# QUALITY ASSURANCE PROJECT PLAN

## Sheboygan AOC Pathway to Delisting Habitat BUI's—Survey and Assessment

Prepared for:

**U.S. Environmental Protection Agency GLNPO**
**17G**
**77 West Jackson Boulevard Review**
**Chicago, IL 60604**

**Grantee: United States Environmental Protection Agency (US EPA)**
**Funding Opportunity Number: EPA-R5-GL2010-1**
**Focus area: Toxic Substances and Areas of Concern**
**Program: Coordinated Implementation of Remedial Action Plan Programs and Processes**

**Project Proposal Number: EPAGLNPO-2010-TX-1-807-421**

Prepared by:

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July 20th, 2011

## PART A – OVERALL PROJECT MANAGEMENT

### A.1 Title of Plan and Approval

**Quality Assurance Project Plan**
**Sheboygan AOC Pathway to Delisting Habitat BUI's—Survey and Assessment**

**Prepared by:**
**Laurel L. Last**
**Wisconsin Department of Natural Resources**

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Donalea Dinsmore, Great Lakes Funding and Quality Assurance Coordinator, WDNR

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Note: Interim approvals granted for field work granted as chapters completed to meet schedule constraints.

* Approval is subject to QA follow-up on outstanding details discussed during pre sampling review with GLRI QA coordinator for WDNR Mark Dinsmore. LJB 11/15/11

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## A.4 Project/Task Organization

**Table 1. Roles & Responsibilities for Entire Project.**

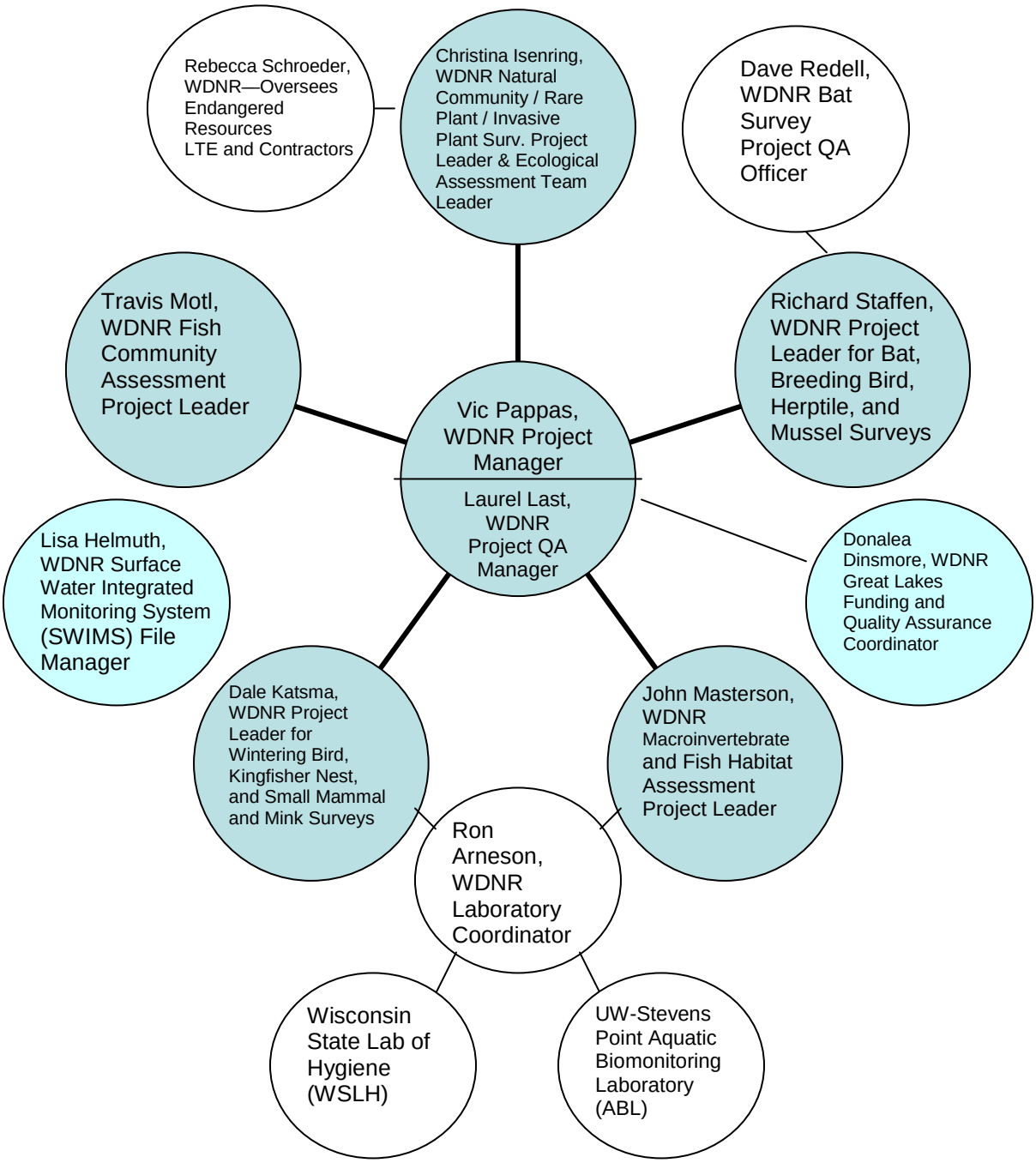
| Individual(s) Assigned | Responsible for: |
|---|---|
| Jennifer Conner, EPA Project Officer | • Review project information and reporting in Great Lakes Accountability System (GLAS)<br>• Assist the Project Manager in defining milestones for the project |
| Donalea Dinsmore, WDNR Great Lakes Funding and Quality Assurance Coordinator | • Approve QAPP<br>• Ensure that the approved QAPP is uploaded into SWIMS database<br>• Project reporting on Great Lakes Accountability System (GLAS) |
| Vic Pappas, WDNR Sheboygan Basin Supervisor, Project Manager | • Overall project management<br>• Monitors study progress<br>• Ensures project completion |
| Laurel Last, WDNR Water Resources Management Specialist, Project QA Manager | • QAPP preparation & distribution<br>• Overall project QA/QC<br>• Ensures QAPP is followed<br>• Project reporting in SWIMS database |
| *WDNR Ecological Assessment Team* | • Perform historical data / literature review for segments not covered by individual survey reports<br>• Receive and review data and reports from field surveys<br>• Complete Ecological Assessment (project final report) |
| WDNR Ecological Assessment Contractors | • Assist the Ecological Assessment Team in data review and report preparation |
| Travis Motl, WDNR Fisheries Biologist, Fish Community Assessment Project Leader | • Fish community assessment project leader and QA officer<br>• Management, data collection, analysis, and reporting for fish community assessments<br>• Ensure that property owners are contacted for access before fish surveys are conducted<br>• *Ecological Assessment Team member* |
| Susan Beyler, WDNR Regional Inland Fisheries Supervisor | • Hire and supervise Fisheries Biologist and LTEs |
| Brad Eggold, WDNR Southern Lake Michigan Fisheries Supervisor | • Assist with planning for fish community assessments |
| Fisheries LTEs | • Conduct fish community assessments<br>• Enter fish assessment data into WDNR/USGS Fish and Habitat Database |
| John Masterson, WDNR Water Resources Specialist, Macroinvertebrate and Fish Habitat Assessment Project Leader | • Macroinvertebrate and fish habitat assessment project leader and QA officer<br>• Data collection, analysis, and reporting for macroinvertebrate and fish habitat assessments<br>• Hire and supervise Watershed LTE<br>• Ensure that property owners are contacted for access before macroinvertebrate and fish habitat |

| | |
|---|---|
| | surveys are conducted<br>• *Ecological Assessment Team member* |
| Matt Steiger, Watershed LTE | • Conduct macroinvertebrate and fish habitat assessments |
| UW-Stevens Point Aquatic Biomonitoring Laboratory (ABL) | • Analyze all samples for macroinvertebrate assessment<br>• Enter data into DNRBUG program |
| Stanley Szczytko, US-SP ABL Principal Investigator | • Review ABL QA reports<br>• Prepare final report of macroinvertebrate results |
| Jeffrey Dimick, US-SP ABL Laboratory Supervisor | • Supervise and train ABL personnel<br>• Prepare ABL QA reports<br>• Maintain ABL inventory and equipment |
| Lisa Helmuth, WDNR Surface Water Integrated Monitoring System (SWIMS) File Manager | • Ensure that macroinvertebrate data from ABL is uploaded into SWIMS<br>• Manage SWIMS database, which will include approved QAPP, macroinvertebrate data, and project reports |
| Richard Staffen, WDNR Assistant Zoologist, WDNR Project Leader for Bat, Breeding Bird, Herptile, and Mussel Surveys | • Bat survey project leader<br>• Breeding bird survey project leader and QA officer<br>• Herptile survey project leader and QA officer<br>• Mussel survey project leader and QA officer<br>• Oversee data collection, analysis, and reporting for these surveys<br>• *Ecological Assessment Team member* |
| Bill Smith, WDNR Heritage Zoologist | • Data verification of breeding bird survey<br>• Herptile data and photo voucher review<br>• Mussel survey data and photo voucher review<br>• Oversight of breeding bird survey contractor<br>• Oversight of herptile contractor<br>• Oversight of mussel contractor |
| Dave Redell, WDNR Bat Ecologist | • Bat survey project QA officer<br>• Analyze bat survey data<br>• Prepare a final report of bat inventory results |
| Owen Boyle, WDNR Regional Ecologist | • Conduct mobile acoustical bat surveys |
| Lisie Kitchel, WDNR mussel biologist | • Mussel photo voucher review |
| Breeding Bird Survey Contractor | • Conduct breeding bird surveys<br>• Contact property owners before surveys are conducted<br>• Complete and submit breeding bird survey data sheets<br>• Prepare a final report of breeding bird survey results |
| Herptile Survey Contractor | • Conduct herptile surveys<br>• Contact property owners before surveys are conducted<br>• Complete historical data / literature review of herptiles in study area<br>• Prepare a final report of herptile survey results |
| Mussel Survey Contractor | • Conduct mussel surveys<br>• Contact property owners before surveys are |

| | |
|---|---|
| | conducted<br>• Complete historical data / literature review of mussels in study area<br>• Prepare a final report of mussel survey results |
| Christina Isenring, WDNR Heritage Ecologist, Natural Community / Rare Plant / Invasive Plant Survey Project Leader and Ecological Assessment Team Leader | • Natural community / rare plant / invasive plant survey project leader and QA officer<br>• Oversee data collection, analysis, and reporting for natural community / plant assessments<br>• Project Liaison who would coordinate distribution of NHI data when requested<br>• *Ecological Assessment Team Leader* |
| Rebecca Schroeder, WDNR Ecosystem & Diversity Conservation Section Chief | • Supervise Endangered Resources (plant / natural community) LTE<br>• Hire and oversee Endangered Resources (ecological assessment) contractors |
| Craig Anderson, WDNR Heritage Botanist | • Plant / natural community voucher review<br>• Keep list of plant /natural community vouchers |
| Andy Clark, WDNR Endangered Resources LTE | • Conduct natural community / rare plant / invasive plant surveys<br>• Complete and submit natural community and plant data sheets and report<br>• Submit plant / natural community vouchers to State Herbarium after review |
| Wisconsin State Herbarium (UW-Madison) | • Receive vouchers of plants / natural communities |
| WDNR NHI staff | • Enter rare species and high-quality natural community locations into the NHI database |
| Dale Katsma, WDNR Wildlife Supervisor, Project Leader for Wintering Bird, Kingfisher Nest, and Small Mammal and Mink Surveys | • Wintering bird survey project leader and QA officer<br>• Kingfisher nest survey project leader and QA officer<br>• Small mammal and mink survey project leader and QA officer<br>• Management, data collection, analysis, and reporting for these surveys<br>• Hire and supervise Wildlife LTE<br>• Ensure that property owners are contacted for access before these surveys are conducted<br>• *Ecological Assessment Team member* |
| Missy Sparrow-Lien, WDNR Wildlife Biologist, Assistant Project Leader for Wintering Bird, Kingfisher Nest, Small Mammal, and Mink Surveys | • Assist Project Leader in management, data collection, analysis, and reporting for these surveys |
| Dustin Miller, Wildlife LTE | • Perform wintering bird surveys and assist with data analysis and reporting<br>• Assist with kingfisher nest survey data collection, analysis, and reporting<br>• Assist with small mammal and mink survey data collection, analysis, and reporting |
| Ron Arneson, WDNR Laboratory Coordinator | • Liaison between WDNR and project laboratories<br>• Procure services with project laboratories |
| Wisconsin State Lab of Hygiene | • Perform PCB, PBDE, organochlorine pesticides, |

| | |
|---|---|
| (WSLH) | perfluorinated compounds, and metals analyses on small mammals and mink |
| Miel Barman, WSLH QA Manager | • QA/QC activities and reporting at WSLH |

**Figure 1. Project Organization Chart**



## A.5 Problem Definition/Background

The lower Sheboygan River and Harbor were designated a Great Lakes Area of Concern (AOC) in 1985. This AOC encompasses the lower river downstream from the Sheboygan Falls Dam including the entire harbor and nearshore Lake Michigan. A Great Lakes AOC is an area where water-quality problems affect the use of the waterway such that it needs priority attention. The lower Sheboygan River and Harbor make up one of 43 AOCs that were identified in the Great Lakes Basin by the International Joint Commission.

In the Sheboygan River, high levels of nutrients, solids, and toxic chemicals entering the river had caused a series of problems including nuisance algal blooms, fish consumption advisories, and contaminated sediments. The pollution of the river was also suspected of contributing to the degradation of animal and plant populations and the reduction in fish and wildlife habitat. Nine Beneficial Use Impairments (BUIs) were identified for the Sheboygan River and Harbor AOC:

- restrictions on fish and wildlife consumption
- degradation of fish and wildlife populations
- fish tumors and other deformities
- bird or animal deformities or reproductive problems
- degradation of benthos
- restrictions on dredging activities
- eutrophication or undesirable algae
- degradation of phytoplankton and zooplankton populations
- loss of fish and wildlife habitat

The end goal is for all of the Great Lakes Areas of Concern to be restored and protected so that they can be “delisted,” or removed from the list of AOCs. In order to do this, a Remedial Action Plan (RAP) must be developed and implemented. It must be shown that all of the BUIs have been addressed and the beneficial uses therefore restored. Goals or targets must be set and then met for each of the BUIs so that the AOC can be considered cleaned up.

The initial Sheboygan River and Harbor RAP was prepared in 1989, and an update was prepared in 1994 and published in 1995. Both plans were cooperative efforts between the Wisconsin Department of Natural Resources (WDNR) and other stakeholders, including other agencies, researchers, and the citizens of the Sheboygan area. The plans analyzed the problems, presented general goals and objectives, and recommended activities to help us reach those goals and restore and protect the Sheboygan River and Harbor.

Although a RAP is very helpful in working toward delisting, it only gets us partway there. A delisting target needs to be set for each beneficial use so that we can judge when it has been restored. In this way, delisting targets can provide a defined endpoint for “how clean is clean” that will support and sustain restoration efforts in the AOC. To this end, in 2008, another collaborative effort resulted in the Delisting Targets for the Sheboygan Area of Concern Final

Report.

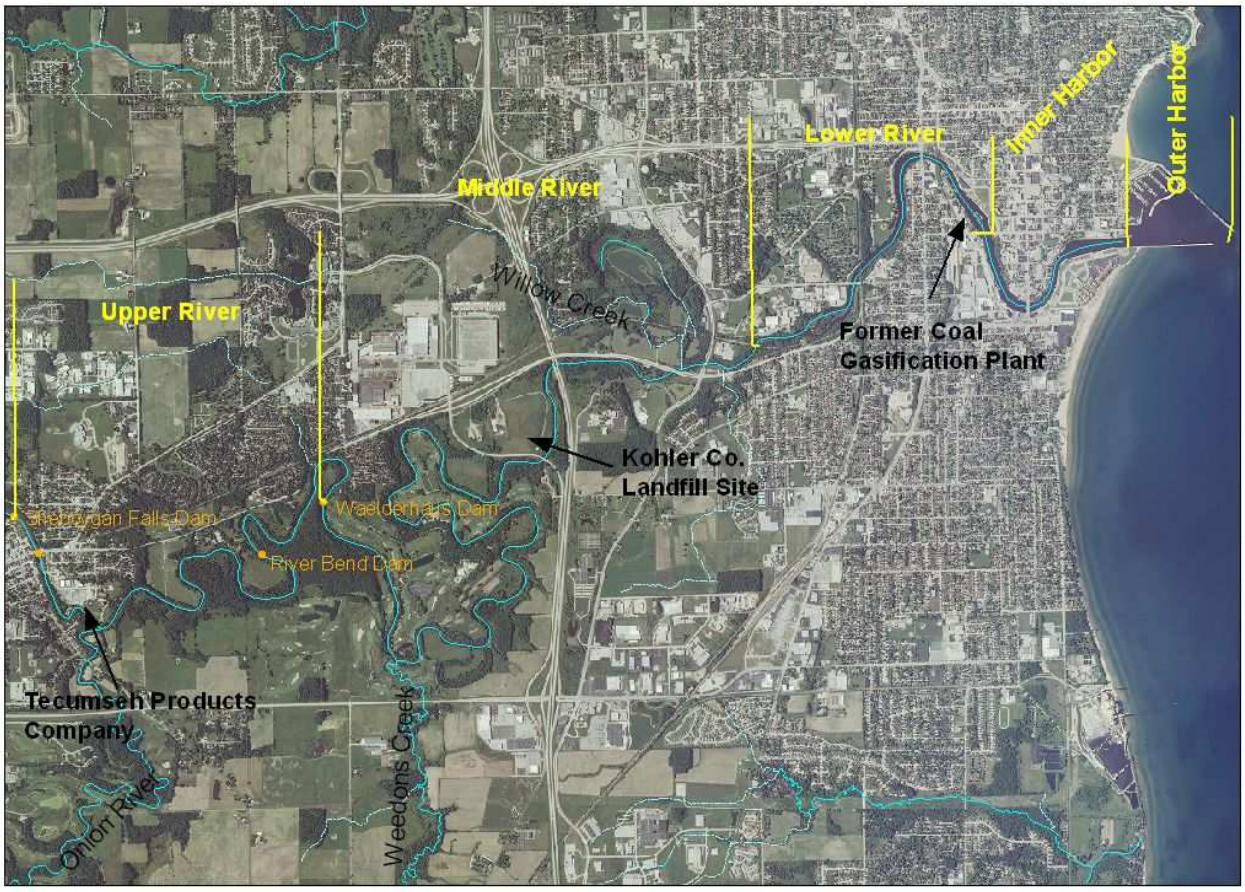
In this Delisting Targets Report, the targets set for two of the BUIs—"degradation of fish and wildlife populations" and "loss of fish and wildlife habitat"—included the development and implementation of a local fish and wildlife habitat management and restoration / rehabilitation plan. In 2009, a Fish and Wildlife Habitat Committee was formed in order to decide on an approach and process to establish this plan. After some discussion, the committee decided that the next step should be to complete an Ecological Assessment—a thorough review of historical and current fish and wildlife population and habitat (ecological) data along with targeted field surveys to fill data gaps. The information gathered by this Assessment could then be used to inform and support the development of the plan, along with delisting strategies for the two fish and wildlife BUIs.

The purpose of this project is to complete a fish and wildlife Ecological Assessment of the Sheboygan River AOC and its riparian corridor, plus primary tributaries that provide fish habitat contiguous to the AOC. The Final Project Report / Ecological Assessment Report will describe and analyze historical and current fish and wildlife population and habitat data, as well as the results of new field surveys. This work will be done in collaboration with the Sheboygan River AOC Fish & Wildlife Technical Advisory Committee (F&W TAC), a sub-committee of the Sheboygan River Basin Partnership's (SRBP) Sheboygan River AOC Citizen Advisory Committee.

The Assessment is a necessary step toward the delisting of the "degradation of fish and wildlife populations" and "loss of fish and wildlife habitat" BUIs for this AOC. The data gathered and synthesized for this project will inform and support the development of an AOC fish and wildlife habitat management and restoration plan and specific delisting strategies for the two fish and wildlife BUIs.

Note that the lower Sheboygan River is also a Superfund site due to sediment contamination. The Sheboygan River and Harbor Superfund Site includes the lower 14 miles of the river and the inner harbor, but not the outer harbor. The reach has been divided into four sections, the Upper River, Middle River, Lower River, and Inner Harbor, for purposes of remediation (see Figure 2). The former Tecumseh Product Co. plant in Sheboygan Falls is considered the primary source of polychlorinated biphenyl (PCB) contamination in river sediment. Soil and surface water is also contaminated with PCBs and heavy metals including arsenic, chromium, copper, lead and zinc. The sediment in the Upper River has now been remediated. A final design for the cleanup plan for the rest of the site was approved in November 2010. It calls for dredging contaminated sediment in the Lower River and Inner Harbor areas and close monitoring in the Middle River segment. Dredging is anticipated to be completed by the end of 2011. There are also contaminated floodplain areas that are slated for remediation—EPA is in the process of negotiating with the adjacent property owner for access. More information can be found at the EPA's Sheboygan River and Harbor Superfund Site website: http://www.epa.gov/region5/sites/sheboygan.

Figure 2. Overview of the Sheboygan River and Harbor Area of Concern, showing Superfund Site segments.




## A.6 Project/Task Description

This project is intended to support the development of delisting strategies and a fish and wildlife habitat management and restoration plan to address the "fish and wildlife population" and "fish and wildlife habitat" beneficial use impairments (BUIs) for the Sheboygan River and Harbor Area of Concern (AOC). This project includes a Rapid Ecological Assessment using historical and current data, as well as conducting new field surveys, as needed, to fill data gaps or update data needed for the Assessment.

The final project report will be the Ecological Assessment Report, which will be completed by the Ecological Assessment Team (see italics in Table 1). This report will incorporate the data and results from the new targeted field surveys and a review of existing historical and current data. It will provide research results on the pre-European settlement habitat and species in order to understand the magnitude of changes and the range of improvement possibilities. It will present results of the biological inventory within the study area and information gathered through the Assessment process and compare it to historical conditions. It will articulate the

specific impairments to fish and wildlife populations and habitats and their causes. The report will present the important or unique features that need to be preserved. It will provide maps of the AOC and each potential restoration or protection site, evaluating site conditions and needs, as determined by the Ecological Assessment Team. The methodology for the Ecological Assessment will be the same as that used by the WDNR's Bureau of Endangered Resources for Rapid Ecological Assessments conducted for property master planning.

This project includes many different targeted field survey segments. These segments include the following:

- Fish community assessment
- Fish habitat assessment
- Macroinvertebrate assessment
- Herptile survey
- Breeding bird survey
- Natural community / rare plant / invasive plant survey
- Bat survey
- Mussel survey
- Wintering bird survey
- Kingfisher nest survey
- Small mammal and mink survey (contaminants)

These segments of the study will be described in detail in Part B of this QAPP. Most segments will be managed and performed separately and by different sets of people. There will be some overlap, such as that between the fish community, fish habitat, and macroinvertebrate assessments, which will be done at many of the same sites. Some of the segments—the macroinvertebrate, kingfisher nest, and small mammal surveys—will require the collection of samples for further analysis. The other segments will not require any samples, other than vouchers in some cases to confirm species identifications. All of the surveys will result in physical and biological data and a final report that will be submitted to the Ecological Assessment Team for incorporation into the Ecological Assessment Report.

Besides being included in the Ecological Assessment Report, the data resulting from the field surveys will be preserved in several databases. The fish community and fish habitat assessment data and instantaneous water quality data will be saved in the USGS/WDNR Fish and Habitat Database. The macroinvertebrate assessment data will be preserved in the University of Wisconsin-Stevens Point (UWSP) Aquatic Biomonitoring Laboratory (ABL) DNRBUG program and the WDNR Surface Water Integrated Monitoring System (SWIMS) database. The bat survey data will be housed with the WDNR Bat Ecology Program. All rare species and high-quality natural community locations will be entered into the Natural Heritage Inventory (NHI) database. The small mammal and mink contaminants data will be automatically transmitted from the laboratory to the WDNR Lab Data Entry System (LDES).

The core study area for this project is the Sheboygan River and Harbor AOC, defined as the lower 14 miles of the Sheboygan River, from the City of Sheboygan Falls dam to, and including, the Sheboygan Harbor (see Figure 2). Although the AOC is described as including "nearshore Lake Michigan," this study will not include Lake Michigan. The study area includes a riparian corridor along the AOC of either 100 meters or the environmental corridor (greenspace), whichever is greater. Figure 3 shows the 100-meter strip and the environmental corridors as mapped by the Bay-Lake Regional Planning Commission (see http://www.baylakerpc.org/natural-resources/environmental-corridors for more information). In addition, the fish and macroinvertebrate assessment study area includes the tributaries of Weedens Creek and Willow Creek up to their headwaters and the Onion River up to the Hingham dam. Additionally, there may be isolated natural areas that are beyond the riparian corridors, but within the watersheds of the target rivers and streams, and important to the project area.

Figure 3. Map of Sheboygan River and Harbor AOC showing Environmental Corridors and 100-m Buffer Strip

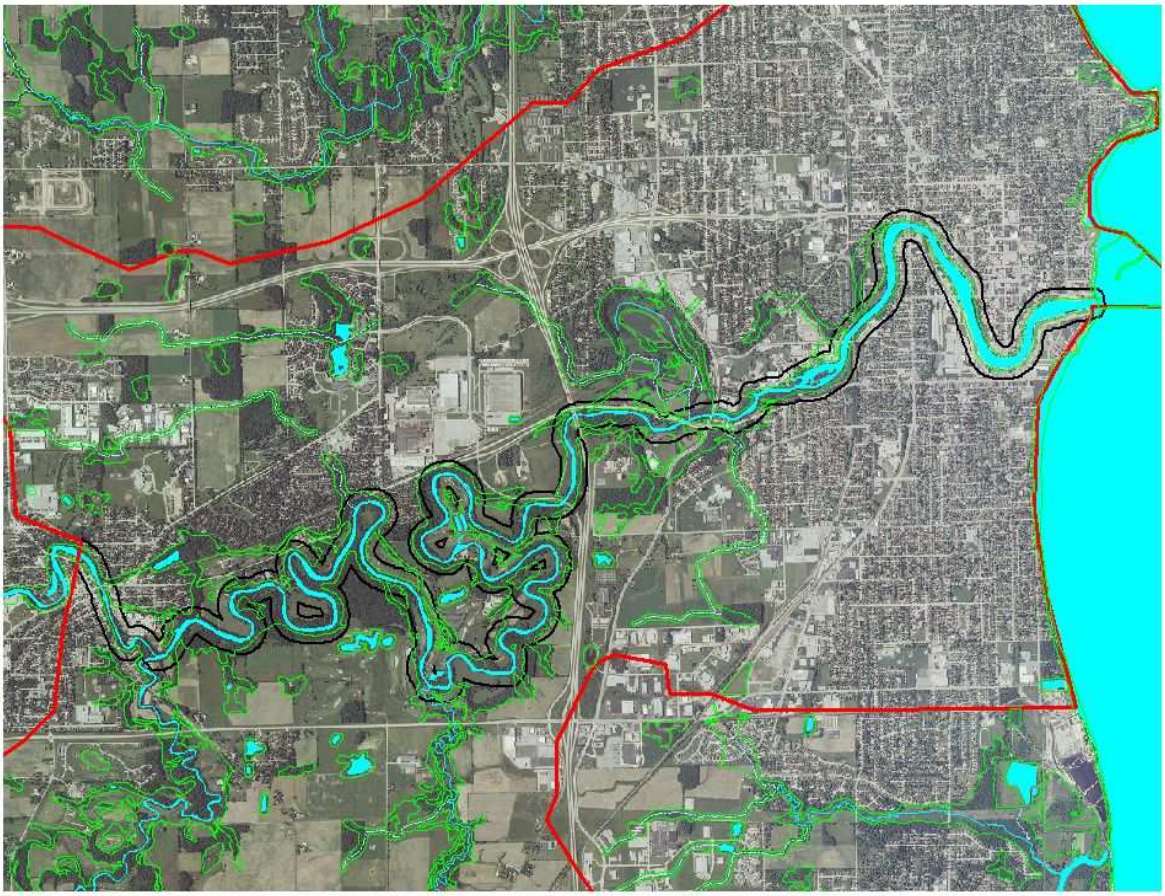


**Table 2. Project Timeline / Work Schedule.**

| Project Schedule | 2010 | | | 2011 | | | | | | | | | | | | 2012 | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | O | N | D | J | F | M | A | M | J | J | A | S | O | N | D | J | F | M | A | M | J | J | A | S | O | N | D |
| **Project Planning** | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| QAPP development & approval | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Field Surveys** | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Bats | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Breeding Birds | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Herptiles | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Mussels | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Plants | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Macroinverts Wadeable | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Macroinverts Nonwadeable | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Fish Habitat | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Aquatic Plants | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Fish Community | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Northern Pike Spawning | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Wintering Birds | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Kingfisher Nest | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Small Mammals | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Mink | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Report Preparation** | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Initial findings available | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Historical data review | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| QA/QC review of survey data | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Final Report Complete | | | | | | | | | | | | | | | | | | | | | | | | | | | |

## A.7 Quality Objectives & Criteria

The primary goal of this project is to complete an Ecological Assessment of the Sheboygan River and Harbor AOC, its riparian corridor, and contiguous streams in order to provide the information necessary to develop a fish and wildlife habitat management and restoration plan and specific delisting strategies for the "degradation of fish and wildlife populations" and "loss of fish and wildlife habitat" BUIs. The information collected through the data and literature review and the new field surveys should be of sufficient quantity and quality to inform the development of these plans and strategies.

The data collected for this study should answer key questions about the health and composition of fish and wildlife communities and their habitats in the study area, including the following:

- What species / communities are there now?
- Where are they?
- How healthy are they?
- What is their approximate abundance?
- What are the potential threats?
- How are they impaired, and what are the causes?
- Are there threatened, endangered, or rare species?
- What areas are especially in need of management, restoration, or preservation?
- How have the communities and habitats changed over time?

This QAPP describes the organization and instructions for field monitoring, data management, and reporting activities that will be followed for this project. Establishing performance criteria will ensure that these activities will be documented and completed at a high level of performance in order to meet the project's objectives. Central to establishing performance criteria will be the use of standard protocols. More information on the data and measurement objectives and performance criteria for each type of field survey can be found in Part B.

## A.8 Special Training/Certification

### Field Personnel

The field work for the bat, fish community, fish habitat, macroinvertebrate, wintering bird, kingfisher nest, small mammal and mink, and natural community / rare plant / invasive plant surveys will be performed by WDNR staff. Some of the field staff will be professional WDNR biologists who are already trained and experienced in the necessary SOPs and methods. Others will be Limited Term Employees (LTEs) who are hired to do this work, and may or may not be familiar with the specific skills and methods required. The Project Leader for each study segment will be responsible for ensuring that all field staff receive the training necessary for

their portion of the study. Prior to the field-sampling season, the Project Leader will go over the SOPs, methods, and QA requirements with the field staff and answer any questions that they may have. All training will be documented and records will be kept in the project file.

The field work for the mussel, breeding bird, and herptile surveys will be performed by outside contractors, as will the mink trapping part of the small mammal and mink surveys. WDNR staff will not be providing special training to the contractors. They will hire only trusted, experienced contractors who are already fully qualified to perform the necessary tasks. The Project Leader will be responsible for communicating project requirements to the contractors prior to the surveys and answering any questions that they may have.

To minimize any potential health and safety risks related to field sampling conducted as part of this project, members of the field crews need to be physically able to conduct field work under demanding conditions and be well prepared to handle contingencies or emergencies. The following are suggested requirements for all field survey personnel:

a) Recent CPR training,
b) Recent first aid training,
c) Completion of a satisfactory interview about health and safety aspects of the project with the Project Leader, including routine safety precautions and a discussion of actions to be taken in the event of an emergency.

**Lab Personnel**

Personnel training at the Aquatic Biomonitoring Laboratory (ABL) is described in the ABL's Quality Assurance Program Plan for Macroinvertebrate Sample Processing (see Appendix B.9). The Principal Investigator (PI) and Lab Supervisor (LS) will ensure that all laboratory personnel are familiar with the importance of the QA plan as it applies to their work efforts. The LS and/or Assistant Lab Supervisor (ALS) will train each new employee on all phases of laboratory work and review each SOP with the employee.

Personnel training at the Wisconsin State Laboratory of Hygiene (WSLH) is described in the Quality Assurance Manual (NELAC QA Manual Revision 8, October 2010), available online at http://www.slh.wisc.edu/dotAsset/21151.pdf. The laboratory is certified by the U.S. EPA and the WDNR to conduct laboratory analysis, and staff conducting the analyses are trained in the methods, quality assurance/quality control procedures, and laboratory safety.

## A.9 Documents and Records

**QAPP Control, Distribution and Updates**

The Project QA Manager is responsible for ensuring the appropriate personnel listed in Section A3 of this QAPP have access to the most current approved version of the QAPP. The original

paper copy of the approved QAPP will be retained by Vic Pappas, Project Manager. The approved QAPP will be converted to Portable Document Format (PDF) and distributed via electronic mail. The final, approved version and any subsequent versions of the QAPP will be uploaded to the WDNR Surface Water Integrated Monitoring System (SWIMS) database for reference and long term storage. In the event that Project Members identified in Section A.4 Project/Task Organization wish to modify or append to the QAPP and supporting protocols, they will forward the request to the Project Manager and Project QA Manager for their review and consideration. Acceptance, acceptance with conditions, or denial of proposed revisions will ultimately be the responsibility of the Project Manager. Approved modifications or addendums to the QAPP and supporting protocols will be made by the Project QA Manager. Each revision of the QAPP will be clearly labeled on each page with the appropriate date and version.

**Field Documents and Records**

The field surveyors will generate various field data during their assessments. Most of the data will be recorded on paper, to be entered later into electronic format. Much of the data will be entered on standardized forms. All field data sheets completed by WDNR personnel will be scanned in as Portable Document Format (PDF) files and uploaded to the SWIMS database. Original paper data sheets will be kept for at least three years. The specific details for the field survey data for each segment of the project can be found in Part B.

**Laboratory Documents and Records**

The two laboratories involved in this study will generate various data and reports. These will include raw data, summary data, and QA reports. Please see Part B for more details.

**Survey Final Reports**

Each survey segment of the project will produce a final report to be uploaded to SWIMS and made available to the Ecological Assessment Team for consideration and inclusion in the Final Ecological Assessment Report. The reports will differ for each segment as far as length, contents, and detail, but all reports will include at minimum:

- Discussion of methods used
- Summary of results
- Discussion of QA/QC, including results of QA checks and any corrective actions
- All data collected (reviewed)

Following are examples of other components that will be included in certain final reports:

- Analysis and interpretation of the data
- Summary statistics or metrics
- Results of a historical data review
- Discussion of species' status
- Ecologically important areas
- Threats observed
- Management considerations
- Remaining inventory and monitoring needs

Please see Part B for more information on the final report for each field survey segment of the project.

**Ecological Assessment Report**

The Ecological Assessment Report will be the final report for this project. It will provide research results on the pre-European settlement habitat and species in order to understand the magnitude of changes and the range of improvement possibilities. It will present results of the biological inventory within the study area and information gathered through the Assessment process and compare it to historical conditions. The Ecological Assessment will articulate the specific impairments to fish and wildlife populations and habitats and their causes. It will present the important or unique features that need to be preserved. The Ecological Assessment will provide maps of the AOC and each potential restoration or protection site, evaluating site conditions and needs. The methodology for the Ecological Assessment will be the same as that used by the WDNR's Bureau of Endangered Resources for Rapid Ecological Assessments conducted for property master planning and will be written by the Ecological Assessment Team.

The Ecological Assessment Report will be submitted to Jennifer Connor, EPA Project Officer. It will be uploaded to SWIMS and made available electronically to all project participants and the Sheboygan River AOC Fish & Wildlife Technical Advisory Committee.

## PART B – INDIVIDUAL SURVEY DETAILS

## B. 1 – FISH COMMUNITY ASSESSMENT

## B.1.A – PROJECT MANAGEMENT

### B.1.A.4 Project/Task Organization

**Table 3. Roles & Responsibilities for Fish Community Assessment.**

| Individual(s) Assigned | Responsible for: |
|---|---|
| Jennifer Conner, EPA Project Officer | • Review project information and reporting in Great Lakes Accountability System (GLAS)<br>• Assist the Project Manager in defining milestones for the project |
| Donalea Dinsmore, WDNR Great Lakes Funding and Quality Assurance Coordinator | • Approve QAPP<br>• Ensure that the approved QAPP is uploaded into SWIMS database<br>• Project reporting on Great Lakes Accountability System (GLAS) |
| Vic Pappas, WDNR Sheboygan Basin Supervisor, Project Manager | • Overall project management<br>• Monitors study progress<br>• Ensures project completion |
| Laurel Last, WDNR Water Resources Management Specialist, Project QA Manager | • QAPP preparation & distribution<br>• Overall project QA/QC<br>• Ensures QAPP is followed<br>• Project reporting in SWIMS database |
| Travis Motl, WDNR Fisheries Biologist, Fish Community Assessment Project Leader | • Fish community assessment project leader and QA officer<br>• Management, data collection, analysis, and reporting for fish community assessments<br>• Ensure that property owners are contacted for access before fish surveys are conducted<br>• Ecological Assessment Team member |
| Susan Beyler, WDNR Regional Inland Fisheries Supervisor | • Hire and supervise Fisheries Biologist and LTEs |
| Brad Eggold, WDNR Southern Lake Michigan Fisheries Supervisor | • Assist with planning for fish community assessments |
| Fisheries LTEs | • Conduct fish community assessments<br>• Enter fish assessment data into WDNR/USGS Fish and Habitat Database |
| Lisa Helmuth, WDNR Surface Water Integrated Monitoring System (SWIMS) File Manager | • Manage SWIMS database, which will include approved QAPP and project reports |

## B.1.A.5 Problem Definition/Background

Developing a fish and wildlife management and restoration plan for the Sheboygan River Area of Concern (AOC) requires synthesizing a variety of sources of background information. When the existing information is considered inadequate for planning, targeted field surveys may be necessary. Current information on the Sheboygan River AOC is lacking for fish communities. A summary of the most recent fisheries data within AOC boundaries is listed in Table 4. This includes surveys conducted since 2000. There were also WDNR surveys in 2003 and 2005 that targeted (and recorded) only one or two game fish species. Note that only two of these surveys (in 2003 and 2004) were conducted using standard WDNR fish community survey methods. More current data are needed in order to make quantitative comparisons of fish communities within different sections of the AOC and to further compare those to fish communities outside the AOC. Therefore, a fish community assessment will be conducted to help fill in the data gaps and inform the development of the plan and related delisting strategies. This assessment will include fish community surveys at 16 sites and northern pike spawning surveys at one suspected spawning site within the AOC and connected waterways. The suspected northern pike spawning site was chosen based on suitable habitat type and potential for improvement.

**Table 4. Summary of Recent Fisheries Surveys in the Sheboygan River AOC.**

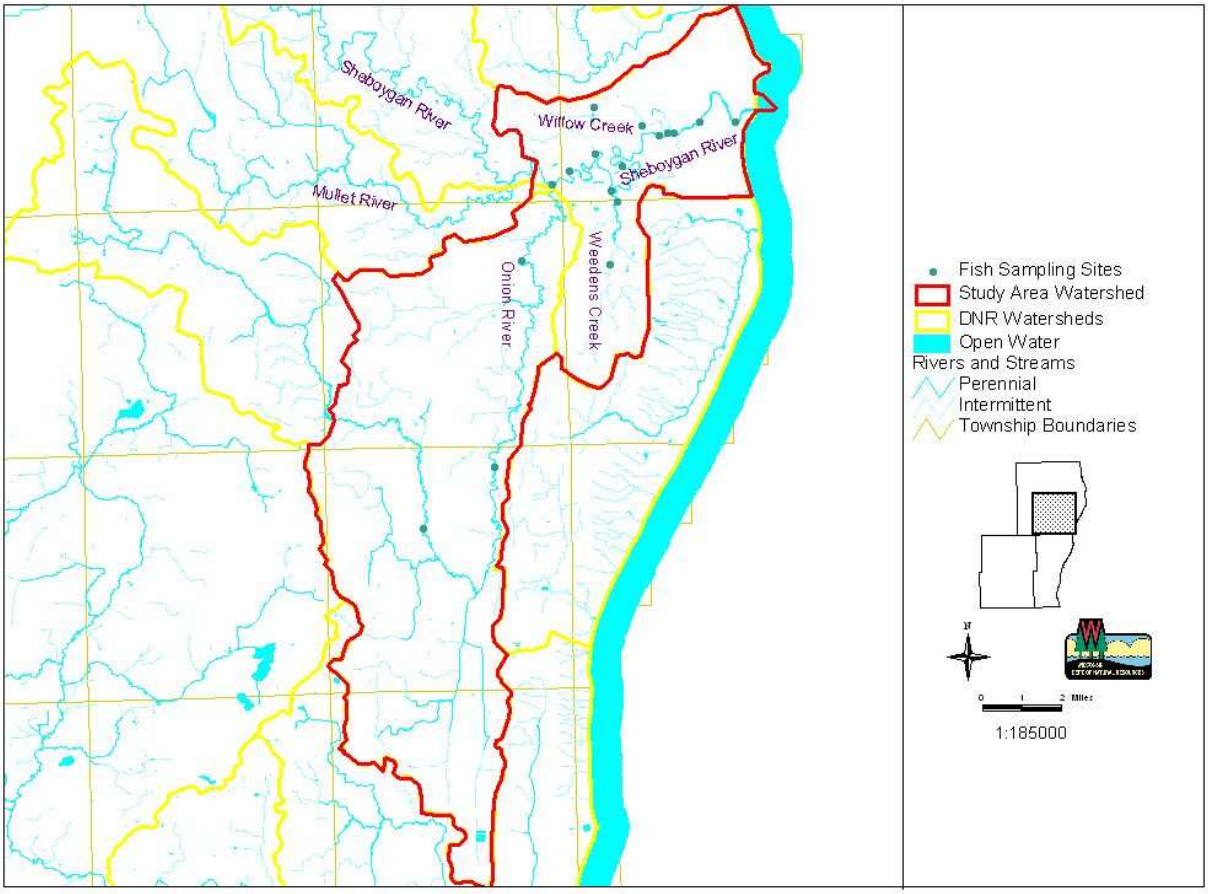
| Year | Surveyor | Method | Site | Segment | Notes |
|---|---|---|---|---|---|
| 2003 | WDNR | Mini-boom shocker (nonwadeable) | Sheboygan River at 14th Street Bridge | Lower River/Inner Harbor | |
| 2004 | WDNR | Stream shocker (wadeable) | Sheboygan River below Waelderhaus Dam | Middle River | Same as this study's Site #5 (see Table 5) |
| 2005 | WDNR | Fyke nets (all species recorded) | Sheboygan River at 14th Street Bridge | Lower River/Inner Harbor | Data were combined with Harbor data (no separate data) |
| 2005 | WDNR | Fyke nets (all species recorded) | Sheboygan Harbor (general description) | Outer Harbor | |
| 2008 | PRS | Electro-shocking (boat-mounted or hand-held wand) | Six sites / reaches along Superfund Site | Upper River, Middle River, Lower River, Inner Harbor | Collected set numbers of specific species for PCB analysis |

## B.1.A.6 Project/Task Description

### Measurements to Be Made / Data to Obtain

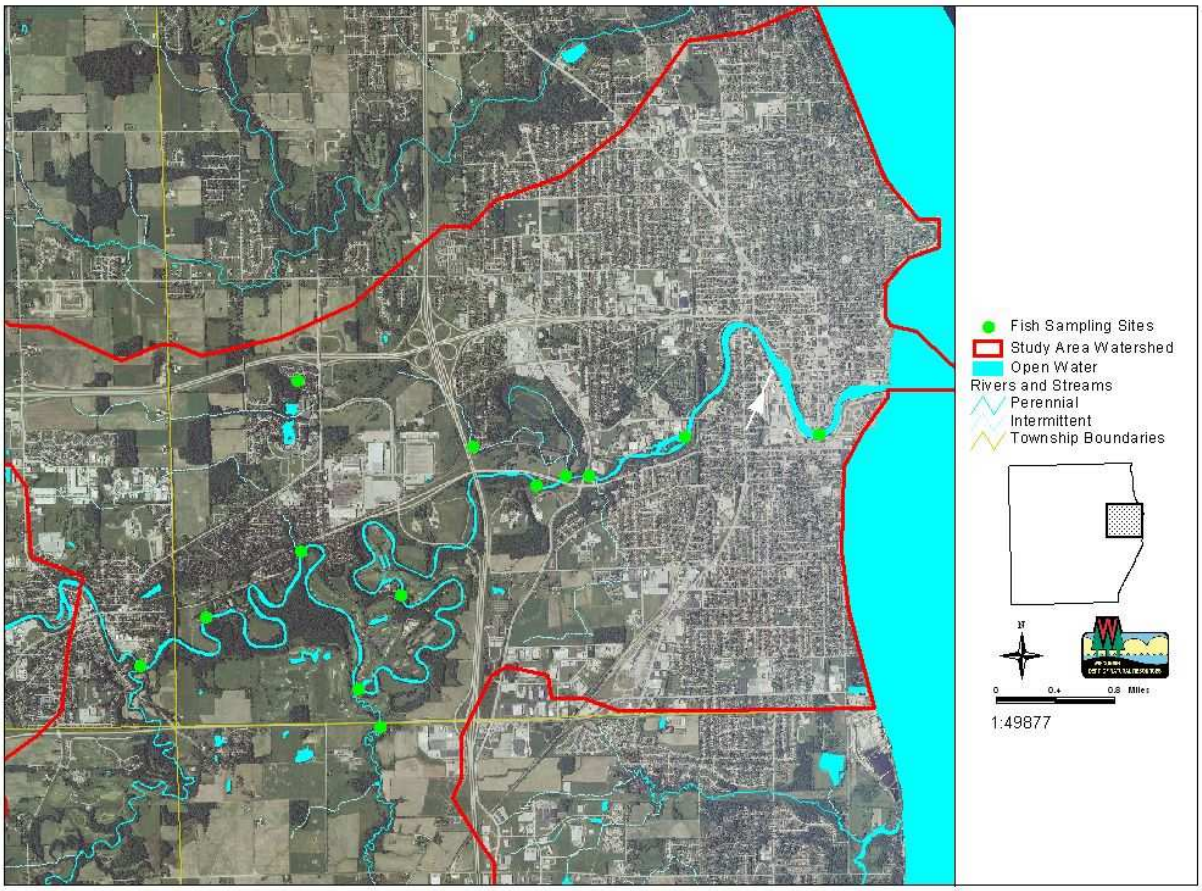
This segment of the study is composed of two main parts: 1) Fish community assessments at 16 sites following WDNR stream monitoring protocols; and 2) Spring northern pike spawning surveys in the AOC near Taylor Drive. Survey sites will be located within the AOC itself and Willow Creek, Weedens Creek, and Onion River below the Hingham Dam—see Figure 4 for a map of the entire study area showing the monitoring stations. Figure 5 shows a close-up of the AOC with nearby fish monitoring stations.

Figure 4. Sheboygan River and Harbor AOC Fish Community Study Area and Monitoring Stations




At each of the 16 stream monitoring locations, WDNR field crews will perform fish community assessments using WDNR protocols for stream monitoring. Eleven of the sites are considered wadeable, and at those sites, the field crews will follow the WDNR protocols for wadeable streams – either Wadable Smallmouth Bass Warmwater Stream Assessments (see Appendix A.1) or Monitoring Protocol for Tier 1 Coldwater Wadable Streams (see Appendix A.2). The three Willow Creek sites (#13-#15) are coldwater sites, and the others are warmwater. The Sheboygan River sites upstream of 8$^{th}$ Street (Site #1), downstream of New Jersey Avenue (Site #2), between the Kohler dams (Site #7), downstream of the Kohler Stables property (Site #8), and downstream of the Onion River Confluence (Site #9) are nonwadeable, and field crews will use the nonwadeable protocol—Baseline Monitoring – Non-Wadable Streams Protocols (see Appendix A.5) at those sites. See Table 5 for descriptions of the sampling stations.

Figure 5. Sheboygan River and Harbor AOC Fish Community Monitoring Stations AOC Close-up




The main differences between the wadeable and nonwadeable methods are the station length and the method of fish collection. Warmwater assessment calls for fish community composition, species relative abundance, and SMB (gamefish) assessment over the first 35 times the mean stream width with a 100 meter minimum and 400 meter maximum. The SMB (gamefish) assessment is then extended to the full 800-meter (0.5-mile) site. For coldwater assessments the length of sites should be 35 times mean stream width on segments greater than or equal to 3 meters wide, and 100 meters on streams less than 3 meters wide. Nonwadeable streams are sampled for 1 mile of contiguous shoreline. Wadeable streams are sampled while traveling upstream using backpack shockers or manually-towed stream shockers, depending on the stream depth and width. Nonwadeable streams are sampled while traveling downstream using a boat-mounted, pulsed-DC electrofishing unit.

At each stream monitoring site, field crew members will count and identify all fish collected. They will measure individual lengths of game fish species. They will record all data on the appropriate field data sheets (see Section B.1.A.9). All specimens will be released after processing unless a sample is needed to confirm species identification. Note that fish habitat and instantaneous water quality data, including temperature, dissolved oxygen, conductivity,

and pH, using a Hydrolab DataSonde 5 (multiprobe) will be collected at all sites as part of the macroinvertebrate and fish habitat assessment segment of the study (see Chapter B.2). The fish community and fish habitat assessments will be performed at approximately the same time.

At the Taylor Drive river section, field crews will conduct a spring northern pike spawning survey following a modified WDNR protocol similar to the Spring Netting I guidelines from Fisheries Assessments – Lakes 2007-09 Sampling Procedures (Appendix A.7). This includes using an appropriate number of 2' X 6' or 3' X 6', 3/4" bar mesh fyke nets to sample most of the available northern pike spawning habitat. They will set the nets at ice out (usually in March) and tend to them daily during peak spawning period, which generally lasts until water temperatures reach 50˚F. For each net on each day, they will record the sex and total length of all northern pike, walleye, and muskellunge caught. They will not be marking the fish as described in the protocol.

After verification, the data from the fish assessments will be used to evaluate the condition of fish communities in the streams. The fish community data will be captured in the WDNR/USGS Fish and Habitat database, which will calculate various summary metrics, including catch per effort, length frequency, and index of biotic integrity (IBI). A final report will be submitted, and the data will be included in the overall Ecological Assessment which is the final report for the Sheboygan AOC Pathway to Delisting habitat BUI's—Survey and Assessment Project.

**Project Timeline:**
Ice out in spring 2011 up to water temperature of 50˚F – Taylor Drive northern pike spawning survey completed.
May 24-September 15, 2011—Warmwater stream surveys completed.
June 15-September 15, 2011 – Coldwater stream surveys completed.
June 15-September 30, 2011 – Nonwadable stream surveys completed.
January 1, 2012— Initial findings available.
June 30, 2012—Final report (Ecological Assessment) completed for entire AOC project.

## B.1.A.7 Quality Objectives & Criteria

The WDNR will conduct fish community and northern pike spawning assessments in the Sheboygan River AOC and connected waterways. Data generated will be used to do the following: 1) Assess the overall condition of fish communities in the AOC and connected streams; 2) Provide baseline data for completion of an ecological assessment; and 3) Serve in the development of a fish and wildlife management and restoration plan and a delisting strategy the for fish and wildlife habitat and population impairments.
Biological data will be used to assess fish community composition and northern pike spawning at individual assessment sites. Biological index scoring will provide numeric criteria to assess whether or not sites are meeting fish community expectations. Data from multiple sampling

sites along a stream will be used to assess the overall condition of fish in individual streams, and aggregation of all the sampling data will be used to identify overall AOC fish community conditions. Although the data collected will be from a single season, we feel that the level of information will be adequate for inferences about future years, barring any extreme environmental conditions. These data, combined with those from the other recent fish surveys, will provide a baseline for completion of an ecological assessment, which will inform the development of a fish and wildlife management and restoration plan for the AOC.

It is important to note that these fisheries assessments are not fish population assessments in the truest sense. They will not provide an estimate of the fish population (i.e., number of fish) of a species in a section of stream. That would entail more than our proposed sampling, and would include a mark and recapture component. Instead, this study will provide an estimate of fish community composition, relative species abundance, and overall population health, along with evidence of presence and spawning activity of certain game fish species.

The collection of high quality and quantity of fishery related data is most often dependent on uncontrollable environmental factors. This is especially the case when conducting spring fish assessments when river discharges and water temperatures can be extreme and constantly fluctuating. The WDNR fisheries program conducts much of their assessment in the spring of the year. Personnel gear and equipment is provided that can often accommodate all but the most extreme field conditions. Personnel safety will not be compromised in order to obtain the needed data.

This QAPP describes the organization and instructions for field monitoring, data management and reporting activities that will be followed for this project. Establishing performance criteria will ensure that these activities will be documented and completed at a high level of performance in order to meet the project's objectives. Central to establishing performance criteria will be the use of WDNR's standardized fish monitoring and data management protocols.

Errors in this assessment will be based upon the following:

a) in-field sampling / analysis error,
b) data transcription error.

If it has been determined that the following has occurred:

1) The field sampling has followed all necessary protocols, and
2) The samples were collected and analyzed successfully

then the analytical results of that sample will be deemed as successful and "good" data, and can be used for further evaluation.

## B.1.A.8 Special Training/Certification

Fisheries assessments will be completed by WDNR fisheries personnel trained in the standard operating procedures for collecting fish samples using standardized active (electrofishing) and passive (netting) equipment. All staff using electrofishing equipment or observing electrofishing from DNR vessels are required to complete an Electrofishing Orientation Training course each year. This course familiarizes operators and observers on all phases of the equipment, its operation, safety procedures, and the fundamentals of electricity.

Fisheries staff are trained to identify fish greater than 26 mm (1-inch) to the lowest taxonomic level, usually species, using fish taxonomic keys for Wisconsin Inland and Great Lake waters (Becker, 1983 and Lyons, 2005).

The Fish Community Assessment Project Leader will be responsible for ensuring that all field staff receive the training necessary for their portion of the study. Prior to the field-sampling season, the Project Leader will go over the SOPs, methods, and QA requirements with the field staff and answer any questions that they may have. All training will be documented and records will be kept in the project file.

To minimize any potential health and safety risks related to field sampling conducted as part of this project, members of the field crew need to be physically able to conduct field work under demanding conditions and be well prepared to handle contingencies or emergencies. The following are suggested requirements for all field survey personnel:

a) Recent CPR training,
b) Recent first aid training,
c) Completion of a satisfactory interview about health and safety aspects of the project with the Fish Community Assessment Project Leader, including routine safety precautions and a discussion of actions to be taken in the event of an emergency.

## B.1.A.9 Documents and Records

### Field Documents and Records

For the wadeable stream surveys, field crew members will complete a Wadable Stream Fish Assessment Data Sheet (see Appendix A.4) for each site (stream reach) sampled. Each data sheet will detail the fish sampling, such as water body, date, time, field crew, survey type, type of pass (up or downstream), gear type, stream width, survey distance, target fish, electroshocking information (current type/volts/amps) and location (latitude and longitude); qualitative water characteristics, such as temperature, clarity, and water level. Data sheets will also include the results of the fish survey, including species, numbers, and individual lengths for the game fish.

At the nonwadeable sites, field crew members will complete the Nonwadeable Baseline Monitoring Electrofishing Data Sheet (NW2) and Electrofishing/Habitat Data Sheet (NW1) (see Appendix A.6). The first sheet (NW2) will list basic information about the sampling, such as date, time, location, and gear, plus the results of the fish survey, including species, numbers, weights, and individual lengths for the game fish. The second sheet (NW1) will include the basic sampling information on NW2, plus additional sampling details, such as shocking distance and river miles, and water characteristics, such as temperature, conductivity, and turbidity. Note that this form also includes a section on habitat, which will be completed as part of the Macroinvertebrate and Fish Habitat Assessment segment of the project (see Chapter B.2).

For the northern pike spawning survey, field crew members will complete a Fish Netting Data Sheet (see Appendix A.8) for each netting event. Each data sheet will detail fish sampling, such as waterbody, location, date, net number, data collector, and water temperature. Data sheets will also include the results of the fish survey, including species, numbers, and individual lengths for the game fish.

All field data sheets will be scanned and saved electronically as Portable Document Format (PDF) files. These will be uploaded to the Surface Water Integrated Monitoring System (SWIMS). All fish assessment results will be proofed and electronically stored in the WDNR/USGS Fish and Habitat Database, which will calculate various summary metrics, including catch per effort, length frequency, and index of biotic integrity (IBI). The Fish and Habitat Database is resident on USGS servers that are routinely backed up.

**Final Report**

A Final Report will be completed for this segment of the project. This report will be uploaded to SWIMS and made available to the Ecological Assessment Team for consideration and inclusion in the Final Ecological Assessment Report. The report will include at minimum:

- Discussion of methods used
- Summary of results
- Summary statistics and metrics
- Discussion of QA/QC, including results of QA checks and any corrective actions
- All data collected

## SECTION B.1.B – DATA GENERATION & ACQUISITION

### B.1.B.1 Sampling Process Design (Experimental Design)

Sampling sites will be located within the Sheboygan River AOC and Willow Creek, Weedens Creek, and Onion River below the Hingham Dam (see Figure 4 and Table 5). Sites #4-6 and #10-17 are wadeable sites. Sites #1, 2, and 7-9 are nonwadeable, so sampling methods there will be somewhat different. These assessments will encompass the same locations as the macroinvertebrate and fish habitat surveys (see Chapter B.2), providing a better picture of overall stream health at those sites. Sampling locations were chosen to represent the different sections of the AOC and the streams directly connected to the AOC. Site #5 was previously surveyed for fish in 2004. Many of the sites have been sampled before for water or sediment chemistry or macroinvertebrates. Using established sites will provide us with more opportunities for comparisons with historical data. Sampling will occur once at each site. This sample design should provide general fish community information on the entire area, and allow us to compare the different sections.

**Table 5. Stream Monitoring Stations for Fish Community Assessment.**

| Site # | STREAM NAME | ACCESS POINT | Latitude | Longitude | River Mile | Stream Type |
|---|---|---|---|---|---|---|
| 1 | Sheboygan River | * US 8th Street - City of Sheboygan | 43.74451 | -87.71285 | 0.7 | Warmwater |
| 2 | Sheboygan River | DS New Jersey Avenue - Wildwood Park/Island Complex | 43.74463 | -87.73079 | 2.5 | Warmwater |
| 3 | Sheboygan River | US Taylor Dr—**NP spawning only** | 43.74106 | -87.74391 | 3.1 | Warmwater |
| 4 | Sheboygan River | US CTHY PP - Esslingen Park | 43.74027 | -87.75094 | 3.5 | Warmwater |
| 5 | Sheboygan River | US of Village of Kohler Municipal Garage | 43.72987 | -87.76962 | 6.6 | Warmwater |
| 6 | Sheboygan River | US Weedens Creek Confluence | 43.72083 | -87.77571 | 8.8 | Warmwater |
| 7 | Sheboygan River | US Waelderhaus Dam - Old Pumphouse Access Road | 43.73442 | -87.78287 | 10.1 | Warmwater |
| 8 | Sheboygan River | DS end of Kohler Stables Property | 43.72825 | -87.79589 | 12 | Warmwater |
| 9 | Sheboygan River | DS Onion River Confluence | 43.72372 | -87.80483 | 12.9 | Warmwater |
| 10 | Onion River | US Ourtown Road | 43.69667 | -87.82086 | 4 | Coldwater |
| 11 | Onion River | US CTHY A | 43.62282 | -87.83698 | 12.1 | Coldwater |
| 12 | Onion River | US Risseeuw Road | 43.60161 | -87.87305 | 20.3 | Coldwater |
| 13 | Willow Creek | US Confluence with Sheboygan River | 43.74105 | -87.74696 | 0.04 | Coldwater |
| 14 | Willow Creek | US Greendale Road | 43.74423 | -87.75937 | 1.1 | Coldwater |
| 15 | Willow Creek | US Woodlake Road | 43.75103 | -87.78274 | 2.8 | Coldwater |
| 16 | Weedens Creek | US State Highway 28 | 43.71708 | -87.77284 | 0.4 | Warmwater |
| 17 | Weedens Creek | US CTHY A | 43.69432 | -87.77714 | 3 | Warmwater |

* US = upstream; DS = downstream.

Specific sampling sites (stations) for wadeable streams were (or will be) selected to take advantage of each streams' structure, usually starting and ending at the downstream end of a riffle in order to facilitate fish capture in the fish community surveys. The three Willow Creek sites are considered coldwater, whereas the others are considered warmwater. Coldwater wadable station length is determined by the mean stream width (MSW), being 35 times the MSW, with a minimum station length of 100 meters (for streams less than 2.9 m MSW).

Warmwater wadable surveys assess fish community composition, species relative abundance, and SMB (gamefish) over the first 35 times MSW with a 100 meter minimum and 400 meter maximum. The SMB (gamefish) assessment is then extended to a full 800-meter (0.5-mile) site. A station's length might be adjusted to be somewhat more or slightly less than 35 times the MSW in order to end at the downstream end of a riffle.

Exact locations of nonwadeable sampling sites are not as critical. The protocol requires sampling main-channel-border habitats, which are relatively shallow shoreline areas along the river channel that carry the majority of the river flow. The nonwadeable sites will be sampled for 1 mile of contiguous shoreline. Although such surveys are sometimes extended in order to capture more game fish, that will not be done in this study in order to avoid overlapping stations. Nighttime surveys will occur if less than 5 game fish are captured during the daytime survey and river conditions allow for safe nighttime survey conditions. The 5-fish minimum was determined by referring to the summary statistics for smallmouth bass (smb) catch per effort in Table 2 of "A sampling framework for smallmouth bass in Wisconsin's streams and rivers" (see Appendix A.11). Note that the Sheboygan River is considered a northern course substrate system, which at the 50$^{th}$ percentile one would expect to catch 5 smb age 1 and older and 3 smb size 8 inches and above per mile of stream length.

The northern pike spawning survey will cover the area necessary to include most of the available spawning habitat at the site. Exact locations of nets will be determined in the field, in order to achieve optimal sampling conditions.

No samples will be required for this segment of the project, unless samples (vouchers) are needed to confirm species identifications. Many measurements will be collected by the field crew members in the field. See Table 6 for a list of these parameters and their criticality.

**Table 6. Classification of Measured Parameters for Fish Community Assessment.**

| Parameter | Measuring Device | Classification |
|---|---|---|
| Sampling location (latitude and longitude) | Garmin GPSMAP 62st Global Positioning System (GPS) | Critical |
| Electrofishing efficiency | Record voltage and amperage output | Critical |
| Electrofishing time | Sample start and end time | Information only for fish catch per unit effort (CPUE) |
| Fish identification | Absence/presence from sample reach; appropriate fish identification keys; personnel training | Critical |
| Fish count | Appropriate fish identification keys and personnel training | Critical |
| Fish length (total mm) | Fish measuring board (1 mm); relative to fish age and spawning adult population; personnel training | Critical |
| Fish weight (g)--Optional | Hand-held Pesola® scales | Information only |
| Fish spawning condition | Gentle external pressure to abdomen and gonads; personnel training | Critical |

| | | |
|---|---|---|
| Water temperature | Hand-held alcohol thermometer | Information only |
| Average stream width | Measuring tape | Information only |
| Station length | Measuring tape or GPS | Critical |
| Discharge | USGS real-time gauging station 04086000; assessing fishability, safety and cue for fish migrations | Critical |

## B.1.B.2 Sampling Methods

### Stream Monitoring Protocols

At each of the 16 stream monitoring locations, WDNR field crews will perform fish community assessments using WDNR protocols for stream monitoring. Eleven of the sites are considered wadeable, and at those sites, the field crews will follow the WDNR protocols for wadeable streams – either Wadable Smallmouth Bass Warmwater Stream Assessments (see Appendix A.1) or Monitoring Protocol for Tier 1 Coldwater Wadable Streams (see Appendix A.2). The three Willow Creek sites (#13-#15) are coldwater sites, and the others are warmwater. Note that both protocols refer to the more detailed instructions in Guidelines for Assessing Fish Communities of Wadable Streams of Wisconsin, March 2001 (see Appendix A.3). For these surveys, the field crews will not be collecting fish weights, water chemistry (other than temperature), or habitat information. They will also not be using the data sheets referred to in the protocols.

At the five nonwadeable sites, field crews will use the IBI procedures in the nonwadeable protocol—Baseline Monitoring – Non-Wadable Streams Protocols (see Appendix A.5). They will not be collecting fish weights, water chemistry (other than temperature), or habitat information.

An overview of the different sampling techniques is provided below.

### Mini-Boom Sampling Technique

A boat-mounted, pulsed-DC electrofishing unit (mini-boom) will be used for any sampling performed at nonwadeable sites. Please see the WDNR protocol for nonwadeable baseline monitoring for more details. To further clarify nonwadeable procedures, nighttime electrofishing will occur if less than 5 game fish are captured during the daytime survey and river conditions allow for safe nighttime survey conditions. Studies indicate that night shocking yields more total fish species and biomass than day shocking. Most game species are found in greater number, and larger individuals are caught during nighttime sampling compared to daytime. The catch differences are pronounced for walleye, catfish, and esocids, but somewhat less notable for centrarchids. Also note that station length will not be extended for these surveys in order to collect more game fish, as that would result in overlapping stations.

**Towed Electrofishing Techniques**

DC-powered towed electrofishing units will be used to collect fish as part of the project. These towed electrofishing units will be used when safe wadeable stream conditions exist, typically water depths less than 0.75 m and velocities less than 1.2 m/sec. Each unit will be operated using a three anode configuration operating at optimal voltage and amperage. Each anode assembly will be operated by a single individual and hand held dip net with a 5 mm-mesh (stretch) dip net. This mesh size retains all fish >26 mm in length. Sampling is conducted in an upstream direction sampling all available cover types and habitats. Because of safety concerns, towed electrofishing will only be completed during daylight hours.

**Backpack Electrofishing Techniques**

DC-powered backpack electrofishing units will be used to collect fish as part of the project. These backpack electrofishing units will be used when safe wadeable stream conditions exist, and waters are too small for towed electrofishing units. Each unit will be operated using a single anode configuration operating at optimal voltage and amperage. Each anode assembly will be operated by a single individual with a 5 mm-mesh (stretch) dip net. This mesh size retains all fish >26 mm in length. Sampling is conducted in an upstream direction, sampling all available cover types and habitats. Because of safety concerns, backpack electrofishing will only be completed during daylight hours.

**Netting Techniques**

Sampling fish with passive netting configurations can be especially effective during spring migration periods. For this study, the only netting that will occur will be for the northern pike spawning survey. For these surveys, 2' X 6' or 3' X 6', 3/4" bar mesh fyke nets will be set at ice out (typically in March) and checked daily through the peak of northern pike spawning. Water temperature will be approximately $45^{o}$ F. Enough nets will be set to sample most of the available northern pike spawning habitat. For each net on each day, all northern pike, walleye, and muskellunge will be sexed and measured (total length – nearest 0.1 inch). Data from each net will be recorded separately. The survey will end once the water temperature reaches $50^{o}$ F. All nets will be removed prior to conducting other sampling.

**Fish Measurements**

All captured fish greater than 26 mm in length will be identified to species and counted. The general health and external condition of each individual fish will also be observed. Mortalities caused by fishing and handling should be noted as a mortality.

Gamefish will be counted and individual lengths will be measured on the following species: Lake sturgeon (Acipensir fulvescens); members of the Trout family (Salmonidae); members of the Pike family (Esocidae); Smallmouth bass (Micropterus dolomieu), Largemouth bass

(Micropterus salmoides) Walleye; Channel catfish (Ictalurus punctatus) and Flathead catfish (Pylodictis olivaris).

Weights and collection of age structures for gamefish will be optional at all sites.

**Water Temperature and Discharge Measurements**

Water temperature and rising river discharges are two of the most important and measureable cues for initiating and timing fish spawning migrations. Instantaneous water temperatures (nearest 0.5 $C^{o}$) will be obtained using an alcohol based hand-held thermometer prior to sampling each station.

Real-time river discharge and stage recorded at 15-minute intervals will be obtained from the United States Geological Service Sheboygan River gauging station (Station 04086000), located 3.9 miles from the river mouth, 0.2 miles downstream of Highway 43, and 0.3 miles upstream of Highway PP (Indiana Avenue). This is between Monitoring Stations 4 and 5.

**Performance Requirements and Corrective Actions**

Corrective actions will be taken if any aspect of the sampling event differs from that planned. Under circumstances where corrective action is needed, the fish community assessment Project Leader will be notified and the situation researched and a decision made. Corrective actions should only be implemented after approval by the Project Leader. Corrective actions will be documented in the field log or data report at the time of decision, and will accompany all reports after analytical results are returned. The fish community assessment Project Leader is ultimately responsible for any corrective actions and appropriate documentation of those actions.

Short-term revisions (e.g., day-to-day) to scheduled sample events due to inclement weather conditions or high river discharge event would not be expected to significantly impact project data quality, quantity, results and conclusions. Under these circumstances, there is no need to formally contact other members of the project group. Longer-term revisions (e.g., week-to-week as a result of watershed wide flood event) could significantly impact project data quality, quantity, results and conclusions. Under these circumstances, a more formal notification and modification to the project's study design, fish sampling numbers and sample protocols would be warranted. The decision to significantly modify project sample frequency, number of sample events, sample protocol and techniques would be made by the fish community assessment Project Leader following consultation with the overall Project Manager.

Since much of the land adjacent to the AOC is privately owned, access could be an issue. Due to Wisconsin's Public Trust Doctrine, field crew members can legally use and perform surveys in all sections of the river itself, but they cannot cross private lands or conduct surveys on private lands without owner permission. Gaining such permission should not be a problem for these

surveys. The Project Leader will ensure that landowner permission is granted before any work is done on private property. If necessary, alternative stream entry sites will be found.

### B.1.B.3 Sample Handling & Custody

Potential field samples for this project include fish voucher specimens collected to confirm species identifications. Voucher specimens will be first fixed in formalin, then washed and stored in ethanol. All voucher jars will be labeled noting sample date, waterbody and associated WIBC code, sample reach identification number, number of preserved specimens and collector's name. A copy of the fish voucher container label is included in Appendix A.9. There will be no custody forms associated with these samples.

### B.1.B.4 Analytical Methods

There are no analytical methods for the fish community surveys; all field methods are described in Section B.1.B.2.

### B.1.B.5 Quality Control

The data collected by this project will be used to identify and prioritize fish and wildlife habitat restoration actions within the Sheboygan River Area of Concern. It will be used for planning and management decisions. No regulatory requirements or clean up decisions will be made using this data about species and habitat in the AOC so there are no applicable action levels or criteria to be met.

**Quality Control Activities**

Field crew members will be following standard WDNR protocols for these assessments (see Appendix A). They will maintain and calibrate equipment as necessary to assure the collection of accurate data (see Sections B.1.B.6 and B.1.B.7). They will check all equipment and supplies each sampling day before heading out into the field (see Section B.1.B.8).

In addition, data completeness will be calculated for this segment of the project. The completeness objective for this project is for 95% of the planned data to be collected and usable. WDNR sampling crews will make every effort to obtain valid data for each sampling point identified in this QAPP.

Other quality control activities and corrective actions for the fish surveys are listed in Table 7.

**Table 7. Quality Control Activities for Fish Community Assessment Measurements.**

| Sample or Measurement Technique | Method and Criteria | Corrective Action |
|---|---|---|
| Electrofishing | For effective fishing mini-boom output > 150 V and 15-20 A; towed stream shocker > 150 V and 6-8 A; check electrical continuity; safety. | Replace units in whole or in part. Standard WDNR issued gear. Serviceable by technicians and "off the shelf" replacement parts readily available. Staff certified for optimum operation and safety features on an annual basis. |
| Fish Total Length (mm) | Distance from anterior-most projection of head to the farthest tip of the caudal fin when the lobes of the fin are squeezed together; 1 m long measuring board in cm and mm increments. | Standard measurement for WDNR fisheries surveys. Replace measurement board if ruler becomes worn and not legible. |
| Fish Weight (g)--Optional | Pesola® scales 0-300g $\pm$ 2 g; 0-600g $\pm$ 5g; 0-1kg $\pm$ 10g; 0-5kg $\pm$ 50g; 0-10kg $\pm$ 100g; 0-20kg $\pm$ 200g. Scales are calibrated against a standard brass weight set prior to each sample event. | Adjust scale zero and weight set. |
| Fish Species Identification | WDNR staff trained to identify fishes > 26mm in total length. Use standard fish taxonomic keys for Wisconsin fishes (Becker, 1983 and Lyons, 2005). | All fish not readily identified in the field will be preserved as voucher specimens for identification the laboratory using dissecting grade microscope. Standard voucher specimen label for project (Appendix A.9) |

### B.1.B.6 Instrument/Equipment Testing, Inspection, and Maintenance

WDNR field crew members will be responsible for testing, inspection, and maintenance of all equipment necessary for the fish assessments for the duration of this study. The primary instruments needing testing and maintenance will be the hand-held thermometers and the Global Positioning System (GPS). These instruments will be maintained and operated as described in their respective user manuals.

**Field Thermometers**

The field thermometers to be used for this study are hand-held alcohol-filled thermometers to be used for instantaneous water temperature measurements. Although the hand-held thermometers cannot be calibrated, they can be checked for accuracy compared to a National Bureau of Standards (NBS) certified and traceable thermometer. Field thermometers will be checked for accuracy annually.

**Global Positioning System**

Field crew members will be using a Garmin GPSMAP 62st GPS for these surveys. They will maintain the unit per manufacturer recommendations. According to the manufacturer, this unit is capable of a position error of less than 10 meters. The objective for this study will be for all GPS measurements to have an error of less than 10 meters.

**Other Equipment**

All electrofishing hardware will require routine maintenance. Generator oil is changed out after 40 hours of operation per the manufacturer's recommendations. The 12 volt battery that operates the electrofishing control boxes are routinely checked for voltage, and are charged with an external battery charger as needed. Electrical continuity checks between anodes and control box are checked at the beginning of each sample reach. Electrical output can be observed on all electrofishing equipment during operation. Output as voltage and amperage is recorded for each sample event to insure maximum performance between sample events. Spare generators, spark plugs, service tools, nets, batteries, anodes and droppers, and cables are kept with the electrofishing unit (mini-boom) or service trailer (towed electrofishing unit).

Other equipment necessary for these assessments include those measuring devices listed in Table 6, plus the following: 17mm-mesh (stretch) dip nets, fyke nets, clipboard, county plat books, and other maps as needed. A camera, although not necessary, might prove valuable for documentation purposes. Any crew members who will be in the water during fish electroshocking will require electrically insulated waders. The nonwadeable sampling will require additional equipment such as a boat and personal flotation devices for the crew. The field crew members will check that all items are present and in good condition before sampling.

## B.1.B.7 Instrument/Equipment Calibration and Frequency

This survey does not use instruments or equipment that can be calibrated. The accuracy of the GPS unit can be verified using established monuments; however, this is not critical for project success.

## B.1.B.8 Inspection/Acceptance of Supplies & Consumables

Critical supplies and consumables for the field assessments include voucher specimen bottles and labels, and formaldehyde. Field crew members will check that all items are present and in good condition before sampling. If any items are missing or inadequate, they will remedy the situation, with the Project Leader's help if necessary, before they leave for the field.

### B.1.B.9 Data Acquisition Requirements for Non-Direct Measurements

The USGS stream discharge gauging station data are the only external and non-measured data for this project. The USGS follows strict data acquisition, field equipment calibration and verification protocols before publishing their data.

### B.1.B.10 Data Management

The field crew members will record the assessment data on appropriate paper forms—See Section B.1.A.9. They will provide these completed forms to the fish community assessment Project Leader. The Project Leader will check the forms for completion and accuracy. He or designated WDNR staff will scan and save all of the forms electronically as Portable Document Format (PDF) files, and then enter the data from the forms into the WDNR/USGS Fish and Habitat Database.

All fish data will be entered and stored in the WDNR/USGS Fish and Habitat Database, a statewide repository for fish community and habitat survey results. Fisheries and habitat data collected from Tier 1 and Tier 2 fisheries management assessment surveys, habitat improvement surveys, stocking and regulation evaluation surveys, tournament permits, stocking permits, fish kill investigations and stocking planning and activities are stored in the Database, which is accessed through the WDNR Fisheries Management Internal Website: http://infotrek.er.usgs.gov/wdnr_bio. Information stored in the Database is used to generate statewide stocking or fisheries summaries, to evaluate fisheries status and trends, to evaluate the effectiveness of regulation strategies or stocking practices, or in regulatory decision making, permitting and policy decisions. The fisheries biologists or designated fisheries technicians and their fish team supervisors are ultimately responsible for the long-term maintenance of all records in the Database within their management area. The protocols for data management for the Fish and Habitat Database are contained in the WDNR Fisheries Management Handbook in Chapter 11, Sections J – P October 2009 draft update (see Appendix A.10).

Each monitoring station for the fish surveys has a Surface Water Integrated Monitoring System (SWIMS) station number. This number will tie the fish data to other chemical and biological data collected at the same sampling location.

## B.2 – MACROINVERTEBRATE AND FISH HABITAT ASSESSMENT

## B.2.A – PROJECT MANAGEMENT

### B.2.A.4 Project/Task Organization

**Table 8. Roles & Responsibilities for Macroinvertebrate and Fish Habitat Assessment.**

| Individual(s) Assigned | Responsible for: |
|---|---|
| Jennifer Conner, EPA Project Officer | • Review project information and reporting in Great Lakes Accountability System (GLAS)<br>• Assist the Project Manager in defining milestones for the project |
| Donalea Dinsmore, WDNR Great Lakes Funding and Quality Assurance Coordinator | • Approve QAPP<br>• Ensure that the approved QAPP is uploaded into SWIMS database<br>• Project reporting on Great Lakes Accountability System (GLAS) |
| Vic Pappas, WDNR Sheboygan Basin Supervisor, Project Manager | • Overall project management<br>• Monitors study progress<br>Ensures project completion |
| Laurel Last, WDNR Water Resources Management Specialist, Project QA Manager | • QAPP preparation & distribution<br>• Overall project QA/QC<br>• Ensures QAPP is followed<br>• Project reporting in SWIMS database |
| John Masterson, WDNR Water Resources Specialist, Macroinvertebrate and Fish Habitat Assessment Project Leader | • Macroinvertebrate and fish habitat assessment project leader and QA officer<br>• Data collection, analysis, and reporting for macroinvertebrate and fish habitat assessments<br>• Hire and supervise Watershed LTE<br>• Ensure that property owners are contacted for access before macroinvertebrate and fish habitat surveys are conducted<br>• Ecological Assessment Team member |
| Matt Steiger, Watershed LTE | • Conduct macroinvertebrate and fish habitat assessments |
| UW-Stevens Point Aquatic Biomonitoring Laboratory (ABL) | • Analyze all samples for macroinvertebrate assessment<br>• Enter data into DNRBUG program |
| Stanley Szczytko, US-SP ABL Principal Investigator | • Review ABL QA reports<br>• Prepare final report of macroinvertebrate results |
| Jeffrey Dimick, US-SP ABL Laboratory Supervisor | • Supervise and train ABL personnel<br>• Prepare ABL QA reports<br>• Maintain ABL inventory and equipment |
| Lisa Helmuth, WDNR Surface Water Integrated Monitoring System (SWIMS) File Manager | • Ensure that macroinvertebrate data from ABL is uploaded into SWIMS<br>• Manage SWIMS database, which will include approved QAPP, macroinvertebrate data, and project reports |
| Ron Arneson, WDNR Laboratory Coordinator | • Liaison between WDNR and project laboratories<br>• Procure services with project laboratories |

## B.2.A.5 Problem Definition/Background

Developing a fish and wildlife management and restoration plan for the Sheboygan River Area of Concern (AOC) requires synthesizing a variety of sources of background information. When the existing information is not considered adequate for planning, targeted field surveys may be necessary. Current information on the Sheboygan River AOC is lacking for benthic macroinvertebrate and qualitative fish habitat. Since 2000, macroinvertebrate surveys have been performed at two sites within the AOC, three sites in Willow Creek, one site in Weedens Creek, and two sites in the Onion River below Hingham Dam. Qualitative fish habitat assessments have been performed at only two sites in all of these areas. In the Sheboygan River, the Wildwood Island complex has an area that appears to have wetland properties. At Taylor Drive and Indiana Avenue there are two wetlands, one that appears connected to the Sheboygan River and the second, an isolated area that was recreated as part of road construction. These wetlands need to be assessed for their ability to support fish communities, including the potential for spawning habitat. Therefore, a macroinvertebrate and fish habitat assessment will be conducted to help fill in the data gaps and inform the development of the plan and related delisting strategies.

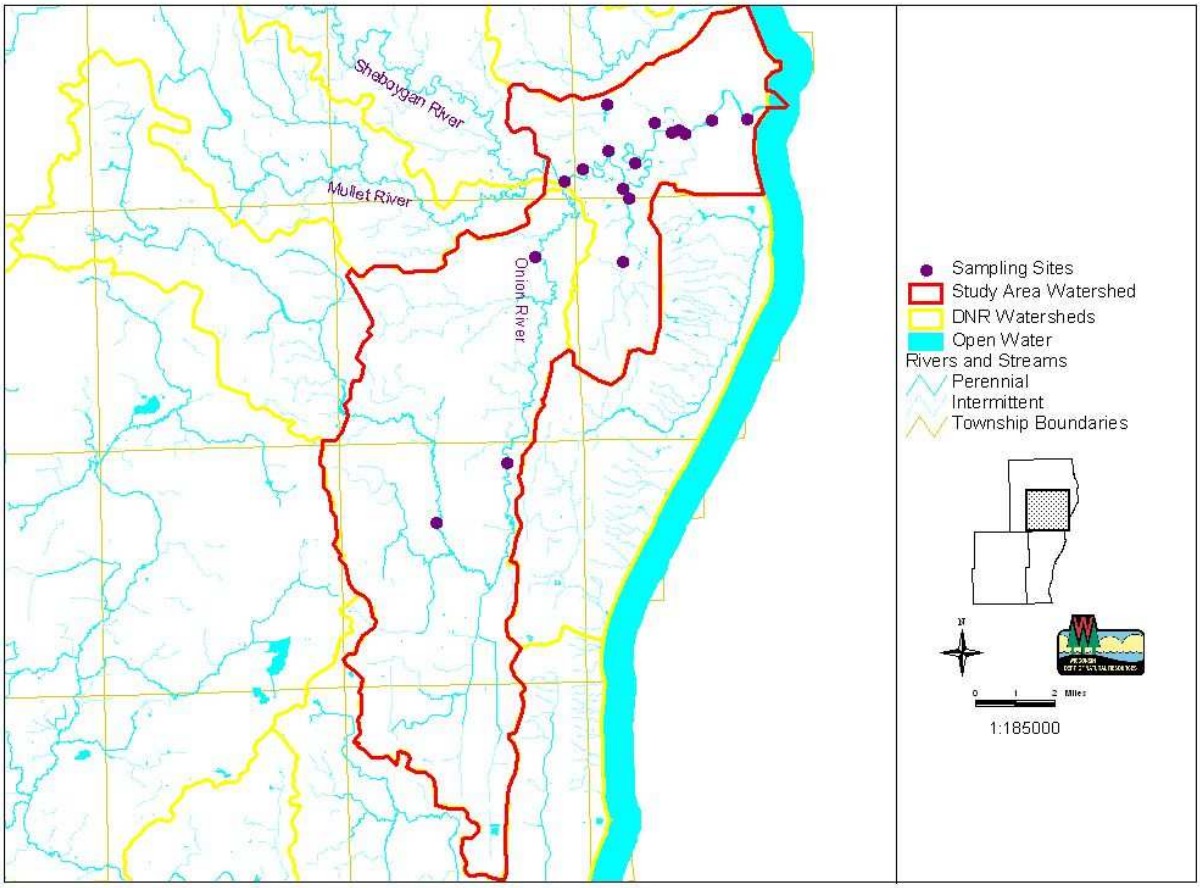
## B.2.A.6 Project/Task Description

### Measurements to Be Made / Data to Obtain

This segment of the study is composed of three main parts: 1) Macroinvertebrate assessments at 16 sites following WDNR baseline stream monitoring protocols; 2) Qualitative fish habitat assessments at the same sites following WDNR protocols; and 3) Two aquatic plant surveys, the first near the Wildwood Park Island complex and the second near the storm water detention pond at the entrance to UW-Sheboygan. The two aquatic plant surveys will assess potential northern pike spawning habitat. Survey sites will be located within the Sheboygan River AOC, Willow Creek, Weedens Creek, and Onion River below the Hingham Dam—see Figure 6 for a map of the entire study area showing the monitoring stations. Figure 7 shows a close-up of the AOC with nearby monitoring stations.

After verification, the data from the surveys described below will be used to evaluate the biological and physical condition of the streams. The macroinvertebrate data will be captured in both the ABL DNRBUG and the WDNR Surface Water Integrated Monitoring System (SWIMS) databases. The fish habitat data and the Hydrolab water quality data will be captured in WDNR/USGS Fish and Habitat database. The aquatic plant survey data will be entered in an Excel workbook and also the SWIMS database. A final report will be submitted, and the data will be included in the overall Ecological Assessment which is the final report for the Sheboygan AOC Pathway to Delisting habitat BUI's—Survey and Assessment Project.

Figure 6. Sheboygan River AOC Macroinvertebrate, Fish Habitat, and Aquatic Plant Monitoring Stations




Benthic Macroinvertebrates

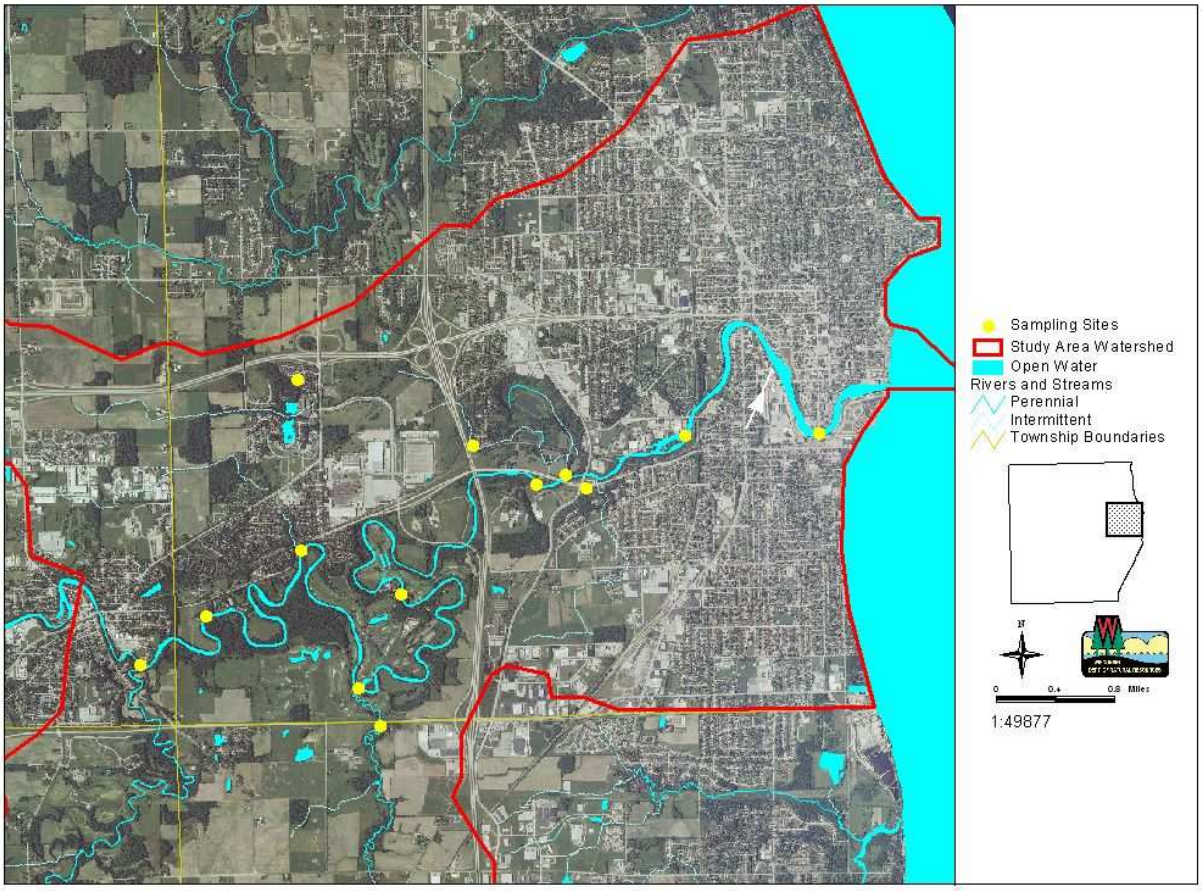
Semi-quantitative macroinvertebrate assessments will be performed at 16 sites. All but one site are considered wadeable, and at those 15 sites, the field crews will follow the protocol for wadeable streams—Guidelines for Collecting Macroinvertebrate Samples from Wadeable Streams, September 2000 (see Appendix B.1). The downstream Sheboygan River (8th Street) site is considered nonwadeable, and field crews will use procedures from Introduction to Standardized Collection and Assessment of Macroinvertebrates in Nonwadeable Rivers of Wisconsin (see Appendix B.2) at that site. These assessments will be done at the same sites as the qualitative habitat and fish community surveys (see Chapter B.1).

At each wadeable site, field crew members will collect macroinvertebrates using kick sampling with a 600-micron mesh net. At the nonwadeable site, the field crew will collect macroinvertebrates using Hester-Dendy artificial substrate samplers, which will be anchored in place and left for 6 weeks. At all sites, the field crew will preserve the samples in alcohol for later identification. They will complete a Macroinvertebrate Field Data Report (Form 3200-081 (R 2/07)—See Appendix B.3). This report will include details about the sampling—such as date,

sampling time, location (latitude and longitude), and estimated area sampled—and descriptors of the sampling site, stream, and watershed—such as habitat type; stream order, gradient, velocity, depth, and width; canopy cover; composition and embeddedness of substrate; and various factors that may be affecting the water resource integrity. Field crew members will also collect instantaneous water quality data, including temperature, dissolved oxygen, conductivity, and pH, using a Hydrolab DataSonde 5 multiprobe and Surveyor 4 handheld display.

Macroinvertebrate samples will be analyzed at the University of Wisconsin-Stevens Point (UWSP) Aquatic Biomonitoring Laboratory (ABL). Lab personnel will sort, count, and identify organisms using standard protocols for semi-quantitative Hilsenhoff's biotic index (HBI) samples (see Appendices B.10, B.11, B.12, and B.13). The data will be entered into the ABL DNRBUG program, which will calculate 26 benthic macroinvertebrate community metrics, including HBI, which has been used by WDNR since 1979 in bioassessments of water quality as part of its Surface Water Monitoring Program.

Figure 7. Sheboygan River AOC Macroinvertebrate, Fish Habitat, and Plant Monitoring Stations Close-up



Qualitative Fish Habitat

Field crew members will also perform qualitative fish habitat assessments in the same stream segments where the macroinvertebrates are collected. These assessments will be performed at about the same time as the fish community assessments. At the wadeable sites, field crew members will follow the WDNR Guidelines for Qualitative Physical Habitat Evaluation of Wadeable Streams, June 2007 (see Appendix B.4). They will complete either Form 3600-532A (R 6/07), for streams < 10 m wide, or Form 3600-532B (R 6/07), for streams > 10 m wide. These forms can be found in Appendix B.5. Field crew members will assess various habitat parameters listed on the forms and give each a rating. The sum of the scores will provide an overall rating of stream habitat quality. At the nonwadeable site, field crew members will complete the Nonwadeable Baseline Monitoring Electrofishing/Habitat Data Sheet - NW1 (see Appendix A.6), except for those questions specifically related to fish sampling (unless the habitat survey is conducted at the same time as the fish survey). They will assess various habitat parameters as listed on the sheet, but will not come up with an overall habitat score. Field crew members at all sites will collect instantaneous water quality data, including temperature, dissolved oxygen, conductivity, and pH, using a Hydrolab DataSonde 5 multiprobe and Surveyor 4 handheld display.

Aquatic Plant Surveys

Aquatic plant (macrophyte) surveys will be conducted at two locations to evaluate the diversity of the plant community and the potential for the sites to support fish communities and spawning. Please see Figure 8 for a map of those areas including the WDNR's potentially restorable wetlands layer. The first site (Wetland Area 1) is within the Wildwood Island Complex. Wetland Area 1 is 13.4 acres in size. The second site (Wetland Area 2), on the southeast corner of the intersection of Taylor Drive and Indiana Avenue, was originally a single wetland that was divided during highway construction. Wetland Area 2 is 2.1 acres in size. The wetland on the southeast corner is privately owned, so landowner permission is needed for the survey. This wetland has a limited connection to the Sheboygan River and may support northern pike spawning. The wetland on the southwest corner (not to be surveyed at this time) is currently isolated from the river, but may provide spawning habitat if it is reconnected to the river.

Field crews will use the point-intercept method described in *Recommended Baseline Monitoring of Aquatic Plants in Wisconsin: Sampling Design, Field and Laboratory Procedures, Data Entry and Analysis, and Applications* (see Appendix B.6) to conduct the macrophyte surveys.

**Figure 8. Sheboygan River AOC Wetland Areas 1 and 2 for Aquatic Plant Surveys.**


**Project Timeline:**
October-November, 2010 — Macroinvertebrate sampling completed at wadeable sites.
January-June, 2011 – Macroinvertebrate identifications completed for wadeable sites.
July-August, 2011 – Macroinvertebrate sampling completed at nonwadeable site.
June-August, 2011 – Aquatic plant surveys completed at two sites.
July-October, 2011 – Macroinvertebrate identifications completed for nonwadeable site.
June-September, 2011 – Habitat assessments completed.
January 1, 2012 — Initial findings available.
June 30, 2012 —Final report (Ecological Assessment) completed for entire AOC project.

### B.2.A.7 Quality Objectives & Criteria

The WDNR will conduct qualitative fish habitat assessments in the Sheboygan River AOC and connected waterways. Data generated will be used to do the following: 1) Assess the overall condition of stream resources in the AOC and connected streams; 2) Provide baseline data for completion of an ecological assessment; and 3) Serve in the development of a fish and wildlife management and restoration plan and a delisting strategy for the fish and wildlife habitat and population impairments.

Physical habitat, instantaneous water chemistry, and biological data will be used to assess

stream quality at individual assessment sites. Habitat and biological index scoring will provide numeric criteria to assess whether or not sites are meeting physical or biological potential. Data will be interpreted to identify which stream reaches may or may not need habitat improvements to support fish and benthic macroinvertebrate populations. Analyses will also be compared to fish community surveys to determine if the streams are meeting their biological potential. Data from multiple sampling sites along a stream will be used to assess the overall condition of individual streams, and aggregation of all the sampling data will be used to identify overall AOC stream quality conditions. These data, combined with those from other recent macroinvertebrate and fish habitat surveys, will provide a baseline for completion of an ecological assessment, which will inform the development of a fish and wildlife management and restoration plan for the AOC.

Errors in this sampling event will be based upon the following:

a) in-field sampling error,
b) handling error post-field, pre-laboratory,
c) laboratory handling error,
d) laboratory analysis error, and
e) data transcription error.

If it has been determined that the following has occurred:

1) The sampling has followed all necessary protocols and samples were taken successfully, and
2) The samples were handled properly prior to and during transport to the laboratory, and
3) All laboratory analysis procedures have been followed, and necessary protocol and analysis were successfully completed,

then the analytical results of that sample will be deemed as successful and “good” data, and can be used for further evaluation.

### B.2.A.8 Special Training/Certification

**Field Personnel**

The Macroinvertebrate and Fish Habitat Assessment Project Leader will be responsible for ensuring that all field staff receives the training necessary for their portion of the study. Prior to the field-sampling season, the Project Leader will go over the SOPs, methods, and QA requirements with the field staff and answer any questions that they may have. All training will be documented and records will be kept in the project file.

To minimize any potential health and safety risks related to field sampling conducted as part of this project, members of the field crew need to be physically able to conduct field work under demanding conditions and be well prepared to handle contingencies or emergencies. The following are suggested requirements for all field survey personnel:

a) Recent CPR training,
b) Recent first aid training,
c) Completion of a satisfactory interview about health and safety aspects of the project with the Macroinvertebrate / Fish Habitat Project Leader, including routine safety precautions and a discussion of actions to be taken in the event of an emergency.

**Lab Personnel**

Personnel training at the Aquatic Biomonitoring Laboratory (ABL) is described in the ABL's Quality Assurance Program Plan for Macroinvertebrate Sample Processing (see Appendix B.9). The Principal Investigator (PI) and Lab Supervisor (LS) will ensure that all laboratory personnel are familiar with the importance of the QA plan as it applies to their work efforts. The QA plan will be posted in the laboratory and readily available for review. All SOPs will also be posted and available for review in the laboratory. The LS will ensure that each laboratory personnel has read, and has a clear understanding of, each SOP as it applies to their work duties. The LS and/or Assistant Lab Supervisor (ALS) will train each new employee on all phases of laboratory work and review each SOP with the employee.

Each new employee will initially train in an assigned SOP only under direct supervision of the LS and/or ALS until SOP is performed to ABL standards. Once trained in SOP, each employee will be subject to spot check QA/QC review by LS and/or ALS. Any noted deficiencies or errors will be addressed as soon as they arise. If deficiencies/errors are noted, the employee will be retrained under direct supervision of the LS and/or ALS until SOP is performed to ABL standards.

## B.2.A.9 Documents and Records

**Field Documents and Records**

Field crew members will complete two forms for each of the 16 macroinvertebrate and fish habitat sites (stream reaches) sampled. The first will be the Macroinvertebrate Field Data Report (Form 3200-081—See Appendix B.3). This report will include details about the macroinvertebrate sampling—such as date, sampling time, location (latitude and longitude), and estimated area sampled—and descriptors of the sampling site, stream, and watershed—such as habitat type; stream order, gradient, velocity, depth, and width; canopy cover; composition and embeddedness of substrate; and various factors that may be affecting the water resource integrity. These forms will be scanned and saved electronically as Portable Document Format (PDF) files, and then the originals will be submitted to the laboratory along with the macroinvertebrate samples. Laboratory personnel will add information to the forms in the "For Lab Use Only" section. The original forms will be returned to the Project Leader and kept in WDNR files for a minimum of 3 years after project completion.

The second form that the field crew members will complete will be one of three different forms. At the wadeable sites, it will be the Wadeable Stream Qualitative Fish Habitat Rating, either Form 3600-532A (for streams < 10 m wide) or Form 3600-532B (for streams > 10 m wide) (see Appendix B.5). This report includes ratings of various habitat parameters—the sum of the scores will provide an overall rating of stream habitat quality. At the nonwadeable site, the form will be the Nonwadeable Baseline Monitoring Electrofishing/Habitat Data Sheet – NW1 (see Appendix A6). This form includes assessments of various habitat parameters, but will not provide an overall habitat score. The habitat data sheets will be scanned and saved electronically as Portable Document Format (PDF) files. All fish habitat assessment results will be proofed and electronically stored in the WDNR/USGS Fish and Habitat Database. The Fish and Habitat Database is resident on USGS servers that are routinely backed up. The original forms will be kept in WDNR files for a minimum of 3 years after project completion.

At the two aquatic plant survey sites, the field crew will complete the aquatic plant monitoring data sheet (Appendix B.7) and the boat survey data sheet (Appendix B.8) referred to in the sampling protocol (Appendix B.6). The forms can be found on the tabs labeled "FIELD SHEET" and "BOAT SURVEY" in the Aquatic Plant Survey Data Workbook, downloadable from the University of Wisconsin Extension website (http://www.uwsp.edu/cnr/uwexlakes/ecology/APM/Appendix-C.xls). The first form includes location/site, county, WBIC (Water Body ID Code), date, observer names, hours worked, site #, depth (ft), dominant sediment type, rake pole or rake rope, total rake fullness, and a rake fullness rating for each species encountered. Each site (sample point) will be associated with a specific predetermined latitude and longitude, so these will not be entered on the data sheet. The second (boat survey) form includes the location/site, county, WBIC (Water Body ID Code), date, field crew names, species seen, nearest sample point, habitat information, and comments. This form is for recording localized plant occurrences that are outside the grid or between sample points. The data sheets will be scanned and saved electronically as Portable Document Format (PDF) files. All results will be proofed and entered into the "ENTRY" sheet in a project-specific copy of the Aquatic Plant Survey Data Workbook. The original forms will be kept in WDNR files for a minimum of 3 years after project completion.

**Laboratory Documents and Records**

Aquatic Biomonitoring Laboratory (ABL) personnel will develop sample logs to record sample processing effort data in electronic format (Excel® spreadsheet). Hard copy sample logs will be developed to allow laboratory personnel to record efforts applied to samples. Effort data entries will include date of sample processing, the initials of laboratory personnel performing sample processing, percent of sample processed to obtain project-specified minimum subsort, and time expenditure for the subsort. Effort data will be ultimately entered into the electronic sample logs. Two electronic log copies will be stored in different locations.

Laboratory taxonomists will record species identifications and counts on macroinvertebrate bench sheets (see Appendix B.14). Data recorded on the bench sheets will include a unique

12-digit sample identification number, names of taxa identified, life stages (as applicable), taxonomic key codes, unique 8-digit organism identification numbers, and number of organisms/taxon. These data will be entered into the DNRBUG program (see below).

Any calibration or maintenance work done on instruments or laboratory equipment will be documented. Records of calibration and maintenance will be maintained in an Excel® file, with two copies stored in different locations. Records will include: identification of the equipment and problem; date of work; person completing the work; and any other pertinent information considered important. Each piece of equipment will be listed on its own worksheet within the Excel® workbook.

All macroinvertebrate data will be generated using the computer DNRBUG program which was developed at the ABL. This program, a compiled Visual dBase program, calculates 26 benthic macroinvertebrate community metrics including the Biotic Index (BI). A standard hard copy report for each sample will be generated using the DNRBUG program including a header and taxalist sheets. The header sheet will include all specific site information completed by a WDNR field person and the unique 12-digit sample identification number. The taxalist sheet will include the unique 12-digit sample identification number, taxonomic determinations, number of organisms/taxon, tolerance value for each taxon, unique 8-digit organism identification number, BI determination and state threatened/endangered ranks where appropriate. Additionally, an Excel® spreadsheet will be developed listing fourteen community metrics (biotic index, family-level biotic index, Max-10 biotic index, index of biotic integrity, species richness, generic richness, percent individuals in the orders Ephemeroptera-Plecoptera-Trichoptera, percent generic taxa in the orders Ephemeroptera-Plecoptera-Trichoptera, Shannon diversity, percent scrapers, percent filterers, percent gatherers, percent shredders and percent individuals in the family Chironomidae).

The LS will send the hard copy reports generated by the DNRBUG program to the macroinvertebrate / fish habitat Project Leader. He will also electronically send the macroinvertebrate data to the WDNR for entry into the WDNR Surface Water Integrated Monitoring System (SWIMS). This process is described in detail in Appendix B.15. The data will be validated, converted to standard formats, and linked to other data for that site and sampling event. The SWIMS File Manager will ensure that the macroinvertebrate assessment results are correctly uploaded into SWIMS.

**Final Report**

A Final Report will be completed for this segment of the project. This report will be uploaded to SWIMS and made available to the Ecological Assessment Team for consideration and inclusion in the Final Ecological Assessment Report. The report will include at minimum:

- Discussion of methods used

- Summary of results
- Summary statistics and metrics
- Discussion of QA/QC, including results of QA checks and any corrective actions
- All data collected

## SECTION B.2.B – DATA GENERATION & ACQUISITION

### B.2.B.1 Sampling Process Design (Experimental Design)

A total of 17 sample sites have been identified for the study (see Figure 6 and Table 9). Sixteen (16) individual macroinvertebrate and qualitative fish habitat assessment sites will be located within the Sheboygan River AOC and Willow Creek, Weedens Creek, and Onion River below the Hingham Dam. Fish community surveys (see Chapter B.1) will also be conducted at these sites, providing a better picture of overall stream health. In addition, aquatic plant surveys will be performed at Sites 2 and 3. Macroinvertebrate, fish habitat, and fish community surveys will not be performed at Site 3. All but the downstream (8th Street) Sheboygan River site are wadeable sites. The 8th Street site is nonwadeable, so sampling methods there will be somewhat different. Sample sites were selected to provide a spatial representation of streams associated with this study. Some of the sites have been sampled before for chemical or biological parameters. Past data will be incorporated into this study if it is valid and less than five years old. Using established sites will provide us with more opportunities for comparisons with historical data using the same or comparable procedures. This sample design should provide general macroinvertebrate and qualitative fish habitat information on the entire area, and allow us to compare the different sections. The aquatic plant surveys will help determine if there is potential spawning habitat for Northern Pike in these areas or if the macrophyte community needs to be improved.

**Table 9. Macroinvertebrate and Qualitative Fish Habitat Sampling Stations.**

| Site # | STREAM NAME | ACCESS POINT | Latitude | Longitude | River Mile |
|---|---|---|---|---|---|
| 1 | Sheboygan River | * US 8th Street - City of Sheboygan | 43.74451 | -87.71285 | 0.7 |
| 2 | Sheboygan River | US New Jersey Avenue - Wildwood Park/Island Complex—**Aquatic Plant Survey** | 43.74463 | -87.73079 | 2.5 |
| 3 | Sheboygan River | SE corner of Taylor Drive and Indiana Avenue —**Aquatic Plant Survey Only** | 43.73970 | -87.74424 | Wetland Complex |
| 4 | Sheboygan River | US CTHY PP - Esslingen Park | 43.74027 | -87.75094 | 3.5 |
| 5 | Sheboygan River | US of Village of Kohler Municipal Garage | 43.72987 | -87.76962 | 6.6 |
| 6 | Sheboygan River | US Weedens Creek Confluence | 43.72083 | -87.77571 | 8.8 |
| 7 | Sheboygan River | US Waelderhaus Dam - Old Pumphouse Access Road | 43.73442 | -87.78287 | 10.1 |
| 8 | Sheboygan River | DS end of Kohler Stables Property | 43.72825 | -87.79589 | 12.0 |
| 9 | Sheboygan River | US Onion River Confluence | 43.72372 | -87.80483 | 12.9 |
| 10 | Onion River | US Ourtown Road | 43.69667 | -87.82086 | 4.0 |
| 11 | Onion River | US CTHY A | 43.62282 | -87.83698 | 12.1 |
| 12 | Onion River | US Risseeuw Road | 43.60161 | -87.87305 | 20.3 |
| 13 | Willow Creek | US Confluence with Sheboygan River | 43.74105 | -87.74696 | 0.04 |
| 14 | Willow Creek | US Greendale Road | 43.74423 | -87.75937 | 1.1 |
| 15 | Willow Creek | US Woodlake Road | 43.75103 | -87.78274 | 2.8 |
| 16 | Weedens Creek | US State Highway 28 | 43.71708 | -87.77284 | 0.4 |
| 17 | Weedens Creek | US CTHY A | 43.69432 | -87.77714 | 3.0 |

* US = upstream; DS = downstream.

In the field, the exact sampling sites / stations for wadeable streams are selected to take advantage of each stream's structure, usually starting and ending at the downstream end of a riffle in order to facilitate fish capture in the fish population surveys. Stations were also chosen to avoid permanent tributaries or hydraulic controls (e.g., dams, old bridge abutments). Each station has been assigned a Station ID in SWIMS so the collected data may be associated with the sampling locations in the database. Where existing station IDs did not exist, new IDs were assigned. Wadeable station length is determined by the mean stream width (MSW), being 35 times the MSW, with a minimum station length of 100 meters (for streams less than 2.9 m MSW). A station's length might be adjusted to be somewhat more or slightly less than 35 times the MSW in order to end at the downstream end of a riffle.

Exact locations of nonwadeable sampling sites are not as critical. The fish sampling protocol requires sampling main-channel-border habitats, which are relatively shallow shoreline areas along the river channel that carry the majority of the river flow.

The aquatic plant surveys at Sites 2 and 3 will cover the area necessary to sample potential northern pike spawning habitat. A grid of sample points will be spread evenly across the area. The number of sample points and grid resolution will be determined by the estimated size of the area to be sampled and the resolution needed to achieve the required survey coverage. Data collected will include date, observer names, hours worked, site #, depth (ft), dominant sediment type, rake pole or rake rope, total rake fullness, and a rake fullness rating for each species encountered. The critical measurements will be the site # (and associated GPS coordinates), species encountered, and rake fullness, along with the summary statistics and metrics calculated from those measurements, such as Shannon Diversity Index and Species Richness.

The only biological sample collections required for this segment of the project are macroinvertebrate samples. At wadeable sites, these will be collected using a 600-micron mesh kick net. One sample will be collected at each site. The objective is to collect at least 100 macroinvertebrates in each sample. Sampling area and /or time may be extended in order to collect at least 100 organisms. At the nonwadeable site, macroinvertebrates will be collected using Hester-Dendy artificial substrate samplers. Three samplers will be combined for a single sample. The Hester-Dendy samplers will be left for six weeks. The organisms in each sample will be counted and identified at the UW-Stevens Point Aquatic Entomology Lab. The macroinvertebrate number and species / taxon data, as well as the metrics and summary statistics, are critical for this study.

A qualitative habitat assessment will be performed at each sampling site (stream reach). At the nonwadeable sites, this will involve rating the stream reach on either five or seven parameters, depending on the mean stream width (greater or less than 10 m wide). These ratings, when summed, provide a numerical habitat score that can then be used to judge overall habitat quality. These scores are critical for the study. The habitat assessment at the nonwadeable site will not result in a numerical habitat score.

Many measurements will be collected by the field crew members in the field. See Table 10 for a list of these parameters and their criticality.

**Table 10. Classification of Measured Parameters for Macroinvertebrate and Qualitative Fish Habitat Assessment.**

| Parameter | Units | Measuring Device | Classification |
|---|---|---|---|
| Sampling location (latitude and longitude) | Decimal degrees | Garmin GPSmap 60CSx Global Positioning System (GPS) | Critical |
| Total sampling time | Minutes | Watch or other time-keeping device | Information only (for number of organisms per unit effort) |
| Estimated area sampled | Square meters | Meter stick and surveyor's judgment | Information only (for estimate of number of organisms per area) |
| Air temperature | Celsius degrees | Hand-held alcohol thermometer | Information only |
| Water temperature | Celsius degrees | Hydrolab DataSonde 5 (multiprobe) | Information only |
| Dissolved oxygen | Milligrams per liter | Hydrolab DataSonde 5 (multiprobe) | Information only |
| Dissolved oxygen | Percent saturation | Hydrolab DataSonde 5 (multiprobe) | Information only |
| pH | Standard units | Hydrolab DataSonde 5 (multiprobe) | Information only |
| Total dissolved solids | Milligrams per liter | Hydrolab DataSonde 5 (multiprobe) | Information only |
| Conductivity | Micromhos per centimeter | Hydrolab DataSonde 5 (multiprobe) | Information only |
| Water transparency | Centimeters | Water clarity tube | Information only |
| Stream gradient | Meters per kilometer | Topographic map or GIS | Information only |
| Stream velocity | Meters per second | Flowmeter | Information only |
| Average stream depth | Centimeters | Meter stick | Information only |
| Average stream width | Meters | Measuring tape | Information only |
| Composition of substrate | Percent | Surveyor's judgment | Information only |
| Substrate embeddedness | Percent | Surveyor's judgment | Information only |
| Canopy cover | Percent | Surveyor's judgment | Information only |
| Station length (for habitat) | Meters | Measuring tape | Critical |
| Station start location | Decimal degrees | Global Positioning System (GPS) | Critical |
| Station end location | Decimal degrees | Global Positioning System (GPS) | Information only |
| Percent channelization | Percent | Surveyor's judgment | Information only |
| Sinuosity | none | Topographic map or GIS | Information only |

## B.2.B.2 Sampling Methods

### Macroinvertebrate Assessments

Semi-quantitative macroinvertebrate assessments will be performed at 16 sites. All but one site are considered wadeable, and at those 15 sites, the field crews will follow the protocol for wadeable streams—Guidelines for Collecting Macroinvertebrate Samples from Wadable Streams, September 2000 (see Appendix B.1). The downstream Sheboygan River (8th Street) site is considered nonwadeable, and field crews will use procedures from the Introduction to Standardized Collection and Assessment of Macroinvertebrates in Nonwadeable Rivers of Wisconsin (see Appendix B.2) at that site.

At each wadeable site, field crew members will collect macroinvertebrates using kick sampling with a 600-micron mesh net. The field crew will preserve the samples in alcohol for later identification. They will complete a Macroinvertebrate Field Data Report (Form 3200-081 (R 2/07)—See Appendix B.3). This report will include details about the sampling—such as date, sampling time, location (latitude and longitude), and estimated area sampled—and descriptors of the sampling site, stream, and watershed—such as habitat type; stream order, gradient, velocity, depth, and width; canopy cover; composition and embeddedness of substrate; and various factors that may be affecting the water resource integrity. Field crew members will also collect instantaneous water quality data, including temperature, dissolved oxygen, conductivity, and pH, using a Hydrolab DataSonde 5 multiprobe and Surveyor 4 handheld display.

At the nonwadeable site, the field crew will collect macroinvertebrates using three Hester-Dendy artificial substrate samplers, which will be anchored in place and left for 6 weeks of macroinvertebrate colonization before collection. Each sampler uses an eyebolt to hold eight 7.6 cm x 7.6 cm (3 inch x 3 inch) plates made of 3.2 mm (1/8 inch) thick masonite hardboard. Spacing between the plates allows for colonization; spacing is 3.2 mm between each of the first three plates, 6.4 mm between each of the next three plates, and 9.6 mm between the last two plates. The field crew will fasten three samplers to an 18 kg cinder block and either suspend it from a snag or set it directly on the substrate. They will avoid placement where the samplers would become completely inundated with sediment, for example, shifting sand or soft substrates. Instead, they will target complex habitats with woody debris, rock, or any other type of colonized substrate, especially in high or low water velocity. Velocity should be 0.09 - 0.5 m/sec. Samplers will be placed to maintain 0.75 – 1.5 m of water above the sampler at low flow. Samplers will be left to colonize macroinvertebrates for six weeks within the window from mid-June through September. After six weeks, the field crew will retrieve the samplers, scrape/rinse off the organisms, combine the sample contents, and preserve them in ethanol. Sample preservation and analyses will follow protocols as per wadeable samples. Field crew members will also collect instantaneous water quality data as they do at the wadeable sites.

**Fish Habitat Assessments**

Field crew members will also perform qualitative fish habitat assessments in the same stream segments where the macroinvertebrates are collected. At the wadeable sites, field crew members will follow the WDNR Guidelines for Qualitative Physical Habitat Evaluation of Wadeable Streams, June 2007 (see Appendix B.4). They will complete either Form 3600-532A (R 6/07), for streams < 10 m wide, or Form 3600-532B (R 6/07), for streams > 10 m wide. These forms can be found in Appendix B.5. Field crew members will assess various habitat parameters listed on the forms and give each a rating. The sum of the scores will provide an overall rating of stream habitat quality. At the nonwadeable site, field crew members will complete the Nonwadeable Baseline Monitoring Electrofishing/Habitat Data Sheet - NW1 (see Appendix A.6), except for those questions specifically related to fish sampling (unless the habitat survey is conducted at the same time as the fish survey). They will assess various habitat parameters as listed on the sheet, but will not come up with an overall habitat score. Field crew members at all sites will collect instantaneous water quality data, including temperature, dissolved oxygen, conductivity, and pH, using a Hydrolab DataSonde 5.

**Aquatic Plant Surveys**

At the aquatic plant (macrophyte) survey sites (see Figures 8 and 9), field crews will adapt methods described in *Recommended Baseline Monitoring of Aquatic Plants in Wisconsin: Sampling Design, Field and Laboratory Procedures, Data Entry and Analysis, and Applications* (Appendix B.6). Before field work is initiated, each site will be divided into equally-spaced sampling points, and the sampling point locations will be loaded onto a GPS. Field crews will navigate to each site using the GPS and will collect macrophytes using a sampling rake as described in the protocol. They will record field data on the aquatic plant monitoring data sheet (Appendix B.7). They will also use the boat survey data sheet (Appendix B.8) to record localized occurrences that are outside the grid or between sample points. Although the protocol says to “voucher each plant species,” plant surveyors will only be collecting plant vouchers as necessary to check questionable species identifications.

This survey method will be modified for non-navigable portions of the wetlands (e.g. property on southwest corner of Taylor Drive intersection). Rather than dragging a rake, the plant density rating will be estimated based on a visual assessment. Dominant plant species will be noted.

**Figure 9. Sheboygan River AOC Wetland Areas 1 (top) and 2 (bottom) for Aquatic Plant Surveys.**

**Performance Requirements and Corrective Actions**

Corrective actions will be taken if any aspect of the sampling event differs from that planned. Under circumstances where corrective action is needed, the macroinvertebrate / fish habitat Project Leader will be notified and the situation researched and a decision made. Corrective actions should only be implemented after approval by the Project Leader. Corrective actions will be documented in the field log or data report at the time of decision, and will accompany all reports after analytical results are returned. The macroinvertebrate / fish habitat Project Leader is ultimately responsible for any corrective actions and appropriate documentation of those actions.

If, during a sampling event, recovery from a pre-determined location is unsuccessful, a new location within the vicinity of the original may be chosen in the field at the discretion of the field team. Reasons that may affect sampling from pre-determined locations include unknown physical anomalies of the riverbed and poor recovery of macroinvertebrates. Documentation of these changes will be made and will include purpose of original location, rationale for changing location, and new location coordinates.

In some instances, weather can be a problem for macroinvertebrate and fish habitat surveys, mostly due to logistical and safety reasons. Surveys will not be performed if field conditions might affect the quality of the data or put the field crew's safety at risk. There should be enough time throughout the field season to coordinate survey effort so that optimal weather conditions can be met.

Since much of the land adjacent to the AOC is privately owned, access could be an issue. Due to Wisconsin's Public Trust Doctrine, field crew members can legally use and perform surveys in all sections of the river itself, but they cannot cross private lands or conduct surveys on private lands without owner permission. Gaining such permission should not be a problem for these surveys. The Project Leader will ensure that landowner permission is granted before any work is done on private property. If necessary, alternative stream entry sites will be found.

## B.2.B.3 Sample Handling & Custody

Field crew members will make sure that each macroinvertebrate sample container is properly labeled. They will make external labels, one for each jar. Labels will have at least a unique sample ID number. If a single sample has to be placed in 2 separate containers due to large sample quantity, field crew members will label the containers accordingly, e.g. container 1 of 2, sample 19990510-16-05. Note that this method differs from that in the Guidelines for Collecting Macroinvertebrate Samples from Wadable Streams, September 2000 (Appendix B.1), in that there will be no internal labels, and the labels will not contain the waterbody name or collector's name—this information will be entered on the field data sheets.

The macroinvertebrate / fish habitat Project Leader will personally deliver all samples and field data sheets to the UW-Stevens Point Aquatic Biomonitoring Laboratory (ABL), where they will be inspected and accepted by the Laboratory Supervisor. All samples and data sheets will be labeled with the unique sample ID numbers, so it will be clear which data sheet belongs to each sample. There will be no custody forms.

Sample tracking and storage at the ABL will follow standard procedures described in the ABL's Quality Assurance Program Plan for Macroinvertebrate Sample Processing (see Appendix B.9). The subsamples used to develop the report will be kept for at least three years. The unsorted remnants of the original samples will be discarded after analysis.

Surveyors of aquatic plants may be collecting plant vouchers as necessary to check questionable species identifications. They will follow the methods described in the aquatic plant survey protocol (see Appendix B.6).

## B.2.B.4 Analytical Methods

### Field

All field methods are described in Section B.2.B.2.

### Laboratory

The macroinvertebrate samples will be analyzed at the University of Wisconsin-Stevens Point (UWSP) Aquatic Biomonitoring Laboratory (ABL). Lab personnel will sort, count, and identify organisms using standard protocols for semi-quantitative Hilsenhoff's biotic index (HBI) samples (see Appendices B.10, B.11, B.12, and B.13). The following is a summary of the procedure for the wadeable site samples. In the lab field samples are placed in gridded trays. A random (numbered) grid square is selected and all macroinvertebrate specimens within the grid square are picked from the tray and placed in a specimen jar. All macroinvertebrates within the grid square are picked. If the target number of 125+ organisms is met, the sub-sampling is completed. If the target number is not met, the next highest number square is picked, and all macroinvertebrates are removed for identification. This process is repeated until the target number of 125+ organisms is reached. The picked specimens are identified by a qualified taxonomist to the lowest practical taxonomic level (typically genus or species) using regional taxonomic identification keys. Taxonomic analytical results data (taxa name and counts) are entered into a database and a number of metrics and indexes are computed for each sample.

The procedure for the nonwadeable site sample will be similar to that for the wadeable site samples, but with some exceptions. The same randomized grid-pan subsampling procedure is employed, but 500 individuals are targeted rather than 125, and a large-rare individual search follows for up to 10 min to include uncommon taxa.

Laboratory personnel are advised to see the Laboratory Supervisor, Assistant Laboratory Supervisor, or Principal Investigator (PI) immediately if any questions or problems arise throughout the procedures. Depending on the situation, the macroinvertebrate / fish habitat Project Leader may also be consulted. If corrective actions are needed, they will be documented at the time of decision, and will accompany all reports after analytical results are returned. The PI is ultimately responsible for any corrective actions and appropriate documentation of those actions.

## B.2.B.5 Quality Control

The data collected by this project will be used to identify and prioritize fish and wildlife habitat restoration actions within the Sheboygan River Area of Concern. It will be used for planning and management decisions. No regulatory requirements or clean up decisions will be made using this data about species and habitat in the AOC so there are no applicable action levels or criteria to be met.

**Quality Control Activities**

Field

Field crew members will be following standard WDNR protocols for these assessments (see Section B.2.B.2.). They will maintain and calibrate equipment as necessary to assure the collection of accurate data (see Sections B.2.B.6 and B.2.B.7). They will check all equipment and supplies each sampling day before heading out into the field (see Section B.2.B.8).

Field crew members will collect field duplicates for macroinvertebrates at a minimum rate of 10% of all samples, or 2 out of 16 sampling sites. These duplicates will be used to calculate if there is variability with sampling methods.

In addition, data completeness will be calculated for this segment of the project. The completeness objective for this project is for 95% of the planned data to be collected and usable. WDNR sampling crews will make every effort to obtain valid data for each sampling point identified in this QAPP.

Laboratory

All analytical procedures are documented in writing as SOPs, and each SOP includes QC information, which addresses the minimum QC requirements for the procedure (see Appendices B.10, B.11, B.12, and B.13). In addition, the laboratory has a Quality Assurance Program Plan, which addresses overall quality assurance for the macroinvertebrate sample processing at the lab (see Appendix B.9).

**Corrective Actions**

Field
Corrective actions will be taken if any aspect of the sampling event differs from that planned. Under circumstances where corrective action is needed, the macroinvertebrate / fish habitat Project Leader will be notified and the situation researched and a decision made. Corrective actions should only be implemented after approval by the Project Leader. Corrective actions will be documented in the field log or data report at the time of decision, and will accompany all reports after analytical results are returned.

Laboratory
Laboratory personnel are advised to see the Laboratory Supervisor, Assistant Laboratory Supervisor, or Principal Investigator (PI) immediately if any questions or problems arise throughout the procedures. Depending on the situation, the macroinvertebrate / fish habitat Project Leader may also be consulted. If corrective actions are needed, they will be documented at the time of decision, and will accompany all reports after analytical results are returned.

## B.2.B.6 Instrument/Equipment Testing, Inspection, and Maintenance

**Field Instruments/Equipment**

WDNR field crew members will be responsible for testing, inspection, and maintenance of all equipment necessary for the macroinvertebrate, fish habitat, and aquatic plant assessments for the duration of this study. The primary instruments needing testing and maintenance will be the Hydrolab DataSonde 5, hand-held thermometers, and the Global Positioning System (GPS). These instruments will be maintained and operated as described in their respective user manuals.

Hydrolab DataSonde 5
The macroinvertebrate / fish habitat Project Leader will assure that the Hydrolab Sonde has the long-term maintenance recommended by the manufacturer (Hach Hydromet). This includes annual service and calibration by the manufacturer. The Field crew members will maintain the instrument and sensors during the course of this study as needed according the *Hydrolab DS5X, DS5, and MS5 Water Quality Multiprobes User Manual* (see Appendix B.16). They will perform a check and calibration of the Hydrolab equipment at the start of each field sampling day. They will check that all the sensors are clean and that the dissolved oxygen sensor membrane is not wrinkled, bubbled, or torn. If necessary, they will replace the electrolyte and membrane on the dissolved oxygen sensor as described in the Hydrolab User Manual.

Field Thermometers
The field thermometers to be used for this study are hand-held alcohol-filled thermometers to

be used for instantaneous air temperature measurements. Although the hand-held thermometers cannot be calibrated, they can be checked for accuracy compared to a National Bureau of Standards (NBS) certified and traceable thermometer. Field thermometers will be checked for accuracy annually.

Global Positioning System (GPS)

Field crew members will be using a Garmin GPSmap 60CSx GPS for these surveys. They will maintain the unit per manufacturer recommendations. Surveyors will record the GPS error displayed by the unit at each survey location. According to the manufacturer, this unit typically has a position error of less than 10 meters. The objective for this study will be for all GPS measurements to have an error of less than 10 meters.

Other Equipment

Other equipment necessary for these assessments includes those measuring devices listed in Table 10, the field gear listed on pp 7-8 of the aquatic plant survey protocol (Appendix B.6), and the following: 600-micron mesh kick net, clipboard, county plat books, and other maps as needed. A camera, although not necessary, might prove valuable for documentation purposes. In addition, any crew members who will be in the water during fish electroshocking for the fish population assessments will require waders. The field crew members will check that all items are present and in good condition before sampling.

**Laboratory Instruments/Equipment**

As part of the laboratory's QA/QC program, a routine preventative maintenance program will be conducted to minimize the occurrence of instrument failure and other system malfunctions. All laboratory instruments are maintained in accordance with manufacturer's specifications and the requirements of the specific method employed. This maintenance is carried out on a regular, scheduled basis and is documented in an Excel® spreadsheet. Records will include: identification of the equipment and problem; date of work; person completing the work; and any other pertinent information. Each piece of equipment will be listed in its own worksheet within the Excel® spreadsheet. For lists of equipment and supplies needed for the macroinvertebrate analysis, please see the standard protocols in Appendices B.10, B.11, B.12, and B.13).

## B.2.B.7 Instrument/Equipment Calibration and Frequency

The only instrument to be used in these assessments that will need calibrating is the Hydrolab DataSonde 5. The macroinvertebrate / fish habitat Project Leader will assure that this instrument has the long-term maintenance recommended by the manufacturer (Hach Hydromet). This includes annual service and calibration by the manufacturer. In addition, the field crew members will calibrate the instrument for pH and dissolved oxygen (DO) using the Surveyor 4 handheld display every day before sampling. They will use the 2-point calibration

method for the pH and the water-saturated air method for the DO. The calibration for conductance is checked with a standard, which also serves as the calibration for TDS. Instructions for these calibrations can be found in the Hydrolab user manual in Appendix B.16. All calibration activities will be recorded in project field books.

### B.2.B.8 Inspection/Acceptance of Supplies & Consumables

Critical supplies and consumables for the field assessments include those listed on pp 7-8 of the aquatic plant survey protocol (Appendix B.6), plus widemouth sample jars, adhesive labels, flagging tape, ethanol, and distilled/deionized water. Field crew members will check that all items are present and in good condition before sampling. If any items are missing or inadequate, they will remedy the situation, with the Project Leader's help if necessary, before they leave for the field.

Supplies used by the laboratory for the macroinvertebrate analysis are listed in the lab's standard protocols for semi-quantitative Hilsenhoff's biotic index (HBI) samples (see Appendices B.10, B.11, B.12, and B.13). Laboratory personnel will be responsible for ensuring that all supplies are inspected and replaced if needed. Only reagents and preservatives in sufficient quality to meet project requirements will be used. As a general rule, 80% isopropyl alcohol will be used as the standard preservative for benthic macroinvertebrate samples. Purchased reagents such as mounting media will be labeled with the date received, the date opened, and the expiration date when appropriate.

### B.2.B.9 Data Acquisition Requirements for Non-Direct Measurements

Non-direct measurements (secondary data) will not be used for these assessments.

### B.2.B.10 Data Management

**Field Data**

The field crew members will record the assessment data on paper forms. These will include a Macroinvertebrate Field Data Report (Form 3200-081—See Appendix B.3) for every macroinvertebrate / habitat site, a Wadeable Stream Qualitative Fish Habitat Rating, either Form 3600-532A (for streams < 10 m wide) or Form 3600-532B (for streams > 10 m wide) (see Appendix B.5), for each wadeable site, and a Nonwadeable Baseline Monitoring Electrofishing/Habitat Data Sheet – NW1 (see Appendix A.6) for the nonwadeable site. At the two aquatic plant survey sites, the field crew will complete the aquatic plant monitoring data sheet (Appendix B.7) and the boat survey data sheet (Appendix B.8). The crew members will provide these completed forms to the macroinvertebrate / fish habitat Project Leader.

The Project Leader will check the forms for completion and accuracy, and he or designated WDNR staff will scan and save all of the forms electronically as Portable Document Format (PDF) files, to be uploaded to the WDNR Surface Water Integrated Monitoring System (SWIMS). He will then enter the data from the fish habitat forms and the Hydrolab DataSonde 5 water quality data into the WDNR/USGS Fish and Habitat Database. He will also enter the aquatic plant survey data into an Aquatic Plant Survey Data Workbook, (http://www.uwsp.edu/cnr/uwexlakes/ecology/APM/Appendix-C.xls), which will calculate various summary statistics and metrics in the STATS worksheet (see protocol in Appendix B.6). The aquatic plant data will also be stored in SWIMS. The Project Leader will deliver the Macroinvertebrate Field Data Reports to the UW-Stevens Point Aquatic Biomonitoring Laboratory (ABL) along with the macroinvertebrate samples. These reports will be returned after sample analysis. The Project Leader will keep all original field data sheets at his office for a period of three years.

All qualitative fish habitat data will be entered and stored in the WDNR/USGS Fish and Habitat Database, a statewide repository for fish population and habitat survey results. Fisheries and habitat data collected from Tier 1 and Tier 2 fisheries management assessment surveys, habitat improvement surveys, stocking and regulation evaluation surveys, tournament permits, stocking permits, fish kill investigations and stocking planning and activities are stored in the Database, which is accessed through the WDNR Fisheries Management Internal Website: http://infotrek.er.usgs.gov/wdnr_bio. Information stored in the Database is used to generate statewide stocking or fisheries summaries, to evaluate fisheries status and trends, to evaluate the effectiveness of regulation strategies or stocking practices, or in regulatory decision making, permitting and policy decisions. The fisheries biologists or designated fisheries technicians and their fish team supervisors are ultimately responsible for the long-term maintenance of all records in the Database within their management area. The protocols for data management for the Fish and Habitat Database are contained in the *WDNR Fisheries Management Handbook* in Chapter 11, Sections J – P October 2009 draft update (see Appendix A.10).

Each monitoring station for the macroinvertebrate and fish habitat surveys has a Surface Water Integrated Monitoring System (SWIMS) station number. This number will tie the data to other chemical and biological data collected at the same sampling location.

**Laboratory Data**

UWSP ABL personnel will add additional information to the Macroinvertebrate Field Data Reports (in the "For Lab Use Only" section) pertaining to the initial sample sorting procedure. Taxonomists will record species identifications and counts on macroinvertebrate bench sheets (see Appendix B.14). ABL personnel will enter these data, along with the data from the Macroinvertebrate Field Data Reports, into the DNRBUG program, a compiled Visual dBase program developed at the ABL. The DNRBUG program calculates 26 benthic macroinvertebrate community metrics including the Biotic Index (BI)—please see Section B.2.A.9 Documents and

Records for more information. Accuracy of data entry will be hand checked by comparing the computer generated reports against the hand written bench and field sheets. Additional data validity checks are made within the DNRBUG computer program. All data checks are executed prior to performing metric calculations and subsequent database storage.

Master computer database files containing all field and laboratory data will be updated as new samples are processed. All data developed by ABL will be stored in the master database. Electronic copies of the master database will be stored on three different hard drives and two different forms of external media storage (CD and flash drive). Hard drive storage will be accessible to only the Principal Investigator (PI) and Laboratory Supervisor (LS). External media storage is secured by the LS. At regular intervals, the updated master database will be made accessible through the ABL website (available at http://www.uwsp.edu/water/biomonitoring/index3.htm).

Taxonomic information for Wisconsin aquatic macroinvertebrates is stored within the DNRBUG program in the file TAXAMAST.DBF. This file contains the taxon-unique 8 digit organism identification number, taxonomic nomenclature, BI tolerance value (if applicable) and Wisconsin Threatened/Endangered rank listing of the aquatic macroinvertebrates in Wisconsin. This file will be updated as new taxonomic classifications and information become available. Periodic literature reviews, and consultations with colleagues, will be conducted to ensure that TAXAMAST.DBF data are current.

The LS will send the hard copy reports generated by the DNRBUG program to the macroinvertebrate / fish habitat Project Leader. He will also electronically send the macroinvertebrate data to the WDNR for entry into SWIMS, a statewide repository for water and sediment monitoring data, including chemical, physical, and biological (macroinvertebrate and aquatic invasives) data. The data entry/upload process is described in detail in Appendix B.15. The data will be validated, converted to standard formats, and linked to other data for that site and sampling event using the SWIMS-generated station ID and project ID. The SWIMS File Manager will ensure that the macroinvertebrate assessment results are correctly uploaded into SWIMS. Once in SWIMS, the data will be available online to WDNR and non-WDNR partners and associated with the project details.

## B.3 – HERPTILE SURVEY

## B.3.A – PROJECT MANAGEMENT

### B.3.A.4 Project/Task Organization

**Table 11. Roles & Responsibilities for Herptile Survey.**

| Individual(s) Assigned | Responsible for: |
|---|---|
| Jennifer Conner, EPA Project Officer | • Review project information and reporting in Great Lakes Accountability System (GLAS)<br>• Assist the Project Manager in defining milestones for the project |
| Donalea Dinsmore, WDNR Great Lakes Funding and Quality Assurance Coordinator | • Approve QAPP<br>• Ensure that the approved QAPP is uploaded into SWIMS database<br>• Project reporting on Great Lakes Accountability System (GLAS) |
| Vic Pappas, WDNR Sheboygan Basin Supervisor, Project Manager | • Overall project management<br>• Monitors study progress<br>• Ensures project completion |
| Laurel Last, WDNR Water Resources Management Specialist, Project QA Manager | • QAPP preparation & distribution<br>• Overall project QA/QC<br>• Ensures QAPP is followed<br>• Project reporting in SWIMS database |
| Lisa Helmuth, WDNR Surface Water Integrated Monitoring System (SWIMS) File Manager | • Manage SWIMS database, which will include approved QAPP and project reports |
| Richard Staffen, WDNR Assistant Zoologist, WDNR Project Leader for Herptile Survey | • Herptile survey project leader and QA officer<br>• Oversee data collection, analysis, and reporting for herptile surveys<br>• Ecological Assessment Team member |
| Bill Smith, WDNR Heritage Zoologist | • Herptile data and photo voucher review<br>• Oversight of herptile contractor |
| Herptile Survey Contractor | • Contact property owners before herptile surveys are conducted<br>• Conduct herptile surveys<br>• Complete historical data / literature review of herptiles in study area<br>• Prepare a final report of herptile survey results |
| Christina Isenring, WDNR Heritage Ecologist | • Project Liaison who would coordinate distribution of NHI data when requested |
| WDNR NHI staff | • Enter rare species and high-quality natural community locations into the NHI database |

## B.3.A.5 Problem Definition/Background

Developing a fish and wildlife management and restoration plan for the Sheboygan River Area of Concern (AOC) requires synthesizing a variety of sources of background information. When the existing information needed for the conservation of biological diversity is not considered adequate for planning, a "biotic inventory" is conducted. These inventory efforts focus on rare species and high-quality examples of native communities and include field surveys, as well as data collection, synthesis, and interpretation. The scope and intensity of biotic inventory efforts vary according to the size and ecological complexity of the properties involved, as well as the amount of existing information available. Herptile (amphibian and reptile) surveys are routinely conducted on properties as part of these efforts. These data will aid in the prioritization of ecologically important sites and conservation of rare species.

## B.3.A.6 Project/Task Description

Herptile surveys will be performed in the Sheboygan River AOC and its riparian corridor. Data generated from these surveys will be used to do the following: 1) Assess the overall health of herptiles in the AOC; 2) Provide baseline herptile population data for completion of an ecological assessment; and 3) Serve in the development of a fish and wildlife management and restoration plan and a delisting strategy for fish and wildlife habitat and population impairments.

Herptile surveyors will conduct qualitative herptile surveys at selected locations within the Sheboygan River AOC. At each location, surveyors will compile a list and numbers of all herptile species seen or heard. They will focus on Endangered, Threatened, Special Concern, and regionally rare species (target species), but all species encountered will be noted. They will record the GPS coordinates of any herptiles encountered and locations of surveys. They will also take pictures of specimens of each target species as photo vouchers.

Surveyors will prepare a final report and supporting materials of inventory results. This report will discuss the findings for each site, and include a summary of historical records, detailed survey records, and GPS coordinates of target individuals encountered or important habitat features. A summary report will include discussion of species' status, ecologically important areas, threats observed, management considerations, and remaining inventory and monitoring needs.

The exact survey locations have not yet been selected. Surveyors will identify the survey locations using recent aerial photos, USGS 7.5' topographic maps, various Geographic Information System (GIS) sources, information from past survey efforts, and the expertise of biologists familiar with the properties or with similar habitats in the region. Surveyors will focus on habitats that have the potential to support rare species.

After verification, WDNR NHI staff will enter rare species and high-quality natural community locations into the NHI database, the central repository for rare species and high-quality natural community data for Wisconsin. The final report and data will be included in the overall Ecological Assessment which is the final report for the Sheboygan AOC Pathway to Delisting habitat BUI's—Survey and Assessment Project.

Project Timeline:
April-June and September-October, 2011— Herptile surveys completed.
January 1, 2012— Initial findings available.
June 30, 2012—Final report (Ecological Assessment) completed for entire AOC project.

## B.3.A.7 Quality Objectives & Criteria

The primary objective of this segment of the project is to conduct an inventory of herptile species, focusing on Endangered, Threatened, Special Concern, and regionally rare species (target species) in select areas within the AOC. The information provided by surveyors from this project through a final report will provide screening-level data, allow biologists and planners to understand the distribution of rare and representative species within the AOC, and provide information for selecting the most appropriate sites for conserving rare taxa. These data will also contribute to the overall knowledge for certain rare species, identify threats to these populations, and provide suggestions for habitat improvements. The information collected will be included in an Ecological Assessment, which will inform the development of a fish and wildlife management and restoration plan and a delisting strategy the for fish and wildlife habitat and population impairments.

**A. Precision & Accuracy/Bias**
This method of surveying herptiles does not support measurable precision nor accuracy/bias calculations. The surveyor chosen for this project will be knowledgeable and experienced, with procedures and identification skills that we trust. Also, the surveyor will be required to take photos of representative organisms of target species at each site. These photo vouchers will be verified by Bill Smith, Heritage Zoologist, and Richard Staffen, Assistant Zoologist. Since a single person will be performing all of the surveys, the methods should be consistent among sites. The surveyor will be required to use a GPS device that is accurate to 10 meters or better. Since the species are mobile, the exact locations are not critical—the coordinates are meant to represent the general areas where the species are found.

**B. Data Representativeness**
The primary purpose of this survey is to discover rare species presence and identify potential sites and habitats that could support uncommon herptiles within this AOC. Survey locations will be chosen to maximize the chance of discovering any rare species. Data collected in this fashion will be representative of current herptile habitat present at the selected sites within the AOC. The size of the area represented will be determined by the species and habitat present.

**C. Comparability**

The procedures used in this project will be comparable to those used in other Rapid Ecological Assessments performed by WDNR Bureau of Endangered Resources (BER). Specific herptile survey methods will be at the discretion of the surveyor. Methods and procedures will be documented in the final report.

**D. Completeness**

The project completeness goal is 100%. The contractor must deliver the specified report as a condition of the contract.

## B.3.A.8 Special Training/Certification

We will not be providing special training to the herptile surveyors. They will be hired knowing that they are already fully qualified to perform the necessary tasks. We will use a list of contractors that we have historically worked with in the past and any others that are recommended to us. We will choose from this list based on location in the state for the project and the contractors' knowledge of those landscapes, their availability, and interest. We will generally choose from those who we know and trust from previous work that they will deliver the high-quality products required.

## B.3.A.9 Documents and Records

Using Natural Heritage Inventory (NHI) methodology (see Appendix C.1 and http://www.natureserve.org/prodServices/heritagemethodology.jsp), surveyors will document target rare herptile occurrences. Target species are those listed on the Wisconsin Natural Heritage Working List (see Appendix C.3). Documentation will include a spreadsheet of target species locations that contains the following: species common name, scientific name, waypoint number, Latitude & Longitude of waypoint taken (which should be in decimal degrees with Datum of WGS 84), number of individuals observed, date, habitat type, and observer name. Documentation will also include photographs of specimens for species verification. In addition, surveyors will document sites that were surveyed without finding any target or common species, noting habitats present and what potential target species could utilize those areas. Documentation of private landowner contact will be provided in cases where the surveyor contacts landowners directly for permission to access survey sites on private property.

Surveyors will prepare a final report and supporting materials of inventory results:

Report will be organized to include the following sections: Introduction, Methods, Results (organized by site), and Summary.

a. Introduction will include general background information.
b. Methods will discuss the inventory methods used by the contractor.
c. Results will discuss findings for each site. Information should include summary of historical records, detailed survey records, and GPS coordinates of records.

d. Summary will include discussion of species' status, ecologically important areas, threats observed, management considerations, and remaining inventory and monitoring needs.

After verification, WDNR NHI staff will enter rare species and high-quality natural community locations into the NHI database, the central repository for rare species and high-quality natural community data for Wisconsin. All data added to the NHI database go through a quality control process to ensure their validity and accuracy.

The surveyor shall, for a period of three years after completion and acceptance by the WDNR Project Leader, maintain books, records, documents and other evidence directly pertinent to performance on work under this contract in accordance with generally accepted accounting principles and practices.

Natural Heritage Inventory (NHI) data are exempt from Wisconsin's Open Record Law. All data collected under this project/contract become part of this inventory and should be treated as sensitive data. Distribution of inventory data and reports resulting from the work overseen by the Natural Heritage Inventory will primarily be the responsibility of the NHI Program. Any requests for this data should be directed to the WDNR project liaison who will coordinate distribution. Publication of data by surveyors is permitted if locations of element occurrences are generalized to prevent harm to the elements. The surveyor can distribute reports that do not contain precise locations of element occurrences. A list tallying where these records are distributed will be provided to the project liaison.

The results of the survey will be uploaded to the WDNR Surface Water Integrated Monitoring System (SWIMS) and provided to the team responsible for preparing the Ecological Assessment Report.

## SECTION B.3.B – DATA GENERATION & ACQUISITION

### B.3.B.1 Sampling Process Design (Experimental Design)

The purpose of the herptile survey segment of the project is to provide reliable, accurate information on herptile populations, with an emphasis on rare species, within the Sheboygan River AOC and its riparian corridor. This information can then be used to inform the development of a fish and wildlife management and restoration plan and specific delisting strategies for the fish and wildlife beneficial use impairments (BUIs) in the AOC. The experimental design must ensure collection of quality data in order to support these goals.

Herptile surveyors will conduct qualitative herptile surveys at selected locations within the Sheboygan River AOC. At each location, surveyors record the GPS coordinates, compile a list of herptile species found, and note survey type utilized and effort involved. They will also take pictures of specimens of each target species as photo vouchers. The most critical measurements collected will be the location (GPS coordinates), herptile species present, and photo vouchers of rare species or species not previously documented in the area. All other information, though important to an overall understanding of the status of the herptile populations, is not as critical for this project.

Herptile survey locations will be determined by the surveyor prior to the beginning of the inventory period using their knowledge of this landscape, aerial photos and topographical maps of the project area, various GIS layers, and the list of target species habitat requirements. Surveyors will focus on habitats that have the potential to support rare species.

The number of survey sites will be determined by how much money is available, the amount and quality of habitat available, and access granted to private property. Timing of the surveys will be determined by the surveyor, using his or her professional judgment. As this is a one-time assessment rather than a monitoring study, each site will be surveyed only once during the project.

### B.3.B.2 Sampling Methods

**Sampling Methods**

There is not a standard protocol for the herptile surveys. Specific methods of data collection will be left up to the judgment of the surveyor. Following is a list of possible methods:

- Visual Encounter Searches (VES): Will be performed in and around appropriate habitats and during all associated survey efforts in the area, and could include road cruising (esp. on spring nights following rainfall), basking surveys, and searching appropriate breeding

habitats for nesting turtles or egg masses from breeding salamanders. Time constrained surveys are recommended for this method.

- Drift Fences with Pitfall Traps: Drift fences are barriers that will direct animals traveling on the substrate into pitfall traps placed at the ends of or beside the barriers. Drift fences with pitfall traps will be used to determine species richness at a site and to detect the presence of rare species. The traps capture some species more easily than others because anurans that are strong jumpers or climbers may escape.
- Minnow Traps and Dip Nets: used to capture breeding adult and larval frogs, toads, and salamanders. These are easy to set and can produce well, especially in smaller ponds where individuals will often be more concentrated.
- Calling Surveys (Wisconsin Frog & Toad Survey protocol): Planned survey route with numerous discrete sites or stops near appropriate habitat will be surveyed 3 times throughout the breeding season. Sampling periods will include April 8-30, May 20- June 5, June 20- July 15.
- Cover Object Surveys: 32-48" pieces of 3/4" exterior plywood placed in early April. The boards should be placed near wetlands in sunny, open grasslands or wooded areas to attract snakes and will be checked late in the day when warmed from the sun.

Note that there will be no samples collected for this survey. Individuals of target species may be photographed for photo vouchers.

Note: Contractors selected for this work are responsible for identifying the procedures used in their final report. Before considering any new contractor for this work, WDNR Bureau of Endangered Resources staff would need to evaluate qualifications and procedures.

**Performance Requirements and Corrective Actions**

The herptile surveyor will be responsible for collecting the data as contracted, and will take corrective actions as needed. Corrective actions will be documented in the field log or data report at the time of decision, and will accompany all reports after analytical results are returned.

Weather is the major variable for this work, but there should be enough time throughout the field season to coordinate survey effort so that optimal weather conditions can be met. However, if weather does become a problem, the skilled herpetologist will be able to analyze the habitats present and discuss potential herptile species at a location. Also, since much of the land adjacent to the AOC is privately owned, access could be an issue. Due to Wisconsin's Public Trust Doctrine, the surveyor can legally use and perform surveys in all sections of the river itself, but cannot cross or conduct surveys on private lands without permission. The Project Leader and the surveyor will ensure that landowner permission is granted before any work is done on private property. If necessary, alternative survey sites will be found.

### B.3.B.3 Sampling Handling & Custody

No samples will be collected for this survey.

### B.3.B.4 Analytical Methods

All observations will be done in the field. No analytical equipment or methods will be used.

### B.3.B.5 Quality Control

The data collected by this project will be used to identify and prioritize fish and wildlife habitat restoration actions within the Sheboygan River Area of Concern. It will be used for planning and management decisions. No regulatory requirements or clean up decisions will be made using this data about species and habitat in the AOC so there are no applicable action levels or criteria to be met.

**Quality Control Activities**

Herptile species identification will be performed at the survey site by the surveyor, using his or her training and experience and reference keys as necessary. Photo vouchers will be taken of individuals of target species. These vouchers will then be checked by Bill Smith, Heritage Zoologist, and Richard Staffen Assistant Zoologist. In the event that the surveyor is unsure of the species of a particular herptile, a photo voucher will be collected so the identification can be made or confirmed by the herpetologist. The final report will be reviewed by WDNR Bureau of Endangered Resources staff for accuracy and completeness.

A single person will be performing all of the surveys, supporting consistency of sampling methods. The herptile surveyor will choose methods appropriate for the target species and field conditions, and will document and describe the methods used in a final report. The surveyor will ensure that all equipment and supplies are present and in good working order in order to support the collection of accurate data. The contractor will be responsible for developing procedures to assure that photo vouchers are tied to the field data and location. In addition, the contractor will be responsible for reviewing his or her field records to assure that the information is accurate and complete.

**Corrective Actions**

The herptile surveyor will be responsible for collecting the data as contracted, and will take corrective actions as needed for these surveys. Corrective actions will be documented in the field log or data report at the time of decision, and will be included in the final report.

If the WDNR biologists disagree with an identification made by the surveyor, and there is a question as to its true identity, the information will be kept on file, but will be disregarded in the final report and will not be added to the NHI database. If the specimen can be clearly identified as something other than what the contractor recorded, then the species will be changed for the records and the database. This change will be recorded and included in the final report.

### B.3.B.6 Instrument/Equipment Testing, Inspection, and Maintenance

The herptile surveyor will be responsible for supplying all equipment necessary for the surveys, and for the testing, inspection, and maintenance of that equipment. The primary instrument needing testing and maintenance will be the Global Positioning System (GPS). The surveyor will be responsible for maintaining it and keeping it in operable condition, referring to the owner's manual as needed. Any problems with the GPS unit should be resolved by the surveyor.

Other equipment necessary for these assessments include keys for herptile identification, a camera (preferably digital) to collect photo vouchers, equipment for herptile collection (specific to the method used, but may include drift nets with pitfall traps, minnow traps and dip nets, or plywood sheets), and outdoor clothing appropriate for the conditions. The surveyor will check that all items are present and in good condition before sampling.

### B.3.B.7 Instrument/Equipment Calibration and Frequency

This survey does not use instruments or equipment that can be calibrated. The accuracy of the GPS unit can be verified using established monuments; however, this is not critical for project success.

### B.3.B.8 Inspection/Acceptance of Supplies & Consumables

The particular supplies or consumables used will depend on the sampling methods. The surveyor will ensure that any supplies or consumables required are present and in good condition before sampling.

### B.3.B.9 Data Acquisition Requirements for Non-Direct Measurements

The surveyor is required to do a historical data / literature review of the areas surveyed, and to include the findings in the final report. This information is supplemental to the study, and will be used to provide background information on historical herptile populations. The surveyor

should only include data that are from peer-reviewed journals or other sources that are known to be accurate and reliable. Data from the Natural Resources Heritage Inventory (NHI) will also be evaluated. This database is considered as an authoritative source and no special review of the data obtained from this source will be required.

### B.3.B.10 Data Management

Data management will follow the Benchmark Data Content Standards (BDCS) established by NatureServe (see Appendix C.2). The BDCS ensure a high level of accuracy, currency and quality to the species data maintained across the network of member programs and NatureServe.

The surveyor will record the survey data on paper, and then enter the data into a spreadsheet. The surveyor will be responsible for ensuring that the data are transferred and entered correctly. The surveyor will submit the spreadsheet along with photo vouchers and a final report. Bill Smith, Heritage Zoologist, and Richard Staffen, Assistant Zoologist will check the data, using the photo vouchers to confirm species identifications. After the information in the spreadsheet and final report is checked for accuracy, it will be included in the final report for the Sheboygan AOC Pathway to Delisting project.

After survey data have been verified, WDNR NHI staff will enter rare species and high-quality natural community locations into the NHI database, the central repository for rare species and high-quality natural community data for Wisconsin. All data added to the NHI database go through a quality control process to ensure their validity and accuracy.

## B.4 – BREEDING BIRD SURVEY

## B.4.A – PROJECT MANAGEMENT

### B.4.A.4 Project/Task Organization

**Table 12. Roles & Responsibilities for Breeding Bird Survey.**

| Individual(s) Assigned | Responsible for: |
|---|---|
| Jennifer Conner, EPA Project Officer | • Review project information and reporting in Great Lakes Accountability System (GLAS)<br>• Assist the Project Manager in defining milestones for the project |
| Donalea Dinsmore, WDNR Great Lakes Funding and Quality Assurance Coordinator | • Approve QAPP<br>• Ensure that the approved QAPP is uploaded into SWIMS database<br>• Project reporting on Great Lakes Accountability System (GLAS) |
| Vic Pappas, WDNR Sheboygan Basin Supervisor, Project Manager | • Overall project management<br>• Monitors study progress<br>• Ensures project completion |
| Laurel Last, WDNR Water Resources Management Specialist, Project QA Manager | • QAPP preparation & distribution<br>• Overall project QA/QC<br>• Ensures QAPP is followed<br>• Project reporting in SWIMS database |
| Lisa Helmuth, WDNR Surface Water Integrated Monitoring System (SWIMS) File Manager | • Manage SWIMS database, which will include approved QAPP and project reports |
| Richard Staffen, WDNR Assistant Zoologist, WDNR Project Leader for Breeding Bird Survey | • Breeding bird survey project leader and QA officer<br>• Oversee data collection, analysis, and reporting for breeding bird surveys<br>• Ecological Assessment Team member |
| Bill Smith, WDNR Heritage Zoologist | • Data verification of breeding bird survey<br>• Oversight of breeding bird survey contractor |
| Breeding Bird Survey Contractor | • Contact property owners before breeding bird surveys are conducted<br>• Conduct breeding bird surveys<br>• Complete and submit breeding bird survey data sheets<br>• Prepare a final report of breeding bird survey results |
| Christina Isenring, WDNR Heritage Ecologist | • Project Liaison who would coordinate distribution of NHI data when requested |
| WDNR NHI staff | • Enter rare species and high-quality natural community locations into the NHI database |

## B.4.A.5 Problem Definition/Background

Developing a fish and wildlife management and restoration plan for the Sheboygan River Area of Concern (AOC) requires synthesizing a variety of sources of background information. When the existing information needed for the conservation of biological diversity is not considered adequate for planning, a "biotic inventory" is conducted. These inventory efforts focus on rare species and high-quality examples of native communities and include field surveys, as well as data collection, synthesis, and interpretation. The scope and intensity of biotic inventory efforts vary according to the size and ecological complexity of the properties involved, as well as the amount of existing information available. Breeding bird surveys are routinely conducted on properties as part of these efforts. These data will aid in the prioritization of ecologically important sites and conservation of rare species.

## B.4.A.6 Project/Task Description

Breeding bird surveys will be performed in the Sheboygan River AOC and its riparian corridor. Data generated from these surveys will be used to do the following: 1) Assess the overall health of breeding bird populations in the AOC; 2) Provide baseline bird population data for completion of an ecological assessment; and 3) Serve in the development of a fish and wildlife management and restoration plan and a delisting strategy for fish and wildlife habitat and population impairments.

Surveyors will conduct breeding bird surveys at selected locations within the Sheboygan River AOC and its riparian corridor. At each location, surveyors will compile a list of bird species seen or heard, noting uncommon species encountered and high-quality habitats observed. They will focus on Endangered, Threatened, Special Concern, and regionally rare species (target species), but all species encountered will be noted. They will record the GPS coordinates of each point count survey location.

Surveyors will prepare a final report and supporting materials of inventory results. This report will discuss the findings for each site, and include detailed survey records, and GPS coordinates of records. A summary will include discussion of ecologically important areas, threats observed, management considerations, and remaining inventory and monitoring needs.

The exact survey locations have not yet been selected. Surveyors will identify the survey locations using recent aerial photos, USGS 7.5' topographic maps, various Geographic Information System (GIS) sources, information from past survey efforts, and the expertise of biologists familiar with the properties or with similar habitats in the region. Surveyors will focus on habitats that have the potential to support rare species.

After verification, WDNR NHI staff will enter rare species and high-quality natural community locations into the NHI database, the central repository for rare species and high-quality natural

community data for Wisconsin. The final report and data will be included in the overall Ecological Assessment which is the final report for the Sheboygan AOC Pathway to Delisting habitat BUI's—Survey and Assessment Project.

Project Timeline:
June, 2011— Breeding bird surveys completed.
January 1, 2012— Initial findings available.
June 30, 2012—Final report (Ecological Assessment) completed for entire AOC project.

## B.4.A.7 Quality Objectives & Criteria

The primary objective of this segment of the project is to conduct an inventory of all bird species, focusing on Endangered, Threatened, Special Concern, and regionally rare species (target species) in select areas within the AOC. The information provided by surveyors from this project through a short final report and data sheets will provide screening-level data, allow biologists and planners to understand the distribution of rare and representative species within the AOC, and provide information for selecting the most appropriate sites for conserving rare taxa. These data will also contribute to the overall knowledge for certain rare species, identify threats to these populations, and provide suggestions for habitat improvements. The information collected will be included in an Ecological Assessment, which will inform the development of a fish and wildlife management and restoration plan and a delisting strategy the for fish and wildlife habitat and population impairments.

**A. Precision & Accuracy/Bias**
We will not be performing precision nor accuracy/bias calculations for these surveys. This study area is so small that we will not use the data to develop population estimates. We will instead be able to note known breeding pairs of birds. The surveyor chosen for this project will be knowledgeable and experienced, with identification skills that we trust. All data will be verified by Bill Smith, Heritage Zoologist, and Richard Staffen, Assistant Zoologist. Since a single person will be performing all of the surveys, the methods should be consistent among sites. The surveyor will be required to use a GPS device that is accurate to 10 meters or better. Since the species are mobile, the exact locations are not critical—the coordinates are meant to represent the general areas where the species are found.

**B. Data Representativeness**
The primary purpose of this survey is to discover rare species presence and some general indices of relative abundance within this AOC. Survey locations will be chosen to maximize the chance of discovering any rare species. Data collected in this fashion will be representative of current breeding bird habitat present at the selected sites within the AOC. The size of the area represented will be determined by the species and habitat present.

**C. Comparability**
The procedures used in this project will be comparable to those used in other Rapid Ecological Assessments performed by WDNR Bureau of Endangered Resources (BER). Surveyors will

follow specific protocols (see Appendix C.5) to ensure that the study results will be repeatable. Methods and procedures will be documented in the final report.

**D. Completeness**

The project completeness goal is 100%. The contractor must deliver the specified report as a condition of the contract.

## B.4.A.8 Special Training/Certification

We will not be providing special training to the breeding bird surveyors. They will be hired knowing that they are already fully qualified to perform the necessary tasks. We will use a list of contractors that we have historically worked with in the past and any others that are recommended to us. We will choose from this list based on location in the state for the project and the contractors' knowledge of those landscapes, their availability, and interest. We will generally choose from those who we know and trust from previous work that they will deliver the high-quality products required.

## B.4.A.9 Documents and Records

Using Natural Heritage Inventory (NHI) methodology (see Appendix C.1 and http://www.natureserve.org/prodServices/heritagemethodology.jsp), surveyors will document target rare breeding bird occurrences. Target species are those listed on the Wisconsin Natural Heritage Working List (see Appendix C.3). Documentation will include a spreadsheet of target species locations that contains the following: species common name, scientific name, waypoint number, Latitude & Longitude of waypoint taken (which should be in decimal degrees with Datum of WGS 84), number of individuals observed, date, habitat type, and observer name. Surveyors will supply original Breeding Bird Survey Data Sheets (see Appendix C.4). In addition, surveyors will document sites that were surveyed without finding any target or common species, noting habitats present and what potential target species could utilize those areas. Surveyors will prepare a short final report summarizing these results. The report will include uncommon species encountered, highlights of field surveys, and habitat notes as they relate to bird populations. Documentation of private landowner contact will be provided in cases where the surveyor contacts landowners directly for permission to access survey sites on private property.

All field data sheets will be scanned and saved electronically as Portable Document Format (PDF) files. These will be uploaded to the WDNR Surface Water Integrated Monitoring System (SWIMS). After verification, WDNR NHI staff will enter rare species and high-quality natural community locations into the NHI database, the central repository for rare species and high-quality natural community data for Wisconsin. All data added to the NHI database go through a quality control process to ensure their validity and accuracy.

The surveyor shall, for a period of three years after completion and acceptance by the WDNR Project Leader, maintain books, records, documents and other evidence directly pertinent to performance on work under this contract in accordance with generally accepted accounting principles and practices.

Natural Heritage Inventory (NHI) data are exempt from Wisconsin's Open Record Law. All data collected under this project/contract become part of this inventory and should be treated as sensitive data. Distribution of inventory data and reports resulting from the work overseen by the Natural Heritage Inventory will primarily be the responsibility of the NHI Program. Any requests for this data should be directed to the WDNR project liaison who will coordinate distribution. Publication of data by surveyors is permitted if locations of element occurrences are generalized to prevent harm to the elements. The surveyor can distribute reports that do not contain precise locations of element occurrences. A list tallying where these records are distributed will be provided to the project liaison.

The results of the survey will be uploaded to the WDNR Surface Water Integrated Monitoring System (SWIMS) and provided to the team responsible for preparing the Ecological Assessment Report.

## SECTION B.4.B – DATA GENERATION & ACQUISITION

### B.4.B.1 Sampling Process Design (Experimental Design)

The purpose of the breeding bird survey segment of the project is to provide reliable, accurate information on breeding bird populations, with an emphasis on rare species, within the Sheboygan River AOC and its riparian corridor. This information can then be used to inform the development of a fish and wildlife management and restoration plan and specific delisting strategies for the fish and wildlife beneficial use impairments (BUIs) in the AOC. The experimental design must ensure collection of quality data in order to support these goals.

The surveyor will conduct breeding bird surveys at selected locations within the Sheboygan River AOC. Following the WDNR NHI Landbird Survey Protocol – Off-Road Surveys (see Appendix C.5), he or she will record the date, time, GPS coordinates, and bird species found, along with information on breeding activities, habitat, and weather conditions. The most critical measurements collected will be the location (GPS coordinates) and bird species present. All other information, though important to an overall understanding of the status of the breeding bird populations, is not as critical for this project.

Breeding bird survey locations will be determined by the surveyor prior to the beginning of the inventory period using his or her knowledge of this landscape, aerial photos and topographical maps of the project area, various GIS layers, and the list of target species habitat requirements. Surveyors will focus on habitats that have the potential to support rare species.

The number of survey sites will be determined by how much money is available, the amount and quality of habitat available, and access granted to private property. Timing of the surveys will be determined by the surveyor, using his or her professional judgment, but must be performed during the June breeding season window. As this is a one-time assessment rather than a monitoring study, each site will be surveyed only once during the project.

### B.4.B.2 Sampling Methods

**Sampling Methods**

The surveyor will perform breeding bird surveys using the WDNR NHI Landbird Survey Protocol – Off-Road Surveys (see Appendix C.5). At each survey location, he or she will complete a WDNR NHI Forested State Lands Bird Surveys — Off-Road Survey Datasheet (see Appendix C.4). All birds seen or heard at a given time and location will be counted and identified. This method is used to develop relative indices of presence/absence, abundance, and inferences about bird-habitat relations. This method is a moderately low-cost survey but is not a census and cannot be used to determine health of a population. The survey should only be done during the breeding bird season, which is June 1 – June 30 for Wisconsin. Note that the surveyor will not

be using the grid system to identify point count stations as described in the protocol.

**Performance Requirements and Corrective Actions**

The breeding bird surveyor will be responsible for collecting the data as contracted, and will take corrective actions as needed. Corrective actions will be documented in the field log or data report at the time of decision, and will accompany all reports after analytical results are returned.

Weather is the major variable for this work, but there will be enough time throughout the field season to coordinate survey effort so that optimal weather conditions can be met. Also, since much of the land adjacent to the AOC is privately owned, access could be an issue. Due to Wisconsin's Public Trust Doctrine, the surveyor can legally use and perform surveys in all sections of the river itself, but cannot cross private lands to get to the river without permission. The Project Leader and the surveyor will ensure that landowner permission is granted before any work is done on private property. If necessary, alternative survey sites will be found.

## B.4.B.3 Sampling Handling & Custody

There will be no samples collected for this survey.

## B.4.B.4 Analytical Methods

All observations will be done in the field. No analytical equipment or methods will be used.

## B.4.B.5 Quality Control

The data collected by this project will be used to identify and prioritize fish and wildlife habitat restoration actions within the Sheboygan River Area of Concern. It will be used for planning and management decisions. No regulatory requirements or clean up decisions will be made using this data about species and habitat in the AOC so there are no applicable action levels or criteria to be met.

**Quality Control Activities**

Bird species identification will be performed at the survey site by the surveyor, using his or her training and experience. Since the identifications are primarily done by ear, there is no easy way to confirm them, and it is critical that we trust the observer's skills. All data will be reviewed by Bill Smith, Heritage Zoologist, and Richard Staffen, Assistant Zoologist.

A single person will be performing all of the surveys, supporting consistency of sampling methods. The surveyor will ensure that all equipment and supplies are present and in good working order in order to support the collection of accurate data.

**Corrective Actions**

The breeding bird surveyor will be responsible for collecting the data as contracted, and will take corrective actions as needed for these surveys. Corrective actions will be documented in the field log or data report at the time of decision, and will be included in the final report.

If the WDNR biologists disagree with any identification made by the surveyor, the information will be kept on file, but will be disregarded in the final report and will not be added to the NHI database. This action will be recorded and included in the final report.

### B.4.B.6 Instrument/Equipment Testing, Inspection, and Maintenance

The breeding bird surveyor will be responsible for supplying all equipment necessary for the surveys, and for the testing, inspection, and maintenance of that equipment. The primary instrument needing testing and maintenance will be the Global Positioning System (GPS). The surveyor will be responsible for maintaining it and keeping it in operable condition, referring to the owner's manual as needed. Any problems with the GPS unit should be resolved by the surveyor.

Other equipment that may be helpful for these assessments include keys for bird identification, binoculars or spotting scope, and outdoor clothing appropriate for the conditions. The surveyor will check that all items are present and in good condition before sampling.

### B.4.B.7 Instrument/Equipment Calibration and Frequency

This survey does not use instruments or equipment that can be calibrated. The accuracy of the GPS unit can be verified using established monuments; however, this is not critical for project success.

### B.4.B.8 Inspection/Acceptance of Supplies & Consumables

There are no specialized supplies or consumable materials required for the breeding bird surveys.

### B.4.B.9 Data Acquisition Requirements for Non-Direct Measurements

Non-direct measurements (secondary data) will not be used for the breeding bird surveys.

### B.4.B.10 Data Management

Data management will follow the Benchmark Data Content Standards (BDCS) established by NatureServe (see Appendix C.2). The BDCS ensure a high level of accuracy, currency and quality to the species data maintained across the network of member programs and NatureServe.

The surveyor will record the survey data on paper forms—the Breeding Bird Survey Data Sheets (see Appendix C.4), and provide these to the project coordinator. The surveyor will submit the data sheets along with GPS point locations and a final report. Bill Smith, Heritage Zoologist, and Richard Staffen, Assistant Zoologist will verify the data. After the information in the spreadsheet and final report is checked for accuracy, it will be included in the final report for the Sheboygan AOC Pathway to Delisting project.

After survey data have been verified, WDNR NHI staff will enter rare species and high-quality natural community locations into the NHI database, the central repository for rare species and high-quality natural community data for Wisconsin. All data added to the NHI database go through a quality control process to ensure their validity and accuracy.

## B.5 – BAT SURVEY

## B.5.A – PROJECT MANAGEMENT

### B.5.A.4 Project/Task Organization

**Table 13. Roles & Responsibilities for Bat Survey.**

| Individual(s) Assigned | Responsible for: |
|---|---|
| Jennifer Conner, EPA Project Officer | • Review project information and reporting in Great Lakes Accountability System (GLAS)<br>• Assist the Project Manager in defining milestones for the project |
| Donalea Dinsmore, WDNR Great Lakes Funding and Quality Assurance Coordinator | • Approve QAPP<br>• Ensure that the approved QAPP is uploaded into SWIMS database<br>• Project reporting on Great Lakes Accountability System (GLAS) |
| Vic Pappas, WDNR Sheboygan Basin Supervisor, Project Manager | • Overall project management<br>• Monitors study progress<br>• Ensures project completion |
| Laurel Last, WDNR Water Resources Management Specialist, Project QA Manager | • QAPP preparation & distribution<br>• Overall project QA/QC<br>• Ensures QAPP is followed<br>• Project reporting in SWIMS database |
| Lisa Helmuth, WDNR Surface Water Integrated Monitoring System (SWIMS) File Manager | • Manage SWIMS database, which will include approved QAPP and project reports |
| Richard Staffen, WDNR Assistant Zoologist, WDNR Project Leader for Bat Survey | • Bat survey project leader<br>• Oversee data collection, analysis, and reporting for bat surveys<br>• Ecological Assessment Team member |
| Dave Redell, WDNR Bat Ecologist | • Bat survey project QA officer<br>• Analyze bat survey data<br>• Prepare a final dataset of bat inventory results |
| Owen Boyle, WDNR Regional Ecologist | • Conduct mobile acoustical bat surveys |
| Christina Isenring, WDNR Heritage Ecologist | • Project Liaison who would coordinate distribution of NHI data when requested |

### B.5.A.5 Problem Definition/Background

Developing a fish and wildlife management and restoration plan for the Sheboygan River Area of Concern (AOC) requires synthesizing a variety of sources of background information. When the existing information needed for the conservation of biological diversity is not considered adequate for planning, a “biotic inventory” is conducted. These inventory efforts focus on rare species and high-quality examples of native communities and include field surveys, as well as

data collection, synthesis, and interpretation. The scope and intensity of biotic inventory efforts vary according to the size and ecological complexity of the properties involved, as well as the amount of existing information available. Bat surveys are routinely conducted on properties as part of these efforts. These data will aid in the prioritization of ecologically important sites and conservation of rare species.

## B.5.A.6 Project/Task Description

The Sheboygan River AOC provides critical migrating and breeding habitat for bats. The forests, open wetlands, grasslands, and river corridor provide characteristics which are favorable bat habitat by offering roosting, foraging, and commuting habitat. Very little is known about the bats that use this area, so it is important that surveys be conducted, and the data used to inform future planning.

Bat surveys will be performed in the Sheboygan River AOC. Data generated from these surveys will be used to do the following: 1) Determine the bat species present in the AOC during the survey period; 2) Provide baseline bat population data for completion of an ecological assessment; and 3) Serve in the development of a fish and wildlife management and restoration plan and a delisting strategy for fish and wildlife habitat and population impairments.

WDNR staff, including Dave Redell, Bat Ecologist, and Owen Boyle, Regional Ecologist, will conduct water-based mobile acoustical bat surveys that together will encompass the entire reach of the AOC. They will travel the river downstream in a canoe from Sheboygan Falls to Lake Michigan, collecting bat occurrence data using a mobile bat detection system. Additional land-based surveys will be conducted from Sheboygan Falls to Taylor Drive, the shallow reach of river that is difficult to canoe at night. The mobile detection system will put a species name, time, date, and location (latitude and longitude) stamp on each bat occurrence. The bat surveys will be conducted once in early June, again in early July, and again in late July.

The WDNR Bat Ecologist will analyze the raw data from the bat detection system and prepare a short final report and supporting materials of inventory results. This report will present the findings for the survey to include species presence and abundance. The bat data will be housed with the WDNR bat ecology program. The final report and data will be included in the overall Ecological Assessment which is the final report for the Sheboygan AOC Pathway to Delisting habitat BUI's—Survey and Assessment Project.

Project Timeline:
June-July 2011— Bat surveys completed.
January 1, 2012— Initial findings available.
June 30, 2012—Final report (Ecological Assessment) completed for entire AOC project.

## B.5.A.7 Quality Objectives & Criteria

The primary objective of this segment of the project is to conduct an inventory of all bat species currently present in the AOC. The information provided by surveyors from this project through a final report will provide screening-level data, allow biologists and planners to understand the distribution of rare and representative species within the AOC, and provide information for selecting the most appropriate sites for conserving rare taxa. These data will also contribute to the overall knowledge for certain rare species, identify threats to these populations, and provide suggestions for habitat improvements. The information collected will be included in an Ecological Assessment, which will inform the development of a fish and wildlife management and restoration plan and a delisting strategy the for fish and wildlife habitat and population impairments.

**A. Precision & Accuracy/Bias**

This method of surveying bats does not support measurable precision nor accuracy/bias calculations. The precision and accuracy of this method rely primarily on the Anabat ™ SD2 Bat Detector system. Surveyors will ensure that the system is properly maintained and kept in working order. In addition, the surveyors will be knowledgeable and experienced with bat identification and this particular bat detection system, enabling them to quickly determine whether the system is producing accurate data. All bat data will be reviewed and interpreted by Dave Redell, WDNR Bat Ecologist. The Anabat ™ SD2 Bat Detector system uses a Compact Flash GPS, which is accurate to 10 meters, to collect locational data. Since the species are mobile, the exact locations are not critical—the coordinates are meant to represent the general areas where the species are found.

**B. Data Representativeness**

The primary purpose of this survey is to conduct an inventory of bat species currently present in the AOC. Mobile water-based surveys will be performed along the entire length of the AOC. This sampling design will provide results that are representative of current bat habitat in the AOC.

**C. Comparability**

The procedures used in this project will be comparable to those used in the Wisconsin Bat Monitoring Program and other Rapid Ecological Assessments performed by WDNR Bureau of Endangered Resources (BER). By utilizing the Anabat ™ SD2 Bat Detector and following a standard protocol (see Appendix C.6), surveyors will ensure that the study results will be repeatable.

**D. Completeness**

Data completeness will be calculated for this segment of the project. The completeness objective for this project is for 95% of the planned data to be collected and usable. WDNR surveyors will make every effort to obtain valid data for the entire survey length identified in this QAPP.

### B.5.A.8 Special Training/Certification

The Bat Survey Project Leader and QA Officer will be responsible for ensuring that the WDNR staff performing these surveys receive the training necessary for this portion of the study. Prior to the field-sampling season, the Project Leader or QA Officer will go over the SOPs, methods, and QA requirements with the surveyors and answer any questions that they may have. All training will be documented and records will be kept in the project file.

To minimize any potential health and safety risks related to field sampling conducted as part of this project, surveyors need to be physically able to conduct field work under demanding conditions and be well prepared to handle contingencies or emergencies. The following are suggested requirements for all field survey personnel:

a) Recent CPR training,
b) Recent first aid training,
c) Completion of a satisfactory interview about health and safety aspects of the project with the Project Leader, including routine safety precautions and a discussion of actions to be taken in the event of an emergency.

### B.5.A.9 Documents and Records

Surveyors will utilize an Anabat ™ SD2 Bat Detector to detect and record species name, time, date, and location (latitude and longitude) for each bat occurrence. They will also record the survey start and end time, local weather conditions, and any other observations that may be pertinent to the survey.

The WDNR Bat Ecologist will analyze the raw data from the bat detection system and prepare a short final report and supporting materials of inventory results. This report will present the findings for the survey to include species presence and abundance. The bat data will be housed with the WDNR bat ecology program where it will be used to gain a better understanding of statewide bat distributions and assess bat populations.

The results of the survey will be uploaded to the WDNR Surface Water Integrated Monitoring System (SWIMS) and provided to the team responsible for preparing the Ecological Assessment Report.

## SECTION B.5.B – DATA GENERATION & ACQUISITION

### B.5.B.1 Sampling Process Design (Experimental Design)

The purpose of the bat survey segment of the project is to provide reliable, accurate information on bat populations within the Sheboygan River AOC and its riparian corridor. This information can then be used to inform the development of a fish and wildlife management and restoration plan and specific delisting strategies for the fish and wildlife beneficial use impairments (BUIs) in the AOC. The experimental design must ensure collection of quality data in order to support these goals.

Surveyors will conduct water-based mobile acoustical bat surveys that together will encompass the entire length of the Sheboygan River AOC. It should take between one and three nights to survey the entire 14 miles of AOC. Additional land-based surveys will be conducted from Sheboygan Falls to Taylor Drive, the shallow reach of river that is difficult to canoe at night. This sampling design will provide results that are representative of current bat habitat in the AOC. Surveyors will utilize an Anabat ™ SD2 Bat Detector to detect and record species name, time, date, and location (latitude and longitude) for each bat occurrence. They will also record the survey start and end time, local weather conditions, and any other observations that may be pertinent to the survey. The most critical measurements collected will be the bat species, time, date and location. Note that bat species is the most important measurement and that the approximate—not the exact—time, date, and location, are critical. All other information, though important to an overall understanding of the status of the bat populations, is not as critical for this project.

### B.5.B.2 Sampling Methods

**Sampling Methods**

Bat surveyors will conduct water-based mobile acoustical bat surveys using an Anabat ™ SD2 bat detector. They will follow the protocol used for the Wisconsin Bat Monitoring Program—see "A Trainers Guide to the 'Wisconsin Citizen-Based Acoustic Monitoring Project'" (Appendix C.6).

**Performance Requirements and Corrective Actions**

The survey protocol specifies certain time and weather requirements:

- Daytime temperature exceeds 50°F
- Begin survey ½ hr after sunset (no earlier)
- No precipitation during the survey
- Wind speeds are not to exceed 30 mph
- Surveys can be conducted from April 1st to July 30th

- Surveys are to be at least 1 hour in length & may last up to 3 hrs past starting time

Surveyors will check the weather forecast before leaving to perform a survey, and may abort a survey if they determine that the weather conditions are keeping them from gathering adequate data.

Corrective actions will be taken if any aspect of the sampling event differs from that planned. Under circumstances where corrective action is needed, the Bat Survey Project Leader or QA Officer will be notified and the situation researched and a decision made. Corrective actions should only be implemented after approval by the Project Leader or QA Officer. Corrective actions will be documented in the field log or data report at the time of decision, and will accompany all reports after analytical results are returned. The Project Leader is ultimately responsible for any corrective actions and appropriate documentation of those actions.

Since much of the land adjacent to the AOC is privately owned, access could be an issue. Due to Wisconsin's Public Trust Doctrine, surveyors can legally use and perform surveys in all sections of the river itself, but they cannot cross private lands or conduct surveys on private lands without owner permission. Gaining such permission should not be a problem for these surveys. The Project Leader and the surveyor will ensure that landowner permission is granted before any work is done on private property. If necessary, alternative river access sites will be found.

### B.5.B.3 Sampling Handling & Custody

There will be no samples collected for this survey.

### B.5.B.4 Analytical Methods

All observations will be done in the field. No analytical equipment will be used, unless the Anabat ™ SD2 bat detector can be considered analytical equipment. Please see Sampling Methods in Section B.5.B.2 for information on the use of the bat detector.

### B.5.B.5 Quality Control

The data collected by this project will be used to identify and prioritize fish and wildlife habitat restoration actions within the Sheboygan River Area of Concern. It will be used for planning and management decisions. No regulatory requirements or clean up decisions will be made using this data about species and habitat in the AOC so there are no applicable action levels or criteria to be met.

**Quality Control Activities**

Bat species identification will be performed at the survey site by the surveyor, using the Anabat ™ SD2 bat detector. Surveyors will ensure that the system is properly maintained and kept in working order. In addition, the surveyors will be knowledgeable and experienced with bat identification and this particular bat detection system, enabling them to quickly determine whether the system is producing accurate data. All bat data will be reviewed by Dave Redell, WDNR Bat Ecologist.

**Corrective Actions**

If there is a problem with the bat detection system that will compromise the data, the surveyors will abort or delay the survey until the unit is fixed. If there is a disagreement or question about an identification, the information will be kept on file, but will be disregarded in the final report and will not be added to the NHI database. Any corrective actions will be recorded. If they might affect the accuracy of the final data, they will be included in the final report.

### B.5.B.6 Instrument/Equipment Testing, Inspection, and Maintenance

This survey method requires the use of an Anabat ™ SD2 bat detector, GPS, and PDA (see Section B.5.B.2 and Appendix C.6). Surveyors will be responsible for properly maintaining the equipment, referring to the owner's manual as needed. They will inspect all equipment before each sampling trip. In addition, the surveyors will be knowledgeable and experienced with bat identification and this particular bat detection system, enabling them to quickly determine whether the system is producing accurate data. If there is a problem with the bat detection system that will compromise the data, the surveyors will abort or delay the survey until a solution is found.

### B.5.B.7 Instrument/Equipment Calibration and Frequency

This survey does not use instruments or equipment that can be calibrated. The accuracy of the GPS unit can be verified using established monuments; however, this is not critical for project success.

### B.5.B.8 Inspection/Acceptance of Supplies & Consumables

There are no specialized supplies or consumable materials required for the bat surveys. The Anabat ™ SD2 bat detector does use rechargeable AA batteries—surveyors will ensure that these are fully charged before each survey.

### B.5.B.9 Data Acquisition Requirements for Non-Direct Measurements

Non-direct measurements (secondary data) will not be used for the bat surveys.

### B.5.B.10 Data Management

The primary bat survey data will be collected and stored automatically using an Anabat ™ SD2 Bat Detector connected with a Global Positioning System (GPS) and Personal Data Assistant (PDA). The detector records bat species, time, date, and location, plus audio files of the echolocation calls (converted to the audible range). The surveyor may record other survey observations on paper or in the PDA. The surveyor will be responsible for ensuring that the data are transferred and entered correctly. All bat data will be reviewed and interpreted by Dave Redell, WDNR Bat Ecologist, and will be housed with the WDNR bat ecology program. The final, reviewed survey results will be included in the final report for the Sheboygan AOC Pathway to Delisting project. They will also be used by the WDNR to develop statewide bat distribution maps and to assess bat populations.

## B.6 – MUSSEL SURVEY

## B.6.A – PROJECT MANAGEMENT

### B.6.A.4 Project/Task Organization

**Table 14. Roles & Responsibilities for Mussel Survey.**

| Individual(s) Assigned | Responsible for: |
|---|---|
| Jennifer Conner, EPA Project Officer | • Review project information and reporting in Great Lakes Accountability System (GLAS)<br>• Assist the Project Manager in defining milestones for the project |
| Donalea Dinsmore, WDNR Great Lakes Funding and Quality Assurance Coordinator | • Approve QAPP<br>• Ensure that the approved QAPP is uploaded into SWIMS database<br>• Project reporting on Great Lakes Accountability System (GLAS) |
| Vic Pappas, WDNR Sheboygan Basin Supervisor, Project Manager | • Overall project management<br>• Monitors study progress<br>• Ensures project completion |
| Laurel Last, WDNR Water Resources Management Specialist, Project QA Manager | • QAPP preparation & distribution<br>• Overall project QA/QC<br>• Ensures QAPP is followed<br>• Project reporting in SWIMS database |
| Lisa Helmuth, WDNR Surface Water Integrated Monitoring System (SWIMS) File Manager | • Manage SWIMS database, which will include approved QAPP and project reports |
| Richard Staffen, WDNR Assistant Zoologist, WDNR Project Leader for Mussel Survey | • Mussel survey project leader and QA officer<br>• Oversee data collection, analysis, and reporting for mussel surveys<br>• Ecological Assessment Team member |
| Bill Smith, WDNR Heritage Zoologist | • Mussel survey data and photo voucher review<br>• Oversight of mussel contractor |
| Lisie Kitchel, WDNR mussel biologist | • Mussel photo voucher review |
| Mussel Survey Contractor | • Conduct mussel surveys<br>• Complete historical data / literature review of mussels in study area<br>• Contact property owners as needed before mussel surveys are conducted<br>• Prepare a final report of mussel survey results |
| Christina Isenring, WDNR Heritage Ecologist | • Project Liaison who would coordinate distribution of NHI data when requested |
| WDNR NHI staff | • Enter rare species and high-quality natural community locations into the NHI database |

## B.6.A.5 Problem Definition/Background

Developing a fish and wildlife management and restoration plan for the Sheboygan River Area of Concern (AOC) requires synthesizing a variety of sources of background information. When the existing information needed for the conservation of biological diversity is not considered adequate for planning, a "biotic inventory" is conducted. These inventory efforts focus on rare species and high-quality examples of native communities and include field surveys, as well as data collection, synthesis, and interpretation. The scope and intensity of biotic inventory efforts vary according to the size and ecological complexity of the properties involved, as well as the amount of existing information available. Mussel surveys are routinely conducted on properties as part of these efforts. These data will aid in the prioritization of ecologically important sites and conservation of rare species.

## B.6.A.6 Project/Task Description

Mussel surveys will be performed in the Sheboygan River AOC. Data generated from these surveys will be used to do the following: 1) Provide information on the health and location of any Endangered/Threatened/Special Concern and regionally rare mussel species in the AOC; 2) Provide baseline mussel population data for completion of an ecological assessment; and 3) Serve in the development of a fish and wildlife management and restoration plan and a delisting strategy for fish and wildlife habitat and population impairments.

A WDNR-contracted mussel surveyor will conduct qualitative mussel surveys at selected locations within the Sheboygan River AOC. At each location, the surveyor will compile a list of mussel species found, and make notes on the apparent overall health of the mussel community, approximate individual species abundance, and evidence of recent recruitment. He or she will record the GPS coordinates of the site. The surveyor will also take pictures of live specimens and empty valves of each target species as photo vouchers.

The surveyor will prepare a final report and supporting materials of inventory results. This report will discuss the findings for each site, and include a summary of historical records, detailed survey records, and GPS coordinates of records. A summary will include discussion of species' status, ecologically important areas, threats observed, management considerations, and remaining inventory and monitoring needs.

The exact survey locations have not yet been selected. The surveyor will identify the survey locations using recent aerial photos, USGS 7.5' topographic maps, various Geographic Information System (GIS) sources, information from past survey efforts, and the expertise of biologists familiar with the properties or with similar habitats in the region. The surveyor will focus on habitats that have the potential to support rare species.

After verification, WDNR NHI staff will enter rare species and high-quality natural community locations into the NHI database, the central repository for rare species and high-quality natural community data for Wisconsin. The final report and data will be included in the overall Ecological Assessment which is the final report for the Sheboygan AOC Pathway to Delisting habitat BUI's—Survey and Assessment Project.

Project Timeline:
June-September 2011— Mussel surveys completed.
January 1, 2012— Initial findings available.
June 30, 2012— Final report (Ecological Assessment) completed for entire AOC project.

## B.6.A.7 Quality Objectives & Criteria

The primary objective of this segment of the project is to conduct an inventory of mussel species, focusing on Endangered, Threatened, Special Concern, and regionally rare species (target species) in select areas within the AOC. The information provided by the surveyor from this project through a final report will provide screening-level data, allow biologists and planners to understand the distribution of rare and representative species within the AOC, and provide information for selecting the most appropriate sites for conserving rare taxa. These data will also contribute to the overall knowledge for certain rare species, identify threats to these populations, and provide suggestions for habitat improvements. The information collected will be included in an Ecological Assessment, which will inform the development of a fish and wildlife management and restoration plan and a delisting strategy for the fish and wildlife habitat and population impairments.

**A. Precision & Accuracy/Bias**
This method of surveying mussels does not support measurable precision nor accuracy/bias calculations. The surveyor chosen for this project will be knowledgeable and experienced, with procedures and identification skills that we trust. Also, the surveyor will be required to take photos of representative organisms of each species at each site. These photo vouchers will be verified by Bill Smith, Heritage Zoologist, and Lisie Kitchel, WDNR mussel biologist. Since a single person will be performing all of the surveys, the methods should be consistent among sites. The surveyor will be required to use a GPS device that is accurate to 10 meters or better. Since the species are mobile, the exact locations are not critical—the coordinates are meant to represent the general areas where the species are found.

**B. Data Representativeness**
The primary purpose of this survey is to discover rare species presence and some general indices of relative abundance within this AOC. Survey locations will be chosen to maximize the chance of discovering any rare species. Data collected in this fashion will be representative of current mussel habitat present at the selected sites within the AOC. The size of the area represented will be determined by the species and habitat present.

**C. Comparability**

The procedures used in this project will be comparable to those used in other Rapid Ecological Assessments performed by WDNR Bureau of Endangered Resources (BER). Specific mussel survey methods will be at the discretion of the surveyor. Methods and procedures will be documented in the final report.

**D. Completeness**

The project completeness goal is 100%. The contractor must deliver the specified report as a condition of the contract.

## B.6.A.8 Special Training/Certification

We will not be providing special training to the mussel surveyor. He or she will be hired already fully qualified to perform the necessary tasks. We will use a list of contractors that we have historically worked with in the past and any others that are recommended to us. We will choose from this list based on location in the state for the project and the contractors' knowledge of those landscapes, their availability, and interest. We will generally choose from those who we know and trust from previous work that they will deliver the high-quality products required.

## B.6.A.9 Documents and Records

Using Natural Heritage Inventory (NHI) methodology (see Appendix C.1 and http://www.natureserve.org/prodServices/heritagemethodology.jsp), the surveyor will document target rare mussel occurrences. Target species are those listed on the Wisconsin Natural Heritage Working List (see Appendix C.3). Documentation will include a spreadsheet of target species locations that contains the following: species common name, scientific name, waypoint number, Latitude & Longitude of waypoint taken (which should be in decimal degrees with Datum of WGS 84), number of individuals observed, date, habitat type, and observer name. Documentation will also include photographs of specimens for species verification. In addition, the surveyor will document sites that were surveyed without finding any target or common species, noting habitats present and what potential target species could utilize those areas. Documentation of private landowner contact will be provided in cases where the surveyor contacts landowners directly for permission to access survey sites via private property.

The surveyor will prepare a final report and supporting materials of inventory results:

Report will be organized to include the following sections: Introduction, Methods, Results (organized by site), and Summary.

a. Introduction will include general background information.
b. Methods will discuss the inventory methods used by the contractor.
c. Results will discuss findings for each site. Information should include summary of historical records, detailed survey records, and GPS coordinates of records

d. Summary will include discussion of species' status, ecologically important areas, threats observed, management considerations, and remaining inventory and monitoring needs.

After verification, WDNR NHI staff will enter rare species and high-quality natural community locations into the NHI database, the central repository for rare species and high-quality natural community data for Wisconsin. All data added to the NHI database go through a quality control process to ensure their validity and accuracy.

The surveyor shall, for a period of three years after completion and acceptance by the mussel survey project leader, maintain books, records, documents and other evidence directly pertinent to performance on work under this contract in accordance with generally accepted accounting principles and practices.

Natural Heritage Inventory (NHI) data are exempt from Wisconsin's Open Record Law. All data collected under this project/contract become part of this inventory and should be treated as sensitive data. Distribution of inventory data and reports resulting from the work overseen by the Natural Heritage Inventory will primarily be the responsibility of the NHI Program. Any requests for this data should be directed to the WDNR project liaison who will coordinate distribution. Publication of data by surveyors is permitted if locations of element occurrences are generalized to prevent harm to the elements. The surveyor can distribute reports that do not contain precise locations of element occurrences. A list tallying where these records are distributed will be provided to the project liaison.

The results of the survey will be uploaded to the WDNR Surface Water Integrated Monitoring System (SWIMS) and provided to the team responsible for preparing the Ecological Assessment Report.

## SECTION B.6.B – DATA GENERATION & AQCUISITION

### B.6.B.1 Sampling Process Design (Experimental Design)

The purpose of the mussel survey segment of the project is to provide reliable, accurate information on mussel populations, with an emphasis on rare species, within the Sheboygan River AOC. This information can then be used to inform the development of a fish and wildlife management and restoration plan and specific delisting strategies for the fish and wildlife beneficial use impairments (BUIs) in the AOC. The experimental design must ensure collection of quality data in order to support these goals.

Mussel surveyors will conduct qualitative mussel surveys at selected locations within the Sheboygan River AOC. At each location, surveyors record the GPS coordinates, compile a list of mussel species found, and make notes on the apparent overall health of the mussel community, approximate individual species abundance, and evidence of recent recruitment. They will also take pictures of live specimens and empty valves of each species as photo vouchers. The most critical measurements collected will be the location (GPS coordinates), mussel species present, and photo vouchers of rare species or species not previously documented in the area. All other information, though important to an overall understanding of the status of the mussel populations, is not as critical for this project.

Mussel survey locations will be determined by the surveyor prior to the beginning of the inventory period using his or her knowledge of this landscape, aerial photos and topographical maps of the project area, various GIS layers, and the list of target species habitat requirements. Surveyors will focus on habitats that have the potential to support rare species. Sampling locations may include the following:

- Shallow-water areas
- Exposed sand and gravel bars
- Rivers during low-water periods (droughts, drawdowns, etc.) too deep to wade otherwise
- Islands and streambanks for middens

The number of survey sites will be determined by how much money is available, the amount and quality of habitat available, and access granted to private property. Timing of the surveys will be determined by the surveyor, using his or her professional judgment. As this is a one-time assessment rather than a monitoring study, each site will be surveyed only once during the project.

## B.6.B.2 Sampling Methods

### Sampling Methods

There is not a standard protocol for the mussel surveys. Specific methods of data collection will be left up to the judgment of the surveyor. Following is a list of possible methods:

- Casual collection of specimens (no measure of time, area, or effort)
- Number per unit of time (number per person-hour – e.g. 2 people searching for one hour = 2 person-hours)
- Number per unit of area (e.g., number per unit area – e.g. 10 mussels per meter squared)
- Number per unit of distance (e.g., number per distance – e.g. 20 in 100 meters of shoreline)

Data collected will include the following:

- GPS coordinates
- Species
- Number (or number/time, number/area, number/effort)
- Specimen condition (living, recently dead, etc.)
- Invasive bivalve data (Asian clam presence, Zebra or Quagga mussel presence)

Note that there will be no samples collected for this survey. Mussels may be removed briefly for identification and photograph documentation of species and condition. Empty shells may be photographed for species photo vouchers. All observations will be made at the site.

Note: Contractors selected for this work are responsible for identifying the procedures used in their final report. Before considering any new contractor for this work, WDNR Bureau of Endangered Resources staff would need to evaluate qualifications and procedures.

### Performance Requirements and Corrective Actions

The mussel surveyor will be responsible for collecting the data as contracted, and will take corrective actions as needed. Corrective actions will be documented in the field log or data report at the time of decision, and will accompany all reports after analytical results are returned.

Weather is the major variable for this work, but there will be enough time throughout the field season to coordinate survey effort so that optimal weather conditions can be met. Also, since much of the land adjacent to the AOC is privately owned, access could be an issue. Due to Wisconsin's Public Trust Doctrine, the surveyor can legally use and perform mussel surveys in all sections of the river itself, but cannot cross private lands to get to the river without permission. The Project Leader and the surveyor will ensure that landowner permission is granted before any work is done on private property. If necessary, alternative river access sites will be found.

### B.6.B.3 Sample Handling & Custody

No samples will be collected for this survey.

### B.6.B.4 Analytical Methods

All observations will be done in the field. No analytical equipment or methods will be used.

### B.6.B.5 Quality Control

The data collected by this project will be used to identify and prioritize fish and wildlife habitat restoration actions within the Sheboygan River Area of Concern. It will be used for planning and management decisions. No regulatory requirements or clean up decisions will be made using this data about species and habitat in the AOC so there are no applicable action levels or criteria to be met.

**Quality Control Activities**

Mussel species identification will be performed at the survey site by the surveyor, using his or her training and experience and reference keys as necessary. Photo vouchers will be taken of empty shells of each species. These vouchers will then be checked by Bill Smith, Heritage Zoologist and Lisie Kitchel, WDNR mussel biologist. In the event that the surveyor is unsure of the species of a particular mussel, a photo voucher will be collected so the identification can be made or confirmed by the mussel biologist. The final report will be reviewed by WDNR Bureau of Endangered Resources staff for accuracy and completeness.

A single person will be performing all of the surveys, supporting consistency of sampling methods. The mussel surveyor will choose methods appropriate for the target species and field conditions, and will document and describe the methods used in a final report. The surveyor will ensure that all equipment and supplies are present and in good working order in order to support the collection of accurate data. The contractor will be responsible for developing procedures to assure that photo vouchers are tied to the field data and location. In addition, the contractor will be responsible for reviewing his or her field records to assure that the information is accurate and complete.

**Corrective Actions**

The mussel surveyor will be responsible for collecting the data as contracted, and will take corrective actions as needed. Corrective actions will be documented in the field log or data report at the time of decision, and will be included in the final report.

If the WDNR biologists disagree with an identification made by the surveyor, and there is a question as to its true identity, the information will be kept on file, but will be disregarded in the final report and will not be added to the NHI database. If the specimen can be clearly identified as something other than what the contractor recorded, then the species will be changed for the records and the database. Any changes will be recorded and included in the final report.

### B.6.B.6 Instrument/Equipment Testing, Inspection, and Maintenance

The mussel surveyor will be responsible for supplying all equipment necessary for the surveys, and for the testing, inspection, and maintenance of that equipment. The primary instrument needing testing and maintenance will be the Global Positioning System (GPS). The surveyor will be responsible for maintaining it and keeping it in operable condition, referring to the owner's manual as needed. Any problems with the GPS unit should be resolved by the surveyor.

Other equipment necessary for these assessments include keys for mussel identification, a camera (preferably digital) to collect photo vouchers, measuring devices appropriate to the method used (e.g., measuring tape if recording number of mussels per distance), and outdoor clothing appropriate for the conditions. The surveyor will check that all items are present and in good condition before sampling.

### B.6.B.7 Instrument/Equipment Calibration and Frequency

This survey does not use instruments or equipment that can be calibrated. The accuracy of the GPS unit can be verified using established monuments; however, this is not critical for project success.

### B.6.B.8 Inspection/Acceptance of Supplies & Consumables

The particular supplies or consumables used will depend on the sampling methods. The surveyor will ensure that any supplies or consumables required are present and in good condition before sampling.

### B.6.B.9 Data Acquisition Requirements for Non-Direct Measurements

The surveyor is required to do a historical data / literature review of the areas surveyed, and to include the findings in the final report. This information is supplemental to the study, and will be used to provide background information on historical mussel populations. The surveyor should only include data that are from peer-reviewed journals or other sources that are known to be accurate and reliable. Data from the Natural Resources Heritage Inventory (NHI) will also be evaluated. This database is considered as an authoritative source and no special review of the data obtained from this source will be required.

### B.6.B.10 Data Management

Data management will follow the Benchmark Data Content Standards (BDCS) established by NatureServe (see Appendix C.2). The BDCS ensure a high level of accuracy, currency and quality to the species data maintained across the network of member programs and NatureServe.

The surveyor will record the survey data on paper, and then enter the data into a spreadsheet. The surveyor will be responsible for ensuring that the data are transferred and entered correctly. The surveyor will submit the spreadsheet along with photo vouchers and a final report. The WDNR mussel biologist will check the data, using the photo vouchers to confirm species identifications. After the information in the spreadsheet and final report is checked for accuracy, it will be included in the final report for the Sheboygan AOC Pathway to Delisting project.

After survey data have been verified, WDNR NHI staff will enter rare species and high-quality natural community locations into the NHI database, the central repository for rare species and high-quality natural community data for Wisconsin. All data added to the NHI database go through a quality control process to ensure their validity and accuracy.

## B.7 – NATURAL COMMUNITY / RARE PLANT / INVASIVE PLANT SURVEY

## B.7.A – PROJECT MANAGEMENT

### B.7.A.4 Project/Task Organization

**Table 15. Roles & Responsibilities for Natural Community / Rare and Invasive Plant Survey.**

| Individual(s) Assigned | Responsible for: |
|---|---|
| Jennifer Conner, EPA Project Officer | • Review project information and reporting in Great Lakes Accountability System (GLAS)<br>• Assist the Project Manager in defining milestones for the project |
| Donalea Dinsmore, WDNR Great Lakes Funding and Quality Assurance Coordinator | • Approve QAPP<br>• Ensure that the approved QAPP is uploaded into SWIMS database<br>• Project reporting on Great Lakes Accountability System (GLAS) |
| Vic Pappas, WDNR Sheboygan Basin Supervisor, Project Manager | • Overall project management<br>• Monitors study progress<br>• Ensures project completion |
| Laurel Last, WDNR Water Resources Management Specialist, Project QA Manager | • QAPP preparation & distribution<br>• Overall project QA/QC<br>• Ensures QAPP is followed<br>• Project reporting in SWIMS database |
| Lisa Helmuth, WDNR Surface Water Integrated Monitoring System (SWIMS) File Manager | • Manage SWIMS database, which will include approved QAPP and project reports |
| Christina Isenring, WDNR Heritage Ecologist, Natural Community / Rare Plant / Invasive Plant Survey Project Leader and Ecological Assessment Team Leader | • Natural community / rare plant / invasive plant survey project leader and QA officer<br>• Oversee data collection, analysis, and reporting for natural community / plant assessments<br>• Project Liaison who would coordinate distribution of NHI data when requested<br>• Ecological Assessment Team Leader |
| Rebecca Schroeder, WDNR Ecosystem & Diversity Conservation Section Chief | • Supervise Endangered Resources (plant / natural community) LTE |
| Craig Anderson, WDNR Heritage Botanist | • Plant / natural community voucher review<br>• Keep list of plant /natural community vouchers |
| Andy Clark, WDNR Endangered Resources LTE | • Conduct natural community / rare plant / invasive plant surveys<br>• Complete and submit natural community and plant data sheets and report<br>• Submit plant / natural community vouchers to State Herbarium after review |
| Wisconsin State Herbarium (UW-Madison) | • Receive vouchers of plants / natural communities |
| WDNR NHI staff | • Enter rare species and high-quality natural community locations into the NHI database |

## B.7.A.5 Problem Definition/Background

A natural community, defined here as a distinct and reoccurring assemblage of populations of plants, animals, bacteria, fungi, and viruses naturally associated with each other and their physical environment, is, along with other ecological information, a tool to assess the health of an ecosystem. Components of a natural community include characteristic, rare (defined here as species legally designated in Wisconsin as "Endangered" or "Threatened" as well as species in the advisory "Special Concern" category), and invasive plant species. These components will be surveyed in the Sheboygan River Area of Concern (AOC) to determine the quality of the natural communities present. This information will be included in an Ecological Assessment, which will inform the development of a fish and wildlife management and restoration plan.

## B.7.A.6 Project/Task Description

Natural community / Rare plant / Invasive plant surveys will be performed in the Sheboygan River AOC and its riparian corridor. Data generated from these surveys will be used to do the following: 1) Assess the overall health of natural communities and rare plants in the AOC; 2) Provide baseline natural community and plant population data for completion of an ecological assessment; and 3) Serve in the development of a fish and wildlife management and restoration plan and a delisting strategy for fish and wildlife habitat and population impairments.

Characteristic, rare, and invasive plant species of suspected high-quality natural communities within the Sheboygan River AOC and its riparian corridor will be surveyed. At each site, the surveyor will identify and describe native natural communities and document rare and invasive plants found, taking notes on apparent health, approximate species abundance, and other relevant factors. He will record the GPS coordinates of the site. The surveyor will also take pictures or samples of each target species as vouchers. Target species are those listed on the Wisconsin Natural Heritage Working List (see Appendix C.3). He may also take photos to document other features such as high-quality natural communities, disturbances, or threats.

Survey objectives include the following:

1. Identify, describe, and assess native natural communities along the Sheboygan River AOC.
2. Survey for and document rare and invasive plants along the Sheboygan River AOC.
3. For each site, provide a rare plant reporting form for each rare plant population; a natural community reporting form for each natural community that is either unique or high quality; the conservation significance and management considerations for rare plants and natural communities; an invasive plant reporting form for each invasive plant population; and future inventory needs and considerations.
4. Collaborate with project staff and other personnel familiar with these properties.

Data collected will be used to rank each natural community, following NatureServe's standard

ranking methodology (see Appendix C.12).

The exact survey locations have not yet been selected. The surveyor will identify the survey locations using recent aerial photos, USGS 7.5' topographic maps, various Geographic Information System (GIS) sources, information from past survey efforts, and the expertise of biologists familiar with the properties or with similar habitats in the region. The surveyor will focus on habitats that have the potential to support high-quality natural communities and rare plant species.

After verification, WDNR NHI staff will enter rare species and high-quality natural community locations into the NHI database, the central repository for rare species and high-quality natural community data for Wisconsin. The data from these surveys will be included in the overall Ecological Assessment which is the final report for the Sheboygan AOC Pathway to Delisting habitat BUI's—Survey and Assessment Project.

Project Timeline:
May-September 2011— Natural community / rare plant / invasive plant surveys completed.
January 1, 2012— Initial findings available.
June 30, 2012—Final report (Ecological Assessment) completed for entire AOC project.

## B.7.A.7 Quality Objectives & Criteria

The purpose of this segment of the project is to conduct an inventory of natural communities, rare plants, and invasive plants in select areas within the AOC. The information provided by surveyors from this project will provide screening-level data, allow biologists and planners to understand the distribution of rare and representative species within the AOC, and provide information for selecting the most appropriate sites for conserving rare taxa. These data will also contribute to the overall knowledge for certain rare species, identify threats to these populations, and provide suggestions for habitat improvements. The information collected will be included in an Ecological Assessment, which will inform the development of a fish and wildlife management and restoration plan and a delisting strategy for the fish and wildlife habitat and population impairments.

### A. Precision & Accuracy/Bias

This method of surveying natural communities, rare plants, and invasive plants does not support measurable precision nor accuracy/bias calculations. The surveyor chosen for this project will be knowledgeable and experienced, with identification skills that we trust. Also, the surveyor will be required to take photos or samples of representative organisms of each target species at each site. These vouchers will be verified by a Craig Anderson, WDNR Botanist. Since a single person will be performing all of the surveys, the methods should be consistent among sites. The surveyor will use a Garmin GPSmap 60Cx, which is accurate to 10 meters, to collect locational data.

**B. Data Representativeness**

The primary purpose of this survey is to discover rare species presence and some general indices of relative abundance within this AOC. Survey locations will be chosen to maximize the chance of discovering any rare species. Data collected in this fashion will be representative of current plants and natural communities present at the selected sites within the AOC.

**C. Comparability**

The procedures used in this project will be comparable to those used in other Rapid Ecological Assessments performed by WDNR Bureau of Endangered Resources (BER). The surveyor will use standard survey forms (see Section B.7.A.9) in order to ensure repeatability. Methods and procedures will be documented in the final report.

**D. Completeness**

Data completeness will be calculated for this segment of the project. The completeness objective for this project is for 95% of the planned data to be collected and usable. The surveyor will make every effort to obtain valid data for each sampling point selected.

## B.7.A.8 Special Training/Certification

The Natural Community / Rare Plant / Invasive Plant Survey Project Leader will be responsible for ensuring that the WDNR LTE performing these surveys receives the training necessary for this portion of the study. Prior to the field-sampling season, the Project Leader will go over the SOPs, methods, and QA requirements with the surveyor and answer any questions that he may have. All training will be documented and records will be kept in the project file.

To minimize any potential health and safety risks related to field sampling conducted as part of this project, surveyors need to be physically able to conduct field work under demanding conditions and be well prepared to handle contingencies or emergencies. The following are suggested requirements for all field survey personnel:

a) Recent CPR training,
b) Recent first aid training,
c) Completion of a satisfactory interview about health and safety aspects of the project with the Project Leader, including routine safety precautions and a discussion of actions to be taken in the event of an emergency.

Surveyors will refer to WDNR Manual Code 9187.91 Employees Working Alone for additional information about safety during the field work.

## B.7.A.9 Documents and Records

The surveyor of natural communities, rare plants, and invasive plants will supply the following records and documents:

1. Wisconsin Natural Heritage Inventory (NHI) Rare Plant Field Report forms (Form 1700-049, see Appendix C.8) for each of the rare plant populations. Rare plants must be identified to the appropriate taxon level (i.e., species, subspecies, or variety) as listed on the Wisconsin Natural Heritage Working List (see Appendix C.3 and http://www.dnr.state.wi.us/org/land/er/wlist/). Method(s) of identification must be indicated on the rare plant reporting forms.
2. WI NHI Natural Community forms (see Appendix C.9) and associated plant list with abundance codes.
3. WI NHI Site Summary forms (see Appendix C.10).
4. WI State Herbarium Invasive Plant Report forms (see Appendix C.7).
5. GPS coordinates documenting all rare plant locations and extent of population. GPS points should also be used to document locations of unique features, representative portions of natural communities, shifts in community attributes, or changes in community types. GPS points should also be used to document places where photographs were taken. GPS points should be provided using the WGS84 datum and Decimal Degrees in electronic (e.g. comma-delimited) format, as well as hardcopy. GPS waypoint numbers corresponding to features being documented should be written on forms to allow NHI to cross-reference between the tabular data and the waypoints.
6. Voucher specimens, which will become the property of the WDNR and will be submitted to the Wisconsin State Herbarium (UW-Madison, Madison, WI) upon completion of herbarium labels by NHI staff. Vouchers and a list of vouchers will be submitted to the Heritage Botanist in either hard-copy or electronic format.
7. Photographs of the surveyed rare plant populations, high-quality natural communities, or other documented features such as disturbances or threats. Digital photos should be provided as a jpg or tif.
8. Oral progress reports upon request of project staff.

All field data sheets will be scanned and saved electronically as Portable Document Format (PDF) files. These will be uploaded to the WDNR Surface Water Integrated Monitoring System (SWIMS). After verification, WDNR NHI staff will enter rare species and high-quality natural community locations into the NHI database, the central repository for rare species and high-quality natural community data for Wisconsin. All data added to the NHI database go through a quality control process to ensure their validity and accuracy.

A Final Report will be completed for this segment of the project. This report will be uploaded to SWIMS and provided to the team responsible for preparing the Ecological Assessment Report. The report will include at minimum:

- Discussion of methods used
- Summary of results

- Summary statistics
- Discussion of QA/QC, including results of QA checks and any corrective actions
- All data collected

Natural Heritage Inventory (NHI) data are exempt from Wisconsin's Open Record Law. All data collected under this project become part of this inventory and should be treated as sensitive data. Distribution of inventory data and reports resulting from the work overseen by the Natural Heritage Inventory will primarily be the responsibility of the NHI Program. Any requests for this data should be directed to the WDNR project liaison who will coordinate distribution. Publication of data by surveyors is permitted if locations of element occurrences are generalized to prevent harm to the elements. The surveyor can distribute reports that do not contain precise locations of element occurrences. A list tallying where these records are distributed will be provided to the project liaison.

## SECTION B.7.B – DATA GENERATION & AQCUISITION

### B.7.B.1 Sampling Process Design (Experimental Design)

The purpose of this segment of the project is to identify, describe, and assess native natural communities, including rare, characteristic, and invasive plants in the Sheboygan River AOC and its riparian corridor. This information can then be used to inform the development of a fish and wildlife management and restoration plan and specific delisting strategies for the fish and wildlife beneficial use impairments (BUIs) in the AOC. The experimental design must ensure collection of quality data in order to support these goals.

Sampling Design and Methods:

1. Using a list of rare plants known to occur in Sheboygan County, along with personal experience, the surveyor will conduct field inventories for rare plants at appropriate times in appropriate habitats. These will be meander surveys; there will be no plot-based surveys. The areas of high-quality habitat in the study area that may support rare plant species is so minimal that we expect the surveyor to visit them all.
2. Using NHI methodology (see Appendix C.1 http://www.natureserve.org/prodServices/heritagemethodology.jsp), the surveyor will document rare plant occurrences. Documentation will include 1) completion of a Wisconsin NHI Rare Plant Reporting Form for each population, including method used for identification of the plant to the appropriate level (i.e., species, subspecies, or variety) as listed on the Wisconsin Natural Heritage Working List (see http://www.dnr.state.wi.us/org/land/er/wlist/); 2) collecting a voucher, using the most appropriate method (i.e., photograph, collection of a small amount of plant tissue, or whole plant collection using standard guidelines, such as the Wisconsin Invasive Plants Project's "How to make voucher specimens of plants" (see Appendix C.11)) based on plant population size for each occurrence; and 3) obtaining GPS locations delineating the extent of the population (i.e., for linear populations taking a start point and end point).
3. Using the Wisconsin Natural Heritage Inventory Program's Natural Community classification (see Appendix C.13 and http://www.dnr.state.wi.us/org/land/er/communities/), the surveyor will document high-quality or otherwise significant examples of native natural communities by completing WI NHI Natural Community forms.
4. The surveyor will document invasive plant occurrences by completing WI State Herbarium Invasive Plant Report forms and collecting supporting plant and/or photo vouchers.
5. The surveyor will document sites that were surveyed without finding any rare plants, high-quality natural communities, or invasive plant species. These "negative data" can be important for various uses, including increasing the efficiency of follow-up work or

future inventory projects.

The most critical measurements collected will be the location (GPS coordinates), rare and invasive species presence (or absence), high-quality natural communities presence, and plant or photo vouchers to support the species identifications. All other information, though important to an overall understanding of the status of the plants and natural communities, is not as critical for this project.

Note that exact survey locations have not yet been selected. These will be determined by the surveyor, using criteria agreed upon with project staff, prior to the beginning of the inventory period. The surveyor will utilize his or her knowledge of this landscape, aerial photos and topographical maps of the project area, various GIS layers, and the habitat requirements of target species. The surveyor will focus on habitats that have the potential to support high-quality natural communities and rare species. The sampling will be done within the project area on properties approved for surveys. It is expected that these areas of high-quality habitat will be small and that the surveyor will be able to visit all of them.

The number of survey sites will be determined by how much money is available, the amount and quality of habitat available, and access granted to private property. Timing of the surveys will be determined by the surveyor, using his or her professional judgment. As this is a one-time assessment rather than a monitoring study, each site will be surveyed only once during the project.

## B.7.B.2 Sampling Methods

### Sampling Methods

The survey methods are described in the previous section. Although there is no written protocol for these surveys, they are a standard part of the WDNR Bureau of Endangered Resources Rapid Ecological Assessments, and they utilize standardized reporting forms.

Note that there will be no samples collected for this survey, except for voucher samples collected for species verification and documentation. The surveyor will document rare species by collecting a voucher, using the most appropriate method—taking a photograph, collecting of a small amount of plant tissue, or collecting a whole plant. He will follow standard procedures, such as those described in the Wisconsin Invasive Plants Project's "How to make voucher specimens of plants" (see Appendix C.11). The surveyor may also collect voucher specimens of invasive plants.

### Performance Requirements and Corrective Actions

Corrective actions will be taken if any aspect of the sampling event differs from that planned.

Under circumstances where corrective action is needed, the Natural Community / Rare plant / Invasive plant survey Project Leader will be notified and the situation researched and a decision made. Corrective actions should only be implemented after approval by the Project Leader. Corrective actions will be documented in the field log or data report at the time of decision, and will accompany all reports after analytical results are returned. The Project Leader is ultimately responsible for any corrective actions and appropriate documentation of those actions.

Weather conditions may affect survey results, but there will be enough time throughout the field season to coordinate survey effort so that optimal weather conditions can be met. If there is any question about the affect of the weather on survey results, the surveyor should consult with the Project Leader before proceeding with the survey.

Since much of the land adjacent to the AOC is privately owned, access could be an issue. Due to Wisconsin's Public Trust Doctrine, surveyors can legally use and perform surveys in all sections of the river itself, but they cannot cross private lands or conduct surveys on private lands without owner permission. Gaining such permission should not be a problem for these surveys. The Project Leader and the surveyor will ensure that landowner permission is granted before any work is done on private property. If necessary, alternative survey sites will be found.

### B.7.B.3 Sampling Handling & Custody

The only samples to be collected for this study will be voucher specimens. The surveyor will label the specimens and submit them along with the appropriate form—either the Invasive Plant Report form or the Rare Plant Field Report form—to the Project Leader. After verification, all vouchered specimens, with herbarium labels, will be deposited at the Wisconsin State Herbarium at the University of Wisconsin-Madison, and a list of vouchered specimens will be sent to the WDNR Heritage Botanist.

### B.7.B.4 Analytical Methods

All observations will be done in the field. No analytical equipment or methods will be used.

### B.7.B.5 Quality Control

The data collected by this project will be used to identify and prioritize fish and wildlife habitat restoration actions within the Sheboygan River Area of Concern. It will be used for planning and management decisions. No regulatory requirements or clean up decisions will be made using this data about species and habitat in the AOC so there are no applicable action levels or criteria to be met.

**Quality Control Activities**

Plant species identification will be performed at the survey site by the surveyor, using his or her training and experience and reference keys as necessary. Photo, tissue, or whole plant vouchers will be taken of individuals of target (rare) species. These vouchers will then be checked by Craig Anderson, WDNR Botanist. In the event that the surveyor is unsure of the species of a particular plant, a voucher will be collected so the identification can be made or confirmed by the Botanist.

A single person will be performing all of the surveys, supporting consistency of sampling methods. The surveyor will ensure that all equipment and supplies are present and in good working order in order to support the collection of accurate data.

**Corrective Actions**

If the WDNR biologist disagrees with an identification made by the surveyor, and there is a question as to its true identity, the information will be kept on file, but will be disregarded in the final report and will not be added to the NHI database. If the specimen can be clearly identified as something other than what the contractor recorded, then the species will be changed for the records and the database. Any changes will be recorded and included in the final report.

## B.7.B.6 Instrument/Equipment Testing, Inspection, and Maintenance

The primary instrument needing testing and maintenance will be the Global Positioning System (GPS). The Project Leader will provide the surveyor with a Garmin GPSmap 60Cx, and will be responsible for maintaining it and keeping it in operable condition, referring to the owner's manual as needed. Any problems with the GPS unit should be resolved by the Project Leader.

Other equipment necessary for these assessments include keys for plant identification, a digital camera, measuring devices (meter stick, tape measure), a portable plant press, and scissors or knife for voucher collection. The surveyor will check that all items are present and in good condition before sampling.

## B.7.B.7 Instrument/Equipment Calibration and Frequency

This survey does not use instruments or equipment that can be calibrated. The accuracy of the GPS unit can be verified using established monuments; however, this is not critical for project success.

### B.7.B.8 Inspection/Acceptance of Supplies & Consumables

The main supplies needed for these surveys will be plastic bags for voucher collection. The surveyor will ensure that any supplies or consumables required are present and in good condition before sampling.

### B.7.B.9 Data Acquisition Requirements for Non-Direct Measurements

No existing / secondary data will be used for this portion of the study.

### B.7.B.10 Data Management

Data management will follow the Benchmark Data Content Standards (BDCS) established by NatureServe (see Appendix C.2). The BDCS ensure a high level of accuracy, currency and quality to the species data maintained across the network of member programs and NatureServe.

The surveyor will record the survey data on paper, using standard reporting forms. These include the following which can be found in Appendices C7 through C10:

- Rare plant reporting forms (form 1700-049) for each of the rare plant populations
- Natural Community forms and associated plant list with abundance codes
- Site Summary forms
- Invasive Plant forms

Craig Anderson, WDNR Botanist, will check the data, using the vouchers to confirm species identifications. After the survey information is checked for accuracy, it will be included in the final report for the Sheboygan AOC Pathway to Delisting project. In addition, WDNR NHI staff will enter rare species and high-quality natural community locations into the NHI database, the central repository for rare species and high-quality natural community data for Wisconsin. All data added to the NHI database go through a quality control process to ensure their validity and accuracy.

## B.8 – WINTERING BIRD SURVEY

## B.8.A – PROJECT MANAGEMENT

### B.8.A.4 Project/Task Organization

**Table 16. Roles & Responsibilities for Wintering Bird Survey.**

| Individual(s) Assigned | Responsible for: |
|---|---|
| Jennifer Conner, EPA Project Officer | • Review project information and reporting in Great Lakes Accountability System (GLAS)<br>• Assist the Project Manager in defining milestones for the project |
| Donalea Dinsmore, WDNR Great Lakes Funding and Quality Assurance Coordinator | • Approve QAPP<br>• Ensure that the approved QAPP is uploaded into SWIMS database<br>• Project reporting on Great Lakes Accountability System (GLAS) |
| Vic Pappas, WDNR Sheboygan Basin Supervisor, Project Manager | • Overall project management<br>• Monitors study progress<br>• Ensures project completion |
| Laurel Last, WDNR Water Resources Management Specialist, Project QA Manager | • QAPP preparation & distribution<br>• Overall project QA/QC<br>• Ensures QAPP is followed<br>• Project reporting in SWIMS database |
| Lisa Helmuth, WDNR Surface Water Integrated Monitoring System (SWIMS) File Manager | • Manage SWIMS database, which will include approved QAPP and project reports |
| Dale Katsma, WDNR Wildlife Supervisor, Project Leader for Wintering Bird Survey | • Wintering bird survey project leader and QA officer<br>• Management, data collection, analysis, and reporting for wintering bird survey<br>• Hire and supervise Wildlife LTE<br>• Ensure that property owners are contacted for access before wintering bird surveys are conducted<br>• Ecological Assessment Team member |
| Missy Sparrow-Lien, WDNR Wildlife Biologist, Assistant Project Leader for Wintering Bird Survey | • Assist Project Leader in management, data collection, analysis, and reporting for wintering bird survey |
| Dustin Miller, Wildlife LTE | • Perform wintering bird surveys |

### B.8.A.5 Problem Definition/Background

The first step in an ecological assessment is to gather baseline information on the area in question. In the Sheboygan River Area of Concern (AOC), data on birds is collected from summer Breeding Bird Surveys and an annual Mid-winter Waterfowl Survey conducted as part of the US Fish and Wildlife Service effort. These two surveys provide us with important data,

but still leave an incomplete overall picture. Breeding Bird Surveys are broad in scope, but are limited to the summer months. The existing Mid-winter Waterfowl Survey is limited to a single day and is only concerned with waterfowl. An enhanced Mid-winter Bird Survey was developed to address these shortcomings. The objective of this survey is to gather simple information on species presence/absence and their relative abundance in the AOC during the winter. The data collected from this survey will provide us with a better understanding of which species most commonly use the AOC in the winter months. This survey, when synthesized with the other bird surveys already being done, will give us a more complete picture of year-round species use of the Sheboygan River AOC. The results of the survey will serve to inform the development of fish and wildlife management and restoration plans and delisting strategies for fish and wildlife habitat and population impairments.

## B.8.A.6 Project/Task Description

### Measurements to Be Made / Data to Obtain

Wintering bird surveys will be performed using methods to expand upon those for the Mid-Winter Waterfowl Surveys, which are performed every January in cooperation with the U.S. Fish & Wildlife Service Division of Migratory Bird Management (see http://www.fws.gov/birddata/databases/mwi/aboutmwi.htm). The methods will be similar, but our surveys will include non-waterfowl and non-open water sites (when open water is not available), and occur bi-weekly throughout the winter season.

A total of 12 points will be surveyed along the length of the AOC. The 12 points will be distributed between 5 river segments (see Figure 9). Four of the segments, the Upper River, Middle River, Lower River, and the Inner Harbor, were delineated by the U.S. EPA for purposes of remediation (U.S. EPA RAP). The 5th segment is the Outer Harbor area within the breakwaters. There will be 3 survey points along the Upper River, 5 survey points along the Middle River, 2 survey points along the Lower River, and 1 survey point each along the Inner Harbor and Outer Harbor. The specific survey locations will vary and will be chosen by the surveyor on the day of the survey—see the following sections for more details. The surveyor will complete a Sheboygan AOC Mid-Winter Bird Survey data form (see Appendix D.1) for each of the sites. Data recorded will include the following:

- Bird species and numbers
- Date
- Segment
- Point number
- GPS coordinates
- GPS error
- Temperature
- Wind speed and direction
- Cloud cover

- Visibility
- Time (start and stop)
- Estimate of distance surveyed

The surveys will be performed bi-weekly during the survey period. No sample collection is planned, but dead birds that are found during the survey work will be collected for possible necropsy or contaminants analysis.

After verification, the data will be used to evaluate the distribution and condition of wintering birds using the AOC. A final report will be submitted, and the data will be included in the overall Ecological Assessment which is the final report for the Sheboygan AOC Pathway to Delisting habitat BUI's—Survey and Assessment Project.

**Project Timeline:**
December 20th, 2010 to April 1st, 2011 — Wintering bird surveys performed.
January 1, 2012 — Initial findings available.
June 30, 2012 — Final report (Ecological Assessment) completed for entire AOC project.

## B.8.A.7 Quality Objectives & Criteria

The WDNR will conduct wintering bird surveys in the Sheboygan River AOC during the winter of 2010-2011. The objective of the survey is to gather basic information on bird species presence/absence and their relative abundance in the AOC during the winter. Bird survey data will be used to estimate the species, numbers, and distribution of birds wintering in the AOC. They will provide information needed to assess winter habitat use of the AOC. They should also provide general information about the overall condition of the wintering bird population. Although the data collected will be from a single season, we feel that the level of information will be adequate for inferences about future winters. These data will provide a baseline for completion of an ecological assessment, which will inform the development of a fish and wildlife management and restoration plan for the AOC.

This QAPP describes the organization and instructions for field monitoring, data management and reporting activities that will be followed for this project. Establishing performance criteria will ensure that these activities will be documented and completed at a high level of performance in order to meet the project's objectives. Central to establishing performance criteria will be the use of standard bird survey and data management protocols.

Errors in this assessment will be based upon the following:

a) in-field sampling / analysis error, and
b) data transcription error.

If it has been determined that the following has occurred:

1) The field sampling has followed all necessary protocols, and
2) The samples were collected and analyzed successfully

then the analytical results of that sample will be deemed as successful and "good" data, and can be used for further evaluation.

### B.8.A.8 Special Training/Certification

The Wintering Bird Survey Project Leader will be responsible for ensuring that all field staff receive the training necessary for their portion of the study. Prior to the field-sampling season, the Project Leader will go over the SOPs, methods, and QA requirements with the field staff and answer any questions that they may have. All training will be documented and records will be kept in the project file.

To minimize any potential health and safety risks related to field sampling conducted as part of this project, members of the field crew need to be physically able to conduct field work under demanding conditions and be well prepared to handle contingencies or emergencies. The following are suggested requirements for all field survey personnel:

a) Recent CPR training,
b) Recent first aid training,
c) Completion of a satisfactory interview about health and safety aspects of the project with the Wintering Bird Survey Project Leader, including routine safety precautions and a discussion of actions to be taken in the event of an emergency.

Surveyors will refer to the WDNR Cold Weather Handbook 9181.1 and 9187.91 Employees Working Alone for additional information about safety during the field work.

### B.8.A.9 Documents and Records

**Field Documents and Records**

Surveyors will complete a Sheboygan AOC Mid Winter Bird Survey data form (Appendix D.1) for each sampling day. This report will include the bird species and numbers observed, as well as the survey date, sampling time, location (latitude and longitude), weather conditions, GPS error, an estimate of the distance covered, and any other pertinent information. All field data sheets will be scanned and saved electronically as Portable Document Format (PDF) files. These will be uploaded to the WDNR Surface Water Integrated Monitoring System (SWIMS). All survey results will be proofed and entered into electronic format (Excel® spreadsheet), where basic statistics (mean, range, totals) will be performed.

**Final Report**

A Final Report will be completed for this segment of the project. This report will be uploaded to the WDNR Surface Water Integrated Monitoring System (SWIMS) and provided to the team responsible for preparing the Ecological Assessment Report. The report will include at minimum:

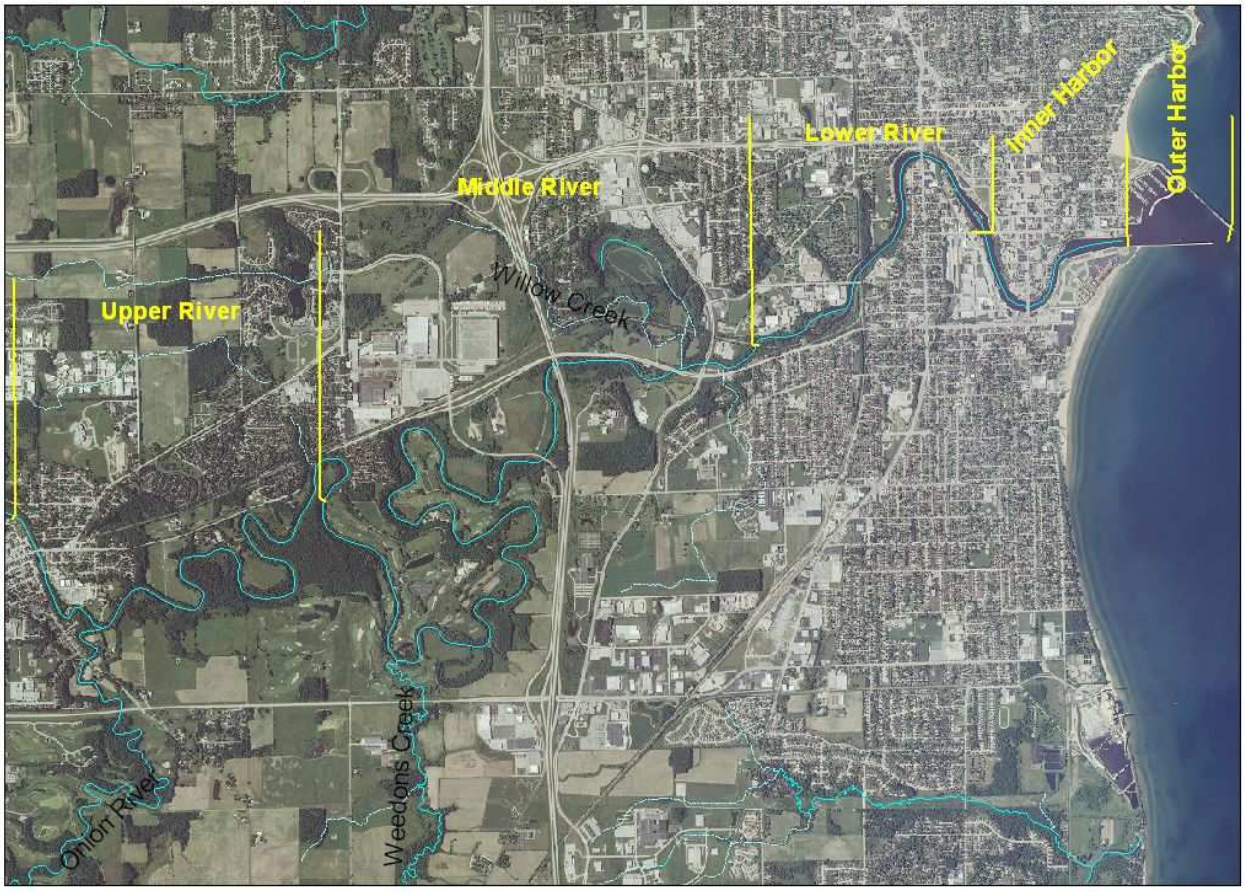
- Discussion of methods used
- Summary of results
- Summary statistics
- Discussion of QA/QC, including results of QA checks and any corrective actions
- All data collected

## SECTION B.8.B – DATA GENERATION & AQCUISITION

### B.8.B.1 Sampling Process Design (Experimental Design)

A total of 12 points will be surveyed along the length of the Sheboygan River AOC. The 12 points will be distributed between 5 river segments (see Figure 10). Four of the segments, the Upper River, Middle River, Lower River, and the Inner Harbor, were delineated by the U.S. EPA for purposes of remediation (U.S. EPA RAP). The 5th segment is the Outer Harbor area within the breakwaters.

Figure 10. Sheboygan River and Harbor AOC Wintering Bird Survey River Segments.




The number of survey points per segment is approximately proportional to each segment's length of the overall AOC. There will be 3 survey points along the Upper River, 5 survey points along the Middle River, 2 survey points along the Lower River, and 1 survey point each along the Inner Harbor and Outer Harbor.

Within each segment, point locations will be chosen by the surveyor on the day of the survey. These points are not predetermined and will be selected based upon a hierarchy of criteria. First and foremost, point locations should cover as much open water as possible without re-

sampling areas or re-counting birds. If the river is either ice-free or completely iced-in, point locations should be chosen that are representative of the characteristics of each river segment. They will be spaced far enough apart as to cover as much of the river corridor as possible, and avoid sample overlap. The surveyor will estimate and record the distance covered by the survey at each point, and will ensure that that there is no overlap between survey locations. Selection of point locations will be subject to river accessibility issues and the surveyor's judgment based upon the above criteria.

Surveys will be performed bi-weekly from December 20th, 2010 to April 1st, 2011. Specific survey dates may be adjusted to account for weather conditions. Survey frequency may be increased if a bird die-off occurs, in order to better understand the situation.

For the goals of this survey, it is unnecessary to survey the entire length of the Sheboygan AOC. This sample design allows for adaptability in the face of unpredictable open-water conditions, extreme winter weather, and unforeseen issues with river accessibility, while still providing general baseline information on species presence/absence and relative abundance.

No samples will be required for this segment of the project, unless dead birds are collected for necropsy or contaminants analysis. Many measurements will be collected by the surveyors in the field. See Table 17 for a list of these parameters and their criticality.

**Table 17. Classification of Measured Parameters for Wintering Bird Survey.**

| Parameter | Units | Measuring Device | Classification |
|---|---|---|---|
| Sampling location (latitude and longitude) | Decimal degrees | Garmin GPSmap 76 CSx Global Positioning System | Critical |
| GPS error | Meters | Garmin GPSmap 76 CSx Global Positioning System | Critical |
| Start and stop time | Hours and minutes | Watch or other time-keeping device | Information only |
| Bird identification | (none) | Absence/presence from site; appropriate bird identification keys; personnel training | Critical |
| Bird count | Individual birds | Appropriate bird identification keys and personnel training | Critical |
| Air temperature | Celsius degrees | Kestrel 3000 | Information only |
| Wind speed | Miles per hour | Kestrel 3000 | Information only |
| Wind direction | (none) | Local NOAA weather report | Information only |
| Cloud cover | Percent | Visual estimate | Information only |
| Visibility | Miles | Local NOAA weather report | Information only, unless < 1 mile (then postpone survey) |

## B.8.B.2 Sampling Methods

**Sampling Methods:**

Surveys will be conducted from vehicles or on foot. Survey locations should be as close to the river's edge as local conditions allow. Surveyors will spend 5 minutes at each location attempting to identify and count all bird species within range of sight and sound. Depending on the location of the survey point, they may need to discount birds that are outside of the intended river segment or that would be counted for a different survey point. In the event there are large numbers of birds or widely scattered groups of birds, the surveyor will be allowed to take extended time beyond the original 5 minute allocation. This time extension will be used to count and accurately identify large groups or widely scattered groups of birds at a point. Birds would not be included in the survey count if they arrive during the extended time. Note that this time extension beyond 5 minutes is a change to the original protocol. Please see Appendix D.2 for a detailed explanation of this and other method changes that occurred during the study.

Other field data that will be collected on site includes GPS location, air temperature, cloud cover, visibility, start/end times, GPS error, and an estimate of the distance covered by the survey. Information on wind speed and direction and visibility will be obtained from local

hourly NOAA weather reports. All pertinent information will be recorded on a Sheboygan AOC Mid-Winter Bird Survey data form (See Appendix D.1). This data sheet is a modification of the Mid-Winter Waterfowl Survey sheet.

The only samples to be collected for this study will be dead birds that are found incidental to the survey work. Surveyors will respond to reports of dead birds and increase the frequency of surveys if die-offs occur. If die-offs of more than 5 birds occur, they will collect specimens and send them to the WDNR Wildlife Health Specialist for necropsy. They will follow the procedures described in the "Collection and Disposition of Birds and Mammals" section (22-30) of the Wildlife Management Operations Handbook (see Appendix D.3). The procedures include wearing disposable gloves when handling the dead birds and freezing them as soon as possible if they cannot be delivered to the Wildlife Health Specialist within 24 hours. They will call Wildlife Health for specific instructions before they ship or deliver a specimen to the Wildlife Health Specialist for necropsy.

**Performance Requirements and Corrective Actions**

Corrective actions will be taken if any aspect of the sampling event differs from that planned. Under circumstances where corrective action is needed, the wintering bird survey Project Leader or Assistant Project Leader will be notified and the situation researched and a decision made. Corrective actions should only be implemented after approval by the Project Leader. Corrective actions will be documented in the field log or data report at the time of decision, and will accompany all reports after analytical results are returned. The wintering bird survey Project Leader is ultimately responsible for any corrective actions and appropriate documentation of those actions.

Weather conditions may affect survey results, particularly if the weather affects visibility. Surveys will not be conducted if visibility is less than 1 mile. Surveyors will check the weather forecast before leaving to perform a survey, and may abort a survey if they determine that the weather conditions are keeping them from gathering adequate data. If there is any question about the affect of the weather on survey results, they should consult with the Project Leader or Assistant Project Leader before proceeding with the survey. Survey dates may be adjusted in order to avoid unsuitable weather conditions.

Since much of the land adjacent to the AOC is privately owned, access could be an issue. Due to Wisconsin's Public Trust Doctrine, surveyors can legally use and perform surveys in all sections of the river itself, but they cannot cross private lands or conduct surveys on private lands without owner permission. Gaining such permission should not be a problem for these surveys. The Project Leader and the surveyor will ensure that landowner permission is granted before any work is done on private property. If necessary, alternative river access / viewing sites will be found.

### B.8.B.3 Sample Handling & Custody

The only samples to be collected for this study will be dead birds that are found incidental to the survey work. When surveyors collect a specimen for necropsy, they will follow the procedures described in the "Collection and Disposition of Birds and Mammals" section (22-30) of the WDNR Wildlife Management Operations Handbook (see Appendix D.3) and the 2011 "General guidelines for what to submit to WH for necropsy" (see Appendix D.4). They will fill out and attach a Fish & Wildlife Specimen Submission Diagnostic Tag, Form 2300-144 (see Appendix D.5), to the dead bird. They will also complete an online wildlife necropsy submission form through the WDNR Wildlife Health database, accessed at http://prodoasjava.dnr.wi.gov/whdb/field/home.do. The form follow very closely the Wildlife Necropsy Submission/Diagnostic Report, Form 2300-143 (see Appendix D.6), which is no longer used. There will be no custody forms.

### B.8.B.4 Analytical Methods

There are no analytical methods for wintering bird survey, as it is simply an observational survey.

### B.8.B.5 Quality Control

The data collected by this project will be used to identify and prioritize fish and wildlife habitat restoration actions within the Sheboygan River Area of Concern. It will be used for planning and management decisions. No regulatory requirements or clean up decisions will be made using this data about species and habitat in the AOC so there are no applicable action levels or criteria to be met.

**Quality Control Activities**

The majority of the surveys will be done by a single observer. If the primary observer is unavailable, then another trained and experienced observer will perform the survey. During the first month of data collection, two observers will perform concurrent surveys. Points will be selected and visited jointly and independent survey sheets will be filled out. Data on species recorded during the overall survey will be compared for consistency between the two observers, and with any previous surveys. Between the two observers, we will strive for agreement in species identified and counted at each point, and over the entire concurrent survey. Allowances are made for differences in each observer's visual and auditory capabilities. If the two observers identifications vary by more than 3 species at each point, the project leader will design and administer a test of visual and auditory identification of common Wisconsin winter birds. Surveys will continue only after the surveyors can pass this test. Discrepancies in bird species identification are more critical than in regards to numbers, since

we are only determining relative abundances.

Partway through the study, we switched to a dependent dual observer method, which requires a primary observer and a secondary observer. The primary observer's responsibility is to identify all birds by sight and sound, and to dictate them to the secondary observer. The secondary observer's first responsibility is to record the observations of the primary observer. Additionally, the secondary observer records any observations that he or she makes independent of the primary observer. The primary and secondary observers switch roles throughout the day. Please see Appendix D.2 for a detailed explanation of this and other method changes that occurred during the study.

Surveyors will be following standard protocols as described in this QAPP. They will maintain and calibrate equipment as necessary to assure the collection of accurate data (see Sections B.8.B.6 and B.8.B.7). They will check all equipment and supplies each sampling day before heading out into the field (see Section B.8.B.8).

Data completeness will be calculated for this segment of the project. The completeness objective for this project is for 95% of the planned data to be collected and usable. WDNR sampling crews will make every effort to obtain valid data for each sampling point identified in this QAPP.

**Corrective Actions**

Corrective actions will be taken if any aspect of the sampling event differs from that planned. Under circumstances where corrective action is needed, the Project Leader or Assistant Project Leader will be notified and the situation researched and a decision made. Corrective actions should only be implemented after approval by the Project Leader. Corrective actions will be documented in the field log or data report at the time of decision, and will accompany all reports after analytical results are returned.

### B.8.B.6 Instrument/Equipment Testing, Inspection, and Maintenance

WDNR wintering bird surveyors will be responsible for testing, inspection, and maintenance of all equipment necessary for the surveys for the duration of this study. The primary instrument needing testing and maintenance will be the Global Positioning System (GPS). The GPS used for this survey will be a Garmin GPSmap 76CSx. This instrument will be maintained and operated as described in its user manual. Surveyors will perform a check of the GPS equipment at least once per sampling day by recording the position of a fixed benchmark with known x and y coordinates. The coordinates will be recorded and compared with the benchmark to verify that the GPS unit is functioning consistently. Surveyors will also record the GPS error displayed by the unit at each survey location. According to the manufacturer, this unit typically has a position error of less than 10 meters. The objective for this study will be for all GPS

measurements to have an error of less than 15 meters.

Other equipment necessary for these assessments include those measuring devices listed in Table 17, plus binoculars or a spotting scope and field guides for bird identification. A camera, although not necessary, might prove valuable for documentation purposes. The surveyors will wear boot chains during icy conditions and wear cold-weather clothing appropriate for the conditions. They will refer to the WDNR Cold Weather Handbook 9181.1 as needed. The surveyors will check that all items are present and in good condition before sampling.

### B.8.B.7 Instrument/Equipment Calibration and Frequency

There will be no instruments used in these assessments that will need calibrating.

### B.8.B.8 Inspection/Acceptance of Supplies & Consumables

Critical supplies and consumables for the field assessments include plastic bags and disposable gloves, in case dead birds are found and collected for necropsy. Surveyors will check that all items are present and in good condition before sampling. If any items are missing or inadequate, they will remedy the situation, with the Project Leader's help if necessary, before they leave for the field.

### B.8.B.9 Data Acquisition Requirements for Non-Direct Measurements

Non-direct measurements (secondary data) will not be used for these assessments.

### B.8.B.10 Data Management

Wintering bird surveyors will record the assessment data on paper forms. They will complete a Sheboygan AOC Mid-Winter Bird Survey data form (Appendix D.1) for each survey point and sampling day. This report will include the bird species and numbers observed, as well as the survey date, sampling time, location (latitude and longitude), weather conditions, GPS error, and estimated distance surveyed.

The surveyors will provide these completed forms to the wintering bird survey Project Leader. The Project Leader will check the forms for completion and accuracy. He or designated WDNR staff will scan and save all of the forms electronically as Portable Document Format (PDF) files, and then enter the data from the forms into an electronic format (Excel® spreadsheet), where basic statistics (mean, range, totals) will be performed.

## B.9 – KINGFISHER NEST SURVEY

## B.9.A – PROJECT MANAGEMENT

### B.9.A.4 Project/Task Organization

**Table 18. Roles & Responsibilities for Kingfisher Nest Survey.**

| Individual(s) Assigned | Responsible for: |
|---|---|
| Jennifer Conner, EPA Project Officer | • Review project information and reporting in Great Lakes Accountability System (GLAS)<br>• Assist the Project Manager in defining milestones for the project |
| Donalea Dinsmore, WDNR Great Lakes Funding and Quality Assurance Coordinator | • Approve QAPP<br>• Ensure that the approved QAPP is uploaded into SWIMS database<br>• Project reporting on Great Lakes Accountability System (GLAS) |
| Vic Pappas, WDNR Sheboygan Basin Supervisor, Project Manager | • Overall project management<br>• Monitors study progress<br>• Ensures project completion |
| Laurel Last, WDNR Water Resources Management Specialist, Project QA Manager | • QAPP preparation & distribution<br>• Overall project QA/QC<br>• Ensures QAPP is followed<br>• Project reporting in SWIMS database |
| Lisa Helmuth, WDNR Surface Water Integrated Monitoring System (SWIMS) File Manager | • Manage SWIMS database, which will include approved QAPP and project reports |
| Dale Katsma, WDNR Wildlife Supervisor, Project Leader for Kingfisher Nest Survey | • Kingfisher nest survey project leader and QA officer<br>• Management, data collection, analysis, and reporting for kingfisher nest survey<br>• Hire and supervise Wildlife LTE<br>• Ensure that property owners are contacted for access before kingfisher nest surveys are conducted<br>• Ecological Assessment Team member |
| Missy Sparrow-Lien, WDNR Wildlife Biologist, Assistant Project Leader for Kingfisher Nest Survey | • Assist Project Leader in management, data collection, analysis, and reporting for kingfisher nest survey |
| Dustin Miller, Wildlife LTE | • Assist with kingfisher nest survey<br>• Data collection, analysis, and reporting for kingfisher nest survey |

## B.9.A.5 Problem Definition/Background

Previous studies along the Sheboygan River Area of Concern (AOC) have shown various fish and crayfish species to be contaminated with PCBs, sometimes at very high levels. Suspecting that predators of these potentially contaminated prey species may be bio-accumulating toxins, Heinz, Swineford, and Katsma (1984) tested four species of fish- or crayfish-eating birds collected or found dead along the AOC between 1976 and 1980. They found that the birds' bodies contained levels of PCBs that would be considered harmful to some species based on laboratory tests. Effects of exposure to PCBs and other contaminants can include impairment of reproduction, abnormal behavior, impaired ability to forage, and death (Custer et. al. 2010).

Since 1984, PCB-contaminated sediment has been removed from the Upper River segment of the AOC. Also, previous studies did not monitor the nests of fish-eating birds for possible effects of contamination on reproduction or offspring health. A new study is needed to update and expand our knowledge of the effects of contamination in fish-eating birds, such as belted kingfishers (*Megacyrele alcyon*), along the AOC. Belted kingfishers are a common riparian species found throughout the United States, and feed heavily upon small fish. Habitat use is largely influenced by the availability of clear water bodies for foraging. Preferred habitats tend to contain a greater concentration of riffles to pools, possibly because of higher fish concentrations in these riffles (Davis 1982). Home range size can vary from 0.5 – 5.0 linear miles from the nest location (Hamas 1994), depending on availability of food and nesting banks. Data from Fort Collins, Colorado estimated approximately 1 nesting pair of kingfishers per 1.5 km of river (Shields and Kelly, 1997). In Vermont, nest construction begins in April and nesting begins in early May (Ellison 1985). In Massachusetts, egg dates ranged from May 14th to June 6th (Veit and Peterson 1993). New burrows are constructed each year, though occasionally an old burrow will be reused. Burrows were approx. 1-2 m in length. The average clutch size was 5-7 round, white eggs (Hamas 1994). Incubation lasts 22-24 days, and the young fledge at 27-29 days of age.

We propose monitoring belted kingfishers because of their place as top level predators of fish and other aquatic organisms. Our objective will be the monitoring of belted kingfisher nests found along the Sheboygan River AOC. Of particular interest will be hatching success, percent reaching fledging stage and the presence or absence of any deformities, such as crossed bills. This data will be compared to reports of these metrics in the literature from uncontaminated sites, in order to gain a better understanding of whether and how belted kingfishers in this AOC are currently being negatively affected by PCB contamination.

## B.9.A.6 Project/Task Description

**Measurements to Be Made / Data to Obtain**

Beginning in mid-April, we will use canoes/kayaks to find and identify belted kingfisher (*Megacyrele alcyon*) nest burrows along the Sheboygan River AOC. Potential burrow locations will be recorded by Global Positioning System (GPS), photographed, placed on a field map, and revisited weekly through mid-May, or until eggs are laid, whichever comes first. When eggs are first detected, nests will be visited twice weekly to record information on stage of incubation, clutch size, date and time of nest check, and the age and condition of chicks, if present. This information will be gathered using a video burrow probe system. Nest checking will continue until the young successfully fledge or the nest fails.

Of particular interest will be hatching success, percent reaching fledging stage and the presence or absence of any deformities, such as crossed bills. This data will be compared to reports of these metrics in the literature from uncontaminated sites, in order to gain a better understanding of whether and how belted kingfishers in this AOC are currently being negatively affected by PCB contamination. The data will be included in the overall Ecological Assessment which is the final report for the Sheboygan AOC Pathway to Delisting habitat BUI's—Survey and Assessment Project.

**Project Timeline:**
April, 2011 — Locate belted kingfisher burrows.
April-July, 2011 – Monitor belted kingfisher nests.
January 1, 2012 — Initial findings available.
June 30, 2012 — Final report (Ecological Assessment) completed for entire AOC project.

## B.9.A.7 Quality Objectives & Criteria

The WDNR will conduct surveys of belted kingfisher nests along the Sheboygan River AOC. The data will be used to gain a better understanding of the current effects of contaminants on the fish-eating birds of the AOC. Results will be compared to those in the literature from uncontaminated sites to provide a general impression of whether and how belted kingfishers are being impacted by contamination in the AOC. The final report and data will be included in an ecological assessment, which will inform the development of a fish and wildlife management and restoration plan for the AOC.

During the development of this project plan, the team considered the feasibility of sampling fish-eating birds and analyzing for PCBs. Belted kingfishers and blue herons were considered candidate species at a higher trophic level that should show bioaccumulation of contaminants found in the food chain. Collecting adult kingfishers and herons or kingfisher eggs was proposed. Several factors influenced the decision to exclude this from the scope of the

assessment:

- Fish-eating birds in the Sheboygan River system are migratory and herons feed at multiple sites. This makes it difficult to draw conclusions about the source of any PCB concentrations detected.
- The PCB concentrations in the eggs would be more representative of local food sources; however, obtaining egg samples presented significant challenges which ultimately made sampling impractical.
    - A similar study of kingfisher eggs on the Huron River AOC with about 100 km of river was not successful in detecting significant differences in contaminant levels, so our sampling area of about 23 km would be unlikely to yield a large enough sample of eggs.
    - Kingfisher nests are burrows in the stream bank. Sampling involves digging what could be a significant hole behind the nests for access. There could be issues with landowner permission.
- Observing the kingfisher nests would be a direct way of determining hatching and fledging success and detecting any deformities.

This QAPP describes the organization and instructions for field monitoring, data management and reporting activities that will be followed for this project. Establishing performance criteria will ensure that these activities will be documented and completed at a high level of performance in order to meet the project's objectives. Central to establishing performance criteria will be the use of standard field, laboratory, and data management protocols.

Errors in this sampling event will be based upon the following:

a) in-field sampling / analysis error, and
b) data transcription error.

If it has been determined that the following has occurred:

1) The field sampling has followed all necessary protocols, and
2) The samples were collected and analyzed successfully

then the analytical results of that sample will be deemed as successful and "good" data, and can be used for further evaluation.

### B.9.A.8 Special Training/Certification

The Kingfisher Nest Survey Project Leader will be responsible for ensuring that all field staff receive the training necessary for their portion of the study. Prior to the field-sampling season, the Project Leader will go over the SOPs, methods, and QA requirements with the field staff and answer any questions that they may have. All training will be documented and records will be kept in the project file.

To minimize any potential health and safety risks related to field sampling conducted as part of this project, members of the field crew need to be physically able to conduct field work under demanding conditions and be well prepared to handle contingencies or emergencies. The following are suggested requirements for all field survey personnel:

a) Recent CPR training,
b) Recent first aid training,
c) Completion of a satisfactory interview about health and safety aspects of the project with the Project Leader, including routine safety precautions and a discussion of actions to be taken in the event of an emergency.

## B.9.A.9 Documents and Records

### Field Documents and Records

Surveyors will complete a Sheboygan River AOC Kingfisher Burrow Monitoring data sheet (Appendix E.1) for each nest surveyed. This report will include the following information:

- Date and time of check
- Nest ID
- Nest GPS location and GPS error
- Number of eggs
- Number of chicks
- Additional notes, including stage of incubation, age and condition of chicks, etc.

All field data sheets will be scanned and saved electronically as Portable Document Format (PDF) files. These will be uploaded to the WDNR Surface Water Integrated Monitoring System (SWIMS). All survey results will be proofed and entered into electronic format (Excel® spreadsheet).

### Final Report

A Final Report will be completed for this segment of the project. This report will be uploaded to SWIMS and provided to the team responsible for preparing the Ecological Assessment Report. The report will include at minimum:

- Discussion of methods used
- Summary of results
- Summary statistics
- Discussion of QA/QC, including results of QA checks and any corrective actions
- All data collected

## SECTION B.9.B – DATA GENERATION & AQCUISITION

### B.9.B.1 Sampling Process Design (Experimental Design)

Beginning in mid-April, we will use canoes/kayaks to find and identify kingfisher nest burrows along the Sheboygan River AOC. Potential burrow locations will be recorded by GPS, photographed, placed on a field map, and revisited weekly through mid-May, or until eggs are laid, whichever comes first. When eggs are first detected, nests will be visited twice weekly to record information on stage of incubation, clutch size, date and time of nest check, and the age and condition of chicks, if present. Field data will be recorded on a Sheboygan River AOC Kingfisher Burrow Monitoring data sheet (Appendix E.1). Nest checking will continue until the young successfully fledge or the nest fails.

Nests will be observed using a burrow probe system (see Appendix E.2 for a photograph of the system). The system consists of an outdoor, infrared (7 LEDs) security camera mounted on an adjustable length painters pole with a flex copper tip. The camera is attached to a section of cable that connects to a watertight pelican 1200 case. Inside the pelican case is a 12 volt, 12 amp hour sealed rechargeable battery and an Archos 420 Digital Video Recorder with 20 gb of storage space. This system will allow us to see, and record, the interiors of the burrows.

If visual access to a nest is limited by an adult kingfisher sitting on it, we may resort to digging a hole behind the nest and slowly removing soil until the nest is exposed for viewing. A board would then be placed over the hole to allow access to the nest for the duration of the study (until the nestlings fledge).

The data on kingfishers is limited due to the difficulties inherent in locating kingfisher nests. Kingfishers require freshly cut vertical banks consisting of a substrate that allows for burrowing and does not collapse. Kingfishers are also territorial, and do not share nesting locations. Data from Fort Collins, Colorado estimated approximately 1 nesting pair of kingfishers per 1.5 km of river (Shields and Kelly, 1997). The Sheboygan River AOC is approximately 14 miles (22.5 km) long, and not all of this length is suitable for kingfisher nesting. Using the estimate of 1 pair per 1.5 km of river, we could expect at most 15 pairs of kingfishers. The actual number will likely be less and we may not find all nest locations.

Specific sample locations cannot be predicted, since they will depend on where kingfishers dig their nest burrows. We will search all areas suitable for kingfisher burrows along the banks of the AOC. This sampling design was selected to cover wide areas of the AOC and be representative of the habitats found along the AOC.

This sampling design will allow us to gain a better understanding of the current effects of contaminants on the fish-eating birds of the AOC.

Please see Table 19 for a list of measurements that will be collected by the surveyors and their

criticality.

**Table 19. Classification of Measured Parameters for Kingfisher Nest Survey.**

| Parameter | Units | Measuring Device | Classification |
|---|---|---|---|
| Sampling location (latitude and longitude) | Decimal degrees | Garmin GPSmap 76 CSx Global Positioning System | Critical |
| GPS error | Meters | Garmin GPSmap 76 CSx Global Positioning System | Critical |
| Date | Month/Day/Year | Watch or other time-keeping device | Information only |
| Time | Hours and minutes | Watch or other time-keeping device | Information only |
| Clutch size | (none) | Field observation | Critical |
| Number of chicks | (none) | Field observation | Critical (hatching success) |
| Condition of chicks | (none) | Field observation | Critical (deformities) |

## B.9.B.2 Sampling Methods

**Sampling Methods:**

The survey methods are described in the previous section. Note that there will be no samples collected for this survey.

**Performance Requirements and Corrective Actions**

Corrective actions will be taken if any aspect of the sampling event differs from that planned. Under circumstances where corrective action is needed, the Kingfisher Nest Survey Project Leader or Assistant Project Leader will be notified and the situation researched and a decision made. Corrective actions should only be implemented after approval by the Project Leader. Corrective actions will be documented in the field log or data report at the time of decision, and will accompany all reports after analytical results are returned. The Project Leader is ultimately responsible for any corrective actions and appropriate documentation of those actions.

Since much of the land adjacent to the AOC is privately owned, access could be an issue. Due to Wisconsin's Public Trust Doctrine, surveyors can legally use and perform surveys in all sections of the river itself, but they cannot cross private lands or conduct surveys on private lands without owner permission. Gaining such permission should not be a problem for these surveys. The Project Leader and the surveyor will ensure that landowner permission is granted before any work is done on private property.

### B.9.B.3 Sample Handling & Custody

There will be no samples collected for this survey.

### B.9.B.4 Analytical Methods

There will be no samples collected for these surveys. All field methods are described in Sections B.9.B.1 and B.9.B.2.

### B.9.B.5 Quality Control

The data collected by this project will be used to identify and prioritize fish and wildlife habitat restoration actions within the Sheboygan River Area of Concern. It will be used for planning and management decisions. No regulatory requirements or clean up decisions will be made using this data about species and habitat in the AOC so there are no applicable action levels or criteria to be met.

**Quality Control Activities**

Surveyors will be following standard protocols as described in this QAPP. They will maintain and calibrate equipment as necessary to assure the collection of accurate data (see Sections B.9.B.6 and B.9.B.7). They will check all equipment and supplies each sampling day before heading out into the field (see Section B.9.B.8).

Data completeness will be calculated for this segment of the project. The completeness objective for this project is for 95% of the planned data to be collected and usable. WDNR sampling crews will make every effort to obtain valid data for each sampling point identified in this QAPP.

**Corrective Actions**

Corrective actions will be taken if any aspect of the sampling event differs from that planned. Under circumstances where corrective action is needed, the Project Leader or Assistant Project Leader will be notified and the situation researched and a decision made. Corrective actions should only be implemented after approval by the Project Leader. Corrective actions will be documented in the field log or data report at the time of decision, and will be included in the final report.

### B.9.B.6 Instrument/Equipment Testing, Inspection, and Maintenance

WDNR surveyors will be responsible for testing, inspection, and maintenance of all equipment necessary for the kingfisher nest surveys for the duration of this study. The primary instrument needing testing and maintenance will be the Global Positioning System (GPS). The GPS used for this survey will be a Garmin GPSmap 76CSx. This instrument will be maintained and operated as described in its user manual. Surveyors will record the GPS error displayed by the unit at each survey location. According to the manufacturer, this unit typically has a position error of less than 10 meters. The objective for this study will be for all GPS measurements to have an error of less than 6 meters.

The burrow probe system will also require inspection and maintenance. This system consists of the following components:

- outdoor, infrared (7 LEDs) security camera
- adjustable length painters pole with a flex copper tip
- section of cable
- watertight pelican 1200 case
- 12 volt, 12 amp hr. sealed rechargeable battery
- Archos 420 Digital Video Recorder with 20 gb of storage space

The primary surveyor for this study (Dustin Miller) is knowledgeable and experienced in the proper use, care, and maintenance of these systems and knows where to get further information if he has any questions.

Other equipment necessary for these assessments includes those measuring devices listed in Table 19, plus the following:

- Waders
- Canoe/kayak
- Paddle
- Personal Flotation Device

If the surveyors decide to dig to some of the burrows, they will also need a shovel. The surveyors will check that all items are present and in good condition before sampling.

### B.9.B.7 Instrument/Equipment Calibration and Frequency

There will be no instruments that will need calibrating.

### B.9.B.8 Inspection/Acceptance of Supplies & Consumables

Critical supplies and consumables for the field assessments include the following:

- Data sheets
- Pens/pencils/markers

Surveyors will check that all items are present and in good condition before sampling. If any items are missing or inadequate, they will remedy the situation, with the Project Leader's help if necessary, before they leave for the field.

### B.9.B.9 Data Acquisition Requirements for Non-Direct Measurements

Non-direct measurements will be used for these assessments. Results will be compared to previously published studies from similar but uncontaminated sites. To be considered, the studies must be from peer-reviewed journals.

### B.9.B.10 Data Management

Surveyors will record the assessment data on paper forms. They will complete a Sheboygan River AOC Kingfisher Burrow Monitoring data sheet (Appendix E.1) for each nest surveyed. This report will include information on the date, location of the nest, number and age of eggs and chicks observed, and condition of the chicks, including any deformities.

The surveyors will provide these completed forms to the Project Leader. The Project Leader will check the forms for completion and accuracy. He or designated WDNR staff will scan and save all of the forms electronically as Portable Document Format (PDF) files in SWIMS. He will then enter the data from the forms into an electronic format (Excel® spreadsheet), where basic statistics (mean, range, totals) will be performed.

Data will be used to gain a better understanding of the current effects of contaminants on belted kingfishers and other fish-eating birds of the AOC. Results will be compared to similar studies in uncontaminated locations.

## B.10 – SMALL MAMMAL AND MINK SURVEY

## B.10.A – PROJECT MANAGEMENT

### B.10.A.4 Project/Task Organization

**Table 20. Roles & Responsibilities for Small Mammal and Mink Survey.**

| Individual(s) Assigned | Responsible for: |
|---|---|
| Jennifer Conner, EPA Project Officer | • Review project information and reporting in Great Lakes Accountability System (GLAS)<br>• Assist the Project Manager in defining milestones for the project |
| Donalea Dinsmore, WDNR Great Lakes Funding and Quality Assurance Coordinator | • Approve QAPP<br>• Ensure that the approved QAPP is uploaded into SWIMS database<br>• Project reporting on Great Lakes Accountability System (GLAS) |
| Vic Pappas, WDNR Sheboygan Basin Supervisor, Project Manager | • Overall project management<br>• Monitors study progress<br>• Ensures project completion |
| Laurel Last, WDNR Water Resources Management Specialist, Project QA Manager | • QAPP preparation & distribution<br>• Overall project QA/QC<br>• Ensures QAPP is followed<br>• Project reporting in SWIMS database |
| Lisa Helmuth, WDNR Surface Water Integrated Monitoring System (SWIMS) File Manager | • Manage SWIMS database, which will include approved QAPP and project reports |
| Dale Katsma, WDNR Wildlife Supervisor, Project Leader for Small Mammal and Mink Survey | • Small mammal and mink survey project leader and QA officer<br>• Management, data collection, analysis, and reporting for small mammal and mink survey<br>• Hire and supervise Wildlife LTE<br>• Ensure that property owners are contacted for access before small mammal and mink surveys are conducted<br>• Ecological Assessment Team member |
| Missy Sparrow-Lien, WDNR Wildlife Biologist, Assistant Project Leader for Small Mammal and Mink Survey | • Assist Project Leader in management, data collection, analysis, and reporting for small mammal and mink survey |
| Dustin Miller, Wildlife LTE | • Assist with small mammal and mink survey<br>• Data collection, analysis, and report writing for small mammal and mink survey |
| Ron Arneson, WDNR Laboratory Coordinator | • Liaison between WDNR and project laboratories<br>• Procure services with project laboratories |
| Wisconsin State Lab of Hygiene (WSLH) | • Perform laboratory analyses on small mammals and mink |
| Miel Barman, WSLH QA Manager | • QA/QC activities and reporting at WSLH |

## B.10.A.5 Problem Definition/Background

In 1993, a small mammal community study (Seeley 1993; Appendix E.4) incidentally discovered measurable levels of polychlorinated biphenyls (PCBs) in small mammals collected from three floodplain areas along the Sheboygan River AOC. This was significant because it was the first study that showed that the PCB contamination in the Sheboygan River had found its way into the terrestrial food chain. Floodplain samples collected by Tecumseh in 1990 and 1992 for the Sheboygan River and Harbor Superfund project had already revealed high PCB levels in some floodplain areas. EPA issued a Record of Decision (ROD) for the Site on May 12, 2000. The remedy outlined specific actions to address PCB-contaminated sediment, PCB-contaminated floodplain soil, and groundwater contamination. The selected remedy included removal of floodplain soils containing PCB concentrations above 10 ppm.

In 2004, as part of the Phase II remedial action for the Superfund Site, the URS Corporation and Pollution Risk Services collected 190 soil samples from six floodplain areas of the Sheboygan River AOC. These samples were collected in order to determine the locations and the extent of PCB contaminated floodplain soils along the Sheboygan River. The soil samples were analyzed in January of 2007 by the US EPA Region 5 FIELDS Group. This analysis found significant levels (>20 PPM) of PCBs in five of the six sampled areas in the 0 – 0.5ft range. Two of the six sites had areas of >20 PPM in the 0.5ft – 1.5 ft range. Lower concentrations of PCBs were found to a depth of 5.5 ft in some places. Although required by the 2004 Upper River Consent Decree, the floodplain soils with PCB levels above 10 ppm have not yet been remediated; EPA is in the process of negotiating with the adjacent property owner for access to the floodplains for remediation. These floodplain areas represent important foraging areas for wildlife that target riparian invertebrates and emergent insects.

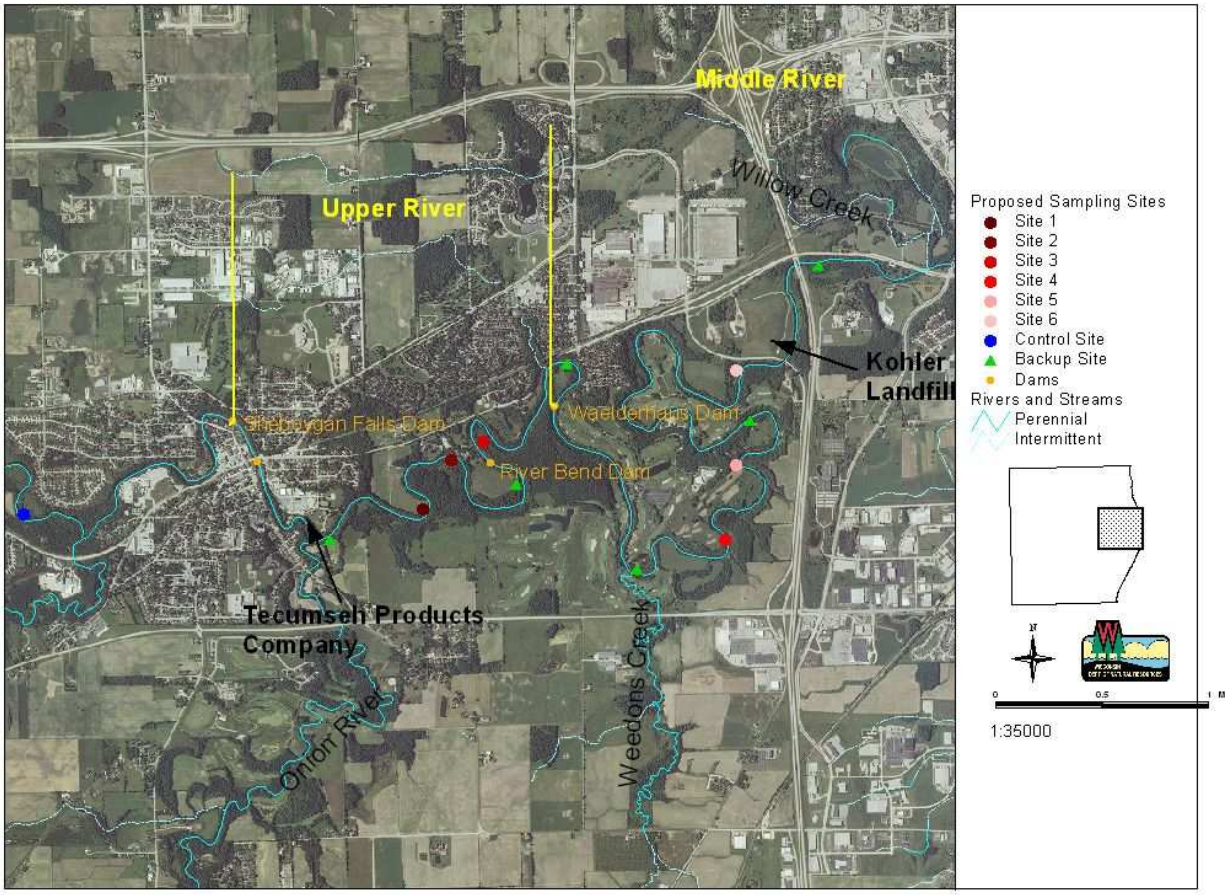
In laboratory settings, mink (*Mustela vison*) have shown an extreme sensitivity to PCB contamination. Even at low levels of exposure, mink reproduction can be impaired. Mink also sit high on the food chain in riparian areas, consuming a wide variety of prey, including fish, amphibians, and small mammals. Much of this prey, such as fish and small mammals, have tested positive in the past for contamination, especially PCB contamination. The wide variety of prey consumed, and the sensitivity to low levels of contamination make mink extremely useful as a bio-indicator of the health of an ecosystem. It has long been suspected that mink populations in the AOC are limited due to the PCB contamination. Previous efforts to locate mink in the area have been unsuccessful, despite the apparent prevalence of suitable habitat (Seeley 1993).

The long-tailed weasel (*Mustela frenata*), short-tailed weasel (*Mustela erminea*), and the least weasel (*Mustela nivalis*) are closely related to mink and utilize the same terrestrial riparian habitats. They also forage on similar food sources, excepting some aquatic prey, and consequently are exposed to similar environmental pollutants. Though there are fewer studies

involving weasels, they have been shown to be as sensitive to chlorinated biphenyls as are mink (Leonards et al 1998) and should also serve as a bio-indicator of ecosystem health.

### B.10.A.6 Project/Task Description

Figure 11. Sheboygan River and Harbor AOC Small Mammal Trapping Sites.




**Measurements to Be Made / Data to Obtain**

Small mammal trapping

Small mammals will be collected from six sites in floodplain riparian areas of the Upper and Middle River segments (as delineated by the U.S. EPA for the Superfund project) of the Sheboygan River AOC and from one control location upstream of the areas of known contamination (see Figure 11). These sites will be the original three sites from the 1993 Seeley study (Sites #4, #5, and #6) plus three of the areas designated by the U.S. EPA FIELDS group as "hotspots" for PCB contamination (Sites #1, #2, and #3). At each individual location, four traps will be set. Three of the traps will be large Sherman live traps, while the fourth trap will be a small-sized Tomahawk live trap. Trapping efforts will continue at each location until the required number of specimens is collected. For the six test sampling sites, the target will be

two white-footed mice (*Peromyscus leucopus*), two meadow voles (*Microtus pennsylvanicus*), and two masked shrews (*Sorex cinereus*) per station, and for the control location, the target will be four individuals of each species. Beyond these core 48 samples, there will be funding to analyze an additional 11 samples from this trapping effort. These may be used for mink or weasels. Mink and weasels are not the main targets of this phase of the study, and trapping efforts for those species will only continue as long as mouse and shrew traps are still open and the researcher has not met the predetermined sample collection limit. If less than 11 mink and weasels are collected, the remaining samples may be used for additional target species or non-target species that die in the traps.

Traps will be checked daily from Tuesday through Friday. The surveyor will collect and record the following information on a Sheboygan River AOC Small Mammal Collection data sheet (Appendix E.3), using one sheet per site per week:

- date and time of each check
- trap ID number
- trap GPS location and GPS error
- date the trap was last opened
- date the trap was last closed
- description of the trapping location
- nighttime low temperature
- amounts of precipitation from the previous 24 hours
- other notes

If the trap captures a small mammal, the surveyor will record information on tail length (mm), foot length (mm), ear length (mm), weight (grams), sex of the specimen, species, and if it was found dead, euthanized, or was released. Non-target and questionable species will be photographed, measured to assist identification, and then released on site.

Those individuals collected for contaminants analysis will be brought back to the WDNR Service Center lab for processing. Liver samples would be preferred because of comparability with other studies and toxic benchmarks. However, due to a minimum sample size requirement (5 grams), some of the samples will be submitted as whole-body samples. This is also the method that was used for the 1993 Seeley study, so results would be comparable to those from that study. Because masked shrews are very small, they will automatically be sent as whole-body samples. The other species of small mammals will be trapped and their livers weighed before a final decision is made. If livers for a particular species are consistently below 5 grams, then whole-body samples will be sent for that species as well. All samples for a particular species will be the same—either whole-body or liver. Due to their larger size, any mink or weasel samples will be livers only. For those that will be sent as whole-body samples, the bodies will be placed individually into sterile collection bags. For those that will be sent as liver samples, the brain, kidneys, and liver will be removed, weighed, and placed individually into sterile

collection bags. Brains and kidneys will be archived in the freezer for possible future contaminant analysis. Whole-body and liver samples will be preserved in the freezer until they are sent to the Wisconsin State Lab of Hygiene (WSLH) for analysis. All samples will be analyzed for the following parameters:

- PCBs (congeners)
- PBDEs
- Organochlorine pesticides
- Percent fat

The laboratory has identified 5 grams as the minimum amount of tissue required for these analyses. Given that masked shrews can weigh as little as 3 to 4 grams each, it may require more than one individual to obtain sufficient weight. If necessary, two shrews may be composited in order to meet the minimum sample size requirement. If collecting this number of individuals cannot be done within the sampling period, then laboratory detection limits will be adjusted to the amount of sample available.

If sufficient tissue is available, the following additional analyses will be requested:

- Perfluorinated compounds (requires 0.5 g sample)
- Cadmium and Lead (approx. 1.5 g sample)*
- Mercury (approx. 0.75 g sample)*

*Smaller sample sizes will result in higher detection limits.

Mink trapping

The WDNR will contract with a local mink trapper to collect mink carcasses from two stretches of the Sheboygan River. The first location will be the Upper River and the upper half of the Middle River segments of the Sheboygan River AOC. The second location will be an area at least five miles upstream and outside of the AOC. As many mink as possible will be collected during the time frame. Carcasses will be labeled to include GPS location, trap type, and date. The brain, kidneys, and liver will be removed from ten specimens and placed individually into sterile collection bags. Brains and kidneys will be archived in the freezer for possible future contaminant analysis. Livers will be sent to the Wisconsin State Lab of Hygiene to be analyzed for the same contaminants as the small mammals (PCBs, PBDEs, organochlorine pesticides, perfluorinated compounds, mercury, cadmium, and lead). Note that the laboratory analysis for these samples will be funded through a separate WDNR capacity grant. Any additional mink carcasses will be properly stored in a freezer for possible future contaminants analysis.

After trapping and analyses are completed, the data will be used to compare the contaminant levels of the mammals collected from the different AOC floodplain sites to each other and to those collected from the upstream control site. The numbers of mink trapped in the AOC will

be compared to those trapped at the upstream site. A final report will be submitted, and the data will be included in the overall Ecological Assessment which is the final report for the Sheboygan AOC Pathway to Delisting habitat BUI's—Survey and Assessment Project.

**Project Timeline:**
July 25th to September 16th, 2011 — Small mammal collection performed.
October 29th to December 9th, 2011 – Mink trapping performed.
August-December, 2011 – Lab analysis performed.
January 1, 2012 — Initial findings available.
June 30, 2012 — Final report (Ecological Assessment) completed for entire AOC project.

## B.10.A.7 Quality Objectives & Criteria

The WDNR will collect common small mammals from floodplain areas in the Sheboygan River AOC and an uncontaminated control site for contaminant analysis. Comparing the AOC sample results to those from the control site will provide information on the current extent of contamination of small mammals in the floodplains of the AOC. Also, a professional mink trapper will be hired to set traps in a selected area of the AOC and in an upstream control area. It is suspected that mink are missing from the area due to the contamination. The results of the contaminant analysis combined with the results of the mink trapping should provide help to answer that question. The final report and data will be included in an ecological assessment, which will inform the development of a fish and wildlife management and restoration plan for the AOC.

The first goal of this study is to collect representative samples of common small mammals (genus *Peromyscus*, genus *Microtus*, and genus *Sorex*) for PCB, polybrominated diphenyl ether (PBDE), and organochlorine pesticide analysis from within the Sheboygan River AOC floodplain. If samples are of sufficient size, they will also be analyzed for perfluorinated compounds (emerging contaminant of concern), cadmium, lead, and mercury, in order to obtain baseline concentrations of those contaminants. This will give us an idea of the current extent of contamination of small mammals within the floodplain areas. This study will not define the small-mammal community or calculate species densities. We are only interested in collecting information on the contaminant loads of small mammals from various locations along the Sheboygan River AOC floodplain. Currently, this is the only method of monitoring the contamination of the floodplains. The information we collect will serve as a baseline for future comparisons of floodplain contamination within the Sheboygan River AOC.

PCBs will be analyzed because they are the primary contaminant of concern. PCB congeners were chosen over total PCBs (Aroclors) for this study because previous experience with the 1993 Seeley study and others have shown that the metabolized PCBs in mammal livers can be difficult to match to commercial PCB mixtures and determine a total PCB value. Due to this problem, some of the mammal samples collected from the Seeley study were analyzed for PCB congeners after a failed attempt to analyze for total PCBs as Aroclors.

The other contaminants will be analyzed in order to obtain a full picture of the contaminant loads of the floodplain mammals. Note that PBDEs and organochlorine pesticide analyses are performed on the same sample extraction as PCBs, so they do not require additional sample. The perfluorinated compounds and metals do, so they will be analyzed only when sample size is sufficient. Little is currently known about the concentrations and effects of these chemicals in the floodplain, but it is likely that at least some of them are present in the small mammals, and may be contributing to health and/or reproductive problems. This is an opportunity to expand our knowledge and provide a baseline for future studies.

Specific objectives of the small mammal trapping and analysis include the following:

1) Estimate the concentrations of the various contaminants (PCBs, PBDEs, and organochlorine pesticides) in small mammals inhabiting the floodplain. The primary contaminant of concern is PCBs.
2) Compare contaminant concentrations between the 2 different contaminated floodplains (FIELDS hotspots and Seeley study sites).
3) Compare contaminant concentrations in small mammals inhabiting the contaminated floodplain with concentrations in small mammals from a control or uncontaminated site.
4) Conduct a qualitative comparison between data collected during the current project and historical data from the same area.
5) Compare contaminant results with known toxicity threshold tissue concentrations, if available.

The second goal of this study is to attempt to trap mink from the AOC and an uncontaminated area upstream in order to compare the number of mink captured in the AOC to the control. The results will help us determine whether there is a difference in mink populations that might be caused by the PCB contamination in the AOC. Ten of the mink carcasses will be analyzed for the same contaminants as the small mammals (PCBs, PBDEs, organochlorine pesticides, perfluorinated compounds, and metals). Any others will be kept for possible future contaminants analysis.

The small number of samples in this study will limit the level of discernment possible; however the sampling plan attempts to balance the resouces available for the project. We plan to use an Analysis of Variance (likely a MANOVA) and an alpha value of 0.05 (95% confidence level). We will also compare observed concentrations to known toxicity threshold concentrations if available. These concentrations do not exist for all of the contaminants.

Note that we are not interested in defining the small-mammal community or in calculating species densities. This study design will provide some general information as to species presence and relative abundance, but will not provide definitive species densities or community characteristics.

This QAPP describes the organization and instructions for field monitoring, data management and reporting activities that will be followed for this project. Establishing performance criteria will ensure that these activities will be documented and completed at a high level of performance in order to meet the project's objectives. Central to establishing performance criteria will be the use of standard field, laboratory, and data management protocols.

Errors in this sampling event will be based upon the following:

a) in-field sampling error,
b) handling error post-field, pre-laboratory,
c) laboratory handling error,
d) laboratory analysis error, and
e) data transcription error.

If it has been determined that the following has occurred:

1) The sampling has followed all necessary protocols and samples were taken successfully, and
2) The samples were handled properly prior to and during transport to the laboratory, and
3) All laboratory analysis procedures have been followed, and necessary protocol and analysis were successfully completed,

then the analytical results of that sample will be deemed as successful and "good" data, and can be used for further evaluation.

## B.10.A.8 Special Training/Certification

### Field Personnel

The Small Mammal and Mink Survey Project Leader will be responsible for ensuring that all field staff receive the training necessary for their portion of the study. Prior to the field-sampling season, the Project Leader will go over the SOPs, methods, and QA requirements with the field staff and answer any questions that they may have. Special training will be required for species identification of similar species of small mammals. Spending some time with an experienced professional and looking at study skins will be required before the scheduled trapping period to prevent misidentifications. This measure is specifically aimed at correctly differentiating between Deer Mice and White-footed Mice, which are two very similar looking species. All training will be documented and records will be kept in the project file.

White-footed mice, meadow voles, and masked shrews are unprotected species and no special permits are required to collect specimens. Weasels (all species) are listed as unprotected furbearers in the state of Wisconsin. Mink are regulated furbearers with a limited season but without any bag or possession limits. The only requirement for trapping mink and weasels is possession of a valid Wisconsin trapping license.

Our planned methods of collection and euthanization will be submitted for review by the Wisconsin Department of Natural Resources Animal Care and Use Committee. No activities will take place until approval is received from the committee and the head veterinarian.

To minimize any potential health and safety risks related to field sampling conducted as part of this project, members of the field crew need to be physically able to conduct field work under demanding conditions and be well prepared to handle contingencies or emergencies. The following are suggested requirements for all field survey personnel:

a) Recent CPR training,
b) Recent first aid training,
c) Completion of a satisfactory interview about health and safety aspects of the project with the Wintering Bird Survey Project Leader, including routine safety precautions and a discussion of actions to be taken in the event of an emergency.

**Contractor**

We will train the contracted trapper in specimen collection and preservation methods for contaminants analysis. We will not be providing training regarding the mink trapping. We will hire a professional mink trapper and he or she will be expected to be proficient in the techniques of trapping and to follow all Wisconsin state trapping regulations.

**Lab Personnel**

Personnel training at the Wisconsin State Laboratory of Hygiene (WSLH) is documented in the laboratory's Quality Assurance Manual (NELAC QA Manual Revision 8, October 2010), available online at http://www.slh.wisc.edu/dotAsset/21151.pdf.

## B.10.A.9 Documents and Records

**Field Documents and Records**

Small mammal surveyors will complete a Sheboygan River AOC Small Mammal Collection data sheet (Appendix E.3) for each sampling week and site. This report will include the following information:

- date and time of each check
- trap ID number
- trap GPS location and GPS error
- date the trap was last opened
- date the trap was last closed
- description of the trapping location

- nighttime low temperature
- amounts of precipitation from the previous 24 hours
- any other pertinent information.

If a trap captures a small mammal, the surveyor will also record information on tail length (mm), ear length (mm), foot length, species, weight (grams), sex of the specimen, and if it was found dead, euthanized, or was released. Note that shrews have no measureable outer ears, so their ear lengths will not be measured. Also, if mink or weasels are captured, the researcher will not be measuring the tails, ears, and feet of those animals. Each specimen collected for analysis will have its brain, kidneys, and liver removed by the surveyor. Each organ will be weighed (information recorded on a Fish & Wildlife Specimen Submission Diagnostic Tag, Form 2300-144 (see Appendix D.5) and individually sealed in a sterile specimen collection bag. Samples of brain tissue and kidneys will be archived in the freezer for possible future contamination studies, and liver samples will be sent to the Wisconsin State Lab of Hygiene for analysis.

The mink trapper will record data for each specimen collected on a Fish & Wildlife Specimen Submission Diagnostic Tag, Form 2300-144). Data recorded will include GPS location, trap type, and date. Ten of these mink will be prepared for analysis as described in the last paragraph. The weights of the brain, liver, and kidneys will be recorded, and the livers will be sent to the lab for analysis.

All field data sheets and specimen tags will be scanned and saved electronically as Portable Document Format (PDF) files. These will be uploaded to the WDNR Surface Water Integrated Monitoring System (SWIMS). All survey results will be proofed and entered into electronic format (Excel® spreadsheet), where basic statistics (mean, range, totals) will be performed.

**Laboratory Documents and Records**

Once the lab has analyzed the samples and done the quality control review, it will release the results to WDNR. The results will be sent over the internet to either a secure FTP site or the EPA exchange node, where they can be printed in report form or downloaded to an Excel spreadsheet. A complete copy of this QAPP will be provided to the lab. The laboratory records are handled in accordance with their quality assurance plan and laboratory certification requirements.

**Final Report**

A Final Report will be completed for this segment of the project. This report will be made available to the Ecological Assessment Team for consideration and inclusion in the Final Ecological Assessment Report. The report will include at minimum:

- Discussion of methods used
- Summary of results
- Summary statistics
- Discussion of QA/QC, including results of QA checks and any corrective actions
- All data collected

## SECTION B.10.B – DATA GENERATION & AQCUISITION

### B.10.B.1 Sampling Process Design (Experimental Design)

**Small Mammal Trapping**

From July 25th, 2011 to September 16th, 2011, small mammals will be collected from six sites in floodplain riparian areas of the Upper and Middle River segments of the Sheboygan River AOC and from one control location upstream of the areas of known contamination (see Figure 11 and Table 21). At each individual location, four traps will be set and the coordinates of the traps recorded. Trapping efforts will continue at each location until the required number of specimens is collected. For the six AOC sampling sites, the target will be two white-footed mice (*Peromyscus leucopus*), two meadow voles (*Microtus pennsylvanicus*), and two masked shrews (*Sorex cinereus*) per station, and for the control location, the target will be four individuals of each species. Beyond these core 48 samples, there will be funding to analyze an additional 11 samples from this trapping effort. If captured, mink (*Mustela vison*) and weasels (*Mustela frenata*, *Mustela erminea*, and *Mustela nivalis*) will be collected and analyzed. Trapping efforts for those species will only continue as long as mouse and shrew traps are still open and the researcher has not met the predetermined sample collection limit. If less than 11 mink and weasels are collected, the remaining samples may be used for additional target species or non-target species that die in the traps. Either the livers or the whole bodies (for species with livers under 5 grams) of collected specimens will be sent to the Wisconsin State Lab of Hygiene (WSLH) to be analyzed for PCBs, PBDEs, organochlorine pesticides, perfluorinated compounds, lead, cadmium, and mercury.

**Table 21. Small Mammal Survey Sites.**

| Site # | Description | Latitude | Longitude |
|---|---|---|---|
| 1 | FIELDS hotspot | 43.72530 | -87.79479 |
| 2 | FIELDS hotspot | 43.72859 | -87.79201 |
| 3 | FIELDS hotspot | 43.72971 | -87.78894 |
| 4 | Seeley "Oxbow" | 43.72265 | -87.76661 |
| 5 | Seeley "Lodge" | 43.72768 | -87.76529 |
| 6 | Seeley "CoA" | 43.73411 | -87.76505 |
| Control | River Oaks | 43.72565 | -87.83223 |
| Backup | Kohler | 43.72335 | -87.80355 |
| Backup | Kohler | 43.72675 | -87.78598 |
| Backup | Kohler | 43.73489 | -87.78096 |
| Backup | Kohler | 43.72078 | -87.77489 |
| Backup | Kohler | 43.73067 | -87.76390 |
| Backup | Kohler | 43.74105 | -87.75715 |

Sample locations were selected to cover wide areas of the floodplain and be representative of the habitats found along the Sheboygan River AOC. Three of the sampling locations are located

in areas designated by the U.S. EPA FIELDS group as "hotspots" for PCB contamination and are slated for remediation. The other three sampling locations were used in the 1993 study which first found contaminated small mammals within the AOC. All six of the sample collection locations are located on private land owned by Kohler Company. The upstream control sampling site was selected to provide a non-contaminated location with similar habitat to the AOC sites and is located on land owned by the State of Wisconsin. All trapping will occur within 10 m of the river. General site characteristics will be noted (e.g., forest, meadow). It will also be noted which sites are in locations that are known to be contaminated (slated for Superfund clean-up). In addition to the six sampling locations, we have six additional sites that can serve as backup locations (see Figure 6 and Table 21). Alternate locations allow us flexibility in the event we are unable to secure permission at one of the initial proposed locations, or if there is some other unforeseen issue with a preferred location. If we are required to select an alternate location, we will choose the nearest alternate trapping location to the initially proposed site.

The 3 main species that will be collected are White-footed Mouse (*Peromyscus leucopus*), Meadow Vole (*Microtus pennsylvanicus*) and Masked Shrew (*Sorex cinereous*). White-footed Mice can be found in good numbers at most, if not all, of the trapping locations. They are a generalist in terms of their diet, and may be representative of both a plant and animal based diet. Meadow Voles are commonly found in grassland areas and are representative of small mammals with a primarily herbivorous diet. Masked shrews are a common shrew species found in moist habitats and are representative of a predominantly insectivorous/carnivorous diet. Though they are not our focus, we are also interested in collecting any incidental catches of Mink (*Mustela vison*) or Long-tailed, Short-tailed, and Least Weasels (*Mustela frenata*, *Mustela erminea*, and *Mustela nivalis*). We are interested in collecting mink and the various weasel species because of their places in the food chain as higher order carnivores that may be bio-accumulating toxins. Mink, and, to a lesser degree, weasels, have been shown to have a high sensitivity to low levels of PCBs in a lab setting, and may be useful as a bio-indicator of the pollution levels of a waterway. Neither mink nor weasels occur in large numbers, and we do not expect to capture more than a few, if any at all.

This sampling design will allow us to compare results among the different AOC sites, between the two floodplain areas (FIELDS hotspots and Seeley study sites), and between the AOC sites and the control site, in order to get an idea of the current extent and distribution of contamination of small mammals in the floodplain areas of the AOC. It will also allow us to do some very general comparisons between the current state of small mammal contamination and that in 1993, when the previous study was done. Collecting the same species at each site will allow for better direct comparisons and minimize differences in contaminant exposures or uptake caused by differences in species' characteristics or habits. By the same token, selecting three species that represent three different feeding habits—herbivorous, generalist, and carnivorous/insectivorous—will help us discern differences in contaminant exposures that are due to different diets, and may show trends associated with contaminant pathways.

Please see Table 22 for a list of measurements that will be collected and their criticality.

**Table 22. Classification of Measured Parameters for Small Mammal and Mink Survey.**

| Parameter | Units | Measuring Device | Classification |
|---|---|---|---|
| Sampling location (latitude and longitude) | Decimal degrees | Garmin GPSmap 76 CSx Global Positioning System | Critical (measurement to be within 10 meters) |
| GPS error | Meters | Garmin GPSmap 76 CSx Global Positioning System | Critical |
| Date | Month/Day/Year | Watch or other time-keeping device | Information only |
| Time of trap check | Hours and minutes | Watch or other time-keeping device | Information only |
| Date trap last opened | Month/Day/Year | Field notes/data sheets | Information only |
| Date trap last closed | Month/Day/Year | Field notes/data sheets | Information only |
| Description of trap location | (none) | Field observation | Information only |
| Mammal species | (none) | Absence/presence from site; appropriate identification keys; personnel training | Critical |
| Mammal sex | (none; male or female) | Appropriate identification keys and personnel training | Information only |
| Mammal weight | Grams | Tubular spring scale | Information only |
| Foot length | Millimeters | Clear plastic ruler | Critical (verify species) |
| Ear length | Millimeters | Clear plastic ruler | Critical (verify species) |
| Tail length | Millimeters | Clear plastic ruler | Critical (verify species) |
| Mammal state | (none; dead, euthanized, or released) | Field observation | Information only |
| Nighttime low temperature | Celsius degrees | Local NOAA weather report | Information only |
| 24-hour precipitation | Inches | Local NOAA weather report | Information only |
| Liver weight (in lab) | Grams | Compact electronic scale (0.1 g sensitivity) | Critical (determination of adequate tissue mass) |
| Brain weight (in lab) | Grams | Compact electronic scale (0.1 g sensitivity) | Information only |
| Kidney weight (in lab) | Grams | Compact electronic scale (0.1 g sensitivity) | Information only |

**Mink Trapping**

Between October 29th and December 9th, 2011 we will contract with a local mink trapper to collect mink carcasses from two stretches of the Sheboygan River. The first location will be the Upper River and the upper half of the Middle River segments of the Sheboygan River AOC. The

approximate boundaries of this area are Rochester Park in Sheboygan Falls downstream to Esslingen Park in the Town of Sheboygan. In addition to trapping mink within areas known to be contaminated, we will have mink collected from an area upstream and outside of the AOC (location to be determined; subject to accessibility/permission). As many mink as possible will be collected during this time frame. We will require the trapper to utilize similar trap set types and utilize similar numbers of traps in each of the two trapping locations. The mink trapper will record data for each specimen collected on a Fish & Wildlife Specimen Submission Diagnostic Tag, Form 2300-144 (see Appendix D.5). Data recorded will include the date of capture, trap type, and GPS location. Livers from ten of the mink carcasses will be analyzed for the same contaminants as the small mammals (PCBs, PBDEs, organochlorine pesticides, and, if sufficient mass, metals and fluorinated compounds). If more than ten mink are trapped, priority will be given to any mink collected from the AOC (versus upstream). Note that the laboratory analysis for these samples will be funded through a separate WDNR capacity grant. Any additional mink carcasses will be properly stored in a freezer for possible future contaminants analysis. The number and approximate locations of mink trapped will be critical for the project.

## B.10.B.2 Sampling Methods

**Sampling Methods:**

Small Mammal Trapping

At each sampling site, four traps will be set. Three of the traps will be large Sherman live traps, while the fourth trap will be a small-sized Tomahawk live trap. The Sherman live animal traps will be baited with a peanut butter and oatmeal mixture while the small Tomahawk live traps will be baited with fresh chicken liver and anise oil. A small amount of Dacron batting will be placed inside each Sherman trap to serve as bedding material and insulation. All trapping will occur within 10 m of the river. A GPS location will be recorded for each trapping station.

Traps will be open from Monday night thru Thursday night and will be checked in the morning hours of Tuesday thru Friday. Captured individuals will be removed from the Sherman live traps into a clear plastic bag to allow for sexing, weighing, measuring, and identification. Ear, foot, and tail measurements will be used to verify species identification. Non-target species or species unable to be identified will be photographed, measured, and then released. If non-target species are found dead in the traps, they will be collected for possible contaminants analysis. Target species will be euthanized by replacing the atmosphere in the plastic bag with carbon dioxide ($CO_2$) using a portable canister of $CO_2$ with a valve and a rubber tube. They will then be photographed, weighed, measured, and sexed. Any captured mink or weasels will be placed into a clear, hard-sided container which is large enough to accommodate the Tomahawk trap and will also be euthanized with $CO_2$. They will be sexed, weighed, and identified. All pertinent information will be recorded on a Sheboygan River AOC Small Mammal Collection data sheet (See Appendix E.3).

Trapping efforts will continue at each location until the required number of specimens is collected. For the six AOC sampling sites, the target will be two white-footed mice, two meadow voles, and two masked shrews per station, and for the control location, the target will be four individuals of each species. Beyond these core 48 samples, there will be funding to analyze an additional 11 samples from this trapping effort. If captured, mink and weasels will be collected, and up to 11 will be analyzed. Trapping efforts for those species will only continue as long as mouse and shrew traps are still open and the researcher has not met the predetermined sample collection target. If less than 11 mink and weasels are collected, the remaining samples may be used for additional target species or non-target species that die in the traps.

The laboratory has identified 5 g as the minimum amount of liver tissue required for the PCB congener and percent fat analyses to achieve the detection limits identified in this document. In order to meet this requirement, whole-body samples will be submitted for the shrews and possibly some of the other small mammal species, depending on the measured mass of the livers collected. It is hoped that using whole-body samples will greatly reduce the need for compositing samples. Because of the small size of the shrews, however, it is likely that they will still need to be composited. If any of the small mammals do not meet the minimum size requirement, then individuals of the same species from the same sample site may be combined into one sample. If combining animals for a species is required, then all samples for that species will be combined in the same manner. The numbers of animals collected would then be increased in order to achieve the required number of samples of each species at each site. The field records for the individual animals will be marked to indicate which individuals have been combined into a sample for analysis. Based on the trapping success (available animals for a species), smaller tissue weights may be submitted for analysis and detection limits adjusted accordingly.

Mink Trapping

Mink trapping will occur in two stretches of the Sheboygan River. The first location will be the Upper River and the upper half of the Middle River segments of the Sheboygan River AOC. The second will be an area at least 5 miles upstream of the AOC. This distance should put the control location outside of the home range of any mink using the AOC. The trapper will use his or her own judgment as far as specific locations and methods. Trapping equipment, set types, and set locations will be required to comply with the official Wisconsin State Trapping Regulations, and may be restricted further in accordance with local ordinances or landowner requests. Preference will be for the use of water sets utilizing conibear traps or leghold traps set in drowning situations. These trap types and set locations are used to lessen the chance of capturing non-target species. We will require the trapper to utilize similar trap set types and utilize similar numbers of traps in each of the two trapping locations. The pelts of any mink captured will be retained by the trapper, and skinned carcasses will be collected two or three times per week. Species identification / confirmation without the pelt is still possible based upon weight, length, and dentition. Specimens will be labeled appropriately and kept frozen until being sent to the Wisconsin State Lab of Hygiene for contaminant testing. The analysis of

ten of the specimens will be funded by a separate WDNR capacity grant.

**Performance Requirements and Corrective Actions**

Corrective actions will be taken if any aspect of the sampling event differs from that planned. Under circumstances where corrective action is needed, the Small Mammal and Mink Survey Project Leader or Assistant Project Leader will be notified and the situation researched and a decision made. Corrective actions should only be implemented after approval by the Project Leader. Corrective actions will be documented in the field log or data report at the time of decision, and will accompany all reports after analytical results are returned. The Project Leader is ultimately responsible for any corrective actions and appropriate documentation of those actions.

There are many factors that might affect the success of a particular trapping location. If a small mammal trapping location fails to yield the required number of specimens or the correct species within 14 days, then a new location will be chosen within 30 m of the original one.

Weather conditions may affect survey results, either by affecting the activities of the small mammals, or, in the case of severe weather, by keeping the surveyors from checking the traps at the usual time. Surveyors will record the nighttime low temperature and the precipitation for the last 24 hours, so the information will be available in case those factors affect the trapping success. They will also record the time and date when a trap was last checked.

The euthanasia method used for the small mammal trapping must be approved by the WDNR Animal Care and Use Committee. All available efforts will be made to prevent trap mortality, but there are cases in which a non-target species is captured and dies in the trap overnight. In such an event, we will collect all the regular information from the specimen, and then we will collect the specimen and archive it in the freezer for possible future testing.

Since much of the land adjacent to the AOC is privately owned, access could be an issue. Due to Wisconsin's Public Trust Doctrine, surveyors can legally use and perform surveys in all sections of the river itself, but they cannot cross private lands or conduct surveys on private lands without owner permission. Gaining such permission should not be a problem for these surveys. The Project Leader and the surveyor will ensure that landowner permission is granted before any work is done on private property. For the mink trapping part of the project, permission will be obtained from all involved landowners and all local ordinances will be followed or any special exemptions will be obtained. If necessary, alternative sampling sites will be found.

The project leader will verify species identifications periodically to insure appropriate identifications and take action to correct any misidentifications. He will also evaluate the trapping success and determine whether traps need to be moved, the sampling period

extended, or, in consultation with others in the project team, whether a smaller tissue sample will be submitted for analysis.

### B.10.B.3 Sample Handling & Custody

After being euthanized, small mammal specimens will be placed in a Whirl-pak sterile collection bag, labeled with a Fish & Wildlife Specimen Submission Diagnostic Tag, Form 2300-144 (see Appendix D.5), and transported to the WDNR Plymouth Service Center lab in a cooler with ice or ice packs. As soon as possible—by the end of the day at the latest—each specimen be processed and placed in the freezer. Each specimen of those species that will be submitted as whole-body samples will be individually sealed in a sterile specimen collection bag. Each individual of those species that will be submitted as liver samples will have its brain, kidneys, and liver removed by the surveyor. Each organ will be weighed (information recorded on a Fish & Wildlife Specimen Submission Diagnostic Tag, Form 2300-144) and individually sealed in a sterile specimen collection bag. Samples of brain tissue and kidneys will be archived in the freezer for possible future contamination studies, and liver and whole-body samples will be placed in a freezer for storage until transport can be arranged to the Wisconsin State Laboratory of Hygiene (WSLH). Samples may be combined prior to submission in order to achieve the minimum sample size required by the lab (see Section B.10.B.4). There will be no chain-of-custody forms. Samples will be received at the WSLH following standard protocols described in the laboratory's Quality Assurance Manual (NELAC QA Manual Revision 8, October 2010), available online at http://www.slh.wisc.edu/dotAsset/21151.pdf.

We will provide sterile specimen collection bags and will train the contracted mink trapper in specimen collection and preservation methods. Mink specimens will be labeled with a Fish & Wildlife Specimen Submission Diagnostic Tag, Form 2300-144 (see Appendix D.5). Skinned carcasses will be collected from the trapper two or three times per week. Ten of the specimens will be processed for analysis as described in the last paragraph. The remaining specimens will be archived in the freezer for possible future contamination studies.

### B.10.B.4 Analytical Methods

The small mammal, mink, and weasel liver and whole-body specimens will be analyzed by the Wisconsin State Lab of Hygiene (WSLH). PCB congeners and percent fat results are critical for the study. Analyses that can be performed on the same sample extract are a second priority, and other analyses take a lesser priority. Analysis will be based on having sufficient tissue mass. The laboratory (WSLH) will analyze the collected small mammal, mink, and weasel samples for the following parameters (list is in priority order):

- PCB congeners
- Percent fat

- PBDEs
- Organochlorine pesticides
- Perfluorinated compounds*
- Lead*
- Cadmium*
- Mercury*

* These parameters would require additional tissue mass.

The WSLH will analyze the whole-body and liver samples using the methods in Table 23. These methods are described in Appendices F.1 through F.6. Specific analyses will be performed based on the available tissue mass with PCB congeners and percent fat given the highest priority. The laboratory has identified 5 grams as the minimum amount of liver tissue required for these analyses. If any of the samples do not meet the minimum size requirement, then the laboratory should consult with the project manager and may process the available sample, adjusting the sample detection limits and scope of analyses as appropriate to the sample size.

**Table 23. Laboratory Analytical Methods for Small Mammals and Mink.**

| Proc Code | Procedure Name | Method |
|---|---|---|
| I323ITT | DIG, ICP/AAS, TISSUE (KRYNITSKY 1987) | EHD Metals Method 620.2 rev 1, March 2008 |
| I220ITT | CADMIUM, ICP, TISSUE (SW846 6010B) | EHD Metals Method 400.2 rev 2, November 2009 |
| I380ITT | LEAD, ICP, TISSUE (SW846 6010B) | EHD Metals Method 400.2 rev 2, November 2009 |
| I430XTT | MERCURY, COLD VAPOR, TISS (SULLIVAN/DELFINO 1982) | EHD Metals Method 540.4 rev 2, March 2010 |
| O1400F1 | PERCENT FAT IN TISSUE - 1410/1440 | ESS Org Method 1410 rev 5, 12/15/2008 |
| O1400P1 | TISSUE SAMPLE PREPARATION - 1410/1440 | ESS Org Method 1410 rev 5, 12/15/2008 |
| O1410D2 | PCB CONGENER ANALYSIS IN TISSUE - 1410 | ESS Org Method 1410 rev 5, 12/15/2008 |
| O1410D7 | POLYBROMINATED DIPHENYL ETHERS IN TISSUE - 1410 | ESS Org Method 1410 rev 5, 12/15/2008 |
| O1410B2 | PESTICIDE RESIDUE - HEXACHLOROBENZENE - 1410 | ESS Org Method 1410 rev 5, 12/15/2008 |
| O1410B4 | PESTICIDE RESIDUE - HEPTACHLOR EPOXIDE - 1410 | ESS Org Method 1410 rev 5, 12/15/2008 |
| O1410B8 | PESTICIDE RESIDUE IN TISSUE - OXYCHLORDANE - 1410 | ESS Org Method 1410 rev 5, 12/15/2008 |
| O1410E9 | PESTICIDE RESIDUE IN TISSUE - DIELDRIN - 1410 | ESS Org Method 1410 rev 5, 12/15/2008 |
| O1410F1 | PESTICIDE RESIDUE IN TISSUE - CHLORDANES - 1410 | ESS Org Method 1410 rev 5, 12/15/2008 |
| O1410F2 | PESTICIDE RESIDUE IN TISSUE - P,P'-DDE - 1410 | ESS Org Method 1410 rev 5, 12/15/2008 |

| | | |
|---|---|---|
| O1410F3 | PESTICIDE RESIDUE - P,P'-DDD & P,P'-DDT - 1410 | ESS Org Method 1410 rev 5, 12/15/2008 |
| O1480A1 | PERFLUORINATED CMPDS IN TISSUE | ESS Org Method 1480 rev 2, 11/15/2010 |
| O1480P1 | PERFLUOR CMPDS IN TISSUE | ESS Org Method 1480 rev 2, 11/15/2010 |

General laboratory safety practices are outlined in the Chemical Hygiene Plan for Environmental Sciences, which is available to all laboratory personnel. All laboratory waste, excess reagents, and samples will be disposed of in a manner which is consistent with applicable rules and regulations. Waste disposal guidelines are described in the University of Wisconsin Chemical Safety and Disposal Guide.

## B.10.B.5 Quality Control

The data collected by this project will be used to identify and prioritize fish and wildlife habitat restoration actions within the Sheboygan River Area of Concern. It will be used for planning and management decisions. No regulatory requirements or clean up decisions will be made using this data about species and habitat in the AOC so there are no applicable action levels or criteria to be met.

**Quality Control Activities**

Field

The majority of the small mammal field sampling will be done by a single person. Special training will be required for species identification of similar species of small mammals. Spending some time with an experienced professional and looking at study skins will be required before the scheduled trapping period to prevent misidentifications. This measure is specifically aimed at correctly differentiating between Deer Mice and White-footed Mice, which are 2 very similar looking species.

Surveyors will be following standard protocols as described in this QAPP. They will maintain and calibrate equipment as necessary to assure the collection of accurate data (see Sections B.10.B.6 and B.10.B.7). They will check all equipment and supplies each sampling day before heading out into the field (see Section B.10.B.8).

All mink trapping will be performed by a single person, supporting consistency of sampling methods. We will not be providing training to the mink trapper, other than in preservation techniques specific to sampling for contaminants. The trapper will choose specific methods appropriate for field conditions. The surveyor will ensure that all equipment and supplies are present and in good working order in order to support the collection of accurate data.

Data completeness will be calculated for this segment of the project. The completeness objective for this project is for 95% of the planned data to be collected and usable. WDNR

sampling crews will make every effort to obtain valid data for each sampling point identified in this QAPP.

Laboratory

Quality assurance / quality control activities at the Wisconsin State Laboratory of Hygiene (WSLH) are documented in the laboratory's Quality Assurance Manual (NELAC QA Manual Revision 8, October 2010), available online at http://www.slh.wisc.edu/dotAsset/21151.pdf. Method-specific activities and limits are found in the lab methods documents (see Appendices F.1 through F.6). A table listing the detection and QC limits for all parameters to be analyzed for this study may be found in Appendix F.7. The laboratory is Wisconsin and USEPA certified. All methods to be used for this study are accredited through the National Environmental Laboratory Accreditation Conference (NELAC). We have determined that the WSLH's standard methods and limits meet the data quality requirements for this study.

Given that the amount of tissue available for analysis is limited by the size of the mammals and the effort necessary to trap them, there may be insufficient tissue mass to do sample duplicates or traditional matrix spikes for some of the small mammal species. Assessment of method performance may be limited to a laboratory control sample (a tissue standard reference material or a fortified tissue) and surrogate recoveries.

**Corrective Actions**

Field

Corrective actions will be taken if any aspect of the sampling event differs from that planned. Under circumstances where corrective action is needed, the Project Leader or Assistant Project Leader will be notified and the situation researched and a decision made. Corrective actions should only be implemented after approval by the Project Leader. Corrective actions will be documented in the field log or data report at the time of decision, and will be included in the final report. See section B.10.B.2 for more information on performance requirements and corrective actions.

Laboratory

Any corrective actions taken at the WSLH will follow the Quality Assurance Manual, and will be documented, reported to the Project Leader, and included in the final report.

## B.10.B.6 Instrument/Equipment Testing, Inspection, and Maintenance

**Field**

WDNR surveyors will be responsible for testing, inspection, and maintenance of all equipment necessary for the small mammal surveys for the duration of this study. The primary instrument needing testing and maintenance will be the Global Positioning System (GPS). The GPS used for

this survey will be a Garmin GPSmap 76CSx. This instrument will be maintained and operated as described in its user manual. Surveyors will record the GPS error displayed by the unit at each survey location. According to the manufacturer, this unit typically has a position error of less than 10 meters. The objective for this study will be for all GPS measurements to have an error of less than 6 meters.

Other equipment necessary for these assessments includes those measuring devices listed in Table 22, plus the following:

- Large Sherman Live traps (21 traps)
- Small Tomahawk Live traps (7 traps)
- Leather gloves
- Chest Waders (if necessary to access trapping sites)
- Pens/Pencils/permanent marker pens
- Clipboard
- Spare batteries for GPS
- Backpack
- CO2 canister (portable)
- CO2 tank valve
- Rubber hose/tubing
- CO2 chamber (sized for Tomahawk live traps)
- Camera
- Cooler
- Ice or ice packs for cooler
- Trap stakes
- Large Tomahawk live traps used as raccoon excluders
- Field guides to small mammals/Identification keys

The surveyors will check that all items are present and in good condition before sampling.

All mink trapping equipment will be provided by the contracted trapper. The trapper will be responsible for inspection and maintenance of the equipment.

**Laboratory**

As documented in WSLH's Quality Assurance Manual, a routine preventative maintenance program will be conducted to minimize the occurrence of instrument failure and other system malfunctions. All laboratory instruments are maintained in accordance with manufacturer's specifications and the requirements of the specific method employed. For lists of equipment needed for each analytical method, please see the standard protocols in Appendices F.1 through F.6.

Some equipment will also be necessary for sample processing at the WDNR Plymouth Service Center lab. This will include glass jars for cleaning/decontamination, chemically-cleaned dissection equipment (forceps, scalpel, scissors), and an electronic balance. WDNR staff will ensure that all necessary equipment is present and in good working order.

### B.10.B.7 Instrument/Equipment Calibration and Frequency

There will be no field instruments that will need calibrating. For the GPS measurements, field staff will record the instrument-derived accuracy on the unit and rely on the device to measure the locations of the traps. This measurement is listed as critical because of its importance in relocating traps that have been set and confirmation that the traps are placed appropriately to accomplish project objectives. These locations will be "verified" with DNR GIS special projections to spot any obvious errors (e.g., location projects as being in the river or on a road rather than on a land location expected). Any errors detected will be reconciled.

The electronic balance in the WDNR Service Center lab will be calibrated as described in the instruction manual at least once each day it is used for this study. This will include use of a 200 g external calibration weight. This scale will be sensitive (repeatable) to 0.1 g.

Instruments used at the WSLH for sample analyses will be calibrated as described in the laboratory's Quality Assurance Manual.

### B.10.B.8 Inspection/Acceptance of Supplies & Consumables

Critical supplies and consumables for the field assessments include the following:

- Whirl-pak sterile specimen collection bags
- Plastic specimen observation bag
- Specimen label tags
- Oatmeal/peanut butter bait
- Rodent hair/droppings/bedding bait
- Anise oil/chicken liver bait
- Small mammal trapping data sheets
- Latex examination gloves

Surveyors will check that all items are present and in good condition before sampling. If any items are missing or inadequate, they will remedy the situation, with the Project Leader's help if necessary, before they leave for the field.

Most mink trapping supplies will be provided by the contracted trapper. We will provide sterile

specimen collection bags and specimen label tags. The trapper will be responsible for inspection of the supplies.

Some supplies will be necessary for sample processing at the WDNR Plymouth Service Center lab. These will include the following:

- Paper towels
- Nitrile gloves
- Tap water
- Hexane (pesticide/HPLC grade or better)
- Acetone (pesticide/HPLC grade or better)
- Aluminum foil

WDNR staff will ensure that all necessary lab supplies are inspected and replaced if needed.

Supplies used by WSLH for contaminants analysis are listed in the lab's standard protocols (see Appendices F.1 through F.6). Laboratory personnel will be responsible for ensuring that all supplies are inspected and replaced if needed.

### B.10.B.9 Data Acquisition Requirements for Non-Direct Measurements

The historic data set referred to as the Seeley data has been used as a reference to estimate potential PCB concentrations for this study and to inform the design. The collection procedures used for the Seeley study are similar to those chosen for this sampling plan; however, there are important differences in the analytical procedures that make anything more than a qualitative comparison inadvisable.

Several samples were analyzed for PCBs as Aroclors which involves recognizing a pattern match and quantitation against a commercial PCB mixture. Although some samples were quantified as Aroclors, the concentration is expected to be influenced by PCB metabolism in the animals and samples reported as non-detects cannot be assumed to be reliable results for total PCB.

The method used to analyze samples for PCB congeners is similar as that planned for this sampling event with one important exception: The calibration standard used in the mid-1990s was a Mullins Mix as opposed to a mixture of neat congeners used in the current analyses. Consequently, neither the individual congener concentrations nor the total PCB result (sum of the congeners) can be considered directly comparable results.

**B.10.B.10 Data Management**

Surveyors will record the assessment data on paper forms. They will complete a Sheboygan River AOC Small Mammal Collection data sheet (Appendix E.3) for each sampling site each week. This report will include the species, sex, tail length, ear length, foot length, and weight of each mammal captured, as well as the date of each trap check, the time of each check, the trap ID number, the trap GPS location, the date the trap was last opened, the date the trap was last closed, a description of the trapping location, the nighttime low temperature, and amount of precipitation from the previous 24 hours.

The surveyors will provide these completed forms to the Project Leader. The Project Leader will check the forms for completion and accuracy. He or designated WDNR staff will scan and save all of the forms electronically as Portable Document Format (PDF) files in the WDNR Surface Water Integrated Monitoring System (SWIMS). He will then enter the data from the forms into an electronic format (Excel® spreadsheet), where basic statistics (mean, range, totals) will be performed.

The Wisconsin State Laboratory of Hygiene (WSLH) is required, by state statutes, to provide service to state agencies. Data systems are in place from sample login to final results to meet agency needs. See Appendix F.8 for a description of data flow at the laboratory. Once the sample results have been released by the lab, they are automatically transmitted to the WDNR's Lab Data Entry System (LDES), an Oracle system. The LDES automatically notifies the project coordinator that results are available for viewing. Results can be downloaded via an online query system to a data file (Excel or other formats) for further processing. Documentation for both the laboratory and WDNR data systems is available upon request.

After downloading the laboratory data from the LDES, we will sum the congeners to derive a total PCB concentration. The congeners may be summed in one of the following ways:

- Using ½ detection limit substitution for non-detected congeners and summing the values
- Summing only detected values (assuming a zero for non-detected congeners)
- Summing a subset of congeners based on the detection pattern

An Analysis of Variance (likely a MANOVA) and an alpha value of 0.05 (95% confidence level) to compare contaminant levels between control and AOC locations, between areas scheduled to be remediated (FIELDS hotspots) and the other AOC trapping locations (Seeley sites), and between species across those groups and within those location groups. The summing convention used for each of these comparisons will be documented. We will also compare observed concentrations to known toxicity threshold concentrations if available for the contaminant.

# PART C – ASSESSMENT AND OVERSIGHT

## C.1 Assessments and Response Actions

### Individual Surveys

The Quality Assurance Officer for each segment of the project will be responsible for performing and recording any assessments for that segment, except for those performed by the contracted laboratories. The QA Officer and/or the Project Leader (often the same person) will conduct a meeting or conference call with all staff and contractors who will be conducting the surveys at the beginning of the field season to go over the project details to ensure that everyone will be collecting and recording data in the same way. Staff will be encouraged to ask questions during this meeting and any time questions should arise. General surveillance will be the primary assessment technique of project activities. No other types of assessments are planned. Data checks will be performed during the course of the project, as described in the survey details in Part B. The Quality Assurance Officer for each segment of the project will be responsible for ensuring that any necessary corrective actions are carried out, verified, and documented.

### Ecological Assessment

The Ecological Assessment Team will use the data that passed assessment from the individual surveys in combination with historic data from the study area to evaluate the condition of the biological resources and write the final Ecological Assessment Report. They will evaluate the historic data to make sure that they make sense and are of sufficient quality for our purposes. They will be following the general methodology used by WDNR's Bureau of Endangered Resources for Rapid Ecological Assessments conducted for property master planning. This includes compiling and reviewing existing records, literature, maps, aerial photographs, and original land survey records for the study area. Any historical data that the Team members decide do not meet the requirements will not be included in the final report.

## C.2 Reports to Management

The Project Leader for each segment of the project will provide a written or verbal quarterly status report to the overall Project Manager and Project QA Manager for each quarter during the project. For example, the first report would be for October through December 2010. The report will be provided within 1 week of the last day of the quarter. The Project Manager will schedule quarterly conference calls with all Project Leaders in order to gather these status reports and address any questions or concerns that the Project Leaders may have about the operation of the project. At a minimum, the status reports will include the following:

1. Amount expended this reporting period

2. Subcontracts or subgrants awarded this reporting period
3. QAPP status
4. Local services and/or products purchased this reporting period
5. Number of jobs created this reporting period
6. Work accomplished this reporting period
7. Work goals for coming reporting period

This information will be used by the Project Manager to monitor the status and progress of the project. It will be used by the Project QA Manager to monitor project QA status and actions and complete the project quarterly reporting in the WDNR Surface Water Integrated Monitoring System (SWIMS) database. It will also be used by the WDNR Great Lakes Funding and Quality Assurance Coordinator to report to the USEPA via the Great Lakes Restoration Initiative Great Lakes Accountability System (GLAS). The Quality Assurance Officer for each segment of the project is ultimately responsible for ensuring that any QA problems are reported. The laboratories will be responsible for preparing laboratory QA reports and submitting them, along with the results of the analysis, to the Project Leader or QA manager for that segment. All QA information will be included in the Final Report which will be submitted to the Ecological Assessment Team to be considered in the Ecological Assessment Report.

# PART D – DATA VALIDATION AND USABILITY

## D.1 Data Review, Verification, and Validation

The Project Leader and QA Officer for each segment of the project will be responsible for critically reviewing all project data, metadata, and quality control data to determine if there are any problems that compromise data usability. All data will be reviewed for completeness and correctness. Certain basic calculations will be performed to check the data against the quality criteria. Data completeness will be calculated for each field survey segment. The completeness objective for this project is for 95% of the planned data to be collected and usable. Other data objectives are listed in the project segment chapters in Part B.

## D.2 Verification and Validation Methods

The Project Leader and QA Officer for each segment of the project will be responsible for assuring that all data are verified and validated. Procedures to evaluate field data primarily include checking for transcription errors and reviewing field notebooks. It is expected that the surveyors will check the data in the field, and that the people entering the data into electronic spreadsheets or databases will also check the data. In addition, some of the databases, such as the WDNR/USGS Fish and Habitat Database, perform data checks and provide a mechanism for ensuring that all entered data are validated. The laboratories will be responsible for validation and verification of lab data. Any issues related to data verification and validation will be resolved by the appropriate Project Leader. Any problems that will affect the use of the data for the project objectives will be reported to the overall Project Manager and Project QA Manager.

## D.3 Reconciliation with User Requirements

### Individual Surveys

The Project Leader and QA Officer for each segment of the project will be responsible for critically reviewing all project data, metadata, and quality control data for their segments to determine if there are any problems that compromise data usability. Any problems that will affect the use of the data for the project objectives will be reported to the overall Project Manager and Project QA Manager. The Project Manager will make a final decision regarding the validity and usability of the survey data collected during this project. He will evaluate the sample collection, analysis, and data reporting processes to determine if the data are of sufficient quality to meet project objectives.

**Ecological Assessment**

The Ecological Assessment Team will use the data that passed assessment from the individual surveys in combination with historic data from the study area to complete the final Ecological Assessment Report. They will evaluate the historic data to make sure that they are of sufficient quality for our purposes. The Ecological Assessment Team will routinely meet with the Project Manager and Project QA Manager and others involved in the development of the AOC fish and wildlife habitat management and restoration plan and specific delisting strategies for the two fish and wildlife BUIs in order to insure that the Ecological Assessment Report meets the needs for development of these plans. Any limitations on the use of the data will be reported in the Ecological Assessment Report.

**PART E – REFERENCES**

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