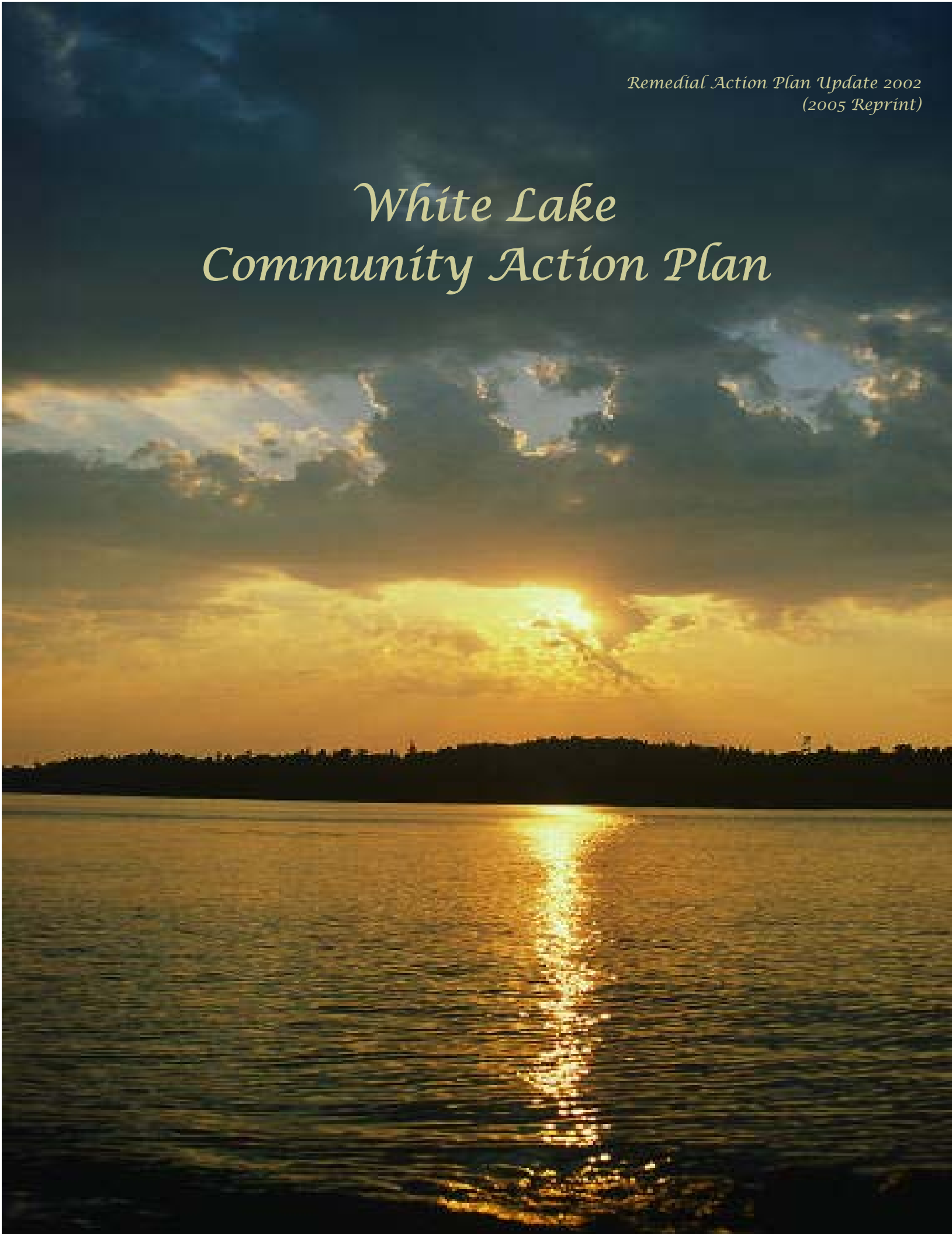
Remedial Action Plan Update 2002
(2005 Reprint)

White Lake Community Action Plan



The White Lake Community Action Plan was prepared by the White Lake Public Advisory Council, in conjunction with the Muskegon Conservation District, as a community based Remedial Action Plan. This document looks to foster continued interest by the public while helping address environmental impairments within White Lake. The White Lake Community Action Plan is an update to the 1995 Remedial Action Plan for White Lake. The first White Lake Remedial Action Plan was completed by the Michigan Department of Environmental Quality in 1987.

White Lake Public Advisory Council

The White Lake Public Advisory Council is a formal council of members from throughout the White Lake area that works to provide the public with information, services, and projects which will improve the environmental quality of White Lake and its affiliated watersheds. Through these activities the Council works to advise agencies, express views and voice the concerns of the local community.

This Publication was made possible by the work of:

Muskegon Conservation District

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White Lake Area Sportfishing Association

White Lake Association

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Robert B. Annis Water Resources Institute - Grand Valley State University

Michigan Department of Environmental Quality - Water Division

Michigan Department of Natural Resources - Fisheries Division

Michigan Department of Natural Resources - Wildlife Division

City of Whitehall

City of Montague

Robert B. Annis Water Resources Institute - Grand Valley State University

Lake Michigan Federation

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Executive Summary

White Lake is a community resource that is beginning to recover from years of neglect and under appreciation. In the past, major efforts have been made to increase the quality of the system by focusing on major points of contamination within the immediate drainage area of White Lake. In 1985, when White Lake was first listed as an Area of Concern for the Great Lakes, the emphasis for remediation looked at determining groundwater pollution sources and sediment contamination. Since that time, many advances have been made toward restoring the lake, including remediation and containment of sites that were adversely impacting groundwater. The overall impact to the White Lake system from these sites is decreasing, but some threats still remain. The greatest threats existing for White Lake presently include sediment contamination, excessive nutrient inputs, changes in land use, and loss of aquatic and terrestrial habitat . These threats directly relate to the Beneficial Use Impairments listed for White Lake and must be addressed in order for this tremendous resource to remain a valued asset to the community.

Sediment Contamination

Sediment contamination has been the focus for most restoration efforts within White Lake and considerable time and effort has been made to eliminate the associated impacts affecting many of the Beneficial Use Impairments. In 2002, a long term effort to locate, reduce, and remove two contamination "hot spots" within the sediment of White Lake was initiated. One of the hot spots was near the Occidental discharge pipe and the other in Tannery Bay at the former Whitehall Leather Company. Following the clean-up of these two sites, three areas with high contaminant concentrations remain. If left as is, these three sites may continue to negatively impact the lake and groundwater. Unfortunately, contamination is wide spread throughout the entire system and even with the remediation sediment contamination will remain. Short of dredging the entire bottom of White Lake, the ecological health of the system will require the slow recovery through natural processes and time.

Nutrient Inputs

Nutrient inputs to White Lake have changed considerably throughout the history of the White Lake Community. Most notably was a dramatic decrease in associated discharges into White Lake following the closing of municipal sewage treatment facilities and constructing a local Muskegon County Treatment facility in the early 1970's for the White Lake area. Subsequent testing has shown increases in water quality from reduced nutrient discharge. Cultural eutrophication appears to have slowed its pace, yet many nutrient sources need to be addressed to improve water quality within White Lake.

A major source for nutrients to White Lake continues to be the White River Watershed which contributes approximately 95% of the water to the system. Because of this, the river system may be the major contributor for nutrients and sediment. White Lake's nutrient sources need to be evaluated and determined to address these issues, whether individually, or within the larger watershed.

Changes in Land Use

The White Lake community is experiencing the same sprawl as neighboring communities, as new development continues to grow from the north side of Muskegon. Changes in the landscape continue throughout the watershed regardless of the White River's designation as a "Natural River" and its associated zoning regulations and restrictions. The landscape changes are impacting the ecological health of the system by altering natural processes throughout the watershed.

Loss of Habitat

Another influence of development around White Lake is the loss of habitat, as the shoreline is quickly becoming encircled by residential development or altered for commercial and recreational use. Habitat loss is a major concern as extensive shoreline development in recent years has led to the elimination of riparian and submergent plants, while isolating upland habitats that still remain. People are building larger homes in smaller spaces along steep hillsides, in ravines, and altering unique habitats like wetlands. Overall, development is eliminating important breeding areas and habitat corridors for fish and wildlife.

Addressing the Issues

The White Lake Public Advisory Council has prepared the following White Lake Community Action Plan as the Remedial Action Plan Update for 2002 in order to address many of the complicated issues underlying specific impairments. Overall, this publication looks to document: remaining pollution sources; evaluate restoration; measure/assess successes; and establish targets and actions to improve and protect White Lake. This document will guide future planning in the White Lake area and within the White River Watershed. If relevant planning is not implemented, it is feared that continued development will have an overwhelming negative impact on the system in spite of the restoration of sediments taking place.

Throughout the document the Public Advisory Council has included targets, goals, and objectives to meet the needs of the White Lake community, as well as technical delisting criteria for governmental agencies. These solutions include:

- Priority Actions for delisting *(listed in the sidebar to the right).*
- Specific solutions for the local communities within each "Resource Issue" as well as the Overall Goals for White Lake.
- Technical Guidelines and Targeted Restored Conditions for researchers, organizations, and governmental agencies.

The White Lake Public Advisory Council will work to begin delisting most impairments by 2008, and submitting removal as an Area of Concern by 2010 pending future restoration.

Beneficial Use Impairments

The following eight Beneficial Use Impairments from the Great Lakes Water Quality Agreement were first listed as high priority for the White Lake system by the International Joint Commission in 1987.

- *Restrictions on fish and wildlife consumption*
- *Degradation of fish and wildlife populations*
- *Degradation of the benthic community (including organisms that live in or on the bottom of a body of water)*
- *Restrictions on dredging activities*
- *Eutrophication, or excessive growth of aquatic plant life*
- *Restrictions on drinking water consumption, or taste and odor problems*
- *Degradation of aesthetics*
- *Loss of fish and wildlife habitat*

The Great Lakes Water Quality Agreement listed 14 Impairments as measurements of ecological health for the Areas of Concern. The 14 Beneficial Use Impairments include those listed above and the following.

- *Bird or animal deformities or reproduction problems*
- *Tainting of fish and wildlife flavor*
- *Fish tumors or other deformities*
- *Beach closings*
- *Added costs to agriculture or industry*
- *Bird or Animal deformities or reproduction problems*

White Lake AOC Delisting

Since the last White Lake Remedial Action Plan in 1995, the overall quality of the lake is improving yet there continue to be a few site specific problems that are negatively impacting how the lake is used. These impacts need to be resolved before delisting. This document recommends the following actions of greatest priority:

1. Removal of all contaminated sediment within the White Lake basin that are presently known to impair uses. Implement a strategy to conduct and prioritize future assessment, monitoring, and remediation activities.

2. Remediation of ALL sites around White Lake that are contaminating groundwater.

3. Determine nutrient loading for the lake and establish 5 and 10-year nutrient management plans.

4. Establishment of a formalized "Master Plan" between all municipalities around White Lake that provides habitat conservation, preservation, and restoration for fish and wildlife.

5. Acquire conservation easements at Dupont, Occidental, and Genesco sites for habitat protection and public land preservation. Utilize sites to give back to the community that has already had so many negatives associated with their health, and the health of the environment.

6. Ensure the White River Watershed Partnership (formed in 2003) remains an active and vital part of remediation efforts in White Lake. The partnership should work on a regional ecosystem scale to educate individuals, coordinate research, and implement community activities and programs.

"Much has been learned, but much still needs to be learned in order to best address the management issues

Remedial Action Plan History

In 1909, as part of an international effort to protect and manage the Great Lakes, the United States and Canada formed the Boundary Waters Treaty and created the International Joint Commission. The Commission is comprised of representatives for each of the two countries including individuals from surrounding states, tribes, and federal agencies. As increased use and environmental pressures continued throughout the 1900's the Commission strengthened the Treaty with the Great Lakes Water Quality Agreements of 1972, 1978, and later revised in 1983. With increased concern about protection of the Great Lakes the Commission's Water Quality Board identified 43 sites, as of 1985, that may be negatively impacting the five Great Lakes. These sites were identified as Areas of Concern and include rivers, lakes, and bays that pose the greatest threat to the overall health of the Great Lakes.

Within Michigan, State agencies and the U.S. Environmental Protection Agency classified 14 Areas of Concern; one of those being White Lake. In 1987 the Water Quality Agreement was again reorganized to include guidelines for preparing locally based plans. These plans, known as Remedial Action Plans, are used to restore water quality at Areas of Concern sites and eliminate negative impacts to the Great Lakes.

Area of Concern Designation

Sites recognized as Areas Of Concern contain degraded water quality conditions that do not allow the water body to be used for designated purposes. These criteria are known as Beneficial Use Impairments and reflect the ecological health of the system. The designation and use for lakes, rivers, and streams are determined by state and federal programs that meet specific criteria. White Lake was designated as an Area of Concern because of severe pollution harming biological life including fish and wildlife, and preventing residents from using water for drinking, recreation, or other purposes. This original designation was due to contaminated groundwater migrating into the lake from the Occidental Chemical Corporation site. However, White Lake continues to be designated as an Area Of Concern because of other contaminated sites surrounding the lake and restrictions of water use.

Remedial Action Plan Process

Because of White Lake's designation, the Remedial Action Plan is used as a guideline to restore and protect White Lake, Lake Michigan, and the Great Lakes. This plan is locally based and designates environmental problems, provides information concerning those original problems, establishes goals for water quality and water use, and provides solutions for restoring White Lake. The development of the White Lake Plan continues to change and may yet expand with further studies revealing problems that extend the scope of original concerns. The final goal of the Plan is to confirm that each of the beneficial uses have been restored. Secondarily, it will provide documentation to the Commission's Water Quality Board for removal of White Lake as an Area of Concern.

The Remedial Action Plan, 2002 Update

The White Lake Public Advisory Council, State, or Federal governments have yet to file delisting for any of the priority Beneficial Use Impairments cited as priority in 1987. This is due to the high connectivity of contaminated sediments and groundwater affecting many of these impairments. Prior research has also brought other issues to the forefront and shed new light on water quality issues within the system.

In preparing the 2002 Update, the Public Advisory Council continues to believe that focusing on impairments may be too rigid a structure for public involvement. Without public involvement the Remedial Action Plan will not gain support, and fail to meet the needs of the White Lake Area of Concern. This publication uses more common and recognizable terms to address many of the complicated issues underlying specific impairments and defines impairments utilizing a wider scope to increase public understanding and involvement. Thus, the 2002 Update has evolved into the ***White Lake Community Action Plan***.

The White Lake Community Action Plan

The Community Action Plan calls upon individuals, residents, business owners and municipalities within the White Lake area to act upon the recommendations and actions. These actions and solutions are based upon suggested needs for the community and were determined by individuals, groups, and agencies involved in the White Lake Public Advisory Council. This approach will hopefully address the issue that apparent restorations do not necessarily mean the problem has been eliminated and can draw attention to specific human actions that have contributed to a specific impairment in the first place.

Technical advice was used throughout the preparation of this document knowing the importance of relating public comment to the complex interactions between the biological, chemical, and physical aspects of the ecosystem. Technical information combined with research and monitoring suggestions are found near the end of this document. Technical sections address specific objectives related to the Remedial Action Plan process and the listing of White Lake as an Area of Concern. Resource advisors and public comment have been utilized to address mutually acceptable decisions that ensure the continued interest in the protection and restoration of White Lake.

Delisting Criteria

As White Lake moves toward restoration, individual Beneficial Use Impairments may be removed while the community and Public Advisory Council work toward final delisting. The final removal of White Lake as an Area Concern must meet specific criteria and move through formal approval by state, federal, and international agencies. Upon completion and approval of final reports the International Joint Commission will move to officially remove White Lake as an Area of Concern. Most, importantly the White Lake community will celebrate a long history of restoring a cherished natural resource, White Lake.

The White Lake Public Advisory will utilize the following criteria to delist individual Beneficial Use Impairments:

- A delisting target has been met through remedial actions and monitoring confirms that the beneficial use has been restored.
- Research or technical information demonstrates that the beneficial use impairment is due to natural rather than human causes.
- The impairment is not limited to the local area, but rather is typical of lake-wide, region-wide, or area-wide conditions. Under this situation, the beneficial use did not have to be originally recognized as impaired.
- The impairment is caused by sources outside the Area of Concern. The impairment is not restored according to the impairment classification and can be either removed or changed to “impaired - not due to local sources.”

This publication has been developed through the technical guidance of the following individuals and emphasizes topics that are of particular interest and relevance to the White Lake community. The following individuals have helped to give technical guidance and relate complicated issues within the lake using language more common to the community. Through these efforts the specifics of the remedial action plan process will develop a community understanding of many technical aspects and foster a greater individual involvement in restoring White Lake.

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Introduction

The birth of White Lake took place approximately ten thousand years ago due to a unique combination of glacial sand deposition and the sands further movement. With this movement the sand eventually built many of the dunes seen along the shoreline and subsequently reduced the size of the mouth from White River to Lake Michigan. These events slowly formed a drowned river-mouth lake at the end of the White River. The river, now White Lake, was originally known as "Waubish-sibi" by local Native Americans because of the large, white, clay deposits that colored the water at its mouth. Early French maps labeled the river as "La Rivier Blanche"; a name given by the early explorers as a translation from its native name. Other historical sources document the name of White Lake coming from a vision Father Marquette had while gazing at the birch lined shore. Regardless, the final English translation remains and the lake now thousands of years old covers 2,571 acres, is approximately five and a half miles long, averages a mile in width, has a mean depth of 23 ft., and maximum depth of 70 ft. The White River continues to be the major tributary to the lake contributing approximately 95% of the water.

Other significant historical events of White Lake and the White River Watershed include its importance throughout the region during the lumbering era. Twenty-eight sawmills once surrounded White Lake and in conjunction with Muskegon Lake supplied much of the lumber to rebuild Chicago after the *Great Fire*. Following the lumbering boom, the area developed into a region for fruit growers and early industrial entrepreneurs of metal castings and leather production. Since this early development the communities of Montague and Whitehall began to congregate near the new mouth of the White River along the eastern end of White Lake. With community development the area became popular for tourists and families. At the beginning of the 20th Century visitors traveled from Chicago aboard steamships to enjoy the rustic and pleasant lifestyle of the White Lake Area. With the increase in permanent residents, and following the wind down of wartime industry during the 1940's, White Lake began to build its economic reputation with a future in chemical manufacturing.

In recent years, the cities and surrounding townships of White Lake have become a mix of light industrial, spreading commercial development, recreational marinas, seasonal cottages, and permanent residents. The community continues to use the lake for recreation, sporting, tourism, and industry. The lake is intertwined with culture and economy, each depending on the continued use and existence of this natural resource. After all, White Lake's most defining asset is its natural resources: the lakes, dunes, beaches, rivers and forests. These natural features provide area residents with the quiet beauty and recreational opportunities that help to define its quality of life. In addition, they provide a significant source of revenue for the local economy by drawing visitors from Grand Rapids, Lansing, Detroit, other areas of Michigan, Chicago, and neighboring states. Today, festivals, outdoor concerts, summer theater, a local farmer's market, craft shows, and community events support the small-town feel and truly show the communities love and appreciation of this great natural resource. The lake has also taken on a "spiritual" importance for many people which relates the beauty and serenity of the lake to a simpler, more enjoyable lifestyle. Many people have fond memories of spending childhood days exploring the local shoreline and enjoying the lake during the summer. White Lake is a place of nostalgia.

White Lake's varied history and continued growth has degraded the ecological system and negatively impacted its greatest resource, water. The following pages look to discuss many of the issues and topics that have impacted White Lake. This document works toward protecting the sustainability of the community from an ecological, economic and social standpoint.

The White Lake Community Action Plan is part of an international effort within the Great Lakes to help protect local communities and restore a major ecosystem that was once declared as "dead or dying". During the early efforts to restore White Lake, the Public Advisory Council played a pivotal role because of the cooperation between individuals, agencies, organizations and governmental units. Through these efforts the Lake Michigan Federation led the way in soliciting research needs, building community education, and continued interaction by governmental agencies. The White Lake Public Advisory Council includes the important efforts of several organizations and individuals supporting the restoration of this locally valued resource. White Lake has already made strides toward this restoration as it begins to turn the corner on recovery after a much troubled past.

The White Lake Community Action Plan gains continued strength from the community by implementing recovery plans and taking actions that go beyond the benefit of the individual. The continued successful development of the White Lake Area will also require a regional, multi-jurisdictional effort. The political jurisdictions that comprise the White Lake Area must come to view economic vitality and planned development within a regional context as opposed to that of a single jurisdiction. This is an important step for the sustainability of the lake in the future because degraded conditions ecologically will also signal a loss of many personal uses.

White Lake
Remedial Action Plan Highlights
(Summary of Restoration Activities)

Contaminated Sediments at the Tannery Bay (Genesco) site and Hooker (Occidental) site were dredged and completed by 2003.

2000, US Army Corps of Engineers completed White Lake 905(b) analysis to determine necessity of environmental dredging.

In 1997, a lake usage survey was conducted by the White Lake PAC. Results are used by local decision makers to assess and resolve conflicts among user groups.

The United States Environmental Protection Agency sampled sediments in the vicinity of the tannery in 1996 and 1997. Results were used to characterize the extent of contamination and to determine the best type of remediation for the site.

The state and the U.S. EPA subsidized the Muskegon County Wastewater Management System as a research project. Industrial wastewater which had been discharged directly into White Lake is now treated and used to irrigate agricultural land. Uncollected irrigation water and storage lagoon leakage are prevented with an impermeable liner. Two municipal sewage outfalls (cities of Whitehall and Montague) have been diverted from White Lake.

Agreement with the State of Michigan and DuPont to pump and treat contaminated groundwater before being discharged into Lake Michigan.

Two contaminated industrial sites, Koch Chemical and Howmet Corporation installed groundwater pumps and treatment systems to stem the flow of polluted groundwater into White Lake.

In 1979, the State of Michigan sued and obtained a court order for the Hooker Chemical Company to clean up several toxic waste disposal and contaminated groundwater areas. Hooker was ordered to complete groundwater studies, pump and treat the contaminated groundwater, excavate the contaminated material and place it in a vault on the company's property, and provide alternate drinking water supplies to local residents whose wells were contaminated by polluted groundwater. *(Groundwater pumping updated in 1999, but status of other activities unknown to the PAC).* The plume of contaminated groundwater moving from the site is being intercepted by the lake-front purge-well network and effectively treated prior to discharge to White Lake.

In order to become involved in the White Lake Public Advisory Council or the Remedial Action Plan process please contact:

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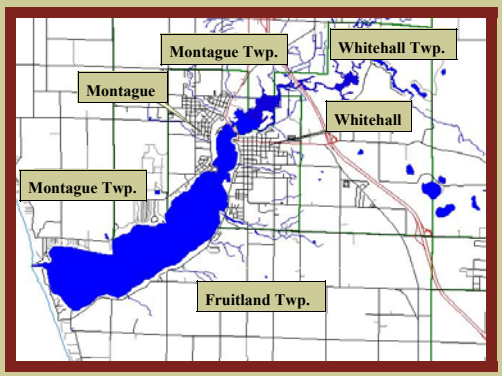


White Lake Area of Concern and Local Municipalities

Aquatic Habitat

White Lake and the White River are part of an aquatic system that provides a variety of natural resource uses including habitat for fish and wildlife, recreational opportunities, and economic opportunity. The aquatic habitat within White Lake encompasses many areas including the open water, bottom (benthos), shallow water areas, artificial structures (docks, seawalls, pilings) and natural structures (logs, rocks, and even rooted plants). Of these, the most important is the aquatic plant community which supports the diversity and richness of other aquatic organisms. Aquatic plants are the forests for the underwater world and provide significant structure for critical life stages of insects and fish. These underwater forests also provide areas of refuge from larger fish for many juvenile game fish.

Associated Problems

Elimination of Aquatic Vegetation: Within White Lake, the loss of rooted plants is dramatically affecting the sustainability of many aquatic insect, fish, bird, and mammal populations. Within certain populations, this type of disruption decreases food sources and can completely eliminate certain species. Disruption of aquatic plants can also change the entire structure of the biological food web and diminishes the ability of organisms to survive. White Lake has already lost a majority of its aquatic habitat which may be limiting certain fish because of reduced reproduction, growth, or overall survival rates.

Many plants have been lost because of:

- Removal during dredging
- Mechanical harvesting
- Chemical herbicides
- Manual pulling to maintain recreational use
- Increased competition with exotic species
- Seawall construction
- Marina development

Overall Aquatic Habitat Goal

Zero net loss of habitat. High quality sites preserved and degraded sites restored. Maintain a healthy, vegetated habitat equal to 50% of the lake surface area.

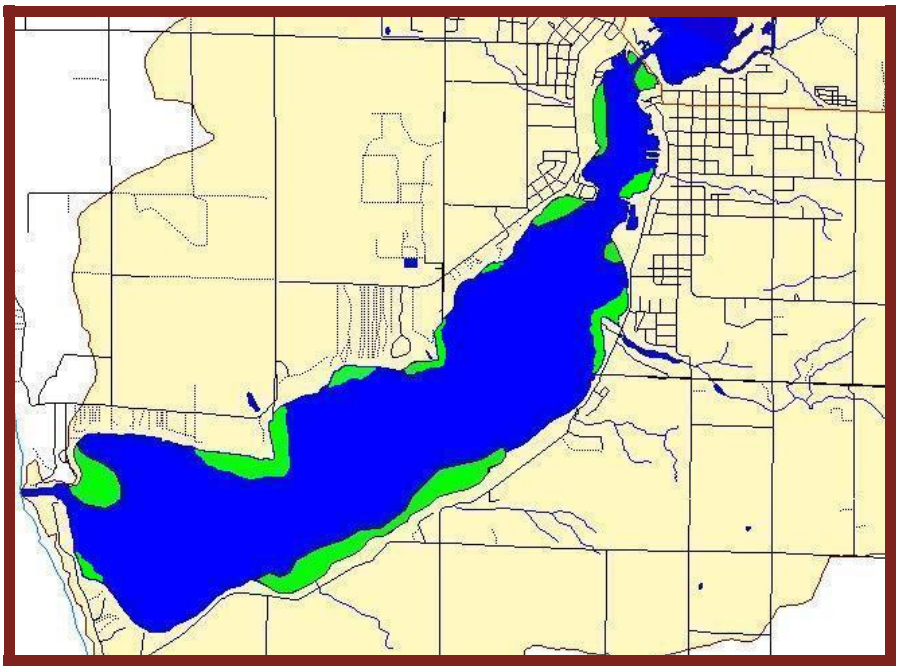
Loss of Usable Habitat: The loss of aquatic vegetation eliminates the natural structure that numerous lake species need for survival. The elimination of aquatic plants has degraded the quality and quantity of habitat for may species of fish, reptiles, amphibians, insects, mammals and birds. These losses have come largely from development and the actions of individual homeowners. While some vegetation control is necessary for certain recreational uses, the elimination of aquatic plants has a direct, negative impact on the sport fishery, hunting and wildlife viewing, and the consequent negative economic impact falling on the entire community.

Habitat is also lost when excessive algal growth, like the large floating plant mats, breakdown through bacterial action and deplete oxygen in the water column. Recent studies show that depths of 20 ft. and greater are often unavailable to fish during the summer months because of the lack of oxygen. Excessive nutrients may be the source of this problem.

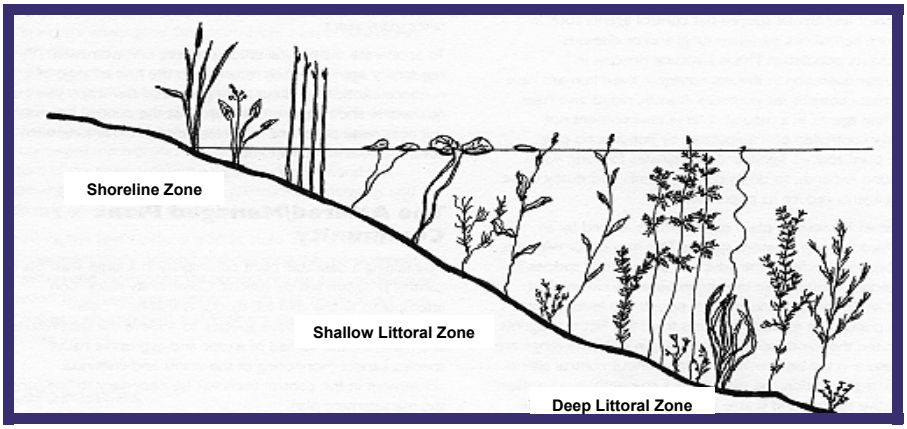
The affects of dredging must also be addressed to ensure usable habitat is protected. When contaminated sediments are removed, native habitat should be restored. The natural lake bottom contours and shallow depths should be replaced in order to provide for the return of native plants and wildlife.

Loss of Recreational Area: The open water has also become degraded through increased growth of free-floating algae and invasive plants. Excessive aquatic plant growth (eutrophication) is also an unacceptable aesthetic issue that limits recreational use and may become a public health concern during certain conditions. Eutrophication has limited a variety of public uses for White Lake including sailing, motor boat use, swimming, and water-skiing.

Public use of the waterway has also been lost from marina development as navigable water is converted from a public trust into a private enterprise, blocking water use and decreasing total navigable area. Of recent concern is the reduced public access to the lake as private landowners attempt to close road endings along the shoreline.



Areas that need to be protected as aquatic habitat in White Lake because of plant diversity and the importance to fish and wildlife species. Areas of special concern for habitat loss include shallow areas especially in the narrows, that have been greatly damaged yet act as important transition zones for juvenile fish. The delta area near the mouth of the White River is also important to the ecology of the entire lake because it provides significant breeding areas for turtles, frogs, toads, and many game fish.



Important vegetation zones found within White Lake's shallow water habitat.

Additional Resources

U.S. Environmental Protection Agency
www.epa.gov/grtlakes/solec/94/habitats

Great Lakes Aquatic Habitat Network & Fund
http://glhabitat.org

White Lake Fish and Waterfowl Aquatic Habitat Assessment - 2001.
Tom Hamilton

White Lake Habitat Assessment – 1995.
Tom Nederveld, Theresa Lauber

White Lake Association
http://www.mlswa.org/white-lake-829/

USDA-NRCS. Wildlife Habitat Incentive Programs
contact USDA-NRCS at the Muskegon Conservation District
http://www.nrcs.usda.gov

SOLUTIONS FOR THE PUBLIC

1. Reduce Dredging - Protect aquatic plants from unnecessary dredging.

2. Protect Native Plants - Help reestablish aquatic plants native to White Lake by not removing, cutting, or spraying "weeds".

3. Provide a Soft Shoreline - Do not build hard structures (breakwalls/ seawalls) along the shoreline. Use shrubs, trees, and shoreline plants to prevent erosion and maintain the natural slope of the lake bottom.

4. Attend Programs - Participate in education programs sponsored by the White Lake PAC, White Lake Association, and other local groups on the importance of identifying and controlling exotic species.

5. Evaluate Your Impact - Participate in a Lake-A-Syst / Home-A-Syst to learn about what impacts you may be having on White Lake.

SOLUTIONS FOR MUNICIPALITIES AND GOVERNMENTAL AGENCIES

1. Maintain Quality Habitat - Utilize aquatic habitat assessments for development and planning to preserve shallow habitat and soft shorelines.

2. Eliminate Exotics - Implement an Integrated Pest Management plan for White Lake that may include a combination of localized herbicide treatments, hand raking, and biological controls for exotic species. Also provide management strategies to stop introductions in the first place.

3. Stop Harvesting - Reduce or eliminate mechanical harvesting of aquatic plants within the lake. Harvesting eliminates native species and encourages exotics like Eurasian watermilfoil.

4. Provide a Habitat Plan - Adopt an Aquatic Habitat Management plan for White Lake that designates specific areas for preservation.

5. Evaluate Nutrient Inputs - Determine source of nutrients in White Lake leading to eutrophication. Implement a nutrient budget to guide nutrient reduction plans from specific uses.

6. Stop Marina Development - Implement a Water's Edge Development plan to eliminate additional marina development and stop expansion of existing marinas.

Contaminated Sediments

Contaminated sediments continue to be a problem for many areas throughout the Great Lakes and include specific areas in White Lake. Industrial development and chemical technology have brought significant economic benefits to the White Lake community, but have also come with associated environmental contamination. Many of these pollution sources were introduced because of chemical advances following World War II and have entered the environment because of limited knowledge, lenient or no laws regulating the discharge of specific contaminants, or through non-compliance. As early as the 1940s there were public complaints about the waste discharges in the vicinity of Tannery Bay from the Whitehall Leather Company. A variety of businesses and industries including chemical companies and a formerly active lumber industry used White Lake as a repository for their waste. Although many of the sources of contamination have been stopped, some continue to act as sources of pollution to White Lake. Many of the chemicals require long periods to breakdown into non-toxic forms, while others never breakdown and remain in the system. Certain chemical properties also increase their ability to combine and attach with sediments of lakes and streams.

Associated Problems

Decreased Ecological Health: One of the greatest problems of contaminated sediments within White Lake is the impact these sediments have on living organisms through direct contact and indirectly by altering the ecological health of the lake. As organisms in the sediment ingest toxins and pass contaminants throughout the food web the physical health and survival rate of certain organisms is negatively impacted. Unfortunately, even after contaminant discharges into the lake are decreased, the contaminants continue to cycle in the system and are spread throughout White Lake. Organisms living in the sediment cycle the materials throughout the system. Sediment is also transported through suspension in the water column and wave movement or water turbulence.

Pose Threat to Human Health: Some chemicals may have chronic impacts on the environment while others become harmful to living organisms as they accumulate in body tissues and fat. Contaminants within White Lake have the most notable affect on human health as contaminants are ingested (fish/wildlife and water) or as individuals come in contact with sediments which may lead to the accumulation of certain toxins in the body. Many contaminants have spread throughout White Lake, and although may not have acute toxic results, continued contact with contaminants like arsenic remain an extremely high concern.

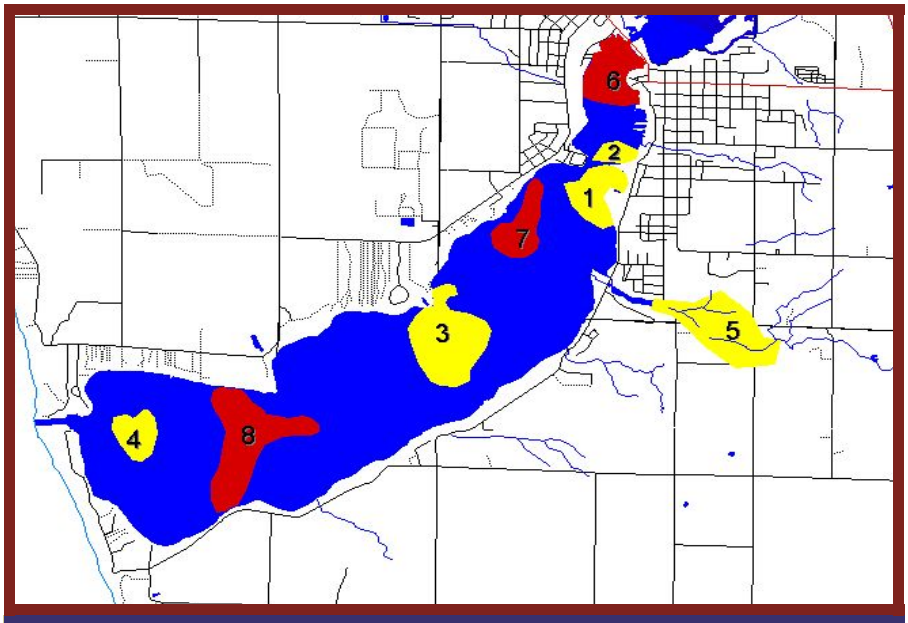
Comprise Drinking Water Supplies: Some of the contaminated sediments in White Lake are also associated with a contaminated groundwater source and may be impacting certain drinking water supplies. Sediments may further threaten drinking water supplies if they are not removed from White Lake and are transported into Lake Michigan. Many western Michigan communities already use Lake Michigan as a drinking water source. White Lake communities, like Montague and Whitehall, are also looking to Lake Michigan as a future drinking water supply because present groundwater sources are proving to be inadequate in quality or quantity.

Overall Contaminated Sediments Goal

Implement a strategy to conduct and prioritize future assessment, monitoring, and remediation activities.

Increase Cost for Dredging: The presence of contaminated sediments increase restrictions on dredging leading to increased costs, regulations, and disposal problems. Dredging costs from contaminated sediments often exceed the financial resources of local governments and complicate issues for the US Army Corps of Engineers in maintaining navigation. Public and private dredging for recreational activities are also exhibiting higher costs as testing and special disposal must meet regulations and permits submitted during 5 year cycles.

Decrease Economic Development: Economic impacts from contaminated sediments can also reach tourism and recreational markets as individuals decrease use of White Lake for recreational boating, fishing, and swimming activities. One of the greatest losses to White Lake's economics would be the elimination of the fishing based economy because of continued fish consumption advisories.



Areas of Contamination Concern in White Lake

SITE	STATUS OF CONTAMINATION	FUTURE
Tannery Bay (Genesco) -**1** Whitehall Leather	Sediment remediation 2003 -Michigan DEQ	Clean-up / Remediation success being monitored
East Bay (Genesco) -**2**	Continued problem area	Remediation not evaluated
Occidental (Hooker) -**3**	Sediment remediation 2003—through CERCLA	Clean-up / Remediation success being monitored
South of Indian Bay -**4**	Continued problem area	Remediation not evaluated
Koch Chemical -**5**	Plume isolated	Koch looking to close site new site RAP proposed
Montague-Whitehall - **6**	Low priority without new data	Baseline monitoring
NW Mill Pond Creek - **7**	Low priority without new data	Baseline monitoring
South of Long Point - **8**	Low priority without new data	Baseline monitoring

Sites 1-5,; Areas of concern for contaminated sediment as designated by Rediske, 2002 . Although a majority of sediments in Tannery Bay were removed in 2003, the east side of the property (site 2) contains highly toxic sediment that will not be remediated. Sites 6-8; Areas of concern as designated by US Army Corps Report in 2000, but disagree with assessment matrix used to evaluate sites for 2002 update.

Additional Resources

White Lake Are of Concern Contaminated Sediment Update– 2002
Rick Rediske.

Expedited Reconnaissance Study: White Lake - 2000
U.S. Army Corps of Engineers.

U.S. Environmental Protection Agency
www.epa.gov/ost/cs
www.epa.gov/glpo/sediments.html

Lake Michigan Federation
www.lakemichigan.org/elimination/c-sediments2.asp
www.lakemichigan.org/elimination/wlseds_index.asp

Hazardous Substance Research Centers/South & Southwest
www.sediments.org

SOLUTIONS FOR THE PUBLIC

1. Report Contamination - Contact the Muskegon Conservation District if you know possible contamination sites due to historical uses (*comments will remain confidential and passed on to the White Lake Public Advisory Council.*

2. Express Your Opinion - Let your local, state, and federal governmental representatives hear your voice concerning known sediment contamination sites. Attend public meetings and hearings that concern sediment contamination.

3. Support Your Representatives - Contact representatives to voice encouragement / congratulations / thanks for helping to restore specific White Lake sites. Representatives need to hear the positives, not just the negatives.

SOLUTIONS FOR MUNICIPALITIES AND GOVERNMENTAL AGENCIES

1. Keep the Momentum - Continue the support for remediation of ALL sites within White Lake. Work to restore remaining upland areas and East Bay at Genesco property to ensure the site is COMPLETELY restored.

2. Prioritize Contamination Sites - Set priorities (in regards to social, environmental, and economic impacts) for all sites that are known to have contaminated sediments .

3. Clean-up Monitoring - Develop and implement monitoring for restored contamination sites including biological / ecological assessments.

4. Develop Contamination Archive - Identify and map sites and extent of area impacted with prior and present contamination for implementation in municipality planning and future development.

5. Assess for the Future - Evaluate sites that are potential sources of contaminants to soils and sediments. Inventory sites of greatest concern and develop a standard inspection protocol for continued monitoring.

6. Strengthen Surveys – Develop and maintain fish and benthic organism surveys in White Lake on a regular schedule to determine if contaminants are being transported in the food web.

Fisheries

White Lake has a proud fisheries heritage that is a major tourism attraction to the community and has an active sport fishing and charter boat industry. White Lake supports a variety of sport fish including walleye, yellow perch, small and large mouth bass, northern pike, bluegill, black crappie, and white sucker as well as migratory salmon and trout from Lake Michigan to the White River. The fish community of White Lake has slowly changed throughout the years with the loss of the native Great Lakes spotted muskellunge, over 60 years ago, to a well established exotic chinook salmon run in the White River in 1970. The walleye population is strong, yet population production continues to be supported by a Michigan Dept. Natural Resources fish culture program. The fishery within White Lake is one of the most important resources that continues to remain in relatively good condition. However, it must also be shared with other resources for lake recreation, tourism, and for aesthetics which continue to change. White Lake's fisheries priority lies in the continued effort to remove fish consumption advisories and eliminate population declines. Loss of the sport fishing would lead to a substantial economic loss for the entire White Lake community and a reduced "quality of life" to residents.

Associated Problems

Continued Threats from Exotic / Invasive Species: Exotic species have had drastic impacts on White Lake fisheries with alewife, white perch, and round goby becoming firmly established in White Lake since 2000. These new species have led to a complicated change in the fishery by changing the food web structure, and outcompeting natives for food and habitat. In the early 1990's, the smallmouth bass population increased relative to the largemouth bass because of the increased water clarity caused by the exotic zebra mussel. Since then, the smallmouth bass declined slightly as the largemouth bass utilized the increase in aquatic vegetation provided by the exotic Eurasian watermilfoil. The watermilfoil was also taking advantage of the conditions created by the zebra mussel. The back and forth change of the bass populations took place simultaneously around the lake as exotics changed habitat structure. During this same period the round goby, another exotic species invaded and became a very competitive, predacious feeder. Presently, adult bass are targeting the goby as food, but the rapid goby population expansion may impact the eggs and fry of both species of bass.

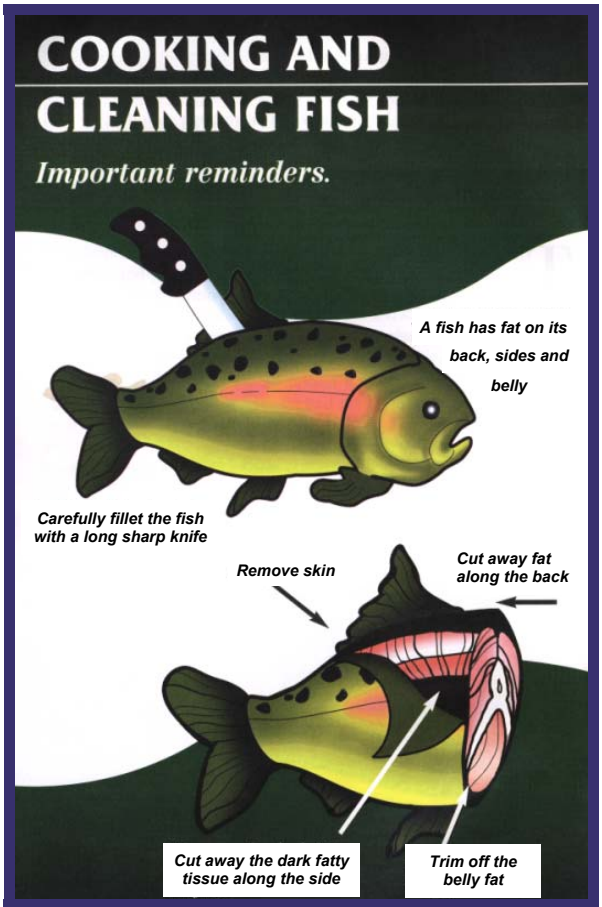
Decreased Health from Contaminants: A sustainable fishery in White Lake has become an issue of increased importance. Consumption advisories continue for certain species due to chemical contamination and elevated levels of specific chemicals. Chlordane and PCBs in carp have led to state and federal fish consumption advisories for White Lake. Contaminant levels in fish for White Lake are a function of many things including: 1) the concentration of the contaminant in the water, 2) the concentration in the fish's primary food supply, 3) the size and age of the fish (older and larger fish generally have higher levels), 4) the fish's habitat (sedentary, bottom - dwelling species are more likely to concentrate toxics from contaminated sediments), and 5) the level in the food web (top-level predators often show higher contaminant levels).

Overall Fisheries Goal

Existing fisheries protected and native fisheries restored using quality management practices. No fish consumption advisories.

Increased Habitat Loss: Another element greatly impacting fisheries is the alteration of habitat used for breeding or certain stages in the life cycle. Habitat alteration can be from competition for space with exotics or through human impacts like dredging, aquatic plant removal, and structural alteration. Other changes in habitat can be attributed to decreased water quality, including sedimentation and impacts from herbicide applications throughout White Lake. Similar lakes have experienced drastic increases in development and the destruction of aquatic habitat has eliminated many native fish species, and increased less desirable species.

Habitat loss is also occurring from depleted oxygen concentrations in the water at lower depths during the summer from the excessive growth of algae. Overall, the loss of habitat may have the greatest impact on sustaining fish populations in White Lake negating the benefits of the sediment restoration projects. If White Lake, as a viable resource, continues to be under appreciated and alterations continue in food web structure then conditions may eventually lead to a collapse in the fishery.



Trim & Cook Fish Properly to Reduce Health Risks. Proper preparation reduces the concentration of organic chemicals, like PCB, even further. By trimming fatty areas before cooking and by cooking in ways that allow fat to drip away, more than 50 percent of the contaminants in fish can be eliminated. Methyl mercury is stored in fish flesh. Special trimming and cooking methods do not remove it.

Information provided by Michigan Department of Community Health. 2002 Michigan Fish Advisory.

Michigan Consumption Advisory for White Lake

	General Population	Women & Children
Carp: (PCB's, Chlordane)	***DO NOT EAT!***	***DO NOT EAT!***
Smallmouth Bass: (Mercury, PCB's)	14-30in. one meal per week	14-30 in. one meal per month
Walleye: (Mercury, PCB's)	14-26in. unlimited consumption 26in.+ one meal per week	14-18 in. one meal per week 18in.+ one meal per month

General Mercury Advisory for ALL inland lakes in Michigan:
No one should eat more than one meal a week of rock bass, yellow perch, or crappie over nine inches in length and bass, walleye, northern pike or muskellunge of any size. Women of childbearing age and children under 15 should not eat more than one meal per month of these fish.

Additional Resources

White Lake Fish and Waterfowl Aquatic Habitat Assessment - 2000.
Thomas E. Hamilton.

White Lake Aquatic Plant Assessment - 1995.
Mark Luttenton.

Michigan Department of Natural Resources
www.michigan.gov/dnr

Great Lakes Sport Fishing Council – Michigan
http://www.great-lakes.org/fish_mi.html

Michigan Department of Community Health
www.michigan.gov/mdch

SOLUTIONS FOR THE PUBLIC

1. Support a Sustainable Fishery - Follow fishing regulations concerning possession (species take) and become educated about fish advisories for White Lake and surrounding waters. Practice catch-and-release.

2. Protect Fisheries Habitat-Protect habitat by not destroying aquatic plant beds or dredging in shallow areas. Leave near shore buffers.

3. Do the Right Thing-Do not dump refuse, liquids, or other illegal or harmful materials into the water.

4. Report Useful Data - Report fish with tumors or growths, tainting of taste/ smell, or any other abnormalities to the Michigan Dept. of Natural Resources.

5. Slow the Spread of Exotics - Learn to identify local exotic species and never release exotics into the lake (including species used as bait).

SOLUTIONS FOR MUNICIPALITIES AND GOVERNMENTAL AGENCIES

1. Determine Public Concern - Survey local fishermen and sport fishing organizations to determine extent of tainting, and population estimates.

2. Health Concerns - Provide research funding or utilize Michigan Dept. Natural Resources fish contaminant monitoring and update Michigan Dept. Public Health consumption advisories. Assess extent & species that are contaminated and determine where/how contaminants are entering aquatic food web.

3. Provide a Solution - Develop aquatic plant habitat plan to protect, preserve, and restore fish habitat for various fishes and stages for certain life cycles (including breeding/spawning habitat for walleye). Implement a nutrient / buffer management plan.

4. Set Harvest Limits - Set localized harvest limits for species of concern.

5. Map What's Important - Provide aquatic zoning ordinances and map extent of critical areas.

6. Increase Your Stock - Support cooperation / funding with local sport fishing organizations to work with Michigan Dept. Natural Resources to implement stocking native fish of importance to White Lake (including White bass, Great Lake Spotted Muskellunge, Sturgeon, and Walleye).

Exotic Species

Exotic species are a major threat to the White Lake watershed in both the terrestrial and aquatic systems, and are considered to be one of the greatest dangers to ecosystems - a serious biological pollution problem. More and more people have knowledge of at least one exotic species, but few understand all the problems associated with that species. The difficulty of determining the impact of biological damage to native systems is often hard to see in the short term. Although exotic species are already a part of our habitat it is those species that are highly invasive that are degrading local habitats. Individuals should always know the life history of organisms before introducing them to new areas to ensure control of invasive exotics.

State and Federal agencies continue to try to find ways of best addressing introductions from Great Lakes ballast water and other sources. Exotic species are a moving target that demands involvement from all levels of government, the public, and businesses. Unfortunately, some local businesses within Whitehall continue to sell exotic species for economic gains.

Associated Problems

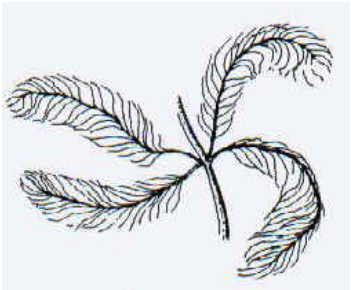
Competition with Native Species: The greatest threat of exotic species is the complete dominance of environments and decreased diversity. Eurasian watermilfoil, purple loosestrife, and zebra mussels are becoming well established. Other species like the round goby and white swan have also increased in recent years. Exotic species often overwhelm a system as they compete with native species for territory and food, and have few predators adapted to their life strategies. The absence of competition from predators and habitat suitability allows uncontrolled population increases, destabilizing the native food web. Changes in the food web have eliminated many native species in White Lake, and reduced the ecological diversity. Remaining species tend to include only those that can resist exotics, and the exotics themselves.

Altered Habitat: As exotic species have spread throughout White Lake, the habitat for native species is limited and further altered. This creates habitats suitable for other exotic species to invade and further weaken native species. White Lake continues to have dramatic changes in fish populations due to habitat alteration, where native species, established exotics, and new exotic arrivals are in competition with each other. Many of these species are spreading rapidly and will only be controlled through the use of integrated pest management.

Economic Impacts: As exotic species continue to invade White Lake the change in the local fishery could have dramatic impacts on the local economy. This effect, combined with limiting recreational use by boaters and swimmers due to increased "weed" growth and decreased aesthetics, could seriously damage the White Lake Community. The costs to manage this issue will increase with each succeeding year and each additional exotic species.

Overall Exotic Species Goal

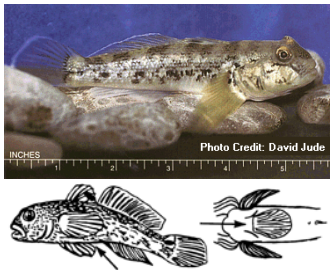
Harmful exotic species eliminated or controlled.
Native species protected.



The **Eurasian watermilfoil** is found in most shallow areas throughout White Lake and has increasingly altered lake habitat, by forming floating mats of vegetation. These exotics are crowding out native species and shed a negative light on all aquatic plants. Watermilfoil interferes with many recreational activities. Since this plant spreads through fragmentation, mechanical harvesting techniques tend to exacerbate the problem.

Zebra mussels, that appear to clean the water, are drastically changing the food web by filtering out microscopic plants and animals that are food for fish. Studies show that nutrient ratios are changing with increases in phosphorus levels causing major algal blooms of microcystis and other problem algae. These persistent exotics attach to intake pipes, docks, and buoys, resulting in a significant economic burden. Water clarity does not necessarily mean water quality.

The **round goby**, a common exotic species often caught by fishermen along piers and docks, is a relatively small fish that has become increasingly abundant in White Lake. This fish out competes other fish for food and habitat, while also preying on the eggs and young of native species. The goby can be singled out from other native species, like the sculpin, by looking for the fused (cup-shaped) dorsal fin.



Round goby

Purple loosestrife is radically changing the character of the shoreline and wetlands around White Lake. A native to Europe and Asia, the plant is rapidly decreasing the diversity of plants and animals in wetlands. Purple loosestrife replaces native vegetation and forms thick, dense stands that are impenetrable and unusable by wildlife for food, shelter, or nesting sites. Turtles, mink, frogs, bitterns, cranes, and herons are all adversely impacted by this noxious weed. Purple loosestrife is still sold at nurseries in the White Lake area and poses a serious threat to the biological community.

The **mute swan** is easily recognized and considered by some to be visually attractive and adding to aesthetic nature of White Lake. Unfortunately these birds have dramatic impacts on native waterfowl through resource competition. Mute swans are extremely territorial and will defend nesting and feeding territories with such vigor as to monopolize and eliminate other species.

Additional Resources

University of Minnesota, Sea Grant Program
http://www.seagrant.umn.edu
http://www.fw.umn.edu/research/milfoil/milfoilbc.html

Great Lakes Information Network
www.great-lakes.net/envt/flora-fauna/invasive/invasive.html

Environmental and Economic Costs Associated with Non-Indigenous species in the United States.
www.news.cornell.edu/releases/Jan99/species_costs.html

Federal efforts concerning invasive species
www.invasivespecies.gov

SOLUTIONS FOR THE PUBLIC

1. Slow the Spread - Do not help introduce new species – be conscious of transporting exotic species on your boat, on the trailer, in the bait bucket, or in your vehicle. Do not purchase exotic live-bait to use in White Lake or the White River Watershed.

2. Start in Your Yard - Remove exotic species on your property in the correct manner so as not to encourage their spread.

3. Money Talks - Do not purchase exotic plants from local nurseries. Know what you're planting, its origin, and its growth characteristics.

4. Help the Community - Volunteer your time to help control and slow the spread of exotics in public areas throughout your community.

5. Improve Regulations - Contact your State and Federal representatives and agencies to encourage them to strengthen their efforts to control exotic species.

SOLUTIONS FOR MUNICIPALITIES AND GOVERNMENTAL AGENCIES

1. Stock Predators - Stock biologically important species to White Lake (walleye, sturgeon) to help mediate population declines from competition with exotics.

2. Integrate Community Control Measures - Implement an Integrated Pest Management Plan to control Eurasian watermilfoil and other exotics. Eliminate the mechanical harvesting of Eurasian watermilfoil.

3. Map the Impact - Assess and map where exotics are of greatest concern within aquatic and terrestrial habitats.

4. Increase Education - Eliminate or reduce introduction pathways and educate individuals about the importance of preventing the introduction of new species.

Shoreline and Wetland Habitat

The White River Watershed is a unique system for the Great Lakes because of the presence of various wetland and shoreline features. A wetland is any area characterized by plants and soils that are adjacent to water, underwater, or have wet conditions during at least part of the year that absorb, filter and clean water. Wetlands are extremely important to maintaining hydrologic stability through flood prevention, groundwater recharge, and slowing the movement of water within the landscape. Wetlands adjacent to lakes buffer the energy transported through wave action, while shoreline vegetation prevents shoreline erosion. Wetlands include areas along streams and rivers within the watershed, and provide viable shoreline corridors for wildlife movement. These habitat corridors protect the stream from excessive warming and improve water quality through filtration by plants along the water's edge. Shoreline and wetland areas are not only unique in what they provide in aquatic benefits, but also from the biological standpoint. These areas contain many species of plants and animals in the White Lake area. This habitat is not only critical for rare species, but to the common species that use these areas for reproduction, growth, and survival. Wildlife that commonly use wetland areas include ducks, geese, shorebirds, songbirds, birds of prey, fish, frogs, salamanders, snakes, turtles, snails, mussels, insects, crayfish, mink, and muskrat.

Associated Problems

Loss of Wildlife: Loss or alteration of shoreline and wetland habitat surrounding White Lake is one of the great concerns for local conservationists, resource managers, and residents. The loss of these habitats will lead to reproductive declines for many wildlife populations. Many species that are important to hunters, naturalist, and scientists may be lost. Wetlands are important for wildlife populations, and are particularly valuable to migratory birds and insects, including the monarch butterfly and many of the warblers (small, colorful songbirds).

Decrease in Aesthetics: Throughout many areas in Michigan and within the White Lake watershed, wetlands and shorelines are destroyed due to an underappreciated and unrecognized value for their importance in the landscape. Too few of these critical areas are left in the condition that benefits both the environment and people. Historically, many wetlands were dredged, drained, and filled to provide valuable farmland. Even today this viewpoint prevails with the continued loss of wetlands, decreasing the general aesthetics, and consequent recreation and tourism. This loss to the quality of life affects the community as the natural beauty and atmosphere of White Lake is altered.

Increased Fragmentation: A majority of White Lake's shoreline and wetland habitat has been fragmented from seawall construction and land development. This type of fragmentation eliminates important spawning and nursery areas for many species of fish and wildlife. Development around White Lake, once primarily seasonal homes, with minimal year-round use, has left approximately 15% of the original shoreline in a relatively natural state. As homes have slowly changed to largely permanent residences, more and more of the shoreline is altered.

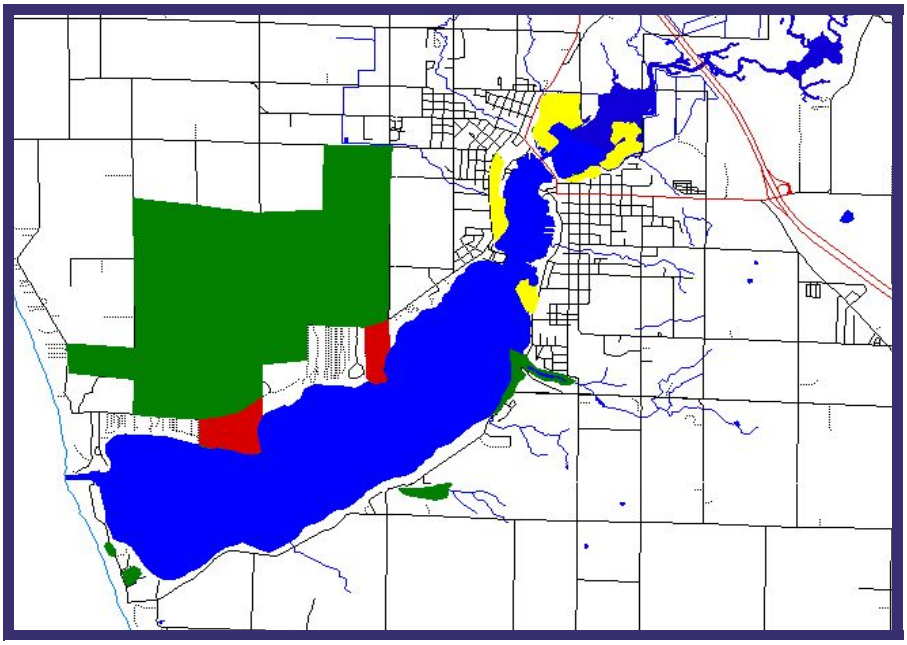
Overall Shoreline and Wetland Habitat Goal

Zero net loss of shoreline habitat and wetlands. Minimum of a 130 ft. habitat buffer established surrounding the lake.

Shoreline Alteration: Changes in shoreline vegetation and use have increased with recent low water levels as people see the opportunity to claim more beach. During low water levels the increased vegetation along the shoreline helps to improve wildlife habitat. During low water exposed bottomlands should be left alone to allow vegetation growth and dormant seeds to establish and increase habitat diversity. A natural shoreline is the best scenario for wildlife preservation in both high and low water level years.

Preservation and restoration of habitat that links aquatic areas with upland areas is poorly understood as an entire system because it is often considered for only specific human uses. Although wetland areas (and associated plant life) are recognized as important zones for many wildlife and waterfowl species, they are often poorly managed because they interfere with human activities.

Loss of habitat acts as one of the initial signals to problems with water quality, signaling decreased use in the future if certain practices continue or problems are not resolved. Many individuals throughout the White Lake area have an interest in the surrounding habitat, and value wildlife viewing and fishing as being of greatest importance. Yet, it is generally felt, that powerboats and marinas are beginning to determine habitat use in the area. This conflict will need to be resolved to ensure the long term health of the lake and allow for a variety of uses.



Areas surrounding White Lake that provide valuable habitat and should be protected. Locations shaded as red are of greatest priority for habitat protection, followed by yellow and green shaded areas, respectively. The White Lake community has the opportunity to utilize several large industrial sites surrounding the lake to preserve these areas as valuable habitat for the future. Smaller private and public lands throughout the areas should also be preserved through conservation easements.

Additional Resources

White Lake Habitat Assessment, 1995.
Tom Nederveld, Theresa Lauber

Michigan Department of Natural Resources
www.dnr.state.mi.us

U.S. Environmental Protection Agency
www.epa.gov/docs/ecoplaces
www.epa.gov/OWOW/wetlands

Clinton River Watershed Council
www.crwc.org/projects/scwetlands/scwhatwhy.html

Living with Michigan's Wetlands: A Landowners Guide.
1996. Wilfred Cwikiel. Tip of the Mitt Watershed Council.

Protecting Coastal Wetlands Resources: Guide for Local Governments.
1992. USEPA, Office of Water. Washington D.C.

SOLUTIONS FOR THE PUBLIC

1. Become Educated - Attend a native plants / buffer area demonstration.

2. Give Habitat Back - Restore altered shoreline with native vegetation to provide habitat and nesting area.

3. Don't Block Access - Provide a soft shoreline that allows access for wildlife. Do not construct new seawalls and restore failing walls with a soft edge.

4. Make Way - Leave corridors and conserve vegetation along the edges of your property for wildlife to use.

5. NEVER FILL IN A WETLAND!! Preserve all wetlands regardless of size or location. Restore previous wetlands by eliminating drainage systems.

SOLUTIONS FOR MUNICIPALITIES AND GOVERNMENTAL AGENCIES

1. Assess Local Wetlands - Map all wetland locations and integrate community wetland protection in your local area plan. Survey/inventory and determine reptile and amphibian populations throughout the lake and protect important identified areas.

2. Fill the Gaps - Prevent critical habitat fragmentation along water's edge and pursue conservation easements on available abandoned contamination sites.

3. Preserve Wetlands and Shoreline Areas - Establish setbacks and zoning ordinances to protect 100 yr. floodplain areas. Stop encroachments that affect flood storage capacity. Evaluate cost/ damage for maintaining wetlands vs. flooding vs. economics vs. public trust.

4. Maintain Corridors - Maintain continuous riparian corridors, such as at road-stream crossings and areas adjacent to roads. Limit utility lines crossing streams to less than 2 per kilometer of stream length. Provide a buffer to human impacts by establishing setbacks through zoning ordinances.

5. Ensure White Lake's Future - Set goal for White Lake shoreline to be 75% natural habitat. Achieve this through conservation and restoration.

6. Determine Resource Use - Survey boat traffic and building permits to evaluate development pressures.

Watersheds & Land Use

The White River watershed is a vast area of land encompassing land along the White River and adjacent to White Lake and spans from Lake Michigan to the northeast side of White Cloud. The watershed in general is all the area of land in which the precipitation drains to a common point. For White Lake this includes the White River and all other tributaries surrounding the lake: Silver, Mill Pond, Strawberry, Bush, Raccoon, Pierson, and Buttermilk Creeks. The White River watershed is predominated by forest land cover (oak/hickory, maple, and elm/ash/cottonwood) with approximately 25% of the land use as agriculture. Local soil types range from the predominant, highly permeable sandy soil to loams, sandy loams, and poorly drained mucks and peat.

The watershed's land cover/uses directly influences the water and individual uses further downstream and within White Lake. Any land use that alters the water upstream affects water quality downstream . The quality of water is determined by how the land is used. Land use within the watershed encompasses everything from natural areas, small home sites, agricultural to industrial, and is becoming increasingly commercialized as urbanization is spreading from the Muskegon area. Other tributaries, because of historical uses contaminating groundwater and discharging materials into surface water, have greatly affected White Lake even though they drain smaller areas.

Associated Problems

Decreasing Wildlife Habitat: Landscape changes from a natural state to one of intensive use also determines the amount of habitat for wildlife. As land continues to be developed, natural areas become fragmented. The livable area for species decreases, and affects migratory pathways and breeding habitat for both mammals and birds. The increased fragmentation due to urban sprawl is one of the greatest threats to species in North America. Habitat loss from anthropogenic causes within larger landscape scales has caused the single largest mass extinction in the earth's history.

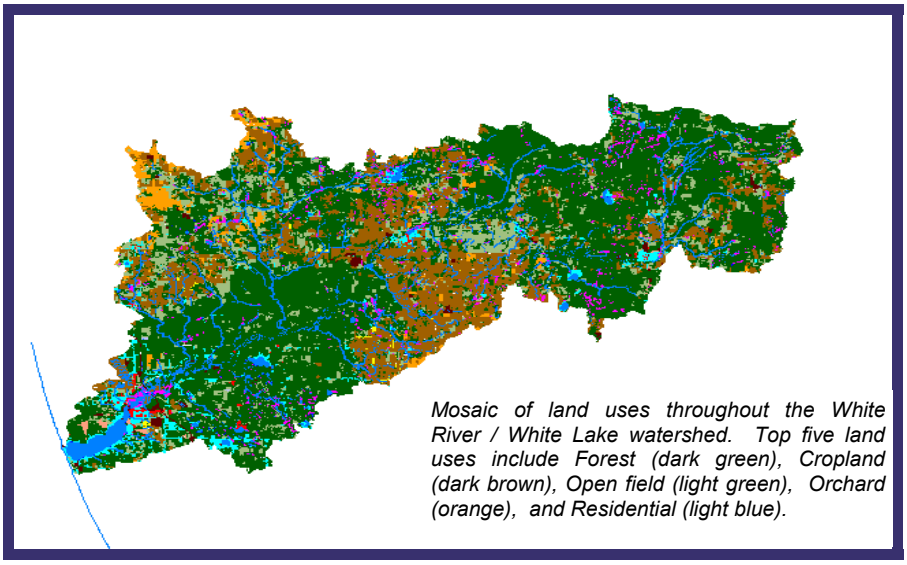
Limited Regional Cooperation: Land use within the White Lake watershed is a complicated issue. The watershed covers a large area and is controlled by many local governments. Because of this fact, land use is often thought as being too big for individuals to have a positive influence. Or, land use is left as the state's responsibility. Yet individuals determine the quality of the environment on their property and what land use practices are implemented. And although there are already several laws and ordinances that regulate land use practices in given areas many are often unrestrictive and environmentally insensitive to local habitats. Ordinances often take into account economics first and allow multiple variances to individuals. Although there is a limited amount of urban use in the watershed, it is concentrated, and continues to concentrate around water. One of the greatest assets In helping improve water quality is the presence of natural areas adjacent to the water, buffer areas, riparian zones, and adoption of the "smart growth" philosophy. Smart growth allows for the continued development and growth of a community through established plans that go beyond the broad stroke of local zoning ordinances.

Overall Watersheds & Land Use Goal

Land use plans and zoning ordinances developed and implemented that protect White Lake and the White River Watershed.

Overall, a watershed-wide approach must be taken in viewing the natural landscape as a benefit to community functions like flood control, water quality, aesthetics, economics, and wildlife. Previous Remedial Action Plans have stressed the need for regional coordination of watershed issues and ecosystem functioning, relating smaller scale environments to the larger system. Fortunately, the White Lake community has already taken some of the first steps toward smart growth. In 1992, the White Lake Area Chamber of Commerce invited the citizens of the area to meet and consider the issues facing them in the next century and how to best prepare. Representatives from the seven local governments participated in the discussion and helped in the development of a long range strategic plan, the *2000 Plus Plan*. Muskegon County is also working to develop the *Muskegon Area-wide Plan* that will integrate regional land use planning by those units involved in the process. The White Lake Public Advisory Council urges individuals involved to include smart growth / sustainability philosophies relating to development and planning surrounding lakes and other water bodies.

Decreased Long-term Economics Benefits: Water resources play an important role for all individuals, and alterations in the landscape often cause greater long term economic harm than benefit. If cost were calculated to provide clean/safe drinking water for the city of Whitehall in the past 50 years (including clean-up for groundwater contamination, providing filtration, replacing wells, and providing service) the costs would far exceed the economic growth provided by activities causing the problems. Especially if we add a fraction of the economic loss in recreation and fisheries throughout the watershed due to erosion, nutrient & chemical contamination, and habitat loss. The negative economic impact is astounding. Now add the cost for each community, resident, and private landowner to overcome these same issues throughout the watershed. The current model of urban sprawl and mass development *does not* improve the community economy in the long run. Rebuilding downtowns, supporting local businesses and agriculture, preserving habitat, and preventing pollution to natural resources ***DOES*** - within communities and within the watershed.



Mosaic of land uses throughout the White River / White Lake watershed. Top five land uses include Forest (dark green), Cropland (dark brown), Open field (light green), Orchard (orange), and Residential (light blue).

Additional Resources

Michigan Department of Natural Resources
www.michigan.gov/dnr

Michigan Department of Environmental Quality
www.michigan.gov/deq

Michigan Land Use Institute
www.mlui.org (231)882-4723

American Farmland Trust
www.farmland.org (202)331-7300

Other Resources:
www.numbersUSA.com (703)816-8820
www.sprawlwatch.org
www.rprogress.org
www.preservenet.com
www.plannersweb.com
www.smartgrowth.org
www.peopleandland.org

SOLUTIONS FOR THE PUBLIC

1. Become Involved – Volunteer with the White River Watershed Partnership. Promote sustainable land use and stop urban sprawl.

2. Protect Your Property - Consider acquiring a conservation easement on your property.

3. Learn About the Watershed - Education about the importance of using natural and native landscapes in developed areas.

SOLUTIONS FOR MUNICIPALITIES AND GOVERNMENTAL AGENCIES

1. Work Together - Use Land use conservation techniques and zoning. If development is going to occur, look for conservation subdivisions and link these with other conservation areas in other communities/municipalities.

2. Inventory Your Community - Inventory community's preserved land and use it to develop ordinances, zoning, and update master plans. Balance between habitat protection and changing land use patterns. Priority is to invest in the local White Lake community and existing infrastructure, not areas outside downtowns.

3. Work on Sub-Watersheds - Ensure every sub-watershed develops a watershed management plan including a storm water management plan. Acquire implementation funds.

4. Preserving the Land - Implement conservation easements on large pieces of property still remaining throughout the watershed including those on prior contamination sites (Dupont /Occidental Chemical Co.) Other portions of highly impacted land (Genesco) should be utilized for *Brownfield Redevelopment*.

5. Reusing the Land – Provide development opportunities at abandoned sites to limit expansion into areas that still have natural vegetation and remain intact.

6. Educate Landowners - Provide Best Management Practice workshops and educational materials. Use floodplain ordinances to regulate development in floodplains and riparian areas.

7. Look at the Big Picture - Develop projects on larger scales to include entire watersheds and ecosystems. Utilize county comprehensive green-ways and provide corridor management.

Groundwater

Groundwater is a vital resource everyone uses, although its quality and quantity is seldom thought of as an individual's responsibility. It constitutes the primary water source in the United States and is the main source of drinking water for the White Lake community. The White Lake community should place a high priority on protecting human health by preventing further contamination and restoring contaminated sites. Groundwater is also an important source in maintaining flow and water levels in rivers, wetlands, and lakes. Large open tracts of undeveloped land are important areas that ensures rainfall infiltrates the soil, replenishing groundwater and eventually surface waters. Groundwater is responsible for almost half of all stream flow in Michigan. While usually a very safe source of clean potable water, groundwater is at risk of contamination by many human activities. Groundwater can move hundreds of feet per year, especially in sand soils common to the White River Watershed. Contamination is not easily contained, and can be prevented.

Associated Problems

Industrial Discharge & Leaching: Groundwater contamination around White Lake has been highly publicized in the past 15 years. Many locations surrounding the lake, once sites of former chemical and industrial complexes, have contributed largely to White Lake's listing as an Area of Concern. Occidental Chemical contributed to the first known groundwater contamination plume moving toward White Lake. In recent years the list of sites of known or suspected groundwater contamination has grown to ten different locations throughout the White Lake area. Many plumes continue to negatively impact the use and consumption of groundwater. Unfortunately this list may not be complete because of the industrial history once prevalent around White Lake and continued encouragement for industrialization. The overall economic cost and welfare of the community has suffered greatly through clean-up costs, continued need to find clean/safe drinking water, and the loss of this natural resource.

Non-point Nutrients: Groundwater pollution and contamination for White Lake occurs from a variety of sources. Other groundwater issues have arisen in recent years because of nutrient contamination and the association with multiple human uses including: homeowner fertilizer use, agricultural fertilizers and improper manure management, septic failure or poor management, placement of septics in improper areas because of soil or drainage, and sewer system malfunctions/breaks. Nutrient contamination is difficult to track with the various sources confusing the point of pollution leading to the name "non-point source pollution." However, non-point source pollution is also one of the easiest to fix because we know it comes from individuals and can be altered through personal actions. Increased nutrients in the aquatic system easily alters the environment, leading to excessive aquatic plant growth (eutrophication) and increase colonization by aggressive "weed" species and exotics. This aggressive weed growth is often seen throughout the summer. The causes for such problems are already known, but source locations are not. Nutrient inputs through groundwater sources are suspected due to the abundance of septics along the southern shore of White Lake. As a lake wide community, steps must be taken to resolve this issue. Unfortunately there is no quick solution to the nutrient problem and general chemical treatments/spraying to deal with weed management only add another complex issue into the equation.

Overall Groundwater Goal

Groundwater contamination sources identified and remediated. Provide clean / safe drinking water.

Underground storage tanks: In recent years, contaminated groundwater has been linked to leaking fuel and oil tanks from old storage sites surrounding White Lake. Limited agency resources are dedicated to the identification and removal of underground storage tanks. Many remain unlocated and likely pose a serious threat to groundwater resources.

Abandoned wells: Due to White Lake's agricultural and industrial history, old abandoned wells may comprise groundwater quality as they are a direct link (through the pipe) to the groundwater. Contaminants entering old wells do not have the opportunity of breaking down with movement through the soil. Old wells can be capped through state and federal programs.

SITE & CONTAMINATION SOURCE	STATUS
Five A Oil Company *Underground storage tanks.*	Removal scheduled for 2002.
Occidental (Hooker) *Historical activities / leachate.*	Sediment Remediation-2003. Groundwater treatment system operating.
E.I DuPont *Lime pile contamination plume.*	Remediation Initiated - 1987.
Tech Cast, Inc. *Aquifer contamination (source unknown).*	Plume migrating. Impacts on White Lake Unknown. Semi-annual monitoring proposed.
White Lake Landfill (Shellcast) *Volatile Organic Chemicals. Source for municipal well no. 3 unknown.*	Monitoring continues at site. Working with landfill to determine extent of plume.
Whitehall Wastewater Facility #2 *Storage lagoon with contamination migrating to groundwater.*	Lagoon Sealed. Interceptor wells installed. Remediation succeeding.
Koch Chemical *Organic contaminants discharging Into Mill Creek Pond though groundwater export.*	Purge wells Installed. Sampling continues at site.
***Site received CERCLA funding and listed as national priority*	
Howmet Corporation *Organic chemical contamination from plant no. 4 and no. 5.*	Groundwater sampling complete. Status unknown.
Whitehall Leather (Genesco) *Heavy metals and Volatile Organic Compounds in sediments. Settling ponds and sludge suggested migration pathways.*	2002 - Remediation of contaminated sediments in Tannery Bay. Disposal sites on upland area unresolved.

POSSIBLE CONTAMINATION SITE	STATUS
Montague Dump (Trailway Campground) *Recently suggested as site of former city dump that may be impacting groundwater.*	Assessed for purchase by City of Montague, but yet to be reviewed by WL PAC.

Additional Resources

Michigan Department of Agriculture
www.michigan.gov/mda

Michigan State University Extension
www.msue.msu.edu/waterqual/wq-mats.html

Center for Applied Environmental Research
University of Michigan, Flint (1-810-766-6600)
www.flint.umich.edu/Departments/RegionalGroundwater/

U.S. Environmental Protection Agency
www.epa.gov/seahome/groundwater/src/ground/htm
www.epa.gov/r5water/index.htm
www.epa.gov/safewater

The Groundwater Foundation
www.groundwater.org
www.lakeaccess.org

SOLUTIONS FOR THE PUBLIC

1. Evaluate Your Impact - Participate in a Lake-A-Syst / Home-A-Syst to learn about what impacts you may be having on White Lake including pesticide and fertilizer uses.

2. Check the Septic – Maintain your septic system through yearly inspections and replace failed systems or hook into sanitary sewer.

3. Soften Your Property – Reduce areas of impervious/hard surfaces in your yard to decrease storm water runoff and increase recharge to groundwater.

4. Plug Abandoned Wells – Call your local conservation district to receive information and possible cost share programs to close abandoned wells *(Groundwater Stewardship Program).*

SOLUTIONS FOR MUNICIPALITIES AND GOVERNMENTAL AGENCIES

1. Evaluate Non-Point Source Pollution - Identify, map, and document critical areas (Non-Point Concerns) in urban, rural, and agricultural areas. Monitor groundwater and surface water inputs for nutrient contamination.

2. Determine Supply Vulnerability - Identify and map present and future areas dependent on groundwater and municipal water supply to determine vulnerability. Consider no fertilizer zones and set-backs near surface water and in recharge areas.

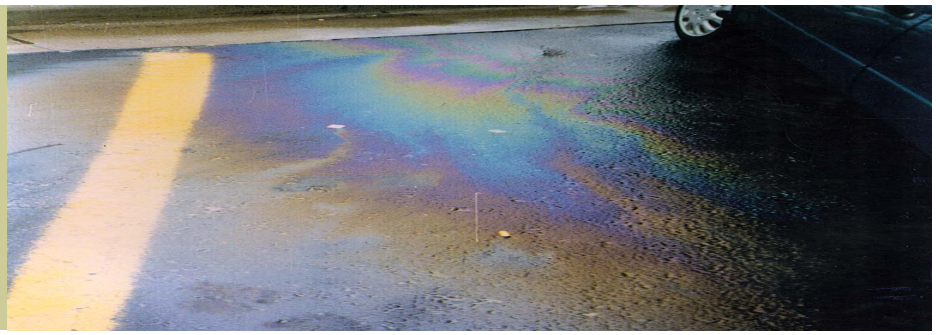
3. Close Abandoned Wells – Evaluate all properties with potential abandoned well sites and properly close all wells surveyed. Use available cost share.

4. Implement Nutrient Education Program - Provide educational materials and programs for public, business, industry, and other municipalities concerning nutrient/ pesticide/herbicide issues. In rural and urban areas, use manure and nutrient management.

6. Implement Septic Inspection System - Initiate scheduled inspections of local septic systems and provide incentives for proper maintenance. Implement reporting procedure for failed systems and survey areas with unknown waste treatment systems.

7. Provide Sanitary Sewage - Construct sanitary sewage service around shoreline of the lake. Ensure closure of septic tank systems and connection to better treatment facilities.

Storm Water Runoff



As communities continue to grow and develop, the amount of natural land cover is slowly being replaced by hard surfaces like streets, roads, driveways, roofs, parking lots, and other man-made structures. Storm water runoff, as related to ecological implications, is largely a function of excessive water from precipitation that is unable to soak into the ground. Because of the expansion of roads and development around White Lake in recent years, there has been increased pressure to increase the network of drains, ditches, and pipes to control runoff. Storm water runoff within urban areas is largely a function of development, and communities will soon be responsible for the quality and quantity of storm water that is generated and leaves their jurisdiction. In short, communities must withhold all water that would normally soak into the ground, recharge groundwater, and naturally be filtered by the soil. Because of many chemicals and compounds associated with storm water, communities must contain water until it meets quality regulations before it may be discharged into local water bodies. Regardless of all these downfalls the White Lake area continue to be engineered for new curbs and storm drains to redirect water.

Associated Problems

Increase Flooding and Erosion: Storm water management, originally a function to control local flooding, has become increasingly common as a means to quickly transport extra water out of the area. With increased use of storm water systems, water levels often exceed the holding capacity during heavy storms. Natural absorption is interrupted and the pathways of water flow are restricted. Hydrologic flow in agricultural areas is altered with channelization (county drains) and in cropland drain fields. Areas once vegetated if left uncovered, or impacted by anthropogenic uses, cause an increase in soil erosion, sedimentation, and agricultural chemicals in the system.

Combined Sewer Overflows: For many years communities throughout Michigan would collect and treat storm water in conjunction with sanitary waste water. However, as systems began to age and no longer had the capacity to treat sewage during large storms, all excess water was released to local waterways. Many communities, including those around White Lake, have disconnected wastewater (sewer) and storm water drains, but now most storm water is untreated and is highly contaminated. Problems associated with untreated storm water could be mitigated through facilities that treat runoff released during the first 0.5-0.75 inches of precipitation. It is this period of a storm that carries most pollutants to local waterways.

Vehicle Fluids Inputs: And although the amount of water entering a system can alter system dynamics, it is what is in the water that causes the greatest problem. Storm water in heavily urbanized areas may be significantly more damaging than sewer overflows because of the toxicity of discharging water. A major source of pollution to local water sources in White Lake is from liquids leaking or spilling from vehicles. Many of these sources like oil, gas, and grease from streets and parking lots greatly decrease water quality. These problems may become the new sources for contaminated sediments in upcoming years.

Property Owner Responsibility: The issue of storm water drains connecting to our local water bodies are mainly a problem in White Lake's downtown areas where streets are curbed and water must be collected and dispersed. Most other areas outside of the downtown do not have curbs and few storm drains so water filters through peoples yards. Some storm water movement still occurs along the streets and through county drains which also discharge to local waters. Whether storm drains are present or not residents and businesses must assume that some portion of the water from their property travels to storm drains. Individual actions are extremely important. Excess fertilizers, herbicide, and vehicle liquids may travel with storm water, especially if present on hard surfaces.

Misuse of Storm Sewers: Individual responsibilities requires the proper use of storm sewers. Individuals should never pour anything down storm drains because they are not connected to local treatment facilities. What goes down the drain empties into your local water source and eventually empties into White Lake and Lake Michigan. Storm sewers also exhibit high levels of salt following spring runoff as streets, sidewalks, and driveways often concentrate salts, from road de-icing during the winter.

Overall Storm Water Goal

Adverse impacts from stormwater eliminated within the immediate drainage area of White Lake

Concentrating chemicals: Many solutions are beginning to take place throughout Michigan including the requirement for large developments to contain all storm water in retention ponds. This solution provides for the water to be detained, soaking into the soil, and utilizing natural filtration. However, this process also holds large concentrations of polluted water from vehicle fluids that can then seep into groundwater. Another solution, gaining wide acceptance in the conservation field is the construction of man made wetlands. These areas provide the continued movement of water at a slowed rate with plants helping to trap, and filter many chemical pollutants, nutrients, and particles. Another major benefit is that wetland areas are created and help to restore these habitat features to the local environment. However, these wetlands do not equal natural wetlands and should never be used to replace, or traded through wetland mitigation, for natural areas.

If you find pollution and believe it is human-induced, please report it to the State of Michigan's Pollution Emergency Alerting System (PEAS) hotline at 1-800-292-4706.

Additional Resources

Better Site Design: A Handbook for Changing Development Rules in Your Community. 1998. Center for Watershed Protection.

Conservation Design for Subdivisions: A Practical Guide to Creating Open Space Networks. 1996. Arendt, Randall G. Island Press.

University of Wisconsin - Extension
http://clean-water.uwex.edu/pubs/stormie/cleaning.pdf

Kitsap County Surface and Storm Water Management
www.kitsapgov.com/sswm/tips.htm

SOLUTIONS FOR THE PUBLIC

1. Maintain Your Car - Keep your car tuned-up to avoid leaks and spills. Ensure proper disposal of waste oil and other automotive fluids that can wash from paved/hard surfaces.

2. Down the Drain - Do *NOT* pour anything down the street drain and avoid using any toxic liquids or solids (fertilizers/herbicides/pesticides/deicing salt) that can be washed from your property. Utilize Muskegon County's household hazardous waste drop off.

3. Increase Filtration- Preserve areas of native vegetation around your property and utilize porous materials for driveways and sidewalks instead of hard surfaces that are non-porous.

SOLUTIONS FOR MUNICIPALITIES AND GOVERNMENTAL AGENCIES

1. Pollution Prevention - Initiate programs to prevent nutrient and other pollution contamination from entering water sources. Implement street sweeping, leaf pick-up and community yard waste composting.

2. Set a Good Example - Eliminate commercial fertilizer and pesticide use on all municipal properties. Utilize compost as a natural fertilizer.

3. Reduce Stormwater Impact - Develop plans to reduce contaminated stormwater in water resources (treat stormwater in residential, commercial, industrial and urban areas). Utilize buffers, in-pipe filters, wetland protection, wetland construction, and ponds as infiltration areas.

4. Limit Hard Surfaces - Reduce impervious surfaces in industrial and commercial areas to reduce runoff.

5. Assess Improper Connections – Survey and map cross connections between storm and wastewater sewer. Eliminate all illicit connections including basement floor drains.

6. Participate in State & Federal Programs - Communities should join Michigan Dept. Environmental Quality voluntary compliance program to help facilitate local regulation and tracking of NDPES permits/discharges.

7. Minimize Salt - Minimize the impact of salt on local waterways by reducing the use for general road maintenance during the winter. Use an alternative de-icing material. Halt the dumping of snow in parking lots that drain melt-water to White Lake.

Erosion & Sedimentation

Erosion is a natural process occurring in many environments through the breaking and wearing down of soil, rock, and surface material through the processes of wind, water, and gravity. As these particles move into the aquatic environment and settle to the bottom, in a process called sedimentation, they can act as an important source of organic material and nutrients in normal minimal amounts. Erosion and sedimentation increase as soil is disturbed through human influence, like destabilization along stream banks, construction, road / stream crossings, and agriculture, where vegetation is removed and soil is exposed to the weather. The greatest threat is construction activities that not only remove vegetation and excavate areas of soil, but also disturbs the soil structure and stability. Erosion is a natural process that normally takes place over long periods of time and impacts small areas, whereas human actions have greatly increased the amount of material moving into the system. Erosion that occurs naturally is necessary to help sustain the energy flow of the system; however, major increases can overload the system with nutrients, organic material, sediment, or contaminated material. Many non-point nutrient sources along the White River are due to erosion at various recreation, residential, construction, and agricultural sites.

Associated Problems

Additional Chemicals: Sediment and soil particles may have high concentrations of fertilizers (nutrients) and pesticides that stick to the particles and are carried with them – eventually being released in other areas causing pollution or contamination. Particles in the water cause many problems for White Lake and tributaries with increased cloudiness, loss of oxygen as organic particles break down, and increased nutrients that can cause excessive aquatic plant growth (eutrophication).

Altering Habitat: Sediments can also change the bottom structure of aquatic systems by reducing depth, burying spawning beds for fish, and burying habitat of some aquatic insects. Sediment deposits in streams degrade entire aquatic systems, and cause the greatest damage and loss to habitat through physical changes in water quality throughout White Lake. Erosion at sites upstream also increase the need for dredging downstream and in White Lake. The increased dredging stresses the economic ability of individuals and local municipalities.

Agricultural Impacts: Soil is lost due to limited vegetative cover on and around fields through raindrop impact and water movement across the surface, removing loose material. Soil is moved to adjacent creeks and streams increasing sediment into the system. Other scenarios involve livestock having free movement to water, or for crossing access. Livestock use the same path destabilizing stream banks allowing erosion to easily occur. Fortunately, many erosion problems within agricultural areas can be prevented with best management practices like crop rotation, fertility / manure management, planting cover crops, leaving vegetative buffers, and properly maintaining drainage systems. Erosion causes millions of acres of agricultural topsoil to be carried away each year, with a net loss of productivity and future sustainability for farming.

Disturbance from Construction: Erosion is also occurring around White Lake at construction sites and in areas that receive heavy traffic. Disturbance of soil and movement of material is even more prevalent around the lake as sandy soils are easily eroded. This is of increasing concern for areas directly adjacent to White Lake where new development is occurring in areas that are perched on slopes that were previously left natural. Soil disturbance from construction can be controlled through proper care and persistent site maintenance. Re-establishment of native vegetation is recommended for 50-80% of the developed site. This allows for reduced runoff, groundwater recharge and habitat replacement.

Overall Erosion and Sedimentation Goal

No erosion from human activities within the watershed. Natural erosion and sedimentation processes continue.

Residential Inputs: Erosion increases in urban and residential areas along steep slopes, with exposed soil, and from increased water flow from storm water sewer outlets. Loses impact the economics through loss of property, decreased use of land, and negatively impacting the quality of adjacent water. The easiest and most common practice to control erosion during construction is through use of daily seeding and silt fences surrounding sloped areas and areas of heavy disturbance.

Recreational Oversight: Most notable in recent years has been increased interest in controlling erosion occurring at recreational areas along the shoreline of the White River. Because of the popularity of water related activities throughout the watershed it is becoming apparent that human efforts to enjoy water is negatively affecting shoreline stability due to heavy use. One major site for recreation just upstream of White Lake is the Muskegon County property known as "Hilt's Landing" or "Burying Ground Point". The original slope was used by recreational vehicles and received heavy foot traffic along the shoreline bank for fishing access. Recently this site was restored improving fish habitat lost from sedimentation, decreasing nutrient inputs, and slowing the associated algal growth in the lake. This site contributed approximately 248 tons of material to the system each year increasing both nutrients and sediment. Burying Ground Point is just the beginning of what should be a watershed initiative to improve the quality of not just White Lake, but areas throughout the White River watershed that are being over utilized without proper management practices in place.

A recent survey has been completed by Timberland RC&D, "White River Streambank Erosion Inventory", to assess and rank erosion sites. This inventory identifies erosion sites and is a tool to remediate sediment impacts to the White Lake from the river.

Stream bank erosion at Burying Ground Point / Hilt's Landing contributing sediment and nutrients to the White River.

Additional Resources

White River Streambank Erosion Inventory - 2002.
Timberland RC&D.

USDA-Natural Resources Conservation Service
www.nrcs.usda.gov

Michigan Department of Agriculture
www.michigan.gov/mda

Michigan Department of Environmental Quality
www.michigan.gov/deq

Michigan State University - Extension
www.msue.msu.edu/waterqual/wq-mats.html

Great Lakes Information Network
www.great-lakes.net/envt/pollution/erosion.html

Washtenaw Co.– Dept. of Environment and Infrastructure Services
www.co.Washtenaw.mi.us/depts/eis/sesc.html

SOLUTIONS FOR THE PUBLIC

1. Become Educated - Attend local workshops related to native landscaping and buffer strips as a way to prevent erosion on public and private property.

2. Protect Public Property - Help maintain public sites along streams and at road crossings by utilizing designated pathways, stairs, and recreation areas. Do not trespass or illegally utilize areas while using snowmobiles or other ATVs in areas that are sensitive to erosion.

3. Need Help? - Contact the Muskegon Conservation District or NRCS-USDA office for on-site assistance before constructing and/or fixing sites.

SOLUTIONS FOR MUNICIPALITIES AND GOVERNMENTAL AGENCIES

1. Provide Contacts - Educate homeowners about preventing erosion & give contact info for reporting erosion sites and answering erosion control questions. Enforce soil erosion control plans for all construction.

2. Implement Buffers - Develop Buffer System Plans for stream and road crossings to mitigate erosion sites and enhance wildlife habitat. Implement as part of Master Plan.

3. Monitor Erosion Sites - Hold workshops for builders and construction companies on preventing soil erosion. Increase inspections of active construction sites and utilize local inspectors visiting sites for other purposes to recognize and report erosion control problems.

4. Determine the Impact - Survey and map areas sensitive to erosion and sedimentation. Evaluate cost damages from loss of property and nutrient contamination (loss of usable water).

5. Implement USDA programs - Provide technical and financial assistance for landowners throughout the watershed to control personal loss of property from erosion, and sustain health of adjacent aquatic systems.

6. Survey the Watershed - Utilize Streambank Erosion Inventory (main branch of White River) to eliminate "extremely severe" and "severe" sites. Develop an inventory for other tributaries throughout the watershed and surrounding White Lake.

Wastewater Management

Up until 1974 the communities of Whitehall and Montague discharged domestic (residential) wastewater to the White River from the former Whitehall treatment facility. Since that time one of the significant health advantages has been management of community wastewater (transport and treatment) by the Muskegon County's northern treatment facility. Many urban areas around White Lake already have sewer systems yet some areas continue to utilize on-site septic systems to manage waste. Septic systems are used throughout the rural areas in the White Lake / River watershed. Both septic and sanitary sewer systems are very efficient in reducing contamination of water if maintained and used properly.

As the White Lake community grows and development continues, the need for new sanitary sewer infrastructure is driving the need for system capacity. In 2003 the White Lake area connected to the main Muskegon County wastewater system and diverted all wastewater from the regional facility. Today the flow is averaging 1.0 million gallons per day (mgd), with a system capacity projected at 1.7 mgd. The northern regional facility continues discharge local groundwater treatment water to the White River as part of the site clean-up taking place. Following the completion of clean-up activities, the White Lake Wastewater Facility will be abandoned because it can no longer meet the needs of the surrounding communities. Although looking to future needs is important, adding infrastructure or maintaining systems that are larger than normal, increases sprawl by encouraging development. Wastewater treatment solves a great number of bacterial health and nutrient problems within aquatic systems, but the overall burden of increased sprawl may be far more damaging to the ecological systems.

Associated Problems

Bacterial and Nutrient Contamination: One of the greatest concerns, and most common problems associated with wastewater discharge to aquatic systems has been the increase in nutrients and threats to human health from bacterial contamination. Throughout several public meetings, bacterial contamination, has been expressed as the major concern by most homeowners. Although this is a serious problem, it is rather common in summer communities. The White Lake community, once a summer resort location with seasonal cottages, is slowly being converted to year-round residences. As residents begin using older, seasonal homes for full time occupancy, it may lead to the use of old, failed, or leaking septic systems. These older systems have limited size capacity and may be adding excessive nutrients and bacteria to the groundwater, and to White Lake. Since many of these homes are located along the shoreline, and sewer hook-ups are presently unavailable, waste entering aquatic systems may cause human-health related problems and lead to beach closings and water contact restrictions. Further sampling for bacteria and nutrients from these sources needs to be addressed in order to gain public support for other water quality projects.

Overall Wastewater Management Goal

Sound wastewater management established and maintained around White Lake and throughout the watershed.

Outdated Systems: Problems associated with the sewer systems around White Lake include old systems, poor maintenance of pipes, treatment facilities reaching capacity, and cross connections between the storm sewers and wastewater sewers. Some sewers were originally designed to carry both sewage and storm water runoff so all water would be treated together. During heavy rains volume becomes so great as to overflow the system. When this occurred, untreated or partially treated sewage flowed into receiving waters. Today, cross connections between the two systems is illegal and all similar connections are being corrected to ensure waste does not lead to contamination. However, cross-connections have been made by mistake around White Lake; especially in areas with older treatment systems as property owners are trying to do the right thing through sewer upgrades. Other systems have simply reached their capacity or are outdated if 25 years or older. Some of these areas, around the western portions of White Lake, only have on-site septic systems where bacterial and nutrient contamination on-site has become an increasing concern. Local residents complain about sewage smells, especially in areas prone to older sewer and septic systems that are beginning to fail.

Inappropriate Use: Other problems associated with wastewater depends on individuals who often associate wastewater treatment as a system that is able to eliminate all kinds of waste from the home – including many toxic chemicals. Wastewater treatment plants are very efficient, but are designed to breakdown organic waste and cannot eliminate many of the chemicals that we pour down drains. One thing to remember is that after wastewater is treated it is always returned back to the environment, and can reach areas where we get our drinking water (groundwater or surface water). This issue becomes increasingly important as newer and more complex chemicals are developed for everyday use. Some of the most common chemical contaminants that end up in wastewater systems are paints and paint solvents, household cleaners, and liquid wastes from garages and basements. These chemicals are often untreatable with present facilities and remain in wastewater discharges. The economic costs to develop facilities to remove these contaminants for our convenience far exceeds the cost of individuals to dispose of them properly. Don't pour anything down the drain you wouldn't want to drink. The increased use of chemical products continues to stress the capacity of our wastewater management, while making it economically hard for communities and municipalities to sustain clean water resources.

Industrial Discharges: Another major concern for the public continues to be industrial discharges to White Lake as many facilities treat their own water. Perhaps one of the greatest benefits to water quality protection to White Lake has been the need to meet pollution discharge (NPDES) permits that are continually monitored for discharge to surface waters. These permits ensure that any releases from direct discharge pipes must maintain water quality criteria before entering natural waters. Discharge from industrial sites surrounding White Lake have largely been resolved either through stopping discharges or through continued monitoring. However, the greatest weakness of permits and monitoring, are that violations are seldom resolved with the actual correcting of problems. Many violations are merely solved through fines that are of little consequence for large corporations or industries because fines are minimal. It is viewed as better economically to pay the fine and discharge a pollutant rather than apply for special release permits and correct problems. The public views fines, variances, and continued permitting as poor wastewater management strategies for White Lake.

Additional Resources

Simple Solutions to Water Pollution. Provided by the White Lake PAC, and available from the Muskegon Conservation District.

The Do's and Don'ts of Implementing a Successful Illicit Connection Program - 1998. Wayne County Department of Environment.

Michigan State University - Extension
http://www.msue.msu.edu/waterqual/wq-mats.html

U.S. Environmental Protection Agency
www.epa.gov/OWM/

http://www.epa.gov/r5water/npdestek/npdmena.htm

Michigan Department of Environmental Quality
www.michigan.gov/deq

SOLUTIONS FOR THE PUBLIC

1. Prevent the Problem - Schedule yearly inspections of your septic system through a certified technician. Correct any problems as soon as they occur.

2. Join the System - Hook up to the municipal wastewater system if available in your area.

3. Save it for Later - Store any household hazardous wastes and bring them to the local drop-offs during the year. If you don't want to store it, you shouldn't be using it. For Muskegon County's *Household Hazardous Waste Drop-Off* call the Department of Public Works.

4. Reduce Your Use - Reduce the amount of water you use. This reduces the amount treated and helps municipalities minimize general operating cost.

SOLUTIONS FOR MUNICIPALITIES AND GOVERNMENTAL AGENCIES

1. Multipurpose Inspection Service - Train building inspectors to recognize cross connections (utilize those already specializing in plumbing for commercial, industrial, and residential).

2. Prepare for the Future - Identify future wastewater infrastructure which fits master plan and evaluate possible revisions to master plan to reduce capacity demand. Do not add wastewater units until it is determined that capacity is insufficient or unavailable to meet needs. "Pre-capacity" will drive development and expansion.

3. Supply by Need - Adequate treatment needs to be considered before new connections are allowed.

4. From Septic to Sewer - Develop ordinance to ensure residents "hook up" to the sewer when it becomes available in their area. Identify areas that septic systems would greatly impact system if failure occurred (utilize county soil survey) and focus infrastructure prior to allowing new development.

5. Protect the New Buyer - Ordinance for all systems inspected and repaired at point of sale (require minimum lot size requirements with annual licensing, inspection, and maintenance).

6. Implement Local Discharge Ordinances - Provide local enforcement of industrial discharge violations that go beyond fines and mandates correcting problems.

Public Education & Stewardship

One of the greatest problems in making changes for White Lake residents is not apathy, but the knowledge to make the correct decisions and opportunities to become involved. Individuals must also trust that decisions they help determine will be moved forward by municipalities and agencies for implementation and enforcement. Participants will lose interest and faith if decisions that are made are not enforced or implemented, whether they agree or disagree with decisions. Efforts by the Public Advisory Council, governmental agencies, or municipalities, will not be successful without the support of the public. In a similar manner, the residents must also give back to the community. Supporting the community helps to build community pride, ownership, and overall stewardship. As an example, local residents and businesses have a unique opportunity to preserve the agricultural history that is still present in the area by buying directly from producers. Through support of local agriculture small family farms can continue to exist by receiving fair market value, rather than wholesale value, for products. Individuals can work directly with agricultural producers they know within their communities and determine product quality while helping to persuade agricultural decisions that affect the White Lake environment.

Presently, the continued interest and pride in the White Lake community is somewhat segregated due to a large summer population. Yet, it is the summer residents that comes back year after year which find White Lake unique, beautiful, and quaint; and are the greatest supporters of the community atmosphere they enjoy. However, this love for White Lake is also encouraging growth and development of many unsustainable uses, like marina development and new home construction.

Associated Strategies

Engaging Residents: Public education about White Lake should extend beyond the local year-round community to those visiting for the summer, or just for a few days. The White Lake community should spread the general view of pride for the natural resources in their community. This pride comes from a proud heritage and interest in natural resources. Organizations and businesses should strive to encourage community pride by providing continued involvement. Community members can become a part of the what is happening and get involved by volunteering time to do water quality monitoring, stream clean-ups, and control exotic species. Or, become involved in public meetings, hearings, and information sessions about White Lake. Hearing other people's opinions and voicing your own will strengthen decisions on a community scale.

Connecting with Students: Environmental science education and training should be the foundation for learning in local school systems by implementing grade specific curriculum. Utilizing local natural resources takes a real-world approach to learning by using the local community, environments, and habitats to help students and teachers reach their goals in social studies, history, math, science, language, and visual arts. White Lake has a vast resource of habitats, people, and opportunities that can bring students a greater depth of knowledge by relating things they learn to their own surroundings. Using the *Environment as an Integrating Concept for Learning* must be brought into the classroom, to not only help the environment, but to help children learn that the environment is part of their community. It is how we relate and interact with our local environments and habitats which make future stewards that feel a real connection and pride to their community. If there is no connection to the natural world and community there is no support. Students that learn about local areas and actually get out of the classroom to experience these habitats, learn and retain more than in traditional settings. Involving children in outdoor activities strengthens the experience and appreciation while meeting state and federal standards, yet is locally relevant. Student education must also reach up into the watershed, beyond the immediate area, to other classrooms and into other communities. The watershed is a tie that binds, connecting communities and educational ideas to other townships and cities. These communities in the watershed are White Lake's sister cities.

Overall Public Education and Stewardship Goal

All citizens, schools, and businesses engaged in awareness and appreciation efforts. Decision-makers supplied with all necessary information to make informed choices.

Continued Interest: Major efforts have already been made for public awareness and involvement, especially for many of the highlighted issues in the lake, like contaminated sediments. However, continued environmental knowledge and involvement is needed to address many issues of great concern, but are seldom addressed and understood. As this document is distributed throughout the White Lake area we encourage local organizations to utilize questionnaires or surveys to gage public opinion and education. One of the greatest assets to community education will be determining the extent of how individuals feel they can help restore and preserve the lake.

Future Involvement: This document looks to increase public interaction with the White Lake Public Advisory Council through periodic updates to this document. These updates will help keep individuals informed and involved. Part of this public education and stewardship will be to encourage local residents to express their opinions on current issues to local, state and federal representatives. Elected officials need to hear both public concern, support, and thanks for working to clean-up White Lake. *The White Lake Public Advisory Council would like to show gratitude and appreciation of the following individuals (elected and otherwise) for helping to ensure the future of White Lake and the surrounding communities.*

A. Winton Dhalstrom
Bob Wesley
Jerry Van Woerkom
Leon Stille
Nancy Frye
Norm Ullman
Henry Roesler
Holly Hughes
Jerry Garman
Kathy Evans
Tanya Cabala
Tom Hamilton
Betty Dhalstrom
Tom Thompson
Duane Trombly
Chuck Vanderlaan
Greg Mund
Phil Dakin
Jerry Grady
Ruth Pitkin
Laura Anderson
Mike Snell
Rand Barfoot
Greg Smith

Additional Resources

U.S. Environmental Protection Agency
www.epa.gov/OWOW/monitoring/volunteer
www.epa.gov/r5water/eom

MAISD Regional Mathematics and Science Center
www.muskegon-isd.k12.mi.us

Muskegon Conservation District
www.muskegoncd.org

Lake Michigan Federation
www.lakemichigan.org

Grand Valley State University - R.B. Annis Water Resources Institute
www.gvsu.edu/awri/

Muskegon County Museum
www.muskegonmuseum.org

SOLUTIONS FOR THE PUBLIC

1. Do Your Part - Continue to utilize this publication as a resource to determine where you can become involved. Help to preserve and protect White Lake by doing your part.

2. Stay Involved - Help local organizations and groups with volunteer monitoring, community projects, education workshops and student projects. Ensure regional watershed connection for all programs.

3. Show Support - Congratulate and support individuals that have already helped improve White Lake.

4. Live Lightly - Adopt conservation as a standard way of life to reduce overall impacts to the White Lake landscape.

SOLUTIONS FOR MUNICIPALITIES AND GOVERNMENTAL AGENCIES

1. Promote White Lake - Develop programs and products that promote and identify the value of natural resources in White Lake. Utilize community events (Celebrate White Lake, Maritime Fish Boil) as educational opportunities.

2. Support Local Businesses - Develop financial support programs for business that enhance White Lake protection as a resource.

3. Support Classroom Programs - Local school districts and educational agencies should support the work of MAISD Regional Math & Science Center to bring relevant, real-world environmental experiences to students.

4. Show Support - Congratulate and support individuals that have already helped improve White Lake. Communities, media, and environmental organizations should reward good/positive behavior that helps protect White Lake. Provide public recognition for individuals.

5. Get the Public Involved - Provide stewardship opportunities that keep individuals involved in restoration.

6. Establish a Public Resource - Utilize the White Lake Public Advisory Council as the resource warehouse for all White Lake studies, reports, and documents related to the continued health of the system.

Pollution Prevention

Pollution prevention can be one of the greatest assets to preserve White Lake and the first step for continued restoration. Many municipalities, governmental agencies, and organizations often deal with solving environmental problems and issues that have already occurred and pose serious threats to the health of humans and ecosystems. Assessing the impact of our actions and providing alternatives to pollution prior to its occurrence is more productive than trying to determine safe levels, concentrations, and clean-up costs in the long term. This approach may not always meet the **wants** of individual people. But, this will help meet the **needs** of the White Lake community by reducing or eliminating the problem before it occurs. Like all other social, economic, and environmental systems, it is more efficient and less costly to prevent problems before they occur rather than try to correct them after the fact. Individuals within the community must examine personal routines and the habits of those who work for them to ensure proper management and protection of White Lake is occurring.

Associated Strategies

Becoming Personally Informed: Contamination continues to be an important issue for White Lake and in recent years industry and agriculture have become highly regulated and have started cleaning up many sites in and around White Lake. Many problems now associated with NEW sources of chemical contaminations are from individuals in our communities. Individuals indirectly support pollution of our landscapes by unknowingly using toxic products or use them incorrectly. Other products that may appear as having minimal impact may in fact be producing environmental damage. Unfortunately, many chemical products used in households today were created to simplify life and ease work. However, many of these same products contain toxins and are readily labeled as toxins for contact, consumption, or inhalation. These products are damaging to human health and all biological life. Pollution prevention may also entail the reduction of manufacturing in general. Many companies are moving materials that are not needed for personal benefit or use.

Becoming Personally Involved: Pollution prevention should be a goal for all property owners. Evaluating what your impacts are can be viewed as reducing the amount of material that leaves your property. If it rains, try to manage water "where it falls" by reducing runoff and ensuring water is not contaminated. If you fertilize, will the excess seep into the groundwater or be washed off the driveway. If dangerous household cleaners are used, are they correctly stored, used, and disposed of properly. Determining the impact you are having on the landscape within your own property will help you better determine the contribution to larger impacts. Help is always available and confidential, if you are unsure of what impacts may be a problem. Most importantly, pollution prevention is about being an educated and responsible community member.

Working Together: Individuals must realize they are part of the larger picture of a larger community And develop an individual ethic and personal responsibility for their actions. Although they may own the property and feel they can do whatever they want, they must also realize that zoning ordinances, building codes, special historic designations, and environmental regulations are to the benefit of all. In order to enhance the whole, we must take into account and utilize the support and strength of each individual. As part of this larger community, organizations and groups should work together to bring individuals increased community activities, commerce, and an enjoyable environment to live in. The White Lake community has already shown great strides in environmental, economic, and social issues through the development of the White Lake 2000 Plan. This plan, and the White Lake Community Action Plan, will help to develop and determine solutions for emerging issues that could strengthen the community and prevent future threats to its sustainability.

Overall Pollution Prevention Goal

Pollution prevention programs implemented that support White Lake's aesthetic value, economic growth, and environmental health.

Changing Personal Views: Pollution Prevention in this section has largely dealt with issues around the home or business. In reality, pollution prevention is a philosophy or ethic to prevent any foreign material from reaching White Lake or even being introduced into the environment in the first place. Expressing pollution as merely chemical related is somewhat misleading. Pollution can be any foreign material that enters the natural system and negatively impacts the stable state of the ecosystem. Some of the most common pollutants include: nutrients, bacteria, wastewater, erosion, and even exotic species. Overall, individuals should remember that dramatic changes in the health of the environmental system will also determine changes in personal health for people using local natural resources. Prevention is the best solution for White Lake's future.

What most people do not realize is that preserving the environment is preserving the future. That which is good for the natural world is good for the people and individuals who live in this world. To remove, pollute, damage, and destroy for the benefit of economics is a shallow pursuit for the future and only meets the short term wants of a few individuals. White Lake is an amazing natural resource, and if not protected could elicit problems well beyond the ability to swim or fish. White Lake is the pride of the community and everyone should work together for its protection.

Additional Resources

Simple Solutions to Water Pollution – Provided by the White Lake PAC. Available from the Muskegon Conservation District.

U.S. Environmental Protection Agency
www.epa.gov/opptintr/p2home
www.epa.gov/glnpo/p2.html
www.epa.gov/reg5rcra/wptdiv/p2pages/index.html

Michigan Department of Environmental Quality – Environmental Assistance Division 1-800-662-9278
www.michigan.gov/ead/

Michigan Department of Agriculture – Environmental Stewardship Division (517) 241-0236
www.mda.state.mi.us/environm/index.html

Northwest Coalition for Alternatives to Pesticides
www.pesticide.org

USDA-Natural Resources Conservation Service
www.nrcs.usda.gov
(Technical services and financial assistance with resource planning, erosion control, pollution prevention and implementing Best Management Practices on agricultural, residential, and

SOLUTIONS FOR THE PUBLIC

1. Get Involved! – Participate and become a member of the White Lake Public Advisory Council and other local organizations that support the sustainability of White Lake.

2. Become Educated – Learn about the products you use and common everyday practices which may contribute to pollution directly and indirectly. The more you know the more you can help and be a part of the solution.

3. Express Your Opinion – Let your Local, State, and Federal governmental representatives hear your voice concerning environmental issues in your community that impact White Lake. If you don't know where to voice your opinion contact the White Lake Public Advisory Council and we will help.

4. Support Your Community - Support local companies, businesses, and the agricultural community that utilize pollution prevention steps that lead toward a more sustainable future in our economic, social, and environmental community. Encourage those groups that do not support pollution prevention to do so.

5. Evaluate Your Impact - Participate in a Lake-A-Syst / Home A Syst / Field A Syst (available from local USDA and Conservation District offices) to learn about what impacts you may be having on White Lake.

6. Reduce/Reuse/Recycle

SOLUTIONS FOR MUNICIPALITIES AND GOVERNMENTAL AGENCIES

1. Waste Reduction – Municipalities should implement pollution prevention and waste reduction philosophies. Provide financial support and opportunities for businesses to perform environmental audits through independent agencies.

2. Support Suppliers and Contractors - Work with suppliers and contractors to reduce waste through production cycles and provide opportunities to participate in programs.

3. Environmental Publicity - Encourage local publications and newspapers to write articles about pollution prevention and recognize those businesses and industries that continue to meet state and federal regulations through voluntary compliance.

Emerging Issues

Brownfield Development
Re-using and identifying contaminated properties will continue to be an issue in White Lake because of its industrial history. However reusing these sites may decrease pressures to develop areas that are not being used. The White Lake community should focus development at brownfield sites and strengthening local downtowns. Planners must realize that we do not have to use every piece of open space and natural area for development.

Over Development
White Lake must address issues that affect tourism and economics around the lake with increased pressure for marinas, condos, and recreational use. In the short term these all increase the local economy, but there becomes a point where the tourism industry falters because of a general loss of aesthetic value and quaintness. Major developments around White Lake include increased marinas and condo development. Many local residents feel that this change is negatively impacting the nature of the community and is changing the general quality of life.

Keyhole Development
Keyhole development is becoming increasingly popular in areas with limitations on lakefront property. This development strategy utilizes a single property along the shoreline as an easement for many other properties adjacent to the waterfront parcel. A single property may hold all the docks and act as a mini-marinas for several users. The development can often ask higher prices for property, but are not taxed similarly. This strategy increases pressure on shoreline habitat by increasing the number of people utilizing a given area. Three municipalities (City of Montague, Fruitland Township, and White River Township) have already implemented zoning ordinances to address keyhole development.

Firm Policies
One of the greatest problems in evaluating development of the landscape is inadequate planning prior to development. Taking the initial steps in determining how the land can be used in the future helps determine a wider scale rather than utilizing a project by project approach. However, one of the greatest weaknesses of a plan is the strength to support it regardless of the project. *Variances* of policies, plans, and ordinances lose overall support and purpose. It is not enough to say this is how we would like the land to look. The community and local governments must make it a reality and put the plan into action.

Air Pollution
One of the most abstract of pollution sources continues to be air pollution brought to White Lake from other communities. This concern was first addressed in the 1994 Remedial Action Plan and continues to be a concern for the future. Air pollution as a toxic input for the White Lake may continue to degrade environmental conditions even if many of the problems presently associated with the White Lake community are eliminated. Control of air pollution must become a regional, national, and even international issue with pressure from local grassroots efforts to make a difference in White Lake's future.

Water Craft
Several issues have arisen in adjacent communities that have caused much concern. One in particular is the increasing use of personal watercraft which degrade wildlife communities, negatively impact the environment, and increase personal risk and injury. The most comprehensive look at these issues has been published by Izaak Walton League of America ("Caught in the Wake: The Environmental and Human Health Impacts of Personal Watercraft - 1999 Personal Watercraft Report." *www.iwla.org/reports/pwc.html).* A similar issue closely linked with the use of watercraft in general has been the increased gas "sheen" around marinas and in areas of slow moving water during recent years. A relevant national article, "Pollution by Pleasure", also mentions underwater exhausts increasing hydrocarbons and other pollutants within local waterways becoming an increasing water quality problem.

Another issue of contention that city planners are seeing within other communities is the introduction of sleep aboard watercraft being used as permanent or seasonal residence moored along the shoreline. And although many of these issues have been related to the aesthetic nature of the community these actions should also address impact to public health because of waste disposal. As well as, the blocking of access to public navigable water. In general there is public concern that increased boating will increase waste dumps into the lake.

White River Watershed
As White Lake, the White River watershed, and communities throughout the watershed continue to change there is also an associated change in how land and water are used. Developing a wider management approach will help the White Lake community tackle some of the harder issues and restore areas that have been degraded from specific land use patterns. Efforts must continue to look at White Lake within an ecosystem or watershed approach to ensure the sustainability of all involved. Through this watershed approach, growth can occur while minimizing the impacts on the natural resources

Water Quality Testing & Public Safety
Area residents have long been concerned about the quality of the water, but with recent knowledge about adverse health affects the public is becoming increasingly interested in this quality as it relates to recreational opportunities. Increased media attention within the local paper concerning contaminated sediments and a national concern about *E. coli* has brought many issues to the forefront for the White Lake community. One major concern within White Lake has been the limited testing and notification of bacterial contamination at swimming beaches. Presently, the Muskegon County Health Department has limited funding to do testing throughout the region and much of the focus has been at state and county parks along the Lake Michigan shoreline. White Lake residents feel the need for testing that is quick and accurate, but acknowledge the first steps may need to be taken locally utilizing volunteers to monitor. Volunteers can provide a baseline and notify appropriate agencies for further testing of possible problem areas. This is a well defined need within White Lake and local, State, and Federal agencies should ensure that funding is available for monitoring.

Increased Populations Growth & Regional Planning
White Lake has experienced significant growth in previous years that certainly foretell future population increases in the future. In order to address the continued growth and subsequent development communities must ensure that they are well prepared. As with most emerging issues within the White Lake area and throughout the watershed, regional scale planning must be addressed and implemented to ensure the future of local communities.

Water Levels
In recent years local residents have expressed a concern about lower water levels and their relationship to water withdrawal and increased demand for freshwater resources. The general public is well informed about water levels cycling between high and low periods, yet still express concern as freshwater resources diminish from pollution, overuse, and regional withdrawals.

Degradation of Migratory Pathways
White Lake and the White River Watershed are readily used by area residents for both hunting and recreation. In prior years many outdoor enthusiasts have witnessed decreases in waterfowl numbers and other migratory species. A general concern exists about the changes in land use throughout the area impacting the Great Lakes flyway for many species. Related to this is the increased electrical light pollution associated with development which impacts migratory species utilizing the White Lake area as a stopping point for migration or by misguiding seasonal resident birds.

SOLUTIONS FOR THE PUBLIC

Your public comment is essential at all public meeting to express your agreement or disagreement with specific emerging issues. Other avenues to have your voice heard.

CONTACT INFORMATION

Local Groups / Organizations

White Lake Public Advisory Council
1001 E. Wesley Ave.
Muskegon, MI 49442

Muskegon Conservation District
940 N. Van Eyck St.
Muskegon, MI 49442
(231)773-0008

White Lake Association
PO Box 151
Montague, MI 49437

White Lake Area Sportfishing Association
PO Box 157
Montague, MI 49437

Local Municipalities / Agencies

City of Montague
(231)893-1155
Zoning Official (231)893-1155

City of Whitehall
(231)894-4048
Zoning Official (231)893-1155

Whitehall Township
(231)893-2095
Zoning Official (231)894-6877

Montague Township
(231)894-4414

Fruitland Township
(231)766-3208

Blue Lake Township
(231)894-6335

White River Township
(231)894-9216

White Lake Area Building Authority
8778 Ferry St.
Montague, MI 49437
(231)893-1155

Research and Environmental Monitoring

Delisting Targets and Measures of Success

The following sections look to provide suggested research and monitoring needs to assess the impact prior actions and accomplishments have had on the delisting of White Lake as an Area of Concern. Throughout this section Beneficial Use Impairment (BUI) will be addressed with a Targeted Restored Condition and suggested Environmental Indicator to help guide and assess the present state of White Lake. This section will also help guide the impact White Lake may be having on Lake Michigan and the larger Great Lakes system.

Successful monitoring programs should evaluate the quality of the water and assess the success of control measures, track trends, and guide decisions and priorities. Overall, community agencies and organizations must have pertinent, reliable data that can be used in a timely manner by decision makers for a cost effective approach to solving problems in White Lake. Tracking conditions are essential, but can be costly and complex. It is the goal to develop understandable measures and indicators, that may be nontraditional in approach, yet relevant to local agencies, future planning, and the public. One method is the development of a community strategy that evaluates possible water quality issues by utilizing general indicators such as % of impervious surfaces, fish advisories, and changes in wetlands to support other functions in the community. For example, on strategy may be the preservation and adequacy of open space as an indicator of available wildlife habitat.

Following the last RAP in 1994/1995 a surge of activities occurred in 1996, but research, monitoring, and actions have been slowed while concentrating efforts on contaminated sediments. Individual citizens involved in sediment clean-ups experienced many early disappointments dampening spirits as clean-up and restoration activities dragged on. This publication will hopefully increase public involvement and help make the next big push toward delisting.

In order for the White Lake Public Advisory Council to submit a formal delisting request it is necessary that the following research, targeted restored conditions, and regulatory programs are mandated for each of the eight Beneficial Use Impairments. It is the consensus of the PAC that meeting these criteria at a local level will ensure the continued restoration of White Lake and mitigate possible impacts to Lake Michigan and the Great Lakes Ecosystem. It is the final goal of the White Lake Public Advisory Council to file a delisting request in 2010, pending all criteria have been met. This timeline will hopefully elicit funding and activities that take place within the White Lake area while providing a timeframe that is achievable and acceptable to the White Lake Public Advisory Council, local governments and citizens.

STATUS OF THE BENEFICAL USE IMPAIRMENTS FOR WHITE LAKE

Restrictions on fish and wildlife consumption	Ongoing research necessary.
Degradation of fish and wildlife populations	Ongoing research necessary.
Degradation of benthic community (organisms that live in or on the bottom of a body of water)	Monitoring and research following clean-ups. Evaluate suspected sites without current status (i.e.—sediment; marina dredging).
Restrictions on dredging activities	Research complete: Dredging restrictions for specific areas need to be mapped and enforced.
Eutrophication, or excessive growth of aquatic plants	Nutrient Balance/Sources study needed to determine loading.
Restrictions on drinking water consumption, or taste and odor problems	Continued monitoring and purge wells necessary.
Degradation of aesthetics	Regional and local Master Plan needed.
Loss of fish and wildlife habitat	Studies need to be implemented into planning with restoration and preservation agendas.

Restrictions on Fish and Wildlife Consumption

Impairment History

Many of the problems associated with consumption restrictions within and around White Lake have been due to contaminated sediments in White Lake that continue to cycle through the food web. In recent years specific data regarding White Lake fish species has been unavailable and relies upon past sampling and analysis for annual restriction advisories. Regardless of this shortfall, advisories have had minimal impact in determining consumption preferences for fish within the community, and minimal local emphasis has taken place to educate individuals to avoid fish with the possibility of greatest concentrations of contaminants. Individuals still keep largest fish, keep fish with abnormalities, and consume more than suggested quantities.

The Next Steps

In 2003, White Lake completed the removal/dredging of two areas of greatest concern for contaminated sediments within the system. Proceeding years will determine if the fishery is recovering and aquatic food web continues to be impacted. Continued consumption advisories and an improved monitoring and research agenda will be necessary within the lake until the recovery and accurate assessment of reduced health risks to individuals is ensured. Due to the nature of the associated advisories, state and federal agencies will be encouraged to take the lead in determining specific contaminant concentrations for given species within lake and within specific areas. The greatest concern is that the contamination will remain in the food web for some time following clean-up.

It is recognized that some statewide consumption advisories will continue to be linked to larger regional issues like mercury deposition from air pollution. However, the White Lake community will continue to suspect contaminant sources (including mercury) within the White Lake Watershed because of its industrial history. Because of this fact, the restored condition for White Lake must meet levels that are equivalent to areas that have had no industrial imprint. To seek levels that ONLY meet the minimum standards, yet remain higher than concentrations from non-industrial areas, would send a negative message to the community that conditions have not been achieved. The general feeling within the community is that White Lake needs a strong resolution for such a destitute legacy of contaminated sediments impacting multiple resources within the lake.

Because a majority of the population also hunts or traps within the local area, further studies should also assess the health impact of consuming certain wildlife like turtles, muskrat, and ducks. Other species that are also a concern because they are highly dependent on this food web, but are not hunted or trapped, include osprey, bald eagles, and herons.

Targeted Restored Condition

No consumption warnings on fish in White Lake. Chemical concentrations in tissues must be equal or below levels found in other areas of the Great Lakes not listed as Areas of Concern by 2008.

Caged fish experiments at White Lake outlet to Lake Michigan, as performed by MDNR, meet state consumption standards. Must meet standards for 2 successive years.

White Lake water quality tests meet all state MDEQ standards for full and partial body contact during 4 successive years.

Suggested Research

Determine level of toxic contaminants for individual fish species within White Lake and provide localized consumption advisories if needed. Focus sampling on species of greatest importance to White Lake system.

Determine if fish species of specific importance to White Lake (walleye, etc.) are being impacted by contaminant levels in species at lower trophic levels. Study should also determine if other wildlife species are being impacted because of their connection with the aquatic food web.

Follow recommendations in *2002 White Lake Contaminated Sediment Update* including future testing in Mill Pond Creek sediments.

Regulatory Programs
Local Municipalities/Organizations

Encourage all local business selling fishing supplies, licenses or providing charter services to supply printed material with consumption warnings. Provide educational materials at municipal boat launches and public areas around White Lake.

Beneficial Use Impairment

Degradation of Fish and Wildlife Populations

Targeted Restored Condition

Ensure community composition of fish species, along with the associate organisms within the food web, are establishing a sustainable fish production by 2005.

Documentation by Michigan Department of Natural Resources that diversity and/or richness indices exhibiting a significant positive trend equivalent to the ecological health and a stable fisheries population by the delisting request in 2010.

All tributaries in the immediate drainage basin of White Lake meet Total Maximum Daily Loads for 2 consecutive sampling regimes (scheduled sampling by DEQ in 2002 and 2008).

Recovery of wildlife populations, which are dependent on the White Lake food web (osprey, eagle, mink) by 2008.

Suggested Research

Investigate and survey fisheries in White Lake and determine production rates for species of importance for the local economy, native fisheries, and threatened or endangered (sturgeon, walleye, muskellunge). Utilize recommendations of Fisheries Resource Guide (completed in 2003).

Inventory endangered and threatened species inhabiting the White Lake Area of Concern to identify critical habitat.

Evaluate if exotic/invasive species or physical deformities (tumors) may be impacting the life cycle and reproductive success of fish and wildlife.

Regulatory Programs
Local Municipalities/Organizations

Provide and encourage educational programs that minimize negative impacts to fish and wildlife populations.

Impairment History

Many of the contaminants that have led to restrictions on fish and wildlife consumption for humans have also been major causes for degradation in fish and wildlife populations. Most notably has been on predators and especially fish-eating wildlife that have contaminants bio-accumulate as they are higher in the food chain. The most common and well known has been the reduction in large birds like osprey and eagles around White Lake until recently, when osprey again have started to nest in the area and local pairs of eagles have been sighted in local communities along the Lake Michigan shoreline. This recent recovery may help assess the overall recovery of wildlife with further research.

Determining the degradation in the fisheries has been somewhat more difficult, except for the total loss of given species, because the size of White Lake has made it extremely difficult to assess the overall fisheries population. At present, estimates can only act as an index in time, while further research and actions may better address the needs of the general population by using habitat as the focus of an overall measure. Whereas, actual estimates for species of economic interest (sturgeon, walleye, spotted muskellunge) should help assess general population trends combined with looking at migratory species as indicators of health in entire watershed. Past efforts have been made to evaluate natural production of game species, but it is generally agreed that the fisheries must be protected from habitat loss in the coming years.

The Next Steps

Basic research must continue to evaluate changes in plant communities looking at densities, location, and percent cover in comparison to historical data, maps, & aerial photos. In the next year, the Michigan Dept. of Natural Resources is planning to release a recommendation, Fisheries Resource Guide, that will help in research needs and management of fisheries within White Lake. Most importantly a baseline needs to be built for the fish community in White Lake either via biomass or #'s for species in given areas. It is the consensus that this must be done every other year starting in 2003 until official delisting can occur.

The hardest part about determining what impacts possible pollution may be having on fish and wildlife populations is that so many other parameters may be playing a pivotal role including exotic species, habitat loss, and pollution. And although all of these are important issues for White Lake, the greatest impact will continue to be habitat.

Fish and wildlife degradation may be best addressed by meeting the needs of keystone species within the White River Watershed. By managing and protecting the needs of this certain species it also ensures, or covers, the needs of multiple species. A prime example has been the creation of Quality Deer Management Areas, as defined by the Michigan DNR, that ensures habitat and survival needs of several other species and increases diversity.

Beneficial Use Impairment

Degradation of the Benthic Community (including organisms that live in or on the bottom of a body of water)

Impairment History

Since White Lake was first listed as an AOC, multiple studies have assessed the concentrations and locations of contaminated sediment within the system. Defining contaminant concentrations and impacts to the system have been fairly complex due to difference agencies and organizations using different criteria. This has led to much confusion as to locations, and ranking of sites for remediation. However, all individuals involved agree that a *No Action* alternative was an unacceptable solution to sediment contamination within White Lake. No action would maintain contamination levels having a negative impact on White Lake.

A recent publication (Rediske, 2002) has shown that assessing sediment contamination requires a multi-criteria index using sediment chemistry, toxicity testing, and impacts to benthic communities. Presently, five sites exist that have known or suspected contaminated sediments and include Tannery Bay, East Bay, Occidental Chemical, E.I. DuPont Chemical, and Muskegon / Koch Chemical. Most importantly, sites must be properly assessed, areas of contamination remediated, and remaining areas allowed to recover through natural processes.

The Next Steps

As part of this document an addendum, the *2002 White Lake Area of Concern Contaminated Sediment Update* evaluates data, since the US Army Corps of Engineers document in 2000. This update addresses the status of benthic life and provides further recommendations for prioritizing future assessment, monitoring, and remediation activities. This document will also help to establish a baseline for recovery following sediment clean-up activities.

Other concerns with benthic organisms also include those animals that have a direct relationship to the sediment because of feeding habits like carp, catfish, and suckers. These organisms do not appear to be negatively impacted and appear to be sustaining or increasing in populations (according to local fishing reports), yet these species do have consumption advisories associated that are of obvious concern and should be continually monitored. Continued monitoring will become increasingly relevant following contaminated sediment clean-up as materials are moved about and resettle, even if in significantly small amounts, and may become exposed and readily available to the food chain.

In combination with many of the contamination problems in White Lake there is increasing degradation or alteration in the benthic community because of the introduction of exotic species and erosion throughout the White River Watershed. Exotic species have greatly affected biological food webs, and most importantly for benthic organisms, has been the loss or change in the structure itself especially from species like the zebra mussel. Other structural changes in the benthos are occurring from erosion and additional sedimentation.

Targeted Restored Condition

Documentation of population increases of pollution intolerant benthic organisms (including *Hexagenia* mayfly) for 3 consecutive years. Increases must include samples taken in 3 of the 5 areas designated as contaminated by 2002 Update - Rediske.

Reclassification by US Army Corps of Engineers concerning the 5 heavily contaminated areas within White Lake as having no impact on ecological health of the system; and/or a reevaluation by local researchers that indicate recovery is occurring and negative impacts have been mitigated.

Erosion sites, along White River, listed as “extremely severe” restored by 2004 and remaining “severe” sites by 2008. Implement plans for remaining sites by delisting date in 2010. (See, ***White River Streambank Erosion Inventory***, 2002. Timberland RC&D). Continued inventory on tributaries of White River.

Suggested Research

Regular benthic macroinvertebrate surveys and research to determine overall population recovery and impact to the aquatic food web.

(In 1987 RAP recommended: Conduct biological assessment and evaluate sediment contaminants at sites affected by storm water and monitoring air toxics to determine the amount of PCBs and chlordane being deposited on the White Lake area (in 2002, data unavailable).

Regulatory Programs
Local Municipalities/Organizations

Development of Integrated Pest Management Plan for White Lake to control exotic species. Provide informational signs at all public access sites about the spread and control of exotic species. Implemented for at least 4 years prior to delisting.

Restrictions on Dredging Activities

Targeted Restored Condition

Reduce/remove sediments within White Lake that have chemical concentrations that increase dredging cost because of mandatory confinement or from general removal of dredge materials.

Suggested Research

Implement sampling/testing strategy for monitoring Genesco (Tannery) & Occidental site to ensure prior remedial actions have addressed possible movement of contaminants from original sites. Testing period includes sampling in 2003, 2005, & 2010.

Regulatory Programs
Local Municipalities/Organizations

Implement lake wide plan that all dredging requires toxicological testing performed prior to dredge permit approval; OR eliminate all recreational dredging on lake regardless of navigability or access. Toxicological testing will determine extent of dredging permitted.

All dredging should be halted at northern end of White Lake near causeway because of possible sediment contamination and loss of habitat within the area; OR provide greater regulations for dredging in areas with low levels of sediment contamination.

All general use dredging limited, even outside areas of greatest concern, to allow lake to recover from background concentrations scattered throughout the lake bottom. Minimize dredging to allow contaminants to become “capped” through natural sedimentation and natural processes to begin breaking down contaminated materials.

Impairment History

White Lake has a long history of state and federal dredging regulations since the original identification of contaminated sediments within the system. With successive testing, as recently as 2001, the entire lake bottom has been identified as containing low levels of certain contaminants. Five “hot-spots” have been identified as high concern to the health and ecology of White Lake. All of these facts have impacted the overall regulations for sediment dredging within the White Lake basin. Regulations for White Lake continue to include 5 year permitting, sediment analysis prior to permit, and sediment containment (on the adjacent owned property) or removal to designated disposal areas. Many areas throughout White Lake continue to have areas that are of concern to federal and state agencies and recovery of the system is still undetermined.

The Next Steps

Dredging within the system has been a multi-edged sword for the White Lake community with regulations and restrictions both helping and hindering the recovery of the system. First, White Lake will have contaminants within the system for many decades. Contaminated sediments are widely dispersed throughout the lake (and will remain even with the major contamination sites remediated). Because of this continued background contamination, many permits are approved for recreational dredging with minimal or no public opportunity for disapproval. Much of this is due to lack of knowledge concerning the areas of contamination within White Lake besides Occidental and the Tannery. However, a major benefit, with proper oversight, is the removal of contaminated sediment with every dredging project within the lake.

Second, the permit process for White Lake must mitigate the negative impacts of contamination to the system, with an increase to the overall improvement. This improvement must become a net positive, and not just for economic reasons. Permits should consider: public access to navigable water, dredging areas with adjacent docks that block public use of the area, biological (fish/wildlife) use, and limiting spread of exotic species. Of greater concern within the permit process, is the minimal regulation during the actual dredging to control turbidity and resuspension of contaminants even in small concentrations. Permitting should not limit economic development, but neither should it consider economic development as the major criteria for increasing the public good.

The community should leave dredging restrictions in place that will limit and control the amount of dredging in the lake. A limit of surface area dredged at each site should be enforced. These permits would not override dredging for commercial transport, or public navigation but would impact private owners and marinas that diminishes public navigable water. Overall, dredging should not be considered a simple act of removing material with little or no impact on the system.

Eutrophication, or Excessive Growth of Aquatic Plant Life

Impairment History

In 1977, the US Environmental Protection Agency classified White Lake as extremely eutrophic (with excessive nutrient levels, low concentrations of dissolved oxygen in deep water during summer stratification, and the presence of nuisance algae). Unfortunately, the impacts from increased eutrophication are extremely hard to reverse. The continued accelerated eutrophication, especially since the 1987 Remedial Action Plan, has been significantly slowed. Although eutrophication is natural process of aging (or filling in of) for a lake, the human impacts surrounding White Lake has dramatically increased this process. Nutrient loading and concurrent eutrophication have been reduced following decreases in sewage discharges, yet many point and non-point sources continue to impact the lake.

The Next Steps

One of the main problems in nutrient contamination for White Lake is from non-point sources. Many other pollution sources are showing significant reductions in the watershed and White Lake. The remaining challenges for non-point source pollution include: home and agricultural fertilizer use, animal wastes, failing septic systems, and erosion/sedimentation. Control of nutrient contamination to aquatic systems has been one of the greatest concerns and challenges ever since the 1972 Great Lake Water Quality Agreement and will continue as such in the future.

Control of nutrient loading to the system will not only help reduce eutrophication / plant growth, it will increase dissolved oxygen levels at lower depths within the water column. Increases in dissolved oxygen will increase usable fish habitat, and provided needed biological activity (bacteria) in sediments that help to naturally break down contamination.

One of the most notable sources for nutrients is sediment from erosion sites along the White River and some of the small tributaries. . In 1982, agricultural land immediately upstream of the White River outlet was stated as a possible source for the majority of the nutrients entering the White Lake system. This site continues to be a significant source when water is being pumped from the muck land. Other sites for erosion include construction areas where silt fences and other sediment control practices are not used.

Individual property owners within the local urban areas should also look to retain nutrients leaving their property, both above and below ground. In general, this means reducing nutrient inputs to the property and conserving water. Keeping water on your property is a simple solution that includes reducing impervious surfaces, not spreading excessive amounts of fertilizers/herbicides, and limiting the amount of sewage water that local municipalities need to treat.

Targeted Restored Condition

Minimize all anthropogenic nutrient sources within immediate drainage area by 10% in 2005 and 50% by 2010. Reduce the number of non-point source erosion sites within the White River watershed by 50% by 2005.

Suggested Research

Perform a comprehensive nutrient management study of White Lake and determine: the trophic status of the lake, major nutrient inputs to the system, and determine anthropogenic sources that may be negatively impacting the system (septic, farms, urban, or other) by 2004.

Evaluate non-point source nutrient loadings and contaminants to ascertain seasonal loadings. Determine the need for a non-point source nutrient loading minimization plan (Underway in 2000, but not completely implemented or all encompassing).

Evaluate organic loading. Continue to monitor nitrogen and phosphorus during seasonal turnovers. Monitor dissolved oxygen and biochemical oxygen demand throughout the year. Sampling should take place yearly until delisting, and then every 4-5 yrs. thereafter.

Regulatory Programs
Local Municipalities/Organizations

Support the formation of a White River Watershed organization to increase nutrient management throughout the 3 county region. Watershed organization should submit an application of funding for a watershed project.

Assessment and remediation of wastewater treatment gaps surrounding White Lake. Include funding for septic conversion throughout region.

Assist in remediation of erosion sites in partnership with grassroots groups.

Beneficial Use Impairment

Restrictions on Drinking Water Consumption, or Drinking Water Taste and Odor Problems

Targeted Restored Condition

Ensure all area residents and businesses have safe drinking water that meets water quality standards (including bacteria, metals, and persistent chemicals). Targeted area includes all areas "downstream" of groundwater contamination that already impacts or would impact White Lake if untreated. Meet standards by 2005.

Evaluate all possible contamination sites by 2006 and implement remedial projects for necessary sites by 2010.

Suggested Research

Develop an annual groundwater monitoring project that ensures restoration of known sites is achieved (or what further actions need to occur).

Conduct biological assessments and evaluate sediment contaminants at sites affected by storm water (not implemented, but requested in1987).

Regulatory Programs
Local Municipalities/Organizations

Continue to support remediation at sites where contamination still exists. Supply or match remediation funding for these projects.

Implement a Decision Support System (DSS) that maps all known groundwater contamination areas, preventing the utilization of groundwater as a water source. Support DSS to add new sites and set-up zoning regulations to protect areas sensitive to groundwater contamination.

Determine all (survey and map) storm sewer and combined sewer outflows within watershed. Eliminate all discharges into White Lake or White River watershed and tributaries. Promote funding of Storm Water Management plans for all municipalities by 2005.

Impairment History

The greatest risk to drinking water consumption in the White Lake community has always been directly related to groundwater contamination from industrial and chemical sources. Much of the contamination occurred from direct discharges, on-site waste disposal, and from spills or storage site leaks. Throughout the years several municipal wells have been moved to improve either the quality or quantity of water supplied to local residents. Groundwater as a drinking water source and water supply for the lake continues to be a major concern. Fortunately, many known sites are undergoing remediation with groundwater purge and treatment wells are beginning to restore groundwater throughout the area. However, some residents continue to rely on private wells, at older cottages and homes, which should be evaluated for contamination.

The Next Steps

Throughout the White Lake area and the surrounding watershed, all communities and individuals rely on groundwater for drinking water. Unfortunately, there are sites of groundwater contamination from known and unknown industrial, agricultural, and/or waste disposal sources. Continued testing of all wells private and public should continue well beyond the delisting of White Lake as an Area of Concern. Within the City of Montague area residents and local officials are revisiting the problem of past groundwater contamination and the necessity to supply adequate drinking water. The final assessment may entail hooking up to the Muskegon County system. New wells have been hard to find, and some private property owners are unable to drill and receive clean water.

Future discoveries of groundwater contamination are likely to occur in upcoming years and local and state programs should be prepared to assess all new sites. Some contaminated sites, like Mill Pond Creek, have already been identified but contamination sources and solutions are unresolved. Since new or suspected contamination sites continue to surface, other drinking water sources should also be evaluated as development pressures continue around White Lake. Major efforts are needed to ensure that surface water supplies are safe and secure from chemical and bacterial contamination. If these issues are not addressed, water supplies will continue to be compromised even if water sources are moved to local surface waters. Clean water supplies, including water from Lake Michigan, continue to be threatened by poor water quality and contaminated sediment transport from adjacent water bodies and water sources.

White Lake area residents and businesses must have a reliable and safe water supply regardless of the source. If this can not be assured using present groundwater remediation procedures, than another source must be provided for all individuals impacted (with no additional cost, beyond normal treatment). If a safe water supply cannot be guaranteed, than all present landowners will be notified, with NO future development occurring in the area until these issues are addressed.

Degradation of Aesthetics

Impairment History

Degradation of aesthetics has been a volatile and somewhat arbitrary beneficial use impairment for the White Lake community. The original concern of diminishing aesthetics was associated with excessive rooted plant and algae growth in the lake. Algal growth within White Lake is still of concern, but eutrophication has been slowed because of nutrient decreases following the elimination of wastewater discharges. The control of nuissance algae remains a high priority for White Lake, yet nutrient inputs from shoreline residents are seldom recognized as a continuing source. Rooted plants also remain high priority as impacting the aesthetic nature of the lake, but specific solutions are less obvious.

Other historical issues related to aesthetics have been directly related to sites where known discharges from chemical and industrial plants entered White Lake. Many of these sites have either eliminated discharges into White Lake or are meeting state and federal regulations. No complaints, regarding color, temperature, or cloudy discharges have been received in recent years.

Area residents are concerned with increases in development surrounding the lake, especially new marinas along the eastern end, as a growing problem. This concern includes the alteration of the shoreline, new marinas removing portions of the lake from public navigable water, increased hard surface sea-wall construction, and new homes being built in many of the natural areas remaining. With continued recreational boating use, oil slicks around marinas and in certain slow moving bays and beach stretches have also been reported. The White Lake community is undergoing many development pressures as urban sprawl from Muskegon is beginning to dramatically change the landscape.

The Next Steps

The two major issues for aesthetics that needs to be addressed are nutrients and development. Nutrients, as related to aquatic plant growth, must be evaluated as a model for the entire lake system. Evaluating the system, developing a nutrient budget, and providing a lake-wide management plan will be the greatest asset and strength to restoring the aesthetics of White Lake. Implementation of a lake management plan would greatly enhance community development and address specific issues (i.e: oil slicks - likely caused from motor boats and personal watercraft, but problem areas need to be confirmed and addressed).

These issues and impairments impact the entire biological community of White Lake and can only be solved through a combined community effort. The White Lake community must work toward the implementation of a strong management plan to address present development pressures, as well as emerging issues that will arise in the near future.

Targeted Restored Condition

Development of a White Lake Regional Master Plan by 2005 (includes City of Whitehall, City of Montague, Montague, Blue Lake, Whitehall, White River, and Fruitland Townships). Plan will include initiatives for conservation, preservation, and restoration of areas.

General aesthetic values of community addressed by 2006 and plans implemented to address and provide public input related to emerging issues.

Suggested Research

Perform a comprehensive nutrient management study by 2004, as related to excessive algal growth Beneficial Use Impairment.

Survey White Lake community about views related to aesthetics of community and development issues around the lake. Provide input to regional planning for watershed wide master plan and implementation.

Survey and map all sites of contamination (present and past) for use in future planning and to document for historical archives.

Regulatory Programs
Local Municipalities/Organizations

Implement conservation easement agenda for White Lake, focusing on areas of significant importance to the system (White Lake Habitat Assessment, 1996) and including properties owned by Occidental, Genesco, and Dupont.

Loss of Fish and Wildlife Habitat

Targeted Restored Condition

No net loss of habitat. Protect all areas existing below 100 year high water level from development and continue to return those areas below this level to natural conditions. PROTECTION is priority #1 and RESTORATION is priority #2.

Restore native vegetation in riparian habitats, near shore, shallow littoral, and deep littoral zones. Ensure 40% of White Lake supports rooted aquatic plant habitat by 2010.

Establish habitat corridors adjacent to shoreline at approximately 130 ft. for all riparian properties by 2006.

White Lake meets dissolved oxygen levels set by state regulations (5.0 mg/L) at all depths for two consecutive summers by 2010.

Suggested Research

Develop a GIS inventory of established habitat and critical areas that need to be monitored for protection and restoration efforts. Determine areas of greatest concern to preserve or restore for fish and wildlife. Establish a minimum size for all buffer corridors.

Conduct research to establish objective, quantitative measure of the effect habitat loss has on animal populations dependent on near-shore areas as part of their life cycle.

Regulatory Programs
Local Municipalities/Organizations

Provide habitat education programs for all property owners in White Lake community, especially along shoreline.

Implement preservation strategies that provide matching funds for private and public habitat conservation. Implement plans to regional level.

Impairment History

Fish and wildlife populations have been an important part of White Lake, with individuals recognizing the importance of monitoring/surveying habitat. Habitat loss has occurred throughout the landscape and has been well documented. Recent studies in evaluating aquatic habitat should play an important role in planning development in the upcoming years and readily repeated to determine changes in habitat.

The Next Steps

Habitat surveys should continue to assess losses as development pressure continues around White Lake. The overall goal is to protect the existing habitat for fish and wildlife species while protecting ecosystem functions that benefit the social, economic and environmental components in the communities. However, to simply preserve what is left is not enough for a sustainable future. We should restore areas that increases the integrity of fish and wildlife habitat, as well as protecting areas already existing. In rural areas surrounding White Lake, efforts should be made to encourage wildlife through best management practices. This priority in agricultural areas will increase the total viability of wildlife habitat, rather than encouraging development and urban sprawl that provides little to no habitat.

Look at the original boundaries of the lake prior to human impact (determine total area of aquatic and terrestrial habitat) to determine measurable loss from development surrounding White Lake. A general goal for the community is to avoid fragmentation of natural habitat throughout the landscape. Utilize aerial photos, densities, transects, and contour mapping to establish habitat integrity and changes in the aquatic environment. Protect existing areas that are critical to reproduction, growth, and survival of fish and wildlife. Restore aquatic habitats and altered shorelines, especially those that are connected to large intact areas through public purchase, conservation easements, state designations, and zoning.

Protect northern end of lake near causeway especially on Whitehall side were low water levels provide excellent habitat for turtles and amphibians. Many habitats of importance for White Lake have already been identified in prior research, both for aquatic and terrestrial environments. These designated areas (which could easily become public property) must be set aside now before future development and economic pressures increase. White Lake municipalities must take the initiative to preserve these properties to help on a large scale, while individual property owners should work to preserve or restore their own piece of property. Working on both large and small scales will minimize the number of isolated habitats within the watershed. If individuals work on small patches throughout the area the habitat integrity of the system will increase, while slowly instilling a greater sense of stewardship on a larger scale. Do not give up on the small lots, but also don't lose perspective of the larger picture.

FUNDING SOURCES

National

U.S. Environmental Protection Agency
www.epa.gov/owm/finan.htm

National Oceanic & Atmospheric Administration-Coastal Services Center
www.csc.noaa.gov/text/grant.html

U.S. Fish & Wildlife Service-Coastal Wetlands Conservation Grants
www.fws.gov/cep/cwgcover.html

National Institutes for Water Resources
www.niwr.org/NIWR

North American Commission for Environmental Cooperation
www.cec.org/grants/general_info/

Water Environmental Research Foundation
www.werf.org

Nathan Cummings Foundation
www.ncf.org/programs_enviro.html

Pew Charitable Trust
www.pewtrusts.com

NOAA Coastal Zone Management Administration Awards
www.cfda.gov/query/query.htm

Great Lakes Commission
www.glc.org

Michigan / Regional

State of Michigan (*www.michigan.gov*)
- Department of Environmental Quality
- Department of Natural Resources
- Department of Community Services

Great Lake Protection Fund
www.glpf.org

George Gund Foundation
www.gundfdn.org

Great Lakes Aquatic Habitat Network & Fund
www.glhabitat.org

The Joyce Foundation
www.joycefdn.org/home.htm

PAL (People And Land)
peopleandland.org

National Oceanic & Atmospheric Administration-Sea Grant
- Great Lakes Network
www.seagrant.wisc.edu/greatlakes/glnetwork

Muskegon / White Lake

Community Foundation for Muskegon County

White River Watershed Fund

Agency Responsibility

The White Lake Public Advisory Council will continue to function as the responsible agency for the delisting of Beneficial Use Impairments for White Lake, with help and support by the Michigan Department of Environmental Quality, Michigan Department of Natural Resources, the US Environmental Protection Agency as well as local and state governmental bodies. The White Lake PAC will provide documentation and delisting status in future products and research. The PAC will support and help move forward the formation of a White River Watershed Assembly to enhance an ecosystem approach to issues.

In previous years the White Lake Remedial Action Plan was driven by state agencies integrating general public ideas with a Technical Team approach. In 1995 it was suggested that a closer link and interaction needs to be made between the PAC and this technical team. This recommendation came to fruition with the Public Advisory Council now driving the RAP process, having a stronger ownership, yet having continued coordination with technical advisors.

It is well recognized that many studies, articles, surveys, and other materials are unknown by the Public Advisory Council and are not distributed between governmental agencies. Presently, there is no one responsible party that cities, townships, organizations, state or federal agencies can contact as a coordinating entity for all these materials. Hopefully with the publication of this document the PAC can further act as resource library that houses all information relevant to White Lake's restoration.

Research Studies, & Summaries (2002-1992)

White Lake Area of Concern Contaminated Sediment Update. 2002. Rick Rediske - R.B. Annis Water Resources Institute, Grand Valley State University. Prepared for the White Lake Public Advisory Council and the Muskegon Conservation District.

White River Streambank Erosion Inventory. 2002. Prepared by Timberland Resource, Conservation, & Development Area Council, INC. for the White Lake Public Advisory Council and the Muskegon Conservation District.

DEQ to Remove Underground Storage Tanks. 2001. DEQ Press Release Dec. 5, 2001(State Listerv)

White Lake Fish and Waterfowl Aquatic Habitat Assessment. 2001. Prepared by Tom Hamilton for the White Lake Public Advisory Council, Muskegon Conservation District, and Michigan Department of Environmental Quality. - *Updating and expansion of earlier (1995) assessment of aquatic plants, including identifying critical habitat.*

Expedited Reconnaissance Study: White Lake Muskegon County, Michigan. Section 905(b) (WRDA 96 Analysis. August 2000. *Define water resource problems related to sediment contamination and identify potentially viable solutions.*

Draft Data Summary Report White Lake 905(b) Analysis. March 2000. Prepared for U.S. Army Corps of Engineers - *Historical and current natural resource data for 905(b) analysis - federal interest in sediment dredging within White Lake.*

White Lake Habitat Assessment. Sept. 1995/May 1996. Prepared for White Lake PAC, Lake Michigan Federation, and Muskegon Conservation District by Tom Nederveld and Theresa Lauber - *Inventory of vegetation and wildlife within a quarter-mile zone around White Lake. Includes historical analysis and recommendations.*

White Lake and Muskegon Lake Watershed Study. Sept. 1995. Richard R.Rediske, Water Resources Institute of GVSU. *Results of water and sediment/heavy metal samples for each lake including discharge areas of adjoining tributaries.*

White Lake Aquatic Plant Assessment. Sept. 1995. Prepared for White Lake PAC and Muskegon Conservation District by Mark Luttenton – *State of macrophyte communities in White Lake: extent of plant growth, species composition, and biomass.*

Work Plan for a Hydrogeological Investigation of the Whitehall Leather Company. Sept. 1995. Prepared by Horizon Environmental for Warner, Norcross, & Judd - *Characterization of surface soils, potential source areas in unsaturated, subsurface soils, and ground water quality at the interface with White Lake.*

White Lake Area of Concern Sediment Assessment Summary of Results. 1994. Prepared by USEPA conjunction with the Michigan DNR, U. S. Army Corps of Engineers, and Thermo Analytical, Inc. - *Determine contaminant concentrations and vertical profiles in the vicinity of the Whitehall Leather Company and determine the need for remedial actions.*

White Lake Public Advisory Council - Concerning the Whitehall Municipal Wells. November 18, 1993. Prepared by Gerald Homminga, City Manager –*Information about the wells, including locations, existence of volatile organic chemicals.*

White River Effluent. 1993. *Data on contaminant levels from January 1992 to October 1993.*

Occidental Chemical Corporation RCRR Facility Investigation. June 1993. *Location, ownership, operation history (production waste spills, environmental permits, surrounding land uses, ecological setting, hydrogeological conditions).*

White Lake Area of Concern Progress Report. January 1993. *An overview of the reasons for identifzying White Lake as an Area of Concern, and the progress made since the Remedial Action Plan submitted in 1987.*

White Lake Watershed Discharge Violations. November, 1993. *Listing of discharge violations from 1989 to 1992.*

A Biological Survey of the North Branch of the White River, Oceana County. July 1992. Prepared as a staff report for the Michigan DNR - *Effects of sedimentation on fish & macroinvertebrate including habitat evaluation and water chemistry.*

Chronic Toxicity Assessment of Occidental Chemical Corporation Outfall 001 Effluent. April 24 - May 1, 1992. Prepared by Deborah Quinn of the Great Lakes and Environmental Assessment Section for the Michigan DNR - *The methods and results of a ceriodaphnia dubia survival and reproduction test to assess the chronic toxicity of the effluent.*

Chronic Toxicity Assessment of Muskegon County, Whitehall WWTP Outfall 002 Effluent. April 24 - May 1, 1992. Prepared by Deborah Quinn of the Great Lakes and Environmental Assessment Section for the Michigan DNR - *The methods and results of a fathead minnow larval survival and growth test. Ceriodaphnia dubia survival and reproduction test on the effluent.*

Research Studies, & Summaries (1991-1967)

Annual Wastewater Report for 1991, White River Basin. Michigan Department of Natural Resources.

Acute Toxicity Assessment of Muskegon County, Whitehall WWTP Outfall 002 Final Effluent, Whitehall, Michigan. May 8 - 10, 1991. Prepared by Christopher Bradlee and Megan McMahon of the Great Lakes and Environmental Assessment Section for the Michigan DNR - *A summary of effluent toxicity on Daphnia magna.*

White River Status of the Fishery Report with Management Plan. Feb. 1991. Richard O'Neal. *Section information (upper, middle, and lower) specifically related to fish, habitat, management history, current status, and analysis.*

Fish Contaminant Monitoring Program White Lake 1987 and 1991 Analytical Results. Prepared by Michigan DNR - *Data on contaminants found in fish of White Lake without analysis or conclusions.*

Phase I Groundwater Investigation for White Lake Landfill. March 1990. Prepared by Fishbeck, Thompson, Carr & Huber, Inc., *Groundwater investigation required by Michigan DNR including soil borings, screened-auger borings, monitor well installation, groundwater sampling and other tests. Conclusions and recommendations included.*

Fish Collection, White Lake. June 1990. Prepared by Richard O'Neal of the Michigan DNR - *Electrofishing surveys comparing game fish numbers associated with disturbed areas and natural areas. Includes analysis, map, remarks, and fishing reports.*

White Lake Analytical Results for MDNR Collected Sediment Samples. September 13,1990. *Data only.*

White Lake Sediment Sampling Stations. *Data only for 1972, 1980, 1986, and 1990*.

Whitehall Municipal Wells Ivestigation Completed. August, 1989. *Field* investigation *of Whitehall Municipal Wells Superfund Site to identify the nature and possible contamination.*

White Lake Total Phosphorus Spring Turnover. 1989. *Data only.*

Michigamme Project, White Lake, Muskegon County. Aug. 1989. Michigan DNR - *Sediment contamination data.*

Benthic Macroinvertebrate Survey of the White River at White Cloud in the Vicinity of an Old (Abandoned) WWTP, Newaygo County. September 16,1983. Prepared by David Kenaga of the Michigan DNR –*Benthic macroinvertebrate study conducted to document the condition of the river since the city stopped use of the primary wastewater treatment facility.*

Biological Assessment of an Unnamed Tributary Receiving the Whitehall-Montague Wastewater Treatment 5 Day Irrigation Facility Discharge. August 16, 1983. (Complete Report) - *A macroinvertebrate study to determine the impacts of the discharge originating from under drainage within the spray irrigation area.*

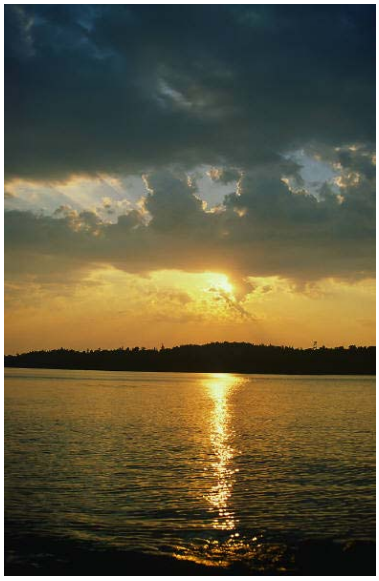
The Impacts of the White Cloud Wastewater Treatment Plant on the White River at White Cloud. June 24, 1981. Prepard by David Kenaga of the Michigan DNR - *A macroinvertebrate survey conducted to determine the impact of the White Cloud Wastewater Treatment Plant on the White River.*

White Lake Press Release. July 2, 1980. Michigan Department of Public Health, Office of Communication - *Confirms that it is safe to swim and fish in White Lake since levels of PCB and PCE were trace.*

Memorandum: Meeting on White Lake. October 2, 1979. Prepared by John L. Isbister, Disease Control Officer - *Addresses conern about whether or not it is safe to swim and fish in White Lake, due to possible presence of PCB.*

Water Chemistry of White Lake. March 1, 1978. Prepared by Elwin Evans, PhD of the Michigan DNR - *Water and sediment testing to assess synthetic organic contamination in White Lake.*

White Lake Nutrient Survey. 1967. Prepared by State of Michigan Water Resources Commission Dept. of Conservation C*ompilation of several surveys dealing with nutrient inputs (nitrogen and phosphorus) to White Lake and the effects of these inputs on the chemistry and productivity of the lake.*



Remedial Action Plan Update 2002
(2005 Reprint)

White Lake
Community Action Plan

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