

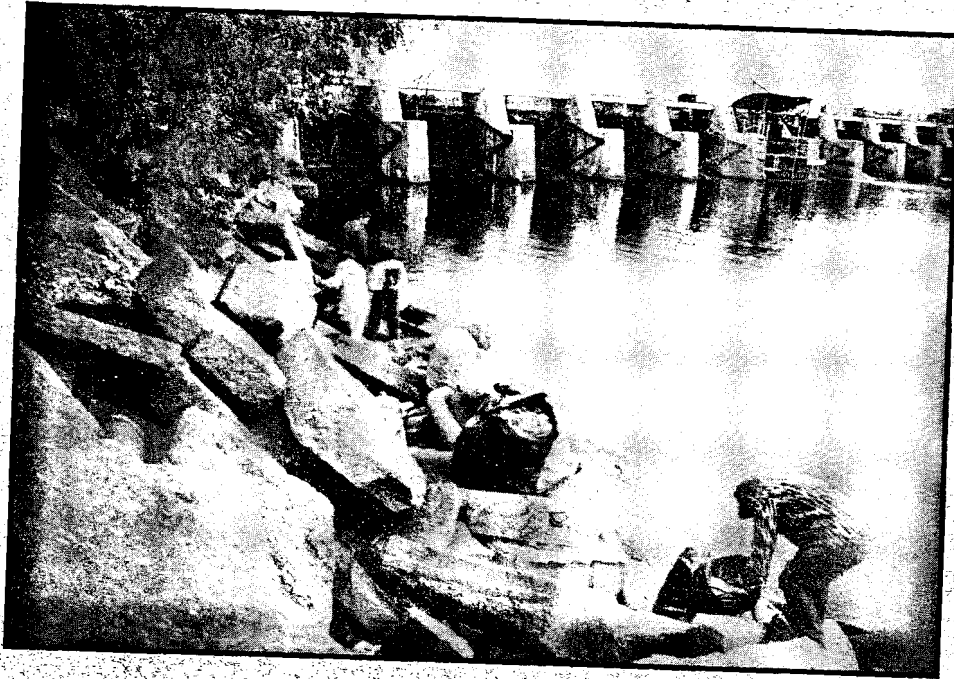
Working Together to Improve and Protect the Great Lakes



A summary of the

**Lower Menominee River
Remedial Action Plan**





**Restoring and protecting our local water resources
is a goal of the
Lower Menominee River Remedial Action Plan**





Introduction

The Great Lakes represent one of the world's greatest natural resources. Abuse of this water resource has led to a variety of serious pollution problems. The Remedial Action Plan process was developed to help guide the cleanup and restoration of the most seriously contaminated locations around the lakes. The Lower Menominee River was selected as one of these sites.

A Great Resource is Threatened

The drainage basin formed by the five Great Lakes is the largest fresh water system on earth, containing trillions of gallons of life-supporting water. This volume equals one-fifth of the total fresh water available on earth. More than 40 million people call the Great Lakes basin their home, with many of these living along the 9,800 miles of shoreline and relying on the lakes for their drinking water. The Great Lakes system also has tremendous economic value, supporting one-sixth of the total industrial activity of North America.

The Great Lakes have historically been used as a disposal site for a wide variety of waste products from human, agricultural and industrial activities. It was thought that these disposal practices were a safe and viable *solution to pollution through dilution* due to the large volume of water in the lakes. The concept turned out to be grossly inaccurate. Some of the discharges contained pollutants that were toxic even at very low concentrations. While other pollutants bioaccumulate through the food chain, and still others quickly settled out of the water column, collecting in sediments of river mouths and harbors. The results were a variety

of pollution problems that threaten ecosystem and water quality in the Great Lakes basin.

Lake Protection Efforts

Pollution problems in the Great Lakes reached a level of severity that required government intervention as early as 1912. Widespread outbreaks of the diseases cholera and typhoid fever near large lakeshore urban areas triggered actions by the International Joint Commission (IJC). The IJC, formed in 1909 to oversee the Boundary Waters Treaty between the United States and Canada, traced the source of the problem to the discharge of untreated sewage from the affected lakeshore cities. Recommendations for water purification and wastewater treatment helped control these pollution problems and eliminated the spread of these water-borne diseases.

During the 1960's, the major concern in the Great Lakes changed to cultural eutrophication - human activities that add excessive nutrients to the water, leading to the growth of large amounts of undesirable plants and algae. Excessive phosphorus discharge into the lakes was the primary cause of the problem. The issue of eutrophication was addressed in 1972 with the signing of the Great Lakes Water Quality Agreement between the United States and Canada, which placed controls on the discharge of phosphorus.

As scientific knowledge increased during the late 1970's, it became evident that toxic substances also represented a serious threat to the Great Lakes ecosystem. These toxic substances included heavy metals, industrial chemicals and pesticides. Expansion of the Great Lakes Water Quality Agreement in 1978 addressed these concerns by including better controls over the discharge of toxic substances.



Pollution "Hot Spots"

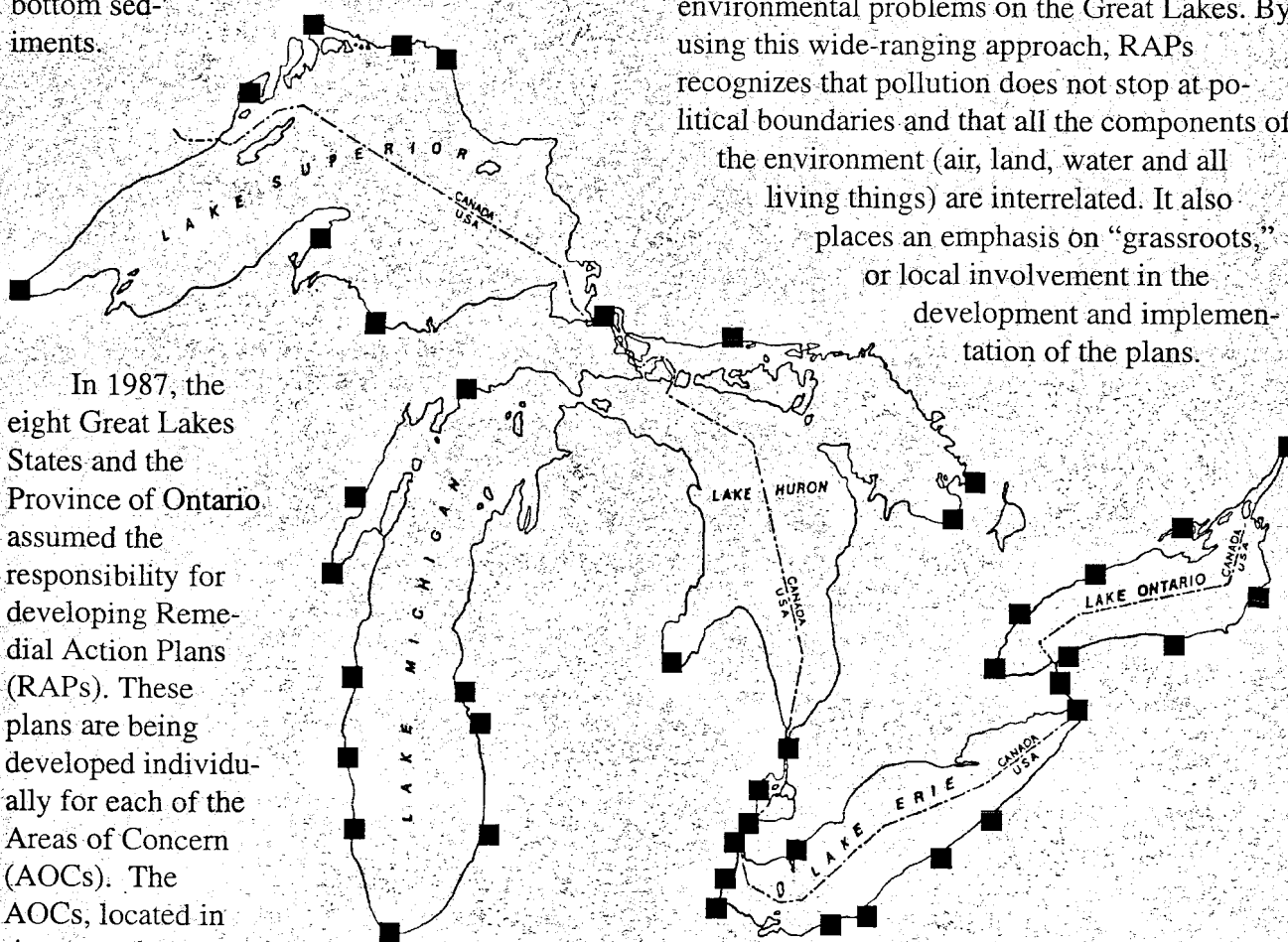
In 1980, the International Joint Commission (IJC) recognized that certain *toxic hot spots* around the shores of the Great Lakes were suffering from persistent environmental problems. Most of these sites were located in industrial and/or urban areas. By the mid 1980's, 43 hot spots, called Areas of Concern or AOCs, had been identified on the Great Lakes. The Lower Menominee River was identified as one of the 10 sites located around Lake Michigan. The major concern in most of these AOCs, including the Lower Menominee River, was the environmental problems caused by the presence of contaminated bottom sediments.

In 1987, the eight Great Lakes States and the Province of Ontario assumed the responsibility for developing Remedial Action Plans (RAPs). These plans are being developed individually for each of the Areas of Concern (AOCs). The AOCs, located in river mouths or

harbor regions around the Great Lakes, were suffering from impaired beneficial uses - environmental problems associated with specific uses of the water resources. These impaired uses were due to historical and/or ongoing pollution problems. The ultimate goal of the Remedial Action Plans was to identify and restore the impaired uses in each AOC, thereby helping to improve and protect the water quality and ecosystem of the entire Great Lakes system.

RAPs, What are They?

Remedial Action Plans (RAPs) utilize an ecosystem approach, interagency cooperation and community participation to tackle tough environmental problems on the Great Lakes. By using this wide-ranging approach, RAPs recognizes that pollution does not stop at political boundaries and that all the components of the environment (air, land, water and all living things) are interrelated. It also places an emphasis on "grassroots" or local involvement in the development and implementation of the plans.





The development of RAPs includes several stages. Background information and data from the AOC is gathered during the first stage. A culmination of this research effort occurs with the publication of a Stage I Report, which includes the AOC's characteristics, background, pollution problems and a list of the impaired beneficial uses that need to be restored.

The second stage of the RAP process recommends remedial actions to correct pollution problems and restore the impaired beneficial uses. Estimated time lines and costs for the implementation of remedial actions, identifying alternative actions and responsible parties or agencies are also a component of the second stage. Pollution prevention and long-range monitoring programs are also developed. Reports and/or updates during this stage are provided on a regular basis. These updated reports reflect the changing status of the AOC due to changes in information, technology, pollution problems and progress.

A third and final stage occurs after all impaired beneficial uses have been restored. After reaching the third stage, the site is delisted, or removed from the list of AOCs.

Area of Concern

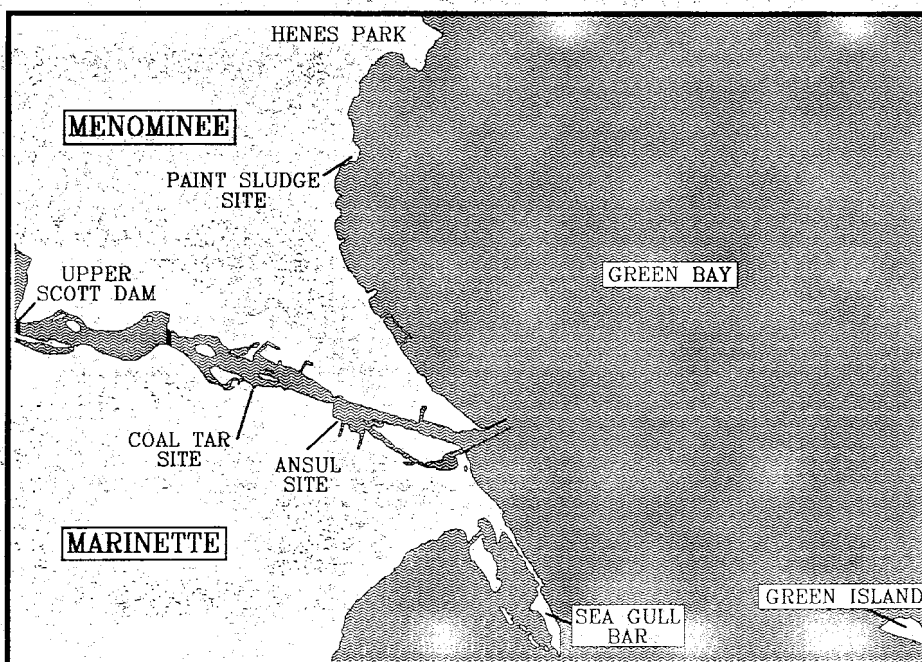
The AOC for the Lower Menominee River RAP includes the lower three miles of the Menominee River, from the upper Scott Paper Co. (Mill Park) dam to the

river mouth. Also included is the Green Bay shoreline from Seagull Bar to Henes Park and an area of Green Bay waters extending out to include Green Island. The Cities of Marinette, WI and Menominee, MI are within the boundaries of the AOC.

Local RAP Development

The Menominee River forms the boundary between northeastern Wisconsin and the upper peninsula of Michigan. Because the AOC lies in both states, the development of the Lower Menominee River RAP is the joint responsibility of the Wisconsin and Michigan Departments of Natural Resources (DNRs). The Wisconsin DNR has assumed the role of lead agency due to the presence of the most severe environmental problems on the Wisconsin side of the river.

Preliminary work for the development of the Lower Menominee River RAP began in 1988. Public meetings were held and a scope of study for the plan was developed. A Citizen's





Advisory Committee (CAC) and a Technical Advisory Committee (TAC) were formed to insure local input and involvement in the development of the plan.

The advisory committees include representatives from a diverse group of local stakeholders (people most interested in, or effected by RAP activities). The Citizen's Advisory Committee (CAC) membership includes local citizens, educators, government officials, area business and industry leaders, and representatives from environmental organizations and sporting groups. The Technical Advisory Committee (TAC) consists of technical experts from the Wisconsin and Michigan Departments of Natural Resources (DNRs), University of Wisconsin, U.S. Environmental Protection Agency (U.S. EPA), and local industry. These

committees have been, and continue to be, active participants in the development and implementation of the RAP.

Work on the development of the Stage I Report began in 1989. The CAC drafted a long-range vision for the desired future state of the AOC. The TAC and CAC jointly developed a set of goals and objectives for achieving the desired future state and the goals of the Great Lakes Water Quality Agreement. The technical committee and the DNRs conducted research to determine the impaired beneficial uses in the Menominee AOC.

The Stage I Report for the Lower Menominee River RAP was completed in late 1990 and submitted to the U.S. Environmental Protection Agency (U.S. EPA) and the IJC for review in

The Desired Future State of the Lower Menominee River AOC

- 1. A health economy consistent with the desired future state and the long term maintenance of the area's natural resources,*
- 2. A diverse transportation network, including a navigable river and harbor, and a land based system, which minimizes adverse environmental impacts,*
- 3. A sustainable recreation base, for the enhancement of the area's tourism industry including: swimmable waters; adequate public access; enhancement of aesthetics and the preservation of scenic beauty of the area; enhancement of water-based recreation facility; and preservation of diverse wildlife populations,*
- 4. Water from the river and bay that is drinkable after standard treatment,*
- 5. A balanced and productive fishery, fully edible by all persons,*
- 6. Water and sediment quality that is not detrimental to human health and wildlife,*
- 7. Planned use of the waterfront for industrial, commercial, residential, recreational and wildlife purposes consistent with the desired future state, and*
- 8. No adverse impacts in the area of concern from other areas of the watershed, bay or region.*



early 1991. The IJC accepted the report in June of 1991 and commended the RAP personnel for their close involvement with local stakeholders in the development of the Stage I Report. This type of grassroots involvement is considered a key ingredient to the successful development and implementation of all RAPs.

Pollution Problems Identified

The major concerns in the Lower Menominee River are in-place toxic pollutants contained in the river sediments. These pollutants include elevated levels of arsenic, lead, oil and grease, polycyclic aromatic hydrocarbons (PAHs), cyanide and mercury. Most of this contamination can be traced to the historical discharge of wastes to the river during the past century.

Sources of pollution in the Lower Menominee River AOC have included: contaminated groundwater and sediments; industrial wastewater discharges; municipal wastewater treatment plants and sewer collection systems; storm water runoff; landfills; bulk storage pile runoff; and other disposal sites and spills. The Lower Menominee River is also affected by pollution sources from outside of the AOC. These exter-

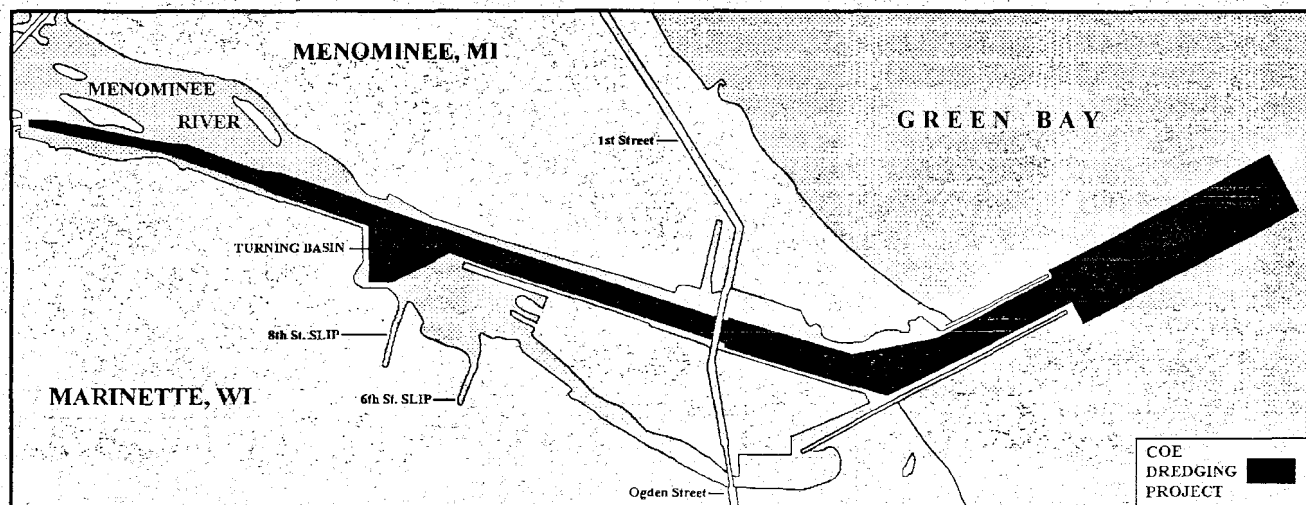
nal sources include air emissions and atmospheric deposition, pollution from adjacent water resources, and contaminated fish from the Fox River and Lower Green Bay.

Impaired Beneficial Uses

The Stage I Report for the Lower Menominee River RAP identified six impaired beneficial uses associated with the AOC. These included dredging restrictions, fish consumption advisories, degraded fish populations, degraded benthos, loss of fish and wildlife habitat, and partial and total body contact restrictions. Some of these impaired uses exist in isolated areas of the AOC or are the result of regional pollution problems. A brief descriptions of each follows.

Restrictions on Dredging Activities

The Lower Menominee River is classified as a federal navigable harbor and is used as a diversified cargo port. In order to maintain the 21 foot channel depths needed to handle large freighters, the harbor has been dredged seven times since 1961. The dredging operations are conducted by the U. S. Army Corps of Engineers, with open water disposal of the dredge





spoils occurring in the bay of Green Bay, within the State of Michigan's boundaries.

Dredging activities in sections of the Lower Menominee River are restricted due to the presence of toxic contaminants in the river's sediments. The Turning Basin portion of the river contains sediments contaminated with the heavy metal arsenic, and has not been dredged since 1965. Some of the arsenic contamination in the Turning Basin is so severe that sediments from this region of the river would be classified as a hazardous waste if an attempt was made to remove them via dredging. The severity of this contamination has limited the range of remedial actions available to restore the area. Arsenic contamination is the major reason the Lower Menominee River was selected as an AOC.

Fish Consumption Advisories

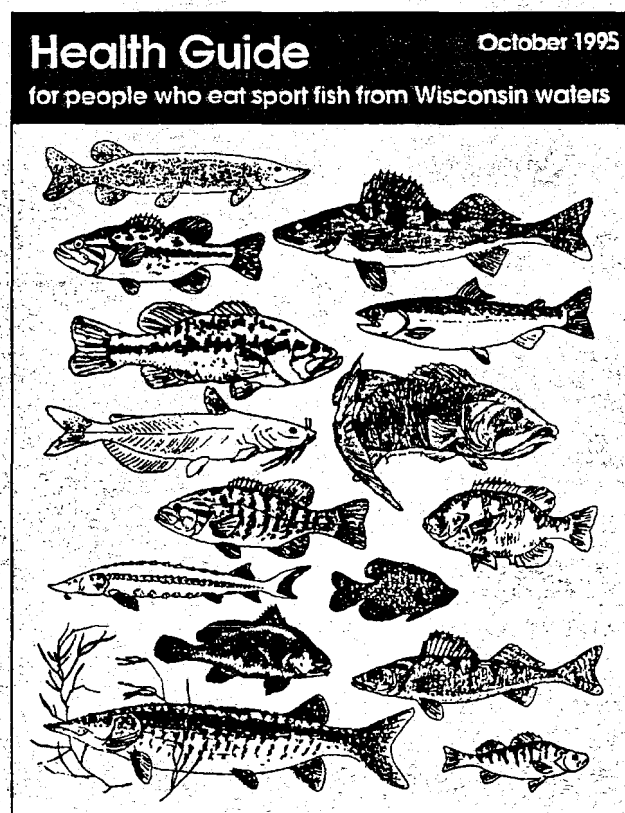
Both Wisconsin and Michigan publish consumption advisories for people who eat sport fish. The publications describe health precautions that should be considered before eating some types and sizes of fish. The advisories are due to the presence of elevated levels of toxic substances in some fish tissue, particularly polychlorinated biphenyls (PCBs), pesticides and mercury. The advisories are updated regularly and are based on the analysis of fish samples and the health standards set by the U. S. Food and Drug Administration (FDA).

Fish from the Menominee River have been included in the fish consumption advisories since their inception in 1976. Some Menominee River fish have been found to exceed the FDA health standards for PCBs and/or mercury.

Some of the highest concentrations of PCB contamination are found in the sediments from the Fox River and Lower Green Bay region.

Because fish freely move throughout the lake from these contaminate sites, fish consumption advisories for PCBs are in effect throughout Lake Michigan and Green Bay waters. Water samples taken from the Menominee River indicate that the levels of PCBs in the river are low. It is therefore believed that the source of the PCB problem in the Lower Menominee River lies outside of the AOC and is most likely the result of the migration of fish from the heavily contaminated Fox River and Lower Green Bay.

Consumption advisories for mercury also exist for some fish caught in the Menominee River. Although water quality sampling in the river have detected slightly elevated levels of mercury, the source of the mercury remains unidentified. Possible sources of the mercury include air pollution and naturally occurring background levels.





Total and Partial Body Contact Restrictions

Total and partial body contact (swimming) restrictions have been established for some areas of the AOC due to bacterial counts (fecal coliform) that have exceeded Wisconsin and Michigan water quality standards. Fecal coliform is an indicator species used to detect the presence of raw sewage. The high bacterial counts are commonly associated with high volumes of storm water runoff during wet weather events. These high volume flows have resulted in wastewater bypassing and combined sewer overflows, the release of untreated sewage into the river, due to inputs that exceed the handling capacities of municipal wastewater treatment plants (WWTP).

Loss of Fish and Wildlife Habitat

Wetlands once outlined most of the Lower Menominee River, providing habitat for a wide variety of fish and wildlife species. Fish used these regions as spawning grounds, while wildlife made use of the wetlands for food and shelter. Waterfront development has eliminated most of these wetland areas.

The loss of fish and wildlife habitat started during the logging era of the late 1800's when wetlands along the river were filled to create sites for sawmills. Disposal of waste products, such as sawdust and scrapwood, from the logging era occurred in the river and remaining wetlands. Some of these wastes still cover sections of the river bottom and contribute to other impaired uses. The loss of wetland habitat continued into the late 1900's when more areas were filled to support urban spread of Marinette and Menominee.

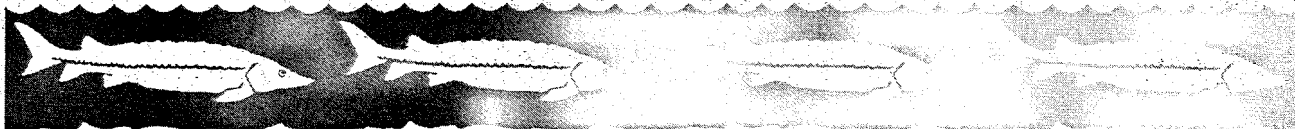
Degraded Benthos

Benthic or bottom dwelling organisms have been affected by the presence of contaminated sediments in the Lower Menominee River. Studies conducted by the U. S. EPA, Wisconsin DNR, Michigan DNR and the consulting firm Dames and Moore document a significant reduction in the number and diversity of benthic species found in isolated sections of the river. Elevated levels of arsenic, cadmium and mercury were detected in an analysis of benthic tissues obtained during one of these studies. Affected areas include the Turning Basin and the Eighth Street Slip. Benthic diversity and populations in these regions were classified as absent, sparse, or at best moderate. Less desirable pollution tolerant benthic species currently dominate many of these sections in the AOC. Other areas that may be affected include the Sixth Street Slip, the South Channel and the river mouth.

Degradation of Fish Populations

A review of the history of the Marinette and Menominee area indicates that current fish populations in the Menominee River represent only a fraction of the once bountiful historical levels. Electrofishing surveys conducted by the Wisconsin DNR indicate that some localized regions of the Lower Menominee River have greatly reduced fish diversity and populations. These sections of the river correspond to those areas known to contain heavily contaminated sediments. Other possible contributing factors include the loss and alteration of fish habitat.

Despite these problems, the Lower Menominee River has the most diverse fishery of any tributary on the western shore of Lake Michigan and fish populations for most of the



river are considered to be good by both the Wisconsin and Michigan DNRs.

Contaminated Sediments - The Major Concern

The major environmental concerns in the Lower Menominee River AOC involve the presence of contaminated sediments. Three contaminate sites were identified during the development of the Stage I RAP. Two sites are located in the Lower Menominee River, with the third site located north of the river mouth on the shore of Green Bay. A description of each site and any associated cleanup activity is listed below.

Ansul Site

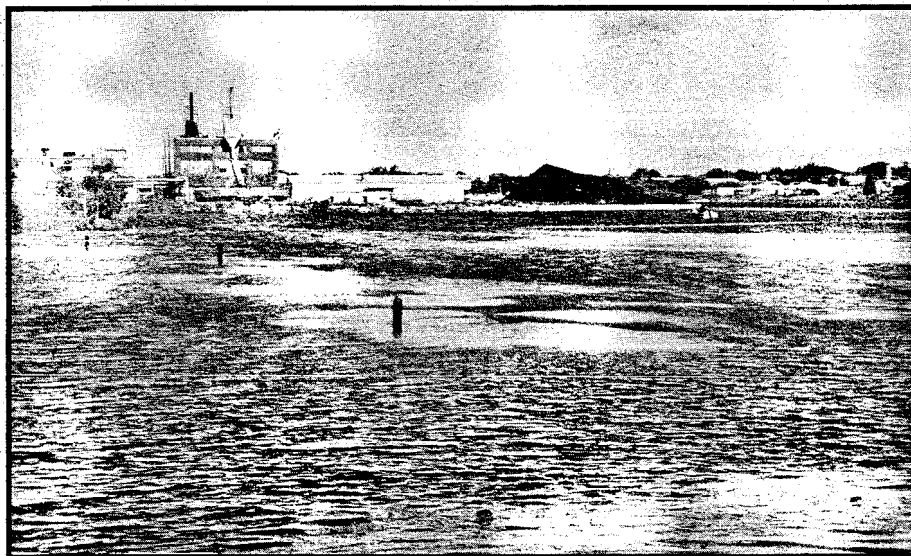
From 1957 to 1977 the former Ansul Chemical Co. manufactured an arsenic-based herbicide. The manufacturing process for this herbicide produced a waste salt that contained two percent arsenic residue. The storage and disposal of this waste salt has resulted in extensive contamination problems at the riverfront manufacturing site. The bottom sediments in the Eighth Street Slip and the Turning Basin regions of the Menominee River contain high levels of arsenic. The soils and groundwater under Ansul are also highly impacted by arsenic. Arsenic is a heavy metal known to have toxic properties.

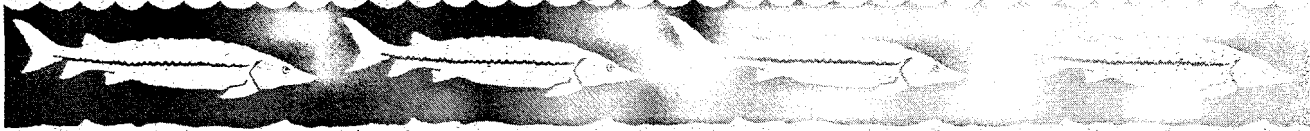
Between 1971 and 1981, Ansul and Wisconsin DNR entered into a

series of mutually agreed upon consent orders. In 1973, the Wisconsin DNR ordered Ansul to institute a study of the arsenic contamination problem, develop a long-term plan for managing arsenic waste salts, and install a trench to reduce the flow of groundwater through the contaminated area.

In 1981, groundwater extraction wells and a treatment system were installed and operated by Ansul in an attempt to address the arsenic contamination under the site. Sixteen million gallons of groundwater were extracted and treated. The process removed 350 tons of arsenic before operations were halted in 1986.

In September of 1990 the U.S. EPA and Ansul signed a corrective action consent order under the Resource Conservation and Recovery Act (RCRA). This consent order requires Ansul to develop and submit a RCRA Facility Investigation (RFI) and Corrective Measures Study (CMS). Should the CMS show that remediation of the site is necessary, Ansul will be required to develop and implement a corrective action plan to address the environmental damage.





Ansul completed an initial RFI work plan in November of 1990. After completing revisions and additions to the plan, a second RFI was submitted to the U.S. EPA in March of 1992. This RFI was modified and resubmitted. The U.S. EPA is still reviewing the document. Once the plan is approved, Ansul will initiate an extensive investigation of the contaminate site.

Paint Sludge Site

The upland, beach and offshore areas of Green Bay near the Flanders Industries, Inc. furniture company in Menominee are contaminated with an estimated 1,000 cubic yards of paint sludge. The contamination occurred under prior ownership (before 1982) when lead-based paint residues, cans and barrels were disposed of along the shoreline behind the factory. Paint sludge deposits averaging three feet thick have been observed in a one-half acre area just off shore from the factory. Ice and wave actions have broken some of the sludge into smaller nodules and dispersed them over a one-half mile section of adjacent shoreline.

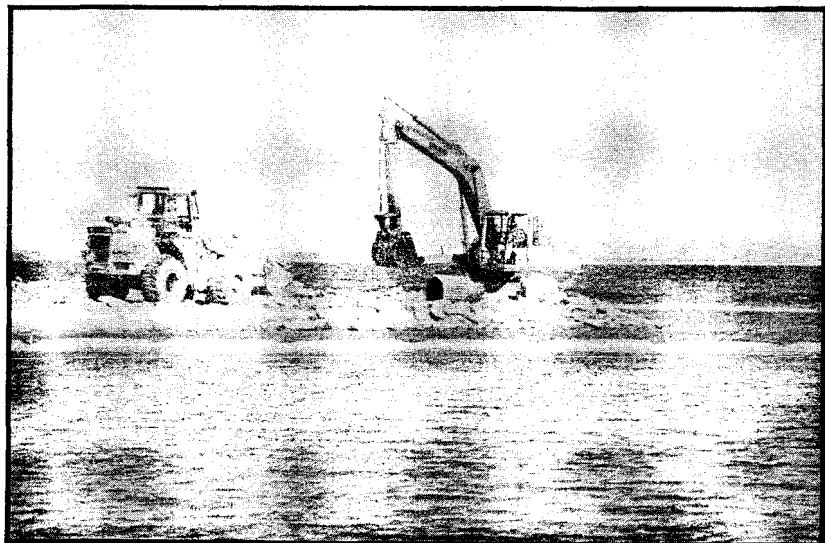
The Michigan DNR filed an Act 307 unilateral administrative order against Flanders Industries in September of 1992. This administrative order requires Flanders to complete an investigation of the site, submit a plan for remediation, and clean up the environmentally contaminated area.

In February of 1993, the Michigan DNR approved a work plan for the building of a containment dike around the offshore paint sludge. Construction of a 900 foot riprap dike around the

offshore paint sludge began in July of 1993. The 20 foot wide dike was constructed from 15,000 cubic yards of quarried rock. A series of membrane liners were incorporated into the dike in an effort to hydraulically seal the area from the surrounding waters of Green Bay. Construction of the dike was completed in September. With the dike in place, the bulk waste deposits are confined and sheltered from further erosional forces.

In March of 1995, a Submerged Waste Removal Work Plan was submitted to the Michigan DNR. The plan outlines the actions needed to remove, stabilize and dispose of the bulk paint wastes contained inside the dike. The dike will be removed and the area returned to its natural setting after the paint is removed. After the work plan is approved by the Michigan DNR, the company will have an eight-month time frame to complete the work.

An upland investigation was also conducted during late 1994 to search for any land-based or groundwater contamination at the site. Results of this investigation are unknown at this time.



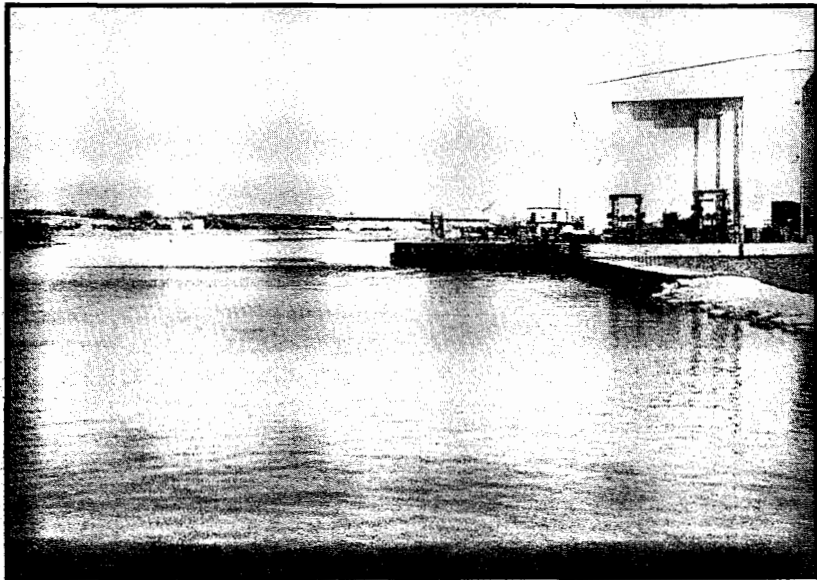


Coal Tar Site

Soils contaminated with coal tar residues were discovered in June of 1989 at a site near the Marinette Wastewater Treatment Plant (WWTP) and the Boom Landing boat launch. The discovery occurred during excavation for the expansion of the WWTP. Analysis determined that these coal tar residues contained several types of polycyclic aromatic hydrocarbons (PAH) compounds. A former coal gasification plant is believed to be the source of these pollutants. The plant operated in that area from 1906 through 1960.

The Wisconsin DNR collected sediment samples near the outfall of the Marinette WWTP in April of 1991. Chemical analysis of the samples detected PAH compounds at a concentration of 3,638 parts per million (ppm). A bioassay resulted in 100% mortality of the test organisms. Several PAH compounds are known to induce cancer and cause chromosome damage in humans.

In April of 1992, the Wisconsin DNR identified Wisconsin Public Service (WPS) as the potentially responsible party and indicated that cleanup of contaminated sediments at the site would be the company's responsibility. WPS hired an environmental consultant in September of 1992 to research the site. A Phase I Remedial Investigation Work Plan was approved for the site in April of 1993. The Phase I Report was completed and submitted to the Wisconsin DNR in September of 1994. The report lists the extent of upland contamination and the results of groundwater monitoring. Most



of the contaminated soils in the area were removed during the WWTP construction.

A work plan for the investigation of offshore PAH sediment contamination in the Menominee River was presented to the Wisconsin DNR in April of 1995. The current extent of PAH contamination is unknown and will be addressed by this investigation. Final plan details are currently being worked out.

Recommendations for Remediation

Work on the second stage of the RAP began immediately after the IJC approved the Stage I Report. Recommendations to improve and protect the Lower Menominee River AOC and address the impaired uses were developed with significant input and assistance from the TAC and CAC. Several drafts of a Stage II Report were completed and reviewed. The final version of the report was renamed the 1995 RAP Update to correspond with changes in the RAP process. Some of the key elements of the report are described as follows.



Sediment Cleanup

Contaminated sediment is the largest and most difficult problem in need of remediation in the Lower Menominee River AOC. These contaminated sediments have a major impact on many of the impaired uses. The three contamination sites identified earlier are under separate enforcement actions that will oversee the necessary cleanup: Ansul Site - U. S. EPA (RCRA); Coal Tar Site - Wisconsin DNR (State Statute 144); and the Paint Sludge Site - Michigan DNR (Act 307). The Lower Menominee River RAP will monitor progress to remediate each site. Cleanup actions, plans and progress will be referenced and included in future RAP documents as they become available.

Habitat Protection

Recommendations in the RAP include the preservation of the remaining fish and wildlife habitat in the AOC. This includes protection for the remaining high quality wetlands in the AOC and possible restoration efforts for other marginal wetlands. One such wetland (near the Sixth Street Slip) was preserved when the City of Marinette removed a bulkhead line designation along the South Channel at the request of the RAP and the CAC. A proposal has also been made to purchase, by the Wisconsin DNR, Green Island and preserve it as a wildlife sanctuary.

Eliminating Swimming Restrictions

Body contact restrictions in the AOC were primarily caused by wastewater bypassing and combined sewer overflows. Most of these problems have been eliminated in the AOC. The



City of Marinette has completed a separation of its storm water and sanitary sewer systems to address bypassing problems. Improvements have also been made to the WWTP. The City of Menominee is currently undergoing construction to separate its storm water and sanitary sewer systems to eliminate overflows.

High bacterial counts had also been detected inside the Menominee Marina. Possible explanations for these elevated counts include the high population of ducks and/or illegal dumping of, or leakage from boat holding tanks. Efforts to address these problems have been effective in reducing bacterial counts to acceptable levels.

Waterfront Improvements

The enhancement of waterfront properties for recreational uses and improved aesthetics



has also been recommended by the RAP. Projects such as waterfront walkways and green spaces are planned. Improvements to area boat launches and beaches will continue to be pursued. The Menekaunee Walkway project was a result of RAP efforts.

Additional Research

A variety of monitoring and sampling operations are recommended and being planned as a part of the RAP. Sediment sampling, fish contaminate sampling, wildlife toxicology, benthos studies and water quality tests will all be conducted. Test results will be used to fill gaps in the data base for the river, as well as to document progress in the remediation of the impaired uses. A Geographic Information System (GIS) computer data base is being developed for the Lower Menominee River to assist with the storage and coordination of this information.

Community Involvement

A vital component to RAPs is public participation in the project. An extensive community information and education program will be a part of the continuing RAP process. Information brochures, displays, slide shows, presentations and local press coverage will be utilized to distribute information and generate community awareness and participation. The CAC will continue to assist with these activities.

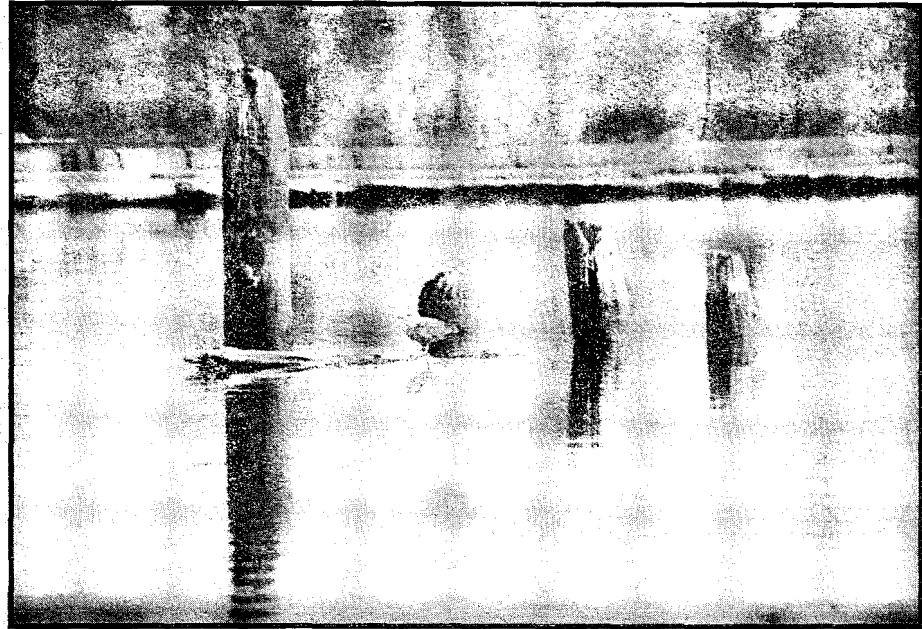
You can become involved in the RAP by learning all you can about the Menominee River, Green Bay and the Great Lakes. Take advantage of this knowledge during political debates over water quality issues and by choosing appropriate representation during elections.

You can also directly assist the RAP with local cleanup efforts. The CAC organizes an annual River/Bay Cleanup Day during early October of each year. Be one of the volunteers that assists with the removal of unsightly garbage from the shorelines within the AOC.





Please remember, the value of our local water resources cannot be underestimated. The restoration and protection of the Great Lakes is of enormous economic and environmental value. Only with your help can the RAP achieve these goals. Take the time to participate in the RAP. Visit the waterfront and gain an appreciation of its value. Take pride in your local water resources.



For more information on the Lower Menominee River Remedial Action Plan please contact:

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