FISH AND WILDLIFE POPULATION AND HABITAT MANAGEMENT AND RESTORATION PLAN

FOR THE

LOWER MENOMINEE RIVER AREA OF CONCERN

Version 1.0
December, 2011

Office of the Great Lakes
Wisconsin Department of Natural Resources

Office of the Great Lakes
Michigan Department of Environmental Quality

Cover Photo: Aerial view from above the Park Mill Dam looking east toward Green Bay.

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LIST OF ACRONYMS

AOC- Area of Concern
BUI- Beneficial Use Impairment
CAC- Citizen's Advisory Committee
FERC- Federal Energy Regulatory Commission
GOAT- Goals, Objectives, and Actions Table
MDEQ- Michigan Department of Environmental Quality
MDNR- Michigan Department of Natural Resources
NAH- North American Hydro
PAH- Polycyclic Aromatic Hydrocarbon
PCB- Polychlorinated Biphenyls
RAP- Remedial Action Plan
SPMD- semi permeable membrane device
TAC- Technical Advisory Committee
U.S. EPA (EPA)- United States Environmental Protection Agency
WDNR- Wisconsin Department of Natural Resources
WPSC- Wisconsin Public Service Corporation

DEFINITIONS

Acceptable Species List- Selected from species found to be dominate in at least one natural area surveyed during the riparian vegetation survey in 2011. Acceptable species include all native and several naturalized species. Several species found on this list are considered only moderately beneficial to the ecosystem, therefore this list is titled "acceptable" instead of "desirable".

Area of Concern (AOC)- Defined by Annex 2 of the 1987 Protocol to the U.S.-Canada Great Lakes Water Quality Agreement as "geographic areas that fail to meet the general or specific objectives of the Agreement where such failure has caused or is likely to cause impairment of beneficial use of the area's ability to support aquatic life." These areas are the "most contaminated" areas of the Great Lakes, and the goal of the AOC program is to bring these areas to a point at which they are not environmentally degraded more than other comparable areas of the Great Lakes. When that point has been reached, the AOC can be removed from the list of AOCs in the Annex, or "delisted."

Beneficial Use Impairment (BUI)- Beneficial uses are ways that a water body can improve the quality of life for people or support life for fish and wildlife. For example, supplying drinking water and providing habitat for fish and wildlife are both beneficial uses of a water body. If a beneficial use is suppressed or unavailable due to environmental problems, like limitations on usage or taste and odor problems with drinking water, then that beneficial use is considered impaired. The International Joint Commission provided a list of 14 possible beneficial use impairments in the 1987 Great Lakes Water Quality Agreement amendment.

Delisting Target- Specific goals and objectives established to track restoration progress of beneficial uses. Once targets have been met, the beneficial use is no longer considered impaired. Targets should be locally derived.

Goal- Goals are broad ideas that may take a long time to achieve. They usually don't change significantly over the life of a project. An example goal statement is, "Nesting populations of a diverse array of wetland-dependent and riparian-associated birds are consistently present within the AOC." The delisting targets for the impairments may also be considered the goal statements (in some cases they may be objectives).

Natural Areas- An area that currently has value as fish and wildlife habitat or has the potential to be restored so that it has value as fish and wildlife habitat. Natural areas can be publically or privately held, and can include wetlands or riparian lands within the AOC. Natural areas are not necessarily formally designated State Natural Areas.

Objective- Objectives are the detailed and quantitative activities that are needed in order to meet goals. Objectives are normally accomplished in less time than goals. They are important because they provide a means of measuring progress toward plan implementation. Objectives should be SMART: Specific, Measurable, Achievable, Realistic, Time-Constrained.

Polychlorinated Biphenyls (PCB)- A group of more than 200 compounds, PCBs have been manufactured since 1929 for uses including electrical insulation, hydraulics, fluorescent lights, and carbonless paper to name a few. In 1979, PCBs were banned because of their persistence in the environment and tendency to magnify up the food chain. They have been linked to reproductive problems in wildlife and are suspected of causing developmental problems in human infants.

Polycyclic Aromatic Hydrocarbons (PAH)- Chemicals commonly associated with oils, greases, and other components derived from petroleum. Some PAH compounds have been identified as cancer or mutation causing.

Project- Also referred to as activity. As defined for this document, a project is a specific activity that has been defined with enough detail to understand who will do the work, how it will be done, and where it will be done. The end result of the activity should be visible and concrete. One or more projects may be defined to meet the goals and objectives for the impairments, if the AOC is not yet eligible for delisting. With this definition, "Coordinating with partners to make sure data is consistently collected and used" would not be a project. However, "XY Agency will host a data coordination meeting and write a set of standards for data collection and analysis for the Menominee River AOC." would be a project.

Protected- A city ordinance or setback significantly limiting alteration of a site from its' present state, or state or local zoning restrictions that significantly limit the alteration of a site from its' present state, or Landowner agreements or conservation easements that significantly limit the alteration of a site from its' present state for an acceptable length of time.

Semi-Permeable Membrane Device (SPMD)- A passive sampling device used to measure concentrations of lipophilic (mixing more easily with oils than water) environmental pollutants like PCBs.

Undesirable Species List- Selected from species found to be dominate in at least one natural area surveyed during the riparian vegetation survey in 2011. Unacceptable species include non-native and invasive species. Several species are considered prohibited or restricted species according to Wisconsin State Statute NR 40, regulated plants. Management activities will reduce populations of these species in protected natural areas to meet restoration objectives.

EXECUTIVE SUMMARY

The purpose of this Fish and Wildlife Population and Habitat Plan (Plan) is to outline a path to removing (delisting) the "**degradation of fish and wildlife populations"** and the **"loss of fish and wildlife habitat"** beneficial use impairments (BUIs) from the Lower Menominee River Area of Concern (AOC). The need for this plan was established in the December 2008 *Lower Menominee River AOC Beneficial Use Impairment Restoration Targets*. This plan meets all requirements of those targets by:

- Defining the causes of fish and wildlife population and habitat impairments within the AOC
- Establishing site specific habitat and population objectives for fish and wildlife species within the AOC
- Identifying fish and wildlife population restoration programs and activities within the AOC and establishes a mechanism to assure coordination among states and programs for assessment monitoring, implementation activities and associated monitoring

Restoration Goals and Objectives for these BUIs have been set by Menominee River AOC Fish and Wildlife Population and Habitat Technical Advisory Committee (TAC). Participants have included the Wisconsin Department of Natural Resources (WDNR), Michigan Department of Natural Resources (MDNR), Michigan Department of Environmental Quality (MDEQ), University of Wisconsin Extension, U.S. Fish and Wildlife Service (FWS), U.S. Environmental Protection Agency (EPA), Federal Bureau of Land Management (BLM), Stantec Consulting, and members of the Menominee AOC Citizens Advisory Committee (CAC). Targeted fish species for management in the AOC include lake sturgeon (Figure A), spotted muskellunge (Figure B).

Figure A: A 76 inch lake sturgeon held by Mike Hawley, Tammie Paoli, and Ron Rhode courtesy, WDNR.

Figure B: Spotted muskellunge held by Larry Vander Kelen. Photo courtesy of Mike Donofrio, WDNR.

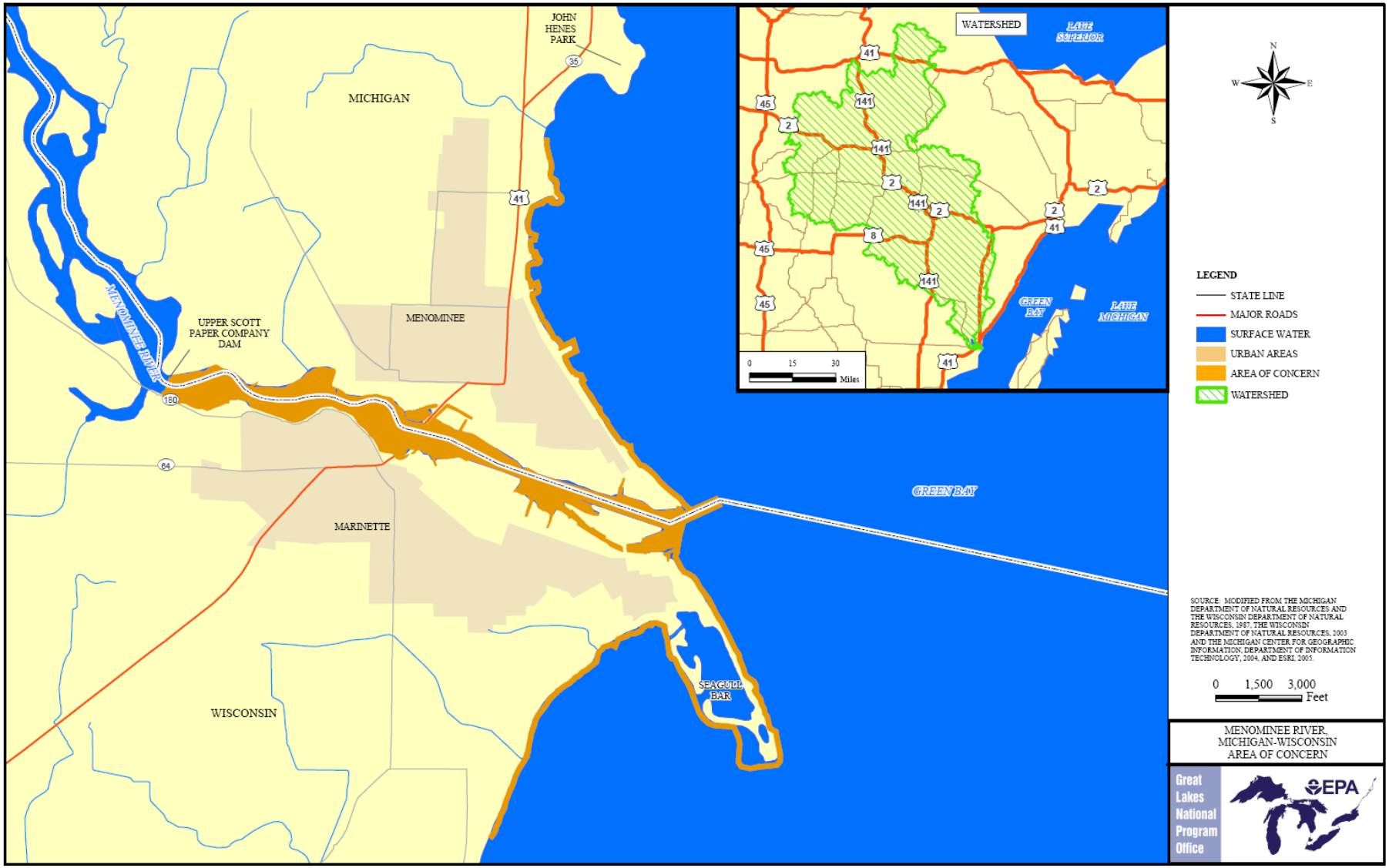

Figure C: Lower Menominee River Area of Concern as delineated by U.S. EPA. Green Island, which was included in the AOC in the 1996 RAP, is not visible on this map, and is located approximately 5 miles east from Seagull Bar.

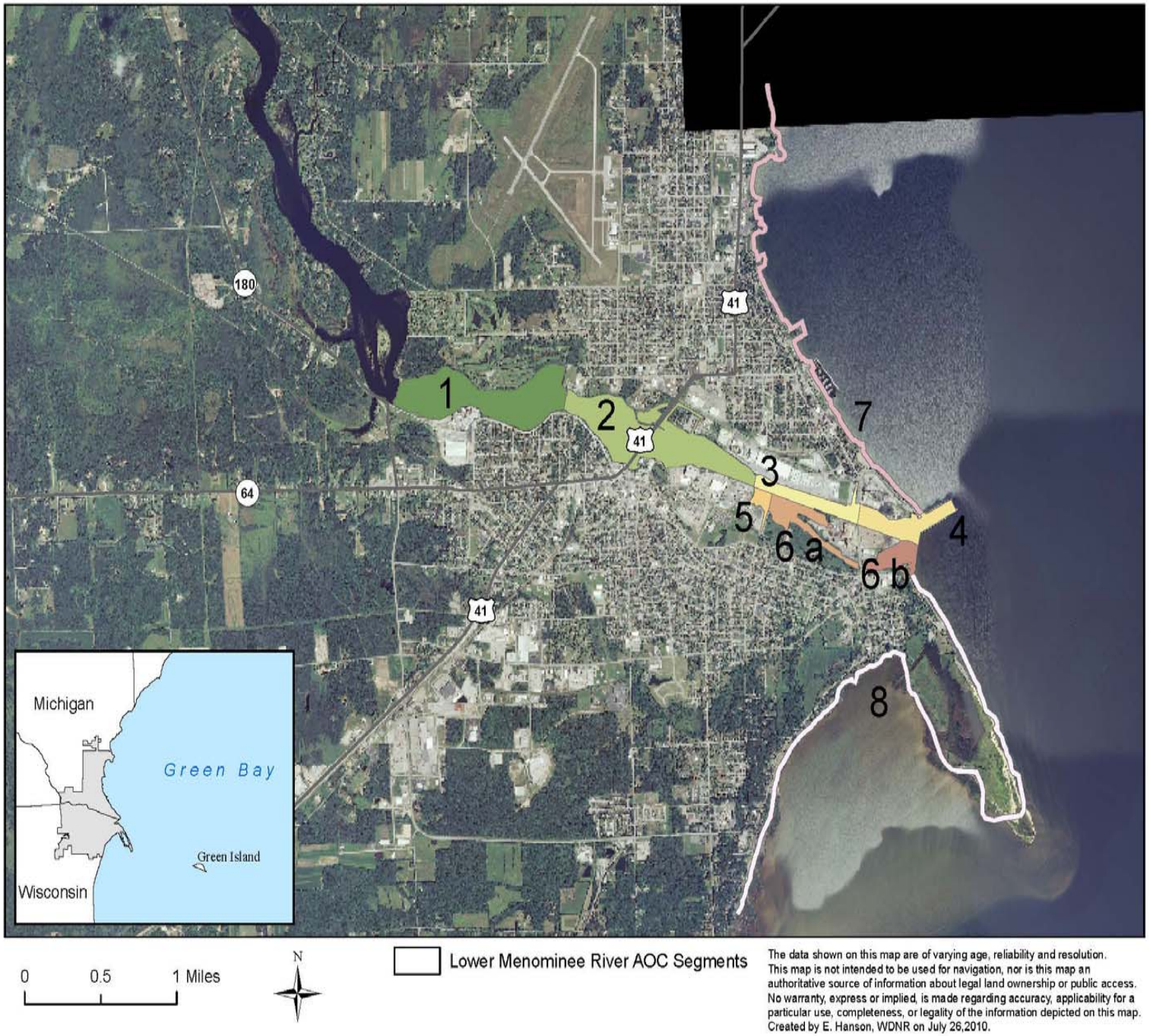

Figure D: Segment Map of the Lower Menominee River Area of Concern. Green Island, seen in the map inlay, has not been assigned a segment number.

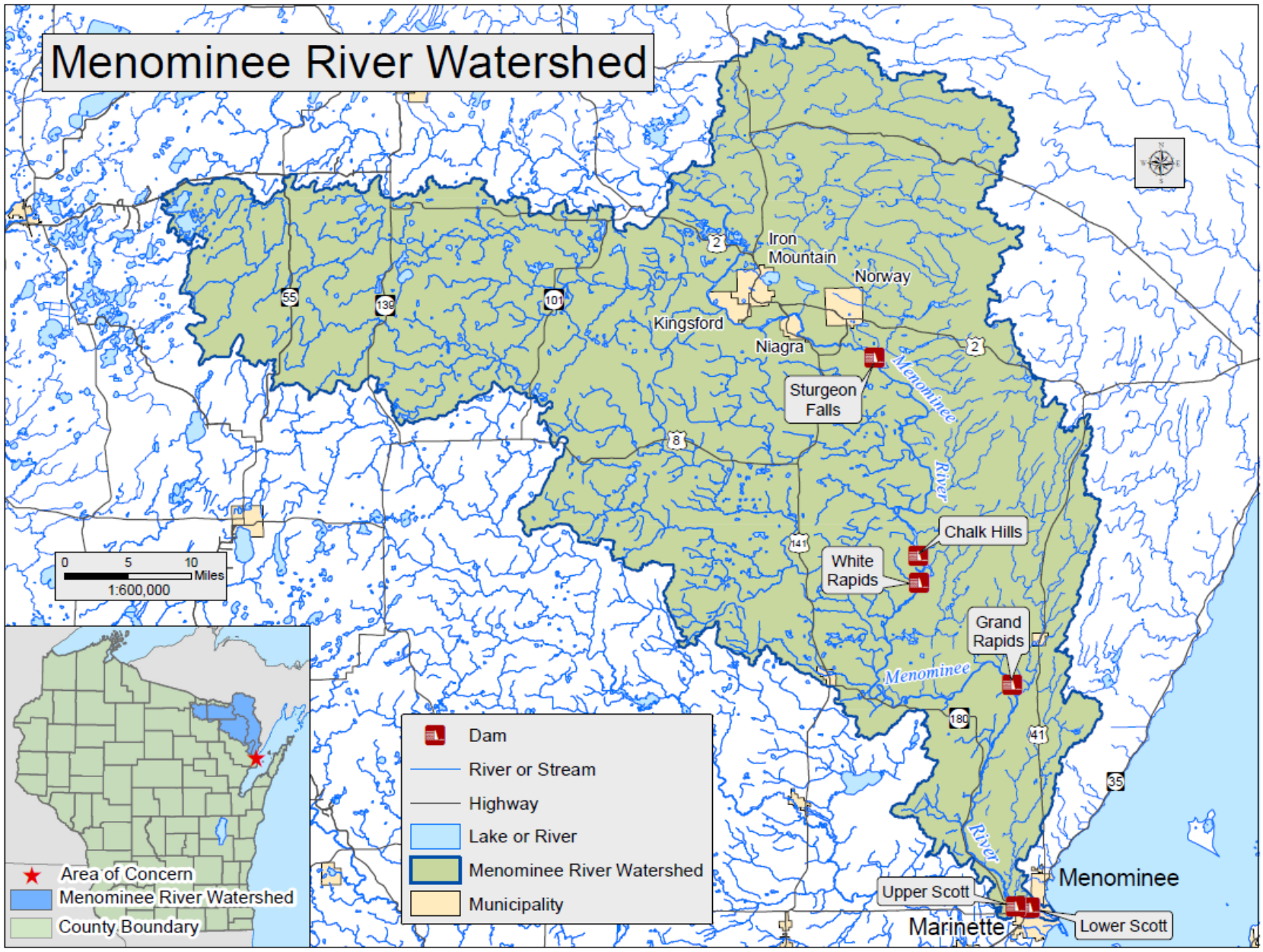

Figure E: Menominee River Watershed including tributaries and dams as they pertain to the Fish Passage Project. The Upper and Lower Scott Dams are commonly referred to as the Park Mill Dam and Menominee or Bridge Street Dams respectively.

INTRODUCTION

The purpose of this Fish and Wildlife Population and Habitat Plan is to outline a path to removing the "**degradation of fish and wildlife populations"** and the **"loss of fish and wildlife habitat"** BUIs from the Lower Menominee River AOC. The heart of this plan is the Goals, Objectives, and Actions Table (GOAT, see Appendix A). This table contains the five overarching goals which must be met to remove these two BUIs. Each goal has at least one detailed and quantitative objective in order to meet the goal. For instance, if the goal was "An enhanced great blue heron population" an objective might be "increase suitable foraging habitat by 20 percent". Activities complete this circuit. Activities are the individual projects and actions that, together, fulfill objectives. Using the example above, activities to meet that objective could be "soften shoreline along Memorial Park" or "conduct a survey of existing foraging habitat within the AOC". It may take several activities to meet a single objective. For this reason, GOAT is considered a living document, as additional activities or modification of objectives may be required if objectives cannot be met. All identified activities need not be implemented for an objective to be completed, but all appropriate objectives must be met before a goal can be considered achieved.

This plan draws direction from Michigan's 2007 DRAFT *Supporting Guidance for Local Restoration Criteria Development: Loss of Fish and Wildlife Habitat and Degradation of Fish and Wildlife.* This guidance establishes that the fish and wildlife population and habitat management plan should focus on specific issues that are directly responsible for causing impairments locally within the AOC. It reiterates that the goal of the AOC program is to restore beneficial uses, not to create a pristine habitat reflective of pre-settlement conditions. The implementation of the AOC fish and wildlife populations and habitat management plan, and subsequent removal of the fish and wildlife BUIs, can be one-step along the way for a broader and more ambitious restoration effort if the community chooses to strive for improvements beyond delisting.

Roles of the Citizen's Advisory Committee & Technical Advisory Committee

Goals, objectives and activities found in GOAT were developed through Citizen's Advisory Committee (CAC) and Technical Advisory Committee (TAC) meetings from approximately 2009-2011. These meetings are open to the public and advertised through the WDNR Meeting Calendar and other means. Members of the CAC assisted the TAC in identifying local issues, targets, and goals, serving as a resource for historical information, and implementing actions. Members of the TAC provided input regarding feasibility, existing conditions, species habitat needs, and restoration/protection opportunities. Ultimately, State agencies, the CAC, and TAC will assess the status of these BUIs, determine when targets have been met, and assist in or initiate the request to the federal government remove the fish and wildlife population and habitat BUIs addressed in this plan.

CAUSES OF FISH & WILDLIFE HABITAT AND POPULATION IMPAIRMENTS

The "degradation of fish and wildlife populations" and "loss of fish and wildlife habitat" BUIs were listed because of the loss of historic wetlands and localized toxicity caused by contaminated sediment. An extensive wetland complex near the mouth of the river was destroyed by log driving activities in the 1800s. Afterwards, land near the mouth of the River was filled for industrial expansion, and the shorelines hardened to prevent erosion. Remaining quality habitat and wetlands are threatened by encroaching invasive plants and access to spawning and juvenile habitat for potamodromous fish like lake sturgeon has been severely limited due to the lack of a safe passage beyond several dams (Figure E). Sediment contaminated with arsenic, polycyclic aromatic hydrocarbons (PAHs, or coal tars), and other heavy metals including cadmium, chromium, copper, lead, mercury, nickel, and zinc have impacted fish populations throughout the AOC (RAP, 1996 and 1990). Sediment was contaminated through industrial activities and stormwater discharges that took place throughout the 1900s.

Log Driving, Urbanization, and Invasive Species

Historically, an extensive wetland complex existed near the river mouth with wide swaths of wild rice. These and other wetland areas along the river were largely eliminated by log driving activities. The river was also used to dispose vast quantities of bark and sawdust during the 1800s, which are still found in river sediment and occasionally washed up on local beaches. At this time the CAC is not interested in pursuing remedial actions for historic logging wastes. Land near the mouth of the River was filled for industrial expansion, and the shorelines hardened to prevent erosion.

Remaining quality habitat and wetlands are threatened by encroaching invasive species. Areas along Green Bay are dominated by the invasive Eurasian Phragmites, *Phragmites australis, subsp. Australis*. However, due to the ubiquitous distribution of this species around the Great Lakes, this plan does not aim for large-scale control of the European phragmites, but to control the species where necessary to protect specific, sensitive areas, such as Seagull Bar or the riverine portions of the AOC, or specific areas identified by the TAC. Purple loosestrife, *Lythrum salicaria,* continues to be a problem along the river corridor and associated wetlands. Non-native buckthorn, *Rhamnus spp.,* and honeysuckle, *Lonicera spp.,* are a significant presence on riverine islands, degrading upland habitat used by wildlife.

Sediment Contamination

Toxic contaminants in the river sediment are a major concern in the lower Menominee River. Poor water quality caused by these sediments has contributed to loss of habitat and degraded fish populations. The known source areas are commonly referred to as the Ansul arsenic and coal tar sites. Agencies and partners are actively pursuing ways to identify any unknown sources of contamination. See page 7 “Activities” for more information.

Ansul Arsenic

Sediment near the turning basin (Figure D, segment 5) and south channel (Figure D, segment 6a) are contaminated with high to elevated levels of arsenic. The contamination is a result of past practices at the nearby Ansul facility, which manufactured an arsenic-based herbicide from the 1950s to the 1970s. As noted in the 1996 RAP, arsenic contamination does not biomagnify up the food chain, but it does bioaccumulate in exposed aquatic life, including fish. Testing has indicated lethality to aquatic test organisms (RAP, 1996). A brief history of clean up efforts is found in Appendix B, additional clean-up information is found in the 1996 RAP.

Coal Tars

During the construction of the Marinette Waste Water Treatment Plant expansion in 1989, soils contaminated with coal tar, polycyclic aromatic hydrocarbons (PAHs), were discovered (RAP, 1990). Site investigations from 1994 to 2002 have discovered approximately 4 acres of contaminated soil, and 1.3 acres of contaminated sediment in the nearby Menominee River (segment 2 southeast of Hwy 41 Bridge, Figure D). The source was determined to be a coal gasification plant which operated prior to 1960. Wisconsin Public Service Corporation (WPSC) was found to be responsible for the remediation of contaminated soils and sediments. From the 1996 RAP, “WDNR conducted solid-phase sediment toxicity tests using *Daphnia magna* with sediments collected near the plant’s outfall. Using a 48-hour acute test, toxicity was 100%.” A brief history of clean up efforts is found in Appendix C, additional clean up information is found in the 1996 RAP.

Habitat Fragmentation

Dams within the Menominee River Watershed and AOC restrict the ability of fish populations to migrate upstream or safely downstream (Figure E). Less available habitat for fish, especially for

potamodromous fish, can negatively impact total population size, natural recruitment, species diversity, and genetic diversity. Five dams on the Menominee River limit the spawning migration of lake sturgeon in the system. Sturgeon Falls, also the site of a dam, was the historic point at which the lake sturgeon could not pass. The lowest two, the Upper and Lower Scott Dams are within the AOC and are owned by North American Hydro (NAH). Presently, the Lake Michigan sturgeon population only has access to 2.75 miles of the Menominee River for spawning and juvenile rearing habitat (Alsberg, C. and Utrup, 2009).

SITE SPECIFIC HABITAT AND POPULATION GOALS, OBJECTIVES, AND ACTIVITIES

The following goals, objectives, and activities were developed by the TAC and are contained in the Goals, Objectives, and Activities Table (Appendix A). The GOAT is intended to be updated as new information and issues are identified or as projects are completed.

Menominee BUI Removal Goals

Once all objectives pertaining to an individual goal have been met, that goal will be considered met. When each goal has been met the Loss of Fish & Wildlife Habitat and Degradation of Fish & Wildlife Populations BUIs will be recommended for removal. Goals are as follows:

- Long-term protection is in place for natural areas and wetlands within the AOC, including Seagull Bar and riverine islands
- Nesting populations of a diverse array of wetland-dependent and riparian-associated birds are consistently present within the AOC
- Enhanced lake sturgeon population
- Diverse and functional native of fish and mussel assemblages that sustain natural recruitment.
- Restore a healthy diverse native vegetation community

Objectives

Objectives are quantitative and considered met once that quantitative benchmark has been reached. Some objectives do not appear quantitative, but are quantified through defined terms within the objective. Other objectives have an “XX” placeholder; these placeholders will be replaced once final reports are received from various surveys and the work described on page 9 “Step One” has been completed. See Figures D and E for locational references. Objectives are as follows:

- XX acres of natural areas within segments 1-6 and XX linear feet within segments 7-8 are protected.
- At least five nesting pairs of birds per acre representing at least 10 different species from the Lower Menominee River AOC Bird List (to be developed) is found within segments XX (to be determined) of the AOC.
- Provide access to approximately 21 river miles to the Lake Michigan sturgeon population (version 1.1 of the Fish Passage and Protection Plan, October 29, 2009).
- Provide safe downstream passage beyond AOC segment 1 to sturgeon (version 1.1 of the Fish Passage and Protection Plan, October 29, 2009).
- There is evidence of recruitment within the AOC below the Lower Scott Dam for the following fish species: walleye, yellow perch, smallmouth bass, muskellunge, whitefish, smallmouth bass, and northern pike.
- There is evidence of recruitment in segment 1 for the following fish species: walleye, yellow perch, smallmouth bass, largemouth bass, and northern pike.
- There is evidence of recruitment within the AOC for native mussel species.
- Species found on the “undesirable species list” comprise no more than 33% of the vegetation community in protected natural areas of the AOC.

Activities

Activities will be suggested and completed until each objective has been met. It's possible that not all the activities in this list will be completed, or that additional activities will be required to meet all established objectives. For each activity, partners and an expected completion date have been identified in GOAT (Appendix A). See Figures D and E for locational references. Activities identified thus far are as follows:

1. Inventory, map, and ground-truth lands within the AOC: wetlands, islands, natural areas and riparian zones; include information about ownership and protection status for these lands.
2. Compile historical monitoring data to establish trends and assess fishery status. Also, assess the potential for existing fisheries programs to provide the needed data regarding fish assemblage and recruitment within the AOC.
3. Analyze the results of the 2010 aquatic vegetation survey and 2011 riparian vegetation survey. Identify areas for habitat improvement projects.
4. Identify existing mechanisms in place for wetlands & riparian protection, identify possible gaps, and identify ways to fill the gaps.
5. Analyze results of the 2011 semi-permeable membrane device (SPMD) study and assess implications of the study for the habitat plan.
6. Review results from Ansul's 2010 sediment characterization project and assess the implications of the study for the habitat plan.
7. Assess the AOC to determine where there are lands that can be protected. Use the assessment to refine habitat plan as appropriate. Use existing tools such as conservation easements, local (city and county) ordinances, conservation programs, state and federal regulations and acquisition to achieve natural areas protection goal.
8. Review results from 2011 riparian vegetation survey to identify natural areas along the lakeshore.
9. Conduct an enhanced bird study (beyond the Presence/Absence survey of 2010), possibly using Marsh Monitoring protocol and engaging volunteers. Use survey results to develop a bird list for the AOC.
10. Conduct an aquatic vegetation survey.
11. Conduct a riparian vegetation survey.
12. Characterize Menominee Dam Flowage sediments and assess the implications of the study for the habitat plan.
13. Characterize Menekaunee Harbor sediments and assess results for F&W implications.
14. Characterize South Channel sediments and assess results for F&W implications.
15. Conduct a mussel survey in the following areas: Park Mill Flowage, Menominee Flowage, and Segment 6A. Surveys will assess hydro dam impacts as well as serve as a baseline for evaluating subsequent sediment remediation & habitat enhancement efforts.
16. Complete a Menominee Flowage fish survey and compare assemblages to Park Mill Flowage to determine the status of the fishery. Develop and carry out recommendations for improving the Menominee Flowage fishery if warranted by survey data.
17. If existing efforts are not sufficient to understand recruitment, conduct recruitment studies below the Menominee Dam. If warranted by the studies, develop and carry out recommendations for enhancing recruitment within the AOC.
18. Seagull Bar- Identify whether fish currently access the pocket and determine what actions would be needed to enhance access if necessary.
19. Complete the first three (of four) phases of the fish passage and protection plan: 1) Downstream passage around the Park Mill Dam; 2) Fish lift and research facility construction at the Menominee Dam; and 3) downstream passage around the Menominee Dam. (needs further discussion).

20. Complete phase four of the fish passage and protection plan, upstream passage around the Park Mill Dam. (not required to for BUI removal).
21. Complete a wetland restoration project in the Menominee Housing/Rio Vista Slough
22. Enhance Strawberry Island and adjacent island by managing invasive species and improving native vegetation.
23. Improve hydrologic connection between South Channel, and Menekaunee Harbor.
24. Complete a wetland restoration in Menekaunee Harbor for improved fish recruitment.
25. Within 2 years of completing dredging of arsenic-contaminated sediments from the river, enhance and/or restore aquatic and riparian vegetation in the area between 6th street slip and USACE designated navigation channel including the area just upstream of Waupaca Foundry.
26. Treat select terrestrial invasive species within the River corridor.
27. Conduct a restoration project in the river channels adjacent to River Park Campground in Menominee.
28. Treat Eurasian water milfoil in the Lower Scott Flowage (consistent with actions taken by NAH through FERC).
29. Establish a monitoring program to evaluate fish passage efforts, upon project completion. The program could include larval assessments, fish counts, tagging, or other means of documenting the movements of fish within the system.
30. Repeat fish recruitment studies, mussel survey, bird survey, and aquatic vegetation survey after the restoration & protection projects have been completed and the target acreage for aquatic habitat sites has been achieved.

NEXT STEPS

Although some placeholders still exist in the objectives, a rough outline of the actions to carry this AOC towards removinging these two BUIs has been developed.

Step One

This step consists primarily of the analysis of existing and forthcoming data. TAC members and state agencies will be largely responsible for this step, although other partners may also assist. Additional funding for data analysis is not requested. This step should be completed during 2012.

- Significant contaminated sediment data is available with more data coming. How sediment remediation affects the overall Fish and Wildlife Plan will have to be determined regularly as new information comes forward.
- Analysis of the aquatic vegetation survey (2010) and riparian vegetation survey (2011) will be used to determine the acres and linear feet of habitat to protect and what natural areas are already protected or already composed of less than 33% undesirable species.
- The TAC has yet to determine what the restoration objective should be for bird populations. Surveying methodology and statistical significance problems remain hurdles. The TAC must decide weather to commit to a quantitative target for bird populations, as is presently the course, or pursue other options.
- CAC and TAC members must continue to support those involved with Fish Passage and Protection Plan. Activities will include submitting letters of support for the project and assisting with project outreach as requested. This will be a continuous activity until funding is secured for phase 3, passive downstream passage below the Upper and Lower Scott Dams.
- TAC members need to compile existing fisheries recruitment data for the applicable species, including mussels, in the AOC. Analysis of this data will allow the TAC to determine weather fish populations show evidence of recruitment, evidence of impaired recruitment, or if more information needs to be gathered to make a determination.

Step Two

Once existing data has been analyzed the second step will commence. The TAC will work with state and federal agencies and the CAC to begin implementing activities to meet objectives. If data gaps were identified as part of step one they will be addressed in step two. The CAC does not have a tax identification number and cannot apply for grant funding directly. It is expected that State agencies and local partners will apply for the funding that will be required to accomplish all necessary activities. The TAC believes that this step could be completed within two years of completing all contaminated sediment remediation projects, if not sooner. The CAC is presently restoring habitat and removing invasive species from a natural area (Strawberry Island) under the direction of the Federal Bureau of Land Management. This work may be used as in-kind match when applying for funding to complete additional habitat restoration activities. Activities 19-28, page 8, have been identified to meet restoration objectives.

Step Three

As activities are implemented the TAC will continuously measure progress towards meeting objectives. Funding need depends on the type and quantity of monitoring that is required to demonstrate progress. If all objectives have been met, except those associated with fish recruitment or populations, these BUI's will be considered in a state of recovery. Long term monitoring, activities 29-30, will be used to meet remaining objectives associated with fish recruitment or populations. Once an objective has been met, any remaining activities for it will no longer be pursued. Conversely, if all identified activities for an objective have been completed and monitoring shows that the objective is still not met, additional activities may be sought to meet that objective.

COORDINATION BETWEEN EXISTING PROGRAMS AND ACTIVITIES

North American Hydro Dam Relicensing

North American Hydro (NAH) is the owner/operator of two hydro electric dams within the AOC. Both Dams, Upper and Lower Scott, are scheduled for relicensing by the Federal Energy Regulatory Commission (FERC) in 2015. As part of a relicensing agreement, NAH will be funding assessments of the fisheries community, fish tissue contaminant burden, sediment contamination, native mussel community, riparian and aquatic vegetation, wetlands, archeological resources, endangered resources, erosion, and water quality. The FERC required studies will take place upstream of the AOC and in segments 1 and 2 (Figure B). These studies are in various states of progress, final reports are expected in the next 18 months.

Through the relicensing process, NAH is working with State and Federal Agencies to facilitate lake sturgeon passage upstream the Upper and Lower Scott Dams and downstream for all species. The Fish Passage Project will be implemented in four phases. Funding has been received through the Great Lakes Restoration Initiative (GLRI) and project partner contributions for phases one and two. The first phase will direct fish moving downstream through the Upper Scott Dam power canal into a chute and around the powerhouse. Until phase three is complete fish will be released into the tailrace below. Phase two will lift and sort lake sturgeon for passage from below the Lower Scott Dam (a.k.a.Menominee or Bridge Street Dam) to upstream of the Upper Scott Dam, a trip completed by truck transport. As the sturgeon are sorted, biologists will check for fish health and remove any invasive species like sea lamprey. The third phase expands phase one. Fish moving through the Upper Scott power canal will be directed into a chute carrying them downstream of the Lower Scott Dam. Phase four would create a nature-like fishway allowing fish to move themselves from phase one fish lift to above the Upper Scott Dam. This phase may not be implemented based on the cost of constructing such a channel.

Fish passage efforts will be protective of upstream fish and wildlife populations. It is expected that this fish passage will add an additional 21 miles of riverine habitat (Figure E). Riverine habitat is important for young sturgeon, who need time to grow before reaching Green Bay. Larger young sturgeon are less vulnerable to predation.

Seagull Bar State Natural Area

Seagull Bar State Natural Area was included in the AOC because of its significant habitat value to fish and wildlife. Seagull bar is presently managed by WDNR for wildlife habitat, including the federally endangered piping plover, and a dune swale ecosystem. Several activities proposed in this plan may overlap with management activities taking place on Seagull Bar. State agencies and the TAC will work with Seagull Bar managers to ensure a coordinated approach as activities are implemented.

ACTIVITIES NOT REQUIRED FOR BUI REMOVAL

Green Island

Green Island is an approximately 80 acre privately owned island located 5 miles east of Seagull Bar State Natural Area (Figure D). Green Island was identified as critical wildlife habitat in the 1990 RAP, and included within the boundaries of the AOC for that reason. The CAC and TAC support acquisition of the Island for conservation purposes. Acquisition of the Island, or other conservation easements, are not required to achieve the removal of any impairment to the AOC. At this time, a plan to fully develop the Island as vacation housing and a resort has been proposed by the Islands owner.

Fish Passage and Protection Plan, Phase Four

Completion of this phase is not required for BUI removal. The volume of sturgeon being passed upstream is expected to be small enough that trucking should be adequate for the foreseeable future. Costs for constructing the nature-like fishway are considerable, and before any construction is possible support from riparian landowners would be necessary. In addition, trucking fish above the Upper Scott Dam is guaranteed safe passage, whereas fish may refuse to use a fish-way for many reasons.

Fish Passage at Upstream Dams

The Fish Passage and Protection Plan's goal is to provide safe fish passage between lake Michigan and Sturgeon Falls. To accomplish this, passage is required at the Lower Scott, Upper Scott, Grand Rapids, White Rapids, and Chalk Hills Dams (figure E). Each dam that is opened for passage provides additional river miles and habitat for sturgeon, positively impacting sturgeon populations. River miles and habitat made available to Lake Michigan sturgeon by providing passage at the Lower and Upper Scott Dams is required to remove the "degradation of fish and wildlife populations" and the "loss of fish and wildlife habitat" BUIs. Both the TAC and CAC strongly support safe fish passage at the remaining dams, but it is not required to remove beneficial use impairments.

REFERENCES

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Michigan Department of Natural Resources and the Environment, June 2007. DRAFT *Supporting Guidance for Local Restoration Criteria Development: Loss of Fish and Wildlife Habitat and Degradation of Fish and Wildlife.*

Wisconsin Department of Natural Resources and Michigan Department of Natural Resources, September 1990. *The Lower Menominee River Remedial Action Plan: Stage One Report.* PUBL WR-246 90.

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GOALS, OBJECTIVES, AND ACTIVITIES TABLE

GOALS				
Long-term protection is in place for natural areas[1] and wetlands within the AOC, including Seagull Bar and riverine islands	Nesting populations of a diverse array of wetland-dependent and riparian-associated birds are consistently present within the AOC.	Enhanced lake sturgeon population	Diverse & functional native fish and mussel assemblages in the AOC that sustain natural recruitment.	Restore a healthy and diverse native vegetation community
APPLICABLE AOC SEGMENTS				
1-6 and 7-8	(needs more investigating)	All	Designate appropriate segments for each species	Specify based on natural areas delineation and prioritization
OBJECTIVES				
XX acres of natural areas within reaches 1-6 and XX linear feet within reaches 7-8 are protected.	At least five nesting pair of birds per acre representing at least 10 different species from the Lower Menominee River AOC Bird List (to be developed) is found within segments XXX (to be determined) of the AOC.	Provide access to approximately 21 river miles to the Lake Michigan sturgeon population (version 1.1 of the Fish Passage and Protection Plan, October 29, 2009).	There is evidence of recruitment within the AOC below the Lower Scott Dam for the following fish species: walleye, yellow perch, muskellunge, whitefish, smallmouth bass, largemouth bass, and northern pike.	Invasive species comprise no more than 33% of the vegetation community in protected natural areas of the AOC.
		Provide safe downstream passage beyond AOC segment 1 to sturgeon (version 1.1 of the Fish Passage and Protection Plan, October 29, 2009).	There is evidence of recruitment in segment 1 for the following fish species: walleye, yellow perch, smallmouth bass, largemouth bass, and northern pike.	
			There is evidence of recruitment within the AOC for native mussel species.	

AOC Segments:

1: Lower Scott Flowage
2: Lower Scott Dam to western edge of the Tyco property
3: Maintained shipping channel
4: Maintained shipping channel/breakwater
5: Adjacent to Tyco property; includes USACE-designated turning basin
6: South Channel and Menekaunee Harbor
7: Green Bay shoreline - Michigan
8: Green Bay shoreline - Wisconsin

[1] A "natural area" is an area that currently has value as fish and wildlife habitat or has the potential to be restored so that it has value as fish and wildlife habitat. Natural areas can be publically or privately held, and can include wetlands or riparian lands within the AOC. Natural areas are not necessarily formally designated State Natural Areas.

	Conducted By	Completed	Tracking Number		GOALS				
					Long-term protection is in place for natural areas[1] and wetlands within the AOC, including Seagull Bar and riverine islands	Nesting populations of a diverse array of wetland-dependent and riparian-associated birds are consistently present within the AOC.	Enhanced lake sturgeon population	Diverse & functional native fish and mussel assemblages in the AOC that sustain natural recruitment.	A healthy and diverse native vegetation community
				ACTIVITIES TO MEET RESTORATION GOALS					
Inventory & Analysis	NES ECOLOGICAL	2012	1	Inventory, map, and ground-truth lands within the AOC: wetlands, islands, natural areas and riparian zones; include information about ownership and protection status for these lands.	X				X
	Fisheries TAC members	2011	2	Compile historical monitoring data to establish trends and assess fishery status. Also, assess the potential for existing fisheries programs to provide the needed data regarding fish assemblage and recruitment within the AOC.				X	
	TAC	2012	3	Analyze the results of the 2010 aquatic vegetation survey and 2011 riparian vegetation survey. Identify areas for habitat improvement projects.	X				X
	TAC/ NES Eco	2012	4	Identify existing mechanisms in place for wetlands & riparian protection, identify possible gaps, and identify ways to fill the gaps.	X				
	MDEQ	2012	5	Analyze results of the 2011 semi-permeable membrane device (SPMD) study and assess implications of the study for the habitat plan.		X	X	X	
	TAC	2012	6	Review results from Ansul's 2010 sediment characterization project and assess the implications of the study for the habitat plan.		X	X	X	
	TAC, WDNR, MDNR	2012	7	Assess the AOC to determine where there are lands that can be protected. Use the assessment to refine habitat plan as appropriate. Use existing tools such as conservation easements, local (city and county) ordinances, conservation programs, state and federal regulations and acquisition to achieve natural areas protection goal.	X				
	TAC	2012	8	Review results from 2011 riparian vegetation survey to identify natural areas along the lakeshore.	X	X			X

	Conducted By	Completed	Tracking Number		GOALS				
					Long-term protection is in place for natural areas[1] and wetlands within the AOC, including Seagull Bar and riverine islands	Nesting populations of a diverse array of wetland-dependent and riparian-associated birds are consistently present within the AOC.	Enhanced lake sturgeon population	Diverse & functional native fish and mussel assemblages in the AOC that sustain natural recruitment.	A healthy and diverse native vegetation community
				ACTIVITIES TO MEET RESTORATION GOALS					
Field Studies	TAC/CAC	2013	9	Conduct an enhanced bird study (beyond the Presence/Absence survey of 2010), possibly using Marsh Monitoring protocol and engaging volunteers. Use survey results to develop a bird list for the AOC.		X			
	ONTERRA	2010	10	Conduct an aquatic vegetation survey.	X				X
	NES ECOLOGICAL	2011	11	Conduct a riparian vegetation survey.					X
	GLNPO/ NAH	2012	12	Characterize Menominee Dam Flowage sediments and assess the implications of the study for the habitat plan.		X	X	X	
	GLNPO	2010	13	Characterize Menekaunee Harbor sediments and assess results for F&W implications.		X	X	X	
	ANSUL	2010	14	Characterize South Channel sediments and assess results for F&W implications.		X	X	X	
	WDNR/ FERC	2012	15	Conduct a mussel survey in the following areas: Park Mill Flowage, Menominee Flowage, and Segment 6A. Surveys will assess hydro dam impacts as well as serve as a baseline for evaluating subsequent sediment remediation & habitat enhancement efforts.				X	
	WDNR/ MDNR	2012	16	Complete a Menominee Flowage fish survey and compare assemblages to Park Mill Flowage to determine the status of the fishery. Develop and carry out recommendations for improving the Menominee Flowage fishery if warranted by survey data.				X	
	WDNR/ MDNR	2013	17	If existing efforts are not sufficient to understand recruitment, conduct recruitment studies below the Menominee Dam. If warranted by the studies, develop and carry out recommendations for enhancing recruitment within the AOC for selected species.			X	X	
	WDNR/ MDNR	2012	18	Seagull Bar- Identify whether fish currently access the pocket and determine what actions would be needed to enhance access if necessary.				X	

	Conducted By	Completed	Tracking Number		GOALS				
					Long-term protection is in place for natural areas[1] and wetlands within the AOC, including Seagull Bar and riverine islands	Nesting populations of a diverse array of wetland-dependent and riparian-associated birds are consistently present within the AOC.	Enhanced lake sturgeon population	Diverse & functional native fish and mussel assemblages in the AOC that sustain natural recruitment.	A healthy and diverse native vegetation community
				ACTIVITIES TO MEET RESTORATION GOALS					
Habitat Restoration and Protection Projects[2]	NAH		19	Complete the first three (of four) phases of the fish passage and protection plan: 1) Downstream passage around the Park Mill Dam; 2) Fish lift and research facility construction at the Menominee Dam; and 3) downstream passage around the Menominee Dam.			X		
	NAH		20	Complete phase four of the fish passage and protection plan, upstream passage around the Park Mill Dam. (not required to for delisting).			X		
	MDEQ	2015	21	Complete a wetland restoration project in the Menominee Housing/Rio Vista Slough				X	X
	BLM	2012	22	Enhance Strawberry Island and adjacent island by managing invasive species and improving native vegetation.		X		X	X
	WDNR	2015	23	Improve hydrologic connection between South Channel, and Menekaunee Harbor.				X	
	WDNR	2015	24	Complete a wetland restoration in Menekaunee Harbor for improved fish recruitment.	X			X	X
	WDNR		25	Within 2 years of completing dredging of arsenic-contaminated sediments from the river, enhance and/or restore aquatic and riparian vegetation in the area between 6th street slip and USACE designated navigation channel including the area just upstream of Waupaca Foundry.	X			X	X
	WDNR/MDNR	2015	26	Treat select terrestrial invasive species within the River corridor.					X
	MDNR	2015	27	Conduct a restoration project in the river channels adjacent to River Park Campground in Menominee.				X	X
	NAH		28	Treat Eurasian water milfoil in the Lower Scott Flowage (consistent with actions taken by NAH through FERC).				X	X

	Conducted By	Completed	Tracking Number		GOALS				
					Long-term protection is in place for natural areas[1] and wetlands within the AOC, including Seagull Bar and riverine islands	Nesting populations of a diverse array of wetland-dependent and riparian-associated birds are consistently present within the AOC.	Enhanced lake sturgeon population	Diverse & functional native fish and mussel assemblages in the AOC that sustain natural recruitment.	A healthy and diverse native vegetation community
				ACTIVITIES TO MEET RESTORATION GOALS					
Monitoring	USFWS		29	Establish a monitoring program to evaluate fish passage efforts, upon project completion. The program could include larval assessments, fish counts, tagging, or other means of documenting the movements of fish within the system.			X		
	WDNR/ MDNR		30	Repeat fish recruitment studies, mussel survey, bird survey, and aquatic vegetation survey after the restoration & protection projects have been completed and the target acreage for aquatic habitat sites has been achieved.		X	X	X	X

1 A "natural area" is an area that currently has value as fish and wildlife habitat or has the potential to be restored so that it has value as fish and wildlife habitat. Natural areas can be publically or privately

2 Additional Habitat Restoration and Protection Projects may be identified once the activities in the Inventory &Analysis, Field Studies, and Planning categories have been accomplished.

TAC- Technical Advisory Committee, MDEQ- Michigan Department of Environmental Quality, WDNR- Wisconsin Department of Natural Resources, MDNR- Michigan Department of Natural Resources, NAH- North American Hydro, GLNPO- Great Lakes National Program Office, BLM- Bureau of Land Management, USFWS- United States Fish and Wildlife Service, and CAC Members

APPENDIX B

Arsenic

In September of 2009 Ansul signed an Administrative Order on Consent with the U.S. EPA and WDNR to (EPA, 2007):

- Construct and maintain an impermeable below-ground barrier wall to control the flow of groundwater to the maximum extent practicable.
- Cap surface soils on-site with arsenic concentrations equal to or above 32 ppm.
- Remove surface soils near the railroads tracks with arsenic concentrations equal to or above 16 ppm (see SOB figure2).
- Collect and treat shallow ground water onsite. Utilize hybrid poplar trees to further suppress the water table. Conduct a technical review of the latest science for treating groundwater containing large quantities of arsenic every five years.
- Remove and properly dispose of all Menominee River sediments with arsenic concentrations equal to or greater than 50 ppm (figure 2, segments 5 and 6a).
- Monitoring remaining sediments natural recovery to a value or 20 ppm or less over a period of ten years after the completion of dredging.

Prior to the signing of the Order on Consent in 2009, Ansul undertook other significant remedial efforts. During the 1970s arsenic salt storage piles were removed from the site and disposed of in a hazardous waste landfill (RAP, 1990). In the 1970s and 80s, arsenic contaminated groundwater was pumped from the site and treated. A ground water interception trench was installed at the southern edge of the property to capture additional contaminated groundwater at this time. An earlier Order on Consent, signed by parties in 1990, required the investigation of surface soils onsite. The 8th street slip, the most highly contaminated area on-site, was contained and remediated from 1997 to 1999.

Since the 2009 Administrative Order on Consent additional remedial efforts have taken place:

- Surface soil capping and removal was completed in 2009. Soils with arsenic concentrations equal to or above 32 ppm have been covered with a cap protective of human health. Soils in the rail road track
- Construction of an impermeable below-ground barrier wall was completed in 2010.
- A shallow groundwater collection system was installed in 2010. Hybrid poplar trees are utilized to augment groundwater pumping.
- A Sediment Removal Work Plan to remediate sediment contaminated with 50 ppm arsenic or more was approved with conditions by EPA in 2011.

APPENDIX C

Coal Tar

During the construction of the Marinette Waste Water Treatment Plant expansion in 1989, soils contaminated with coal tar, polycyclic aromatic hydrocarbons (PAHs), were discovered (RAP, 1990). Site investigations from 1994 to 2002 have discovered approximately 4 acres of contaminated soil, and 1.3 acres of contaminated sediment in the nearby Menominee River. The source was determined to be a coal gasification plant which operated prior to 1960. Wisconsin Public Service Corporation (WPSC) was found to be responsible for the remediation of contaminated soils and sediments. It's believed that a significant portion of soil contamination was removed and properly disposed of during plant construction. Limited contaminated soil removal also took place in 2004 during a City of Marinette sewer system modification. WDNR has conditionally approved a sediment removal work plan, but in 2006, WPSC choose to pursue the EPA Superfund Alternatives program and the work plan has not been implemented. The Superfund Alternatives program allows WPSC to concurrently pursue site investigation and remedy development at six former coal gasification plants throughout Wisconsin. Soil and sediment investigations continue, as well as annual groundwater monitoring.

Appendix D

Technical Advisory Committee (TAC) Members

Organization	Representing	Individual
USFWS: Fisheries	Agency - Federal	Nick Utrup
USFWS: Habitat/NRDA	Agency - Federal	Betsy Galbraith
USACE	Agency - Federal	Martin Kuhn
USEPA	Agency - Federal	John Perrecone
Bureau of Land Management	Agency - Federal	Derek Strohl
Marinette County: LWCD	Agency - Local	Greg Cleereman
Bay-Lake Regional Planning Commission	Agency - regional	Angela Pierce
MDNR: Fisheries	Agency - State	Jessica Mistak
MDNR: Fisheries	Agency - State	Nick Legler
MDNR: Wildlife	Agency - State	Craig Albright
MDEQ: Aquatic Biologist	Agency - State	Sharon Baker
WDNR: Fisheries	Agency - State	Mike Donofrio,
WDNR: Fisheries	Agency - State	Tammie Paoli
WDNR: Wildlife	Agency - State	John Huff
WDNR: Aquatic Biologist	Agency - State	Greg Sevener
WDNR: Area of Concern	Agency - State	Rick Stoll
WDNR: Area of Concern	Agency - State	Benjamin Uvaas
Lower Menominee CAC	CAC	Mark Erickson
Lower Menominee CAC	CAC	Steve Zander
Stantec	Consulting Firm	Jon Gumtow
CH2M Hill	Consulting Firm	Jeff Danko
UP Architects & Engineers	Consulting Firm	Lee Bunting
Chappee Rapids Audubon	Env Group/Cons Club	Trygve Rhude
Great Lakes Sport Fishermen/ CAC	Env Group/Cons Club	Gail Clark
SFK Pulp Recycling/ CAC	Industry	John Groleau
North American Hydro	Industry	Rick Loeffler
UW-Marinette	University	Keith West

Citizens Advisory Committee Members

Citizens Advisory Committee Members

Education Community (2)	Keith West	
Environmental Interests (4)	Trygve Rhude	Steve Zander*
Local Business and Industry (6)	Nancy Douglas	Mark Erickson*
	John Groleau	
Local Government (6)		
Local Residents (2)		
Recreational Users (4)	John Clark	Gail Clark
	John Kukuk	
Tyco International (1)		
Integrys Energy Services Inc. (1)		

* Indicates Co-Chair

Appendix E:
Letter of Support

LOWER MENOMINEE RIVER
CITIZEN'S ADVISORY COMMITTEE

Michigan Department of Environmental Quality
Office of the Great Lakes
Richard Hobrla, AOC Program Manager
Constitution Hall 6 Floor, South Tower
525 West Allegan Street
Lansing, Michigan 48909-7973

Wisconsin Department of Natural Resources
Office of the Great Lakes
Kendra Axness, LaMP and AOC Coordinator
PO Box 7921
101 S Webster Street
Madison, WI 53703-7921

Dear Mr. Hobrla and Mrs. Axness,

The Lower Menominee River Citizens Advisory Committee (CAC) supports the Draft Fish and Wildlife Population and Habitat Management and Restoration Plan for the Lower Menominee River Area of Concern (Plan) (AOC) and requests your review and concurrence. The Plan was prepared by the Michigan Department of Environmental Quality (MDEQ) and Wisconsin Department of Natural Resources Lower (WDNR) in cooperation with the Lower Menominee River CAC Technical Committee. The Plan provides state and federal agencies local perspective into the development of the Degraded Fish and Wildlife Populations and Loss of Fish and Wildlife Beneficial Use Impairments in the Lower Menominee AOC BUIs. The Technical Committee is comprised of CAC members and representatives from state and federal agencies. We realize that this Plan will be the primary document used to track and document progress on these BUIs and we understand that this Plan provides the path to BUI restoration, assessment, and eventual BUI removal.

The format of the document consists of two parts. The first part is an overview of the Fish and Wildlife Population and Habitat BUIs that is intended to be very concise and fairly static, with only infrequent updates. This part references all the documents relevant to the AOC history, including past RAPs where those who are interested can go for more comprehensive information. The Goals, Objectives, Action Table (GOAT) is the second part of the document and is meant to provide an easy reference guide to ongoing and future remedial activities. The GOAT identifies: targeted start and end dates, funding sources, the project lead for each, etc. The tracking matrix is intended to be fairly dynamic, frequently changing with continuous updates as progress is made or additional issues identified.

If you have any questions please contact Mark Erickson Michigan CAC Co-chair (906-863-1954), Steve Zander Wisconsin CAC Co-chair (715-923-7776), or Sharon Baker Michigan AOC Coordinator (517-335-3310, or Ben Uvaas Wisconsin AOC Coordinator (920-662-5465).

Sincerely,

Mark Erickson, Michigan Co-chair

Steve Zander, Wisconsin Co-chair

C.C. Stephen Galarneau, WDNR
Victor Pappas, WDNR