. The Thornapple River sub-basin has two topographically distinct areas. The upper area has less relief and more areas of flat and gently rolling topography with only a few lakes and is generally well drained. The lower area is more rugged and contains numerous lakes and large depressions. The Lower Grand River sub-basin ranges from fairly rugged topography in the entrenched main stream of the Grand River (in the Grand Rapids area) to a low, flat plains area along the lower reaches of the river toward Grand Haven. Many of the tributary streams in this area flow through steep, walled valleys where they join the entrenched valley of the Grand River. The streams are commonly 20 or more feet below the surrounding uplands (Grand River Basin Coordinating Committee, 1972).

1.8.7 Climate

The LGRW enjoys a moderate continental climate and annually experiences 155 frost-free growing days. It is located at a latitude approximately midway between the North Pole and the equator. Air masses originating from the Gulf of Mexico, northern Canada, and the north pacific influence day-to-day weather. The presence of Lake Michigan has a slight moderating effect on annual temperatures and results in increased snowfall near the coast. The mean January temperature in the LGRW is approximately 23° Fahrenheit; the mean July temperature is approximately 71° Fahrenheit. The average rainfall throughout the LGRW is approximately 32 inches. Annual snowfall ranges from 80 inches along Lake Michigan to 40 inches along the eastern edge of the watershed (Bieneman, 1999).

1.8.8 Other Uses

The Lower Grand River Watershed is a vast river system well known for its high water quality and aesthetically pleasing scenery. Year-round outdoor recreational opportunities within the watershed are seemingly endless and include canoeing, camping, hiking, hunting, fishing, golfing, wildlife viewing, skiing, swimming and snowmobiling.

1.8.9 Measurable Water Quality Concerns

Based on the location of the intake pipes, the natural setting of the source water, and land use, the Northwest Ottawa source water has been classified as *Moderate susceptible* to potential contamination. Depending on winds and currents, the discharge from the Lower Grand River may directly affect the public drinking water supply.

It has been demonstrated that nonpoint source pollution from storm water runoff, agriculture activities and other nonpoint source pollutants in the Lower Grand River Watershed can affect the quality of the raw water intake. Despite this the Northwest Ottawa Water Treatment Plant has effectively treated the source to meet drinking water standards.