Lower Green Bay and Fox River Area of Concern

Beneficial Use Impairment Delisting Targets

Looking upstream from the mouth of the Fox River in Green Bay, October 2004

Wisconsin Department of Natural Resources
November 6, 2009

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Introduction

The Lower Green Bay and Fox River Area of Concern (AOC) is one of 43 that were identified in the mid 1980's by the United States and Canada under the Great Lakes Water Quality Agreement (GLWQA). It includes the lower 7.4 mi of the Fox River below the De Pere Dam and a 21 mi^2 area of southern Green Bay out to Point au Sable and Long Tail Point (Figure 1).

In 1987 amendments to the GLWQA further defined Beneficial Use Impairments (BUIs) and 11 were identified for the Lower Green Bay and Fox River AOC. Two BUIs were also listed as suspected, tainted fish and wildlife flavor and fish tumors or other deformities, as there was insufficient data to know whether these problems existed in the AOC. The 11 documented BUIs were the result of contaminated sediments from historic industrial and municipal waste discharges and excessive nutrient and sediment loading from multiple sources. Readers are referred to the Lower Green Bay Remedial Action Plan (WDNR 1988) and the Lower Green Bay Remedial Action Plan Update (WDNR 1993) for a complete summary of the problems, their causes, and suggested actions to restore the AOC. There has been substantial progress made towards reaching the goals outlined in these plans, including the ongoing Fox River Contaminated Sediment Remediation Project to address PCB contaminated sediment in the Lower Fox River by Wisconsin Department of Natural Resources (WDNR) and the U.S. Environmental Protection Agency (EPA).

Beneficial Use Impairments in the Lower Green Bay and Fox River Area of Concern:

- degraded fish and wildlife populations
- loss of fish and wildlife habitat
- degraded benthos
- degraded phytoplankton / zooplankton populations
- eutrophication or undesirable algae
- beach closings / recreational restrictions
- degradation of aesthetics
- restrictions on fish and wildlife consumption
- restrictions on dredging activities
- bird or animal deformities or reproductive problems
- restrictions on drinking water or taste/odor problems

Purpose of Delisting Targets

The Great Lakes Regional Collaboration made setting delisting targets for each BUI a priority so that progress made towards restoring beneficial uses could be documented. WDNR views these delisting targets as planning goals for continued cleanup and restoration. Progress towards delisting will be made with regulatory and cleanup programs that function with their own programmatic goals. The delisting targets are intended to provide guidance without creating specific measures that restrict agency regulatory decision-making and delisting targets are not to be used as the sole basis for cleanup levels for contaminated sites, the basis for permit (WPDES) decisions, the basis for technical plan approval, or for regulatory enforcement. Rather, these delisting targets will serve as planning goals for continued cleanup and restoration as resources are available, and they will be used to judge whether a BUI can be delisted for the AOC.

BUI Delisting Target Development

The following BUI delisting targets were drafted by WDNR staff with help and comments from some members of the Lower Green Bay Remedial Action Plan Science and Technical Advisory Committee, the Biota and Habitat subcommittee, the Lower Fox Total Maximum Daily Load (TMDL) Technical Team, the Lower Fox Partners group, and representatives from: Brown County Health Department, Brown County Land and Water Conservation Department, Brown County Parks Department, DePere Sportsmen's Club, Green Bay Metropolitan Sewerage District, Northeast Wisconsin Paddlers, South Bay Marina, and University of Wisconsin Extension. The final delisting targets were much improved by their contributions over the course of several meetings in the first half of 2009. Thank you to all who participated!

The Lower Green Bay and Fox River BUI delisting targets were partly based upon those of the other Lake Michigan Areas of Concern in Wisconsin: Menominee River, Milwaukee River Estuary and Sheboygan River. Other documents consulted during the delisting target development included the Lower Green Bay Remedial Action Plan (WDNR 1988), the Lower Green Bay Remedial Action Plan Update (WDNR 1993), and the International Joint Commission (IJC) delisting criteria in Appendix 4 of the Delisting Principles and Guidelines (United States Policy Committee 2001). Also included in these targets are the water quality targets for suspended solids, phosphorus, and conditions in the lower bay which were established for the Lower Fox TMDL by an ad-hoc science advisory team.

Degraded Fish and Wildlife Populations and Loss of Fish and Wildlife Habitat

WDNR (1993) listed changes in habitat, impact from exotic species, and toxic chemicals (some of which bioaccumulate and affect reproductive success) as factors contributing to degraded fish and wildlife populations. Native fish populations were considered degraded due to a lack of top predator fish (northern pike and muskellunge) and a limited diversity of forage fish. Wildlife populations were impacted by toxic chemicals, lack of preferred foods, and degraded habitat. Loss of fish and wildlife habitat was determined to be the result of disappearing wetlands (due to human activity and rising water levels), shoreline erosion and filling, and lack of submerged aquatic plants (WDNR 1993).

Restoration of fish and wildlife populations and their habitat in the AOC will require remediation of contaminated sediments in the Lower Fox River, specific habitat restoration projects, fish and wildlife management actions, and reductions in nutrients and sediments. The Lower Fox TMDL water quality targets for phosphorus (0.1 mg/L) and suspended solids (20 mg/L) at the mouth of the Fox River were selected to provide sufficient water clarity for growth of submerged aquatic plants in the AOC. The TMDL will also reference the narrative target for the Green Bay portion of the AOC which is included in the Loss of Fish and Wildlife Habitat BUI delisting target.

The <u>Degraded Fish and Wildlife Populations</u> BUI can be delisted when:

- The AOC contains healthy, self-sustaining, naturally reproducing, and diverse populations of native fish species (including walleye, northern pike, yellow perch, lake sturgeon, Great Lakes spotted muskellunge, and centrarchids) in abundances sufficient to provide ecological function in the fish community; and
- Populations of traditionally harvested fish species are capable of supporting some level of exploitation; and
- The AOC contains healthy, self-sustaining, naturally reproducing, and diverse populations of native furbearers (including mink, muskrats, and otter), amphibians (including spring peepers, leopard frogs, American toads, eastern gray tree frogs, green frogs, bullfrogs, and salamanders), reptiles (including snapping and painted turtles), terns (common and Forster's), migratory diving ducks, dabbling ducks, marsh nesting birds and island-dependent colonial nesting birds in abundances sufficient to provide ecological function; and
- Populations of traditionally harvested wildlife species are capable of supporting some level of exploitation; and
- Invasive species (lamprey, carp, gobies, white perch, and others) expansion is minimized and controlled as needed to protect native species within the AOC and upstream; and
- Contaminant levels in forage fish populations do not impair the reproductive success of fish-eating birds and wildlife (including predatory fish) and meet the criteria established in Annex 1 of the Great Lakes Water Quality Agreement, specifically "the concentration of total polychlorinated biphenyls in fish tissues (whole fish, calculated on a wet weight basis), should not exceed 0.1 micrograms per gram for the protection of birds and animals which consume fish"; and
- The AOC supports fish and wildlife populations at levels consistent with extant fish and wildlife management plan objectives. Specifically, the following objectives should be met unless extant management plans have updated criteria:
    - Predator-prey biomass ratio of fish species in the AOC is 1/10 to 1/20.

  - Average sport angler harvest over a 3 - 4 year period of 7,000 walleye harvested annually and 150,000 yellow perch harvested annually.
  - Lake Sturgeon population that spawns in the Lower Fox River has a minimum of 750 mature adults.
  - Furbearers in the AOC should recover to the point that otters and mink are present, and abundant muskrat populations are present when water conditions in the lower Bay result in emergent marshes.
  - An aggregate total of 15 nesting pairs of marsh-nesting birds per acre should be present in suitable habitat including a diverse assemblage of rails, grebe, herons, wrens, and blackbirds.
  - Resident nesting waterfowl production (including mallards, blue-winged teal, wood ducks, and Canada geese) totals at least 1 young produced per acre of brood water.
  - Nesting populations of a diverse array of waterbirds (including great egrets, great blue herons, black-crowned night herons, double-crested cormorants, white pelicans, common terns, Forster's terns, herring gulls, and ring-billed gulls) are consistently present when suitable habitat is available; and
- Fish and wildlife community structures within the AOC are statistically similar to populations in unimpacted reference sites of highly productive, warm water freshwater estuaries of the Great Lakes

The <u>Loss of Fish and Wildlife Habitat</u> BUI can be delisted when:

- Fish and wildlife management goals are achievable as a result of the physical, chemical, and biological integrity of the AOC waters, including wetlands; and
- A balance of diverse habitat types exists within the AOC that supports all life stage requirements of fish and wildlife populations including:
  - Multiple wetland types (for example: submerged aquatic vegetation, emergent vegetation, sedge meadows, forested & shrub) that adequately represent historic wetland types
  - Quality fish spawning habitats
  - Islands for colonial nesting birds, amphibians, and furbearers
  - Intact migration corridors (both shoreline and water)
  - Unconsolidated beaches (for shorebirds)
  - Habitat for State or Federally listed species (special concern, threatened, or endangered); and
- The hydrologic connectivity between wetlands and the AOC is maintained and restored sufficiently to support fish spawning and allow for fish passage; and
- The Green Bay portion of the AOC contains water clarity and other conditions suitable for support of a diverse biological community, including a robust and sustainable area of submersed aquatic vegetation in shallow water areas.
- The AOC contains a diversity of plants, an abundance of submersed aquatic vegetation, and sufficient invertebrates to provide adequate food supplies to support a diverse assemblage of migratory diving ducks (both mussel and vegetation feeding), fish, and other wildlife (including aquatic invertebrates, amphibians, and reptiles); and
- The AOC meets water quality standards and/or water quality targets of a State and US EPA approved TMDL; and
- The AOC meets Wisconsin water quality criteria for dissolved oxygen and water temperature that are protective of fish and wildlife populations; and

- No waterbodies within the AOC are listed as impaired due to physical or water chemistry conditions in the most recent Wisconsin Impaired Waters List (303(d) List).

Suggestions for Degraded Fish and Wildlife Populations and Loss of Fish and Wildlife Habitat:

- Identify actions to maintain and restore habitat for sensitive fish and wildlife species including:
  - Restoring degraded habitat (for example: Cat Island chain barrier islands, fish passage projects on tributaries, wetland acquisition on the West Shore)
  - Developing and implementing a control strategy for vegetative and aquatic invasive species (e.g. maintaining Rapid Croche Dam as a barrier to lamprey and other invasive species, management of vegetative invasive species)
  - Maintaining an adequate flow regime at the De Pere dam
- Develop a local fish and wildlife habitat management and restoration plan for the AOC that references and builds upon existing plans (including: 1993 Update to the Remedial Action Plan, WDNR Lake Michigan Integrated Fisheries Management Plan, WDNR West Shore Master Plan, Wisconsin Wildlife Action Plan, and those of the Great Lakes Regional Collaboration & the Nature Conservancy) and identifies appropriate monitoring recommendations (for example, frog surveys done within the AOC in the middle 1980s and early 1990s should be repeated).
- Recognize that the TMDL total suspended solids and total phosphorus targets could change if in the future the TMDL targets are met but the AOC is not meeting the goals established in the TMDL. At this point, the TMDL would have to be revisited. Also, the AOC would need to meet any goals or targets specified in any future TMDL that might be completed for parameters other than total suspended solids and total phosphorus.

Degraded Benthos

A low diversity and abundance of benthic (bottom living) invertebrates was the reason for listing this impaired use (WDNR 1993). Sediment pore water was also acutely toxic due to ammonia which may have been due both to point source discharges and the bacterial decomposition of excessive algae blooms.

The delisting targets below are similar to the International Joint Commission's delisting criteria (Environment Canada and US EPA 2001) which state that the BUI may be delisted "when the benthic macroinvertebrate community structure does not significantly diverge from unimpacted control sites of comparable physical and chemical characteristics. Further, in the absence of community structure data, this use will be considered restored when toxicity of sediment associated contaminants is not significantly higher than controls". The delisting target for the Lower Fox – Green Bay AOC requires both comparison with a reference site and sediment toxicity testing. A target was also set for *Hexagenia* populations based on densities seen in Lake Erie and their associated biological reference points: density descriptors of excellent, good, fair, poor, and imperiled (Environment Canada and USEPA 2007). Future studies may assist in determining if these *Hexagenia* densities are appropriate for Lake Michigan.

The <u>Degraded Benthos BUI</u> can be delisted when:

- All remediation actions for known contaminated sediment sources are completed and monitored according to the approved plan and have met their remedial action goal; and
- The benthic community IBI within the site being evaluated is statistically similar to a reference site with similar habitat and minimal sediment contamination; and

- Burrowing mayfly (*Hexagenia*) populations return to the AOC in stable annual abundances between 100-400 nymphs/m^2 (measured as a 3-year running average) or as otherwise indicative of adequate levels of dissolved oxygen in overlying waters and uncontaminated surficial sediments in Lake Michigan; and
- Sediment toxicity (due to ammonia, PCB, or dissolved oxygen) is not present at levels that are acute or chronically toxic (as defined by relevant, field validated, bioassays with appropriate quality assurance/quality controls) to the benthic community; and
- Native benthic communities adequately support the trophic levels that depend upon them.

Suggestions for Degraded Benthos:

- Determine appropriate reference locations for Lower Fox River and Green Bay with comparable depth, substrate, temperature, and nutrient conditions to the AOC. A suggested location for Green Bay portion of the AOC could be on the west shore north of the AOC line past the angle light. Should a suitable reference site for the Lower Fox River not be available, trend sampling could be considered or the bioassay could be substituted.
- Determine the range of existing conditions of benthic community within AOC, where possible integrating with year 2010 Lake Michigan Intensive Monitoring, and building an invertebrate monitoring program to evaluate a range of habitats and substrate sites, and evaluating for wildlife usage.
- Monitoring for benthic community IBI and *Hexagenia* populations. *Hexagenia* populations are an indicator species for mesotrophic conditions and 100-400 nymphs/m^2 is the range considered "good" or "excellent" for Lake Erie populations. If future monitoring indicates other densities are more appropriate for Lake Michigan, those densities should be used.
- Sediment toxicity monitoring after PCB remedial actions have been completed.

Degraded Phytoplankton / Zooplankton Populations

Changes in the AOC phytoplankton and zooplankton populations (tiny, floating plants and animals) were linked to excessive nutrient enrichment and a shift towards dominance of blue-green algae (WDNR 1993). Blue-green algae are considered undesirable as they are a less preferred food source for zooplankton and fish and contribute to depleted oxygen and ammonia toxicity in sediments when decomposed by bacteria (WDNR 1993). A greater portion of the phytoplankton (and its associated energy) ends up decaying on the bottom sediments rather than being passed up through the food web to zooplankton and fish when blue-green algae dominate the phytoplankton. Recent research has also indicated a shift towards dominance by blue-green algae since the invasion of zebra mussels (De Stasio 2008). Some blue-green algae contain potentially toxic compounds and their impact is also considered in the Eutrophication or Undesirable Algae and Beach Closings / Recreational Restrictions BUI delisting targets.

The Lower Fox TMDL will address excessive nutrient enrichment. The water quality target is 100 µg/L (0.1 mg/L) total phosphorus at the mouth of the Fox River and regression analysis indicates that phosphorus levels in inner Green Bay may drop well below 100 µg/L if that level is achieved in the Lower Fox (P. Sager & H.J. Harris, personal communication). Using established relationships between total phosphorus and the relative biomass of blue-green algae, it is predicted that reaching the target (100 µg/L or 0.1 mg/L total phosphorus) will reduce blue-green algae to approximately 50-60% of phytoplankton biomass in the AOC (Figure 3, after Trimbee and Prepas 1987).

The <u>Degraded Phytoplankton / Zooplankton Populations</u> BUI can be delisted when:

- Plankton and zooplankton structure and function do not significantly diverge from unimpaired reference conditions with comparable physical and chemical characteristics, recognizing the uncontrollable impact of invasive species. The following specific objectives should also be met:
  - Sources contributing to nutrient enrichment are identified and controlled; and
  - AOC total phosphorus concentrations consistently meet water quality standards and/or water quality targets of a State and U.S. EPA approved TMDL; and
  - In lower Green Bay, the amount of energy from phytoplankton and zooplankton that reaches the open water food chain has increased, and the amount of energy reaching the bottom sediments has decreased. (In other words, the carbon transfer efficiency of the phytoplankton and zooplankton levels of the food chain in lower Green Bay is increased such that the amount of energy channeled into the detrital food chain is decreased and the amount of energy channeled into the pelagic food chain is increased). This is expected to occur when phosphorus levels and the corresponding percentage of blue-green algae in the phytoplankton are reduced.; and
- Phytoplankton or zooplankton bioassays confirm no significant toxicity in ambient waters in the AOC.

Suggestions for Degraded Phytoplankton / Zooplankton Populations:

- Selection of appropriate reference conditions for comparison of plankton and zooplankton structure and function will need to carefully consider Green Bay's unique conditions (physical, chemical and biological).
- Scientific study of phytoplankton and zooplankton communities in other, non-AOC areas of Lake Michigan will be needed to help identify minimally impacted conditions.
- A metric will need to be defined for measurement of the amount of energy transfer from phytoplankton and zooplankton to other levels of food chain. The desired state would be a balanced energy flow in the food web.

Eutrophication or Undesirable Algae

Historically elevated phosphorus levels have resulted in hypereutrophic conditions (overly productive) and excessive algal blooms in the AOC (WDNR 1993). These algae blooms contribute to decreased water clarity in the AOC which restricts the growth of underwater plants. More recently, since the invasion of zebra mussels, these blooms are increasingly dominated by potentially toxic blue-green algae (De Stasio 2008). Blue-green algal blooms are considered undesirable as they are a less preferred food source for zooplankton and fish and contribute to depleted oxygen and ammonia toxicity in sediments when decomposed by bacteria (WDNR 1993).

The Lower Fox TMDL will address excessive nutrient enrichment. The water quality target is 100 µg/L (0.1 mg/L) total phosphorus at the mouth of the Fox River and regression analysis indicates that phosphorus levels in inner Green Bay may drop well below 100 µg/L if that level is achieved in the Lower Fox (P. Sager & H.J. Harris, personal communication). Using established relationships between total phosphorus and the relative biomass of blue-green algae, it is predicted that reaching the target (100 µg/L or 0.1 mg/L total phosphorus) will reduce blue-green algae to approximately 50-60% of phytoplankton biomass in the AOC (Figure 3, after Trimbee and Prepas 1987).

WDNR proposed assessment methodology for 303(d) listing of waterbodies also considers blue-green algae and is based on the following WHO guidelines:

- less than 20,000 cyanobacterial cells/ml is a relatively low probability of adverse health effects in recreational waters
- 1 µg/L microcystin-LR is the provisional drinking-water guideline

In Wisconsin waters, microcystin-LR is the toxin detected most frequently in high concentrations. The beneficial use impairment delisting target is consistent with WDNR proposed assessment methodology required sampling frequency and timing.

The Eutrophication or Undesirable Algae BUI can be delisted when:

- Total phosphorus concentrations at the mouth of the Lower Fox River meet water quality standards and/or water quality targets specified in a State and US EPA approved Total Maximum Daily Load; and
- There are no violations of the minimum dissolved oxygen concentrations established in Wisconsin Administrative Code Chapter NR 102 within the AOC due to excessive sediment deposition or algae growth; and
- No waterbodies within the AOC are included on the 303(d) list of impaired waters due to nutrients or blue-green algae in the most recent Wisconsin Impaired Waters list.
    - Blue-green algae will be evaluated using the most recent WDNR Consolidated Assessment and Listing Methodology 303(d) listing of impaired waterbodies. Currently the proposed methodology for listing is: 10% of the geometric means of at least 5 monthly samples (collected between May 1 and September 30th in at least 2 years) of phytoplankton samples from waterbodies in the AOC contain more than 20,000 cyanobacterial cells/ml or more than 1 µg/L of microcystin-LR. Delisting of this BUI could occur when the 90% of the geometric means are below these standards.
    - Blue-green algae may also be evaluated using the predicted relative biomass of blue-green algae in phytoplankton when total phosphorus at the mouth of the Lower Fox River reaches the TMDL target of 100 µg/L (0.1 mg/L) (based on Trimbee and Prepas 1987). Delisting of this BUI could occur when less than 50 - 60% of the relative biomass of phytoplankton is blue-green algae.

Suggestions for Eutrophication or Undesirable Algae:

- Total phosphorus should be monitored and evaluated in accordance with Wisconsin's Monitoring Strategy and most recent Consolidated Assessment and Listing Methodology (WisCALM) document. http://dnr.wi.gov/org/water/condition/
- Select monitoring locations from those established by the Green Bay Metropolitan Sewerage District water quality monitoring program
- If total phosphorus levels at the mouth of the Lower Fox reach the TMDL target but the percentage of blue-green algae in phytoplankton does not decrease as expected, the applicability of the Trimbee and Prepas model to this area will be evaluated and other factors examined (for example: nitrogen concentrations).
- Consider alternative analyses for tracking blue-green algae including spectral imaging analysis where applicable.

Beach Closings / Recreational Restrictions

The AOC was historically used for recreational activities, including swimming at Bay Beach on the southern shore of Green Bay near the mouth of the Fox River. Bay Beach closed in 1938 due to excessive bacterial contamination and since that time sedimentation between Renard Island and the beach has reduced the area available for recreational activities (WDNR 1993). Other areas in the AOC, including Communiversity Park and Long Tail Point, are now used unofficially for swimming, wading, and other water sports. Recreational activities common on the Lower Fox River include wading, boating, and water skiing.

Brown County Health Department has been monitoring *E.Coli* as part of the Wisconsin Beach Monitoring Program, weekly at Communiversity Park since 2003. Two beaches are also monitored on the north shore of Long Tail Point; however these are just outside the AOC. *E. coli* is an indicator species and if present in the water may indicate that other harmful pathogens (bacteria, viruses) may be present. Between 2003 and 2008, *E. Coli* levels measured at Communiversity Park and Long Tail Point beaches indicate that beach health in relation to *E.coli* testing is overall good (only one closure in the last 5 years at Communiveristy Park Beach). Closure at beaches occurs when *E. Coli* exceeds 1,000 cfu/100ml and advisories are issued when the *E. Coli* daily mean exceeds 235 cfu/100ml, or the geometric mean for at least 5 samples collected over a 30 day period exceeds 126 cfu/100ml. Data is available at www.wibeaches.us.

Although *E. Coli* may not by present at levels that would pose a risk to swimmers, there is potential for blue-green algae blooms to contain toxins that pose a risk to pets and humans. Monitoring for blue-green algae at public beaches does not occur at this time. Another factor that may deter recreation in the Area of Concern is cloudy water from excessive sediments which reduces visibility.

The Beach Closings / Recreational Restrictions BUI can be delisted when:

- Public swimming beaches within the AOC are open for 95% of the swimming season (between Memorial day and Labor Day) for any 5 year period based on Wisconsin Coastal Beach monitoring protocols for *E. Coli* monitoring and meet the blue-green algae target for 95% of the swimming season (geometric means of phytoplankton samples contain less than 20,000 cyanobacterial cells/ml or less than 1 µg/L of microcystin-LR based on at least 5 monthly samples over at least 2 years)*; and
- No waterbodies within the AOC are included on the list of impaired waters due to pathogen contamination or blue-green algae in the most recent Wisconsin Impaired Waters list

* 20,000 cyanobacterial cells/ml is the guidance level for relatively low probability of adverse health effects in recreational waters; 1 µg/L microcystin-LR is the provisional drinking-water guideline (WHO 2003).

Suggestions for Beach Closings / Recreational Restrictions:

- Evaluate the need for monitoring at areas commonly used for recreation including both the east and west shores of Green Bay, Long Tail Point, and the Lower Fox River. Monitoring should occur at the public beaches most commonly used. Parameters should include blue-green algae and/or its associated toxins including microcystins.
- These delisting targets should be revised and updated as appropriate to ensure consistency with future guidance on blue-green algae standards from EPA or the State of Wisconsin.

Degradation of Aesthetics

WDNR (1993) listed total suspended solids and algal blooms as the prime reason for degraded aesthetics in the AOC. Other factors contributing to degraded aesthetics include piles of zebra mussel shells, objectionable odors, algae scum, and cloudy, turbid water. The Lower Fox TMDL will address excessive phosphorus and sediment loads which are the cause of excessive algae growth and cloudy, turbid water. Its water quality targets at the mouth of the Lower Fox River are 100 µg /L (0.1 mg/L) of total phosphorus and 20 mg/L of suspended solids.

The IJC guidelines defining impaired uses listed aesthetics as degraded when any substance in water produces a persistent, objectionable deposit, unnatural color or turbidity, or unnatural odor. This is consistent with Chapter NR 102.04 (1), Wisconsin Administrative Code, Water Quality Standards for Surface Waters. Sediment is considered an objectionable deposit. Accordingly, the second part of this delisting target was established based on the wording in NR 102.04. Part of the following is also the delisting target used for the Milwaukee AOC.

The Degradation of Aesthetics BUI can be delisted when:

- Total phosphorus and total suspended solid concentrations at the mouth of the Lower Fox River meet water quality standards and/or water quality targets specified in a State and US EPA approved TMDL; and
- Monitoring data within the AOC and/or surveys for any five year period indicates that water bodies in the AOC do not exhibit unacceptable levels of the following properties in quantities which interfere with the Water Quality Standards for Surface Waters:
  (a) Substances that will cause objectionable deposits on the shore or in the bed of a body of water shall not be present in such amounts as to interfere with public rights in waters of the state or impair use.
  (b) Floating or submerged debris, oil, scum, or other material shall not be present in such amounts as to interfere with public rights in waters of the state or impair use.
  (c) Materials producing color, odor, taste, or unsightliness shall not be present in such amounts as to interfere with public rights in waters of the state or impair use.

Suggestion for Degradation of Aesthetics:

- Monitoring locations should be selected from at least three categories of commonly used areas: beaches, marinas, and locations used recreationally (by boaters, water skiers, kayakers, etc). Potential parameters to measure include, but are not limited to: water clarity, total suspended solids, chlorophyll-a, and odor. Other measures of recreational use of the AOC could be considered (for example, the number of boating hours), though it might be difficult to say definitively whether the use was related to aesthetics or not.

Restrictions on Fish and Wildlife Consumption

PCBs (polychlorinated biphenyls) are the primary cause of fish and wildlife consumption advisories in the AOC. A complete list of current fish advisories are available at: http://dnr.wi.gov/fish/consumption/ . The PCB advisory for both the Lower Fox and Green Bay (south of Marinette) advises the public never to eat eight species of fish (some of certain sizes) and to restrict meals for several other species depending upon the fish species and size (Table 1, WDNR 2009). The wildlife consumption advisory can be found in the current Wisconsin Migratory Bird Regulations and is limited to mallard ducks. Hunters are advised to remove all

skin and visible fat before cooking, and to discard drippings or stuffing as they may retain fat containing PCBs.

The Lower Fox Contaminated Sediment Remediation project will address PCB contamination in the AOC. PCBs are a persistent and bioaccumulative toxin, so time and fish tissue monitoring will be needed before consumption advisories can be made less restrictive after completion of the remediation project. More information about this project is available at http://dnr.wi.gov/org/water/wm/foxriver/ . It is important to note that progress towards delisting this BUI will be made within this program that is functioning with its own programmatic goals. This delisting target is not intended to create specific measures that would restrict agency decision-making and will not be used as the basis for cleanup levels for contaminated sites or for regulatory enforcement.

The Restrictions on Fish and Wildlife Consumption BUI can be delisted when:

- The Fox River Contaminated Sediment Remediation has been completed and meets the target established in the plan (Surface Area Weighted Concentration of 0.25 ppm or that determined acceptable by the agencies for completion of the PCB remedial action); and
- Fish and wildlife consumption advisories are the same or lower than those in the associated Great Lake or appropriate control site.

Suggestions for Restrictions on Fish and Wildlife Consumption:

- Ensure that the methodology for establishing the waterfowl consumption advisory considers relevant procedures and levels of contaminants.
- Sufficient fish and wildlife monitoring will be needed. It might also be possible to consider looking at resident fish species within Green Bay to see if they no longer have a statistically significant gradient of PCB concentrations from the Fox River through Green Bay. Comparison to Lake Michigan or other sites will require additional samples and statistics and may be difficult due to expense, differences in species and growth rates.

Restrictions on Dredging Activities

The Lower Fox Contaminated Sediment Remediation project will address the PCB contamination that is the basis for restrictions on dredging in the AOC. More information about this project is available at http://dnr.wi.gov/org/water/wm/foxriver/ . The institutional controls that will remain in place once the remediation project has been completed have not yet been negotiated, but will be defined within the context of that program. This delisting target is not intended to create specific measures that would restrict agency decision-making and will not be used as the basis for cleanup levels for contaminated sites or for regulatory enforcement.

The Restrictions on Dredging Activities BUI can be delisted when:

- All remediation actions for known contaminated sediment sources are completed and monitored according to the approved remediation plans, the remedial action goals have been achieved, and institutional controls have been implemented.

Bird or Animal Deformities or Reproductive Problems

WDNR (1993) listed evidence of bird or animal deformities or reproductive problems related to contaminants in the AOC including: reduced egg hatchability and offspring viability in Forster's terns, high levels of PCBs in eggs of several bird species, reduced reproductive performance and

physiological changes consistent with PCB effects is several species, and circumstantial evidence of impacts on mink and otter.

However, insufficient data are available to show if these problems currently exist in birds or other animals within the AOC. Because contaminants like PCBs and heavy metals that are found in AOC sediments have the potential to impair reproduction and development in wildlife, this BU is likely impacted/impaired within the AOC. However, before delisting can move forward in the AOC, sufficient studies must be conducted to determine if this beneficial use is truly impaired. The delisting targets identified below should be reviewed following completion of the studies and modified in accordance with the findings of those studies.

The <u>Bird or Animal Deformities or Reproductive Problems</u> BUI can be delisted when:

- PCB remedial actions have been implemented and the AOC is in recovery; and
- Studies indicating the incidence rates of deformities (e.g. crossbill syndrome) or reproductive problems (e.g. eggshell thinning) in sentinel wildlife species (avian, amphibian, mammalian, predatory fish, and reptilian) do not exceed background levels of reference populations from unimpacted sites of comparable physical and chemical characteristics.
    - A stepwise approach will be used to conduct both of the following evaluations in the AOC to determine when the BUI can be delisted:

    1. If fish tissue or other food sources (e.g. insects and amphibians) concentrations of contaminants of concern identified in the AOC are:
        a. at or lower than the Lowest Observable Effect Level (LOEL) known to cause reproductive or developmental problems in fish, fish-eating birds, and mammals, the BUI can be delisted, or
        b. not statistically different than Lake Michigan (at 95% confidence interval), then the BUI can be delisted.

        Fish and other food sources (e.g. insects and amphibians) should be of a size and species considered prey for the species under consideration;

    And when

    2. Field studies including observational data and direct measures of birds and other wildlife (including predatory fish) exhibit deformities or reproductive problems are verified through an:
        - Evaluation of observational data of bird and other animal deformities for a minimum of two successive monitoring cycles in indicator species identified in the initial studies as exhibiting deformities or reproductive problems. If deformity or reproductive problem rates are not statistically different than those at minimally impacted reference sites (at a 95% confidence interval), or no reproductive or deformity problems are identified during the two successive monitoring cycles, then the BUI can be delisted. If the rates are statistically different than the reference site it may indicate a source from either within or outside the AOC. Therefore, if the rates are statistically different or the data are insufficient for analysis, then:
        - Evaluation of tissue contaminant levels in egg, young and/or adult wildlife. If contaminant levels are lower than the Lowest Observable Effect Level (LOEL) for that species for a particular contaminant that are not statistically different than those at minimally impacted reference sites (at a 95% confidence interval), then the BUI can be delisted.

Restrictions on Drinking Water or Taste/Odor Problems

The City of Green Bay has been using water from Lake Michigan near Kewaunee as a drinking water source since the mid 1950s. Elevated radium levels in groundwater wells used by communities adjacent to the City caused them to seek an alternative primary source of drinking water. A second pipeline was constructed in 2006 to Manitowoc to access Lake Michigan water for these communities (Ashwaubenon and Scott receive water from the City of Green Bay). No communities use water from within the AOC as a drinking water source.

The original listing of restrictions on drinking water as an impaired use was based upon the unknown risks of substances toxic to human health, taste and odor problems, suspended solids, bacteria and viruses, color, low flow effect on water quality and the high cost of water treatment (WDNR 1993). The IJC Listing Guideline suggested that the use be considered impaired when treated drinking water supplies are impacted to the extent that: 1. densities of disease-causing organisms or concentrations of hazardous or toxic chemicals or radioactive substances exceed human health standards, objectives, or guidelines; 2. taste and odor problems are present; 3. treatment needed to make raw water suitable for drinking is beyond the standard treatment used in comparable portions of the Great Lakes which are not degraded, ie. settling, coagulation, disinfection.

WDNR's drinking water program does not require source water testing. Drinking water standards apply to water after treatment and samples are collected from the point of distribution to the public water supply. However, Wisconsin Administrative Code NR 811.25 does list standards for community surface water supplies as the following:

> NR 811.25 General requirements. The source of water selected as a surface water supply shall provide the highest quality water reasonably available which, with appropriate treatment and adequate safeguards, will meet the drinking water standards in ch. NR 809. Source water shall meet the surface water quality standards in ch. NR 102. Minimum treatment shall include disinfection, coagulation, sedimentation and filtration. The design of the treatment processes, equipment and structures shall depend on an evaluation of the nature and quality of the particular water to be treated. Any proposal which would result in a diversion from the Great Lakes basin requires department approval in accordance with ch. NR 142.
> History: Cr. Register, April, 1992, No. 436, eff. 5–1–92**;** correction made under s. 13.93 (2m) (b) 7., Stats., Register, August, 1994, No. 464.

Given that the IJC listing guideline and the source water general requirements in Ch NR 811.25 reference standard treatment of drinking water, the following beneficial use impairment delisting target is proposed for drinking water after treatment.

The <u>Restrictions on Drinking Water or Taste/Odor Problems</u> BUI can be delisted when treated drinking water supplies meet all of the following:

- Densities of disease-causing organisms or concentrations of hazardous or toxic chemicals or radioactive substances do not exceed human health standards, objectives, or guidelines; and
- Taste and odor problems are not present; and
- Treatment and costs needed to make raw water suitable for drinking is the standard treatment used in comparable portions of the Great Lakes which are not degraded, specifically disinfection, coagulation, sedimentation and filtration.

Suggestions for Restrictions on Drinking Water or Taste/Odor Problems:

- Evaluate the surface water quality of the water in the AOC to determine if treatment to make raw water suitable for drinking would be comparable to portions of the Great Lakes which are not degraded. A system drawing from a river or lake might be more comparable to Green Bay, rather than Kewaunee which draws Lake Michigan water.

Suspected BUIs

Tainted Fish and Wildlife Flavor and Fish Tumors or Other Deformities

While it is possible to develop delisting targets for suspected impairments, it is not required by the US EPA, nor is it a priority for funding projects aimed at delisting BUIs. Given the time available to revise the draft delisting targets emphasis was placed on targets for the actual impairments identified in the Remedial Action Plan.

Table 1. Special advice for PCBs and other chemicals (fish consumption advisories) for fish from the Area of Concern (WDNR 2009).

Waterbody/Species	Unrestricted	Eat no more than 1 meal a week or 52 meals/year	Eat no more than 1 meal a month or 12 meals/year	Eat not more than 1 meal every 2 months or 6 meals/year	Do Not Eat
Fox River from De Pere Dam downstream to mouth					
Black Crappie			All sizes		
Bluegill			All sizes		
Carp					All sizes
Channel Catfish					All sizes
Northern Pike			Less than 33"	Larger than 33"	
Rock Bass			All sizes		
Sheepshead			Less than 10"	10-13"	Larger than 13"
Smallmouth Bass			All sizes		
Walleye			Less than 16"	16-22"	Larger than 22"
White Bass					All sizes
White Perch				All sizes	
White Sucker				All sizes	
Yellow Perch			All sizes		
Green Bay south of Marinette and its tributaries (except the Lower Fox) including the Menominee, Oconto, and Peshtigo Rivers from their mouth up to the first dam					
Brown Trout			Less than 22"	22-28"	Larger than 28"
Carp					All sizes
Channel Catfish				All sizes	
Chinook Salmon			Less than 30"	Larger than 30"	
Musky				Larger than 50"	
Northern Pike			All sizes		
Rainbow Trout			All sizes		
Sheepshead			All sizes		
Smallmouth Bass			All sizes		
Splake			Less than 16"	16-20"	Larger than 20"
Sturgeon					All sizes
Walleye			All sizes		
White Bass					All sizes
White Perch				All sizes	
White Sucker		All sizes			
Whitefish			All sizes		
Yellow Perch		All sizes			

Figure 1. Map of Lower Green Bay and Fox River Area of Concern.

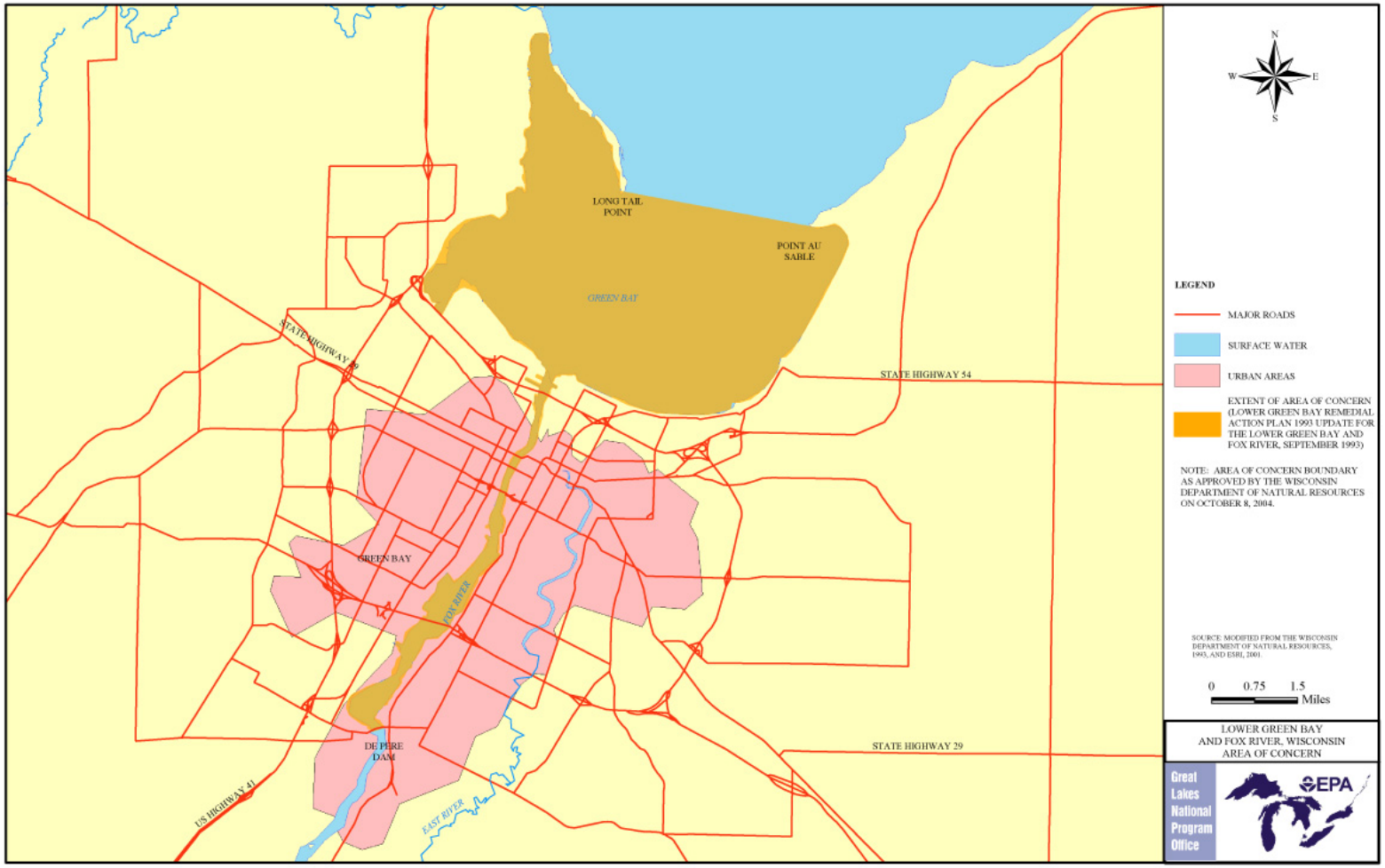


Figure 2. Location of Green Bay Metropolitan Sewerage District Sampling Stations and Location of Zones in Green Bay.

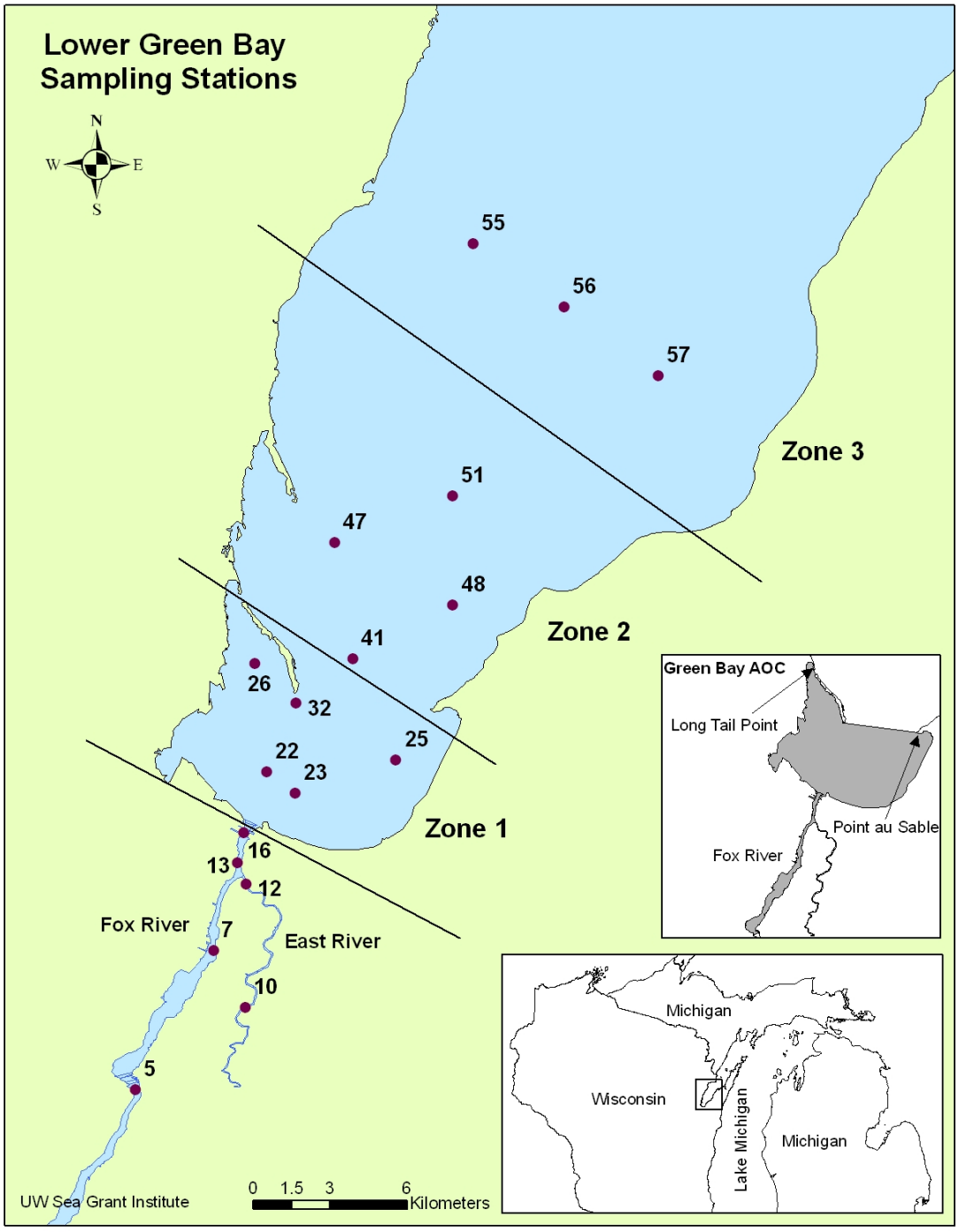
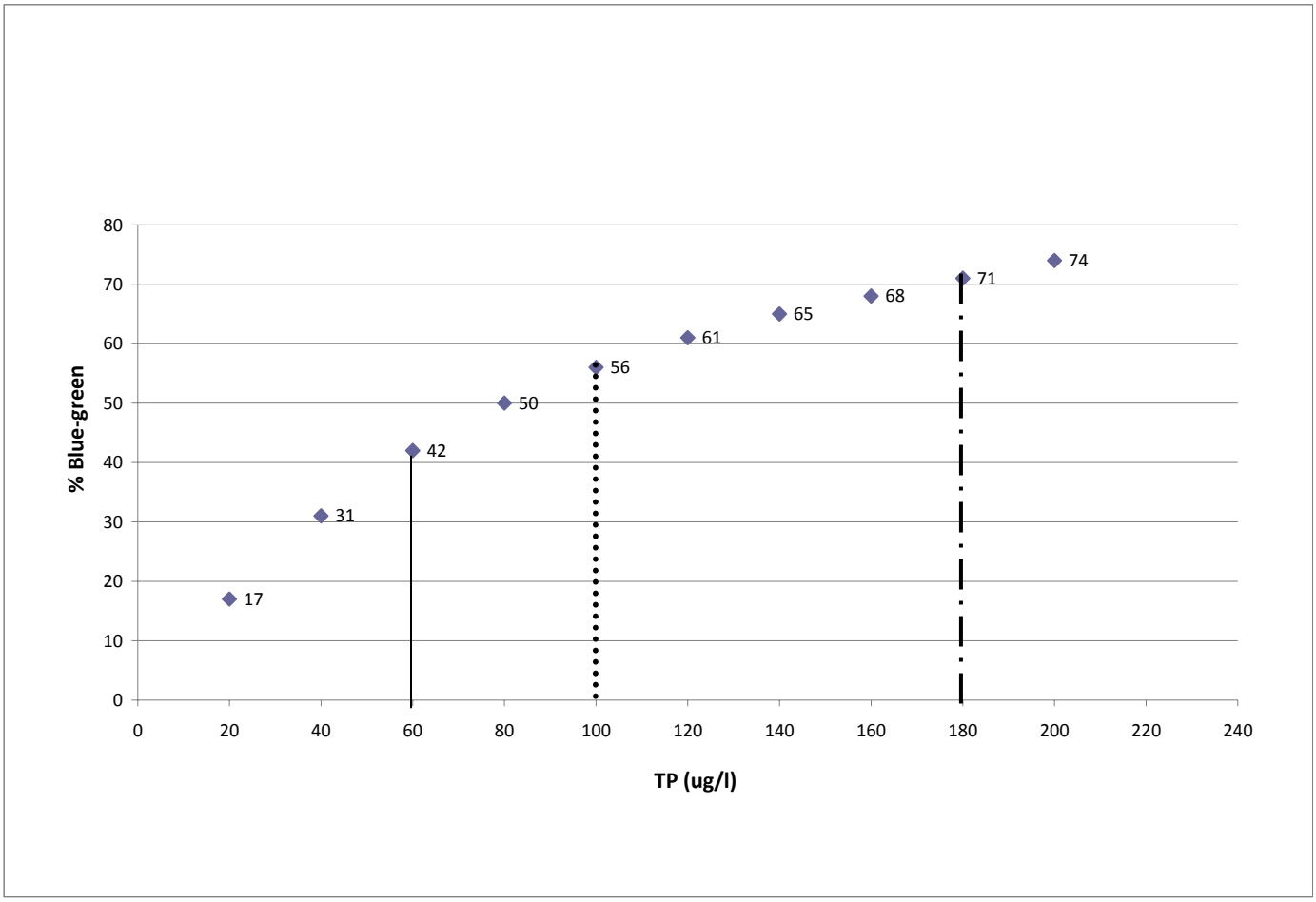


Figure 3. Predicting the relative biomass of Blue-Green algae in phytoplankton from Total Phosphorus levels in lakes, where %BG=100/e + 5-2.62 logTP 1 after Trimbee and Prepas 1987.



Note:
a) The 180 ug/l line is the median total phosphorus level for the Lower Fox River (LFR) in the period 1993-2005
b) The 100 ug/l line is the TMDL numeric target for the mouth of the Lower Fox River
c) The 60 ug/l line is the mean total phosphorus level for Zones 1 and 2, predicted from the Lower Fox River target by the regression: TP = 0.02 + 0.60 (LFR TP), $r^2 = 0.469$ (see text above)

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Appendix A. Notes from Public Input Session on Draft Delisting Targets

July 23, 2009 from 6:30- 8:30 pm
Bay Beach Wildlife Sanctuary Nature Center Auditorium

The meeting began at 6:30 with a 15 minute open house. Attendance was light; ten people attended including some who had previously participated in stakeholder meetings to develop the draft Beneficial Use Impairment targets.

Steve Galarneau (WDNR) then welcomed the audience and gave a 10 minute presentation explaining the purpose of the meeting and providing background on the Area of Concern (AOC) program and Beneficial Use Impairments. He offered the public a chance to move around the room to visit five tables hosted by WDNR staff. Each table had a three panel display listing the Beneficial Use Impairments, proposed delisting targets, and possible next steps. Key discussion points were recorded on flip charts at each table. At 8:10 pm, when conversations at the tables were winding down, Steve Galarneau recalled the group. WDNR staff at each table provided a brief summary to the assembled group of key points discussed at their table. Questions and discussions at the different tables focused more on next steps and projects to restore the AOC than on the actual delisting targets.

The following are the notes recorded at each table:

Table 1. Eutrophication or Undesirable Algae, Degraded Phytoplankton / Zooplankton Populations, and Degradation of Benthos
Jim Reyburn and Erin Hanson (WDNR)

Discussion at this table focused on next steps to achieve the delisting targets, the Lower Fox Total Maximum Daily Load (TMDL) project, and questions about the AOC program including:
- What are the next steps?
- How do tributary projects factor into overall grand scheme of restoration?
- Will the AOC go onto a different list after it's removed from the AOC list?
- What is state role compared to the EPA role?
- What is the difference between the AOC and the TMDL project?

It was noted that many of the actions needed to reduce nutrient related problems in the Area of Concern will have to occur over a larger area than just the AOC, including tributaries . WDNR, through the impaired waters program, maintains a list of impaired waters which is called a 303(d) list and is a requirement of the Clean Water Act. This is independent of the Area of Concern program and designation. The TMDL applies to a much larger area, the Lower Fox Watershed, then the limited area of the AOC.

Other comments made at the table included an observation that the Fox River is underappreciated, that recreational users value clean water (example kayakers), and that better public notice for meetings needs to occur to get better turnout.

Table 2. Impacts to Fish: Habitat and Populations
Loss of Fish and Wildlife Habitat, Degraded Fish and Wildlife Populations
David Rowe and Nick Legler (WDNR)

Discussion at the table focused mainly on PCB consumption advisories and included the following questions:

– How often are fish monitored for PCBs? How are fish tested?
– How often are fish consumption advisories revised?
– Where can people get fish consumption advisory guide books?
– How does industrial and residential development of the lower Fox River influence fish populations?
– Does the DNR do anything to reduce the abundance of carp?

Fish consumption advisory information is posted on WDNR's website and guide books were available at Table 4.

Table 3. Impacts to Wildlife: Habitat, Populations, and Health
Loss of Fish and Wildlife Habitat, Degraded Fish and Wildlife Populations, and Bird or Animal Deformities or Reproductive Problems
John Huff and Katherine Disterhaft (WDNR)

Discussion at the table focused mainly on habitat restoration, specifically the Cat Island Chain restoration project. Questions included:

– What is the timing for restoration?
– How will invasive species be controlled after the islands are built?
– What will protect the rebuilt islands from storm damage?
– What is the plant composition of the area behind the islands?
– How contaminated are the dredge spoils that will be used to build the islands?

With respect to the Cat Island Chain restoration project, there is an expectation of a response from a native seed bank, and invasive species might be addressed through an adaptive management strategy including potential plantings of native species if necessary. The plan is to use clean dredged sediments which have been tested for contamination.

Questions were also asked about monitoring of wildlife populations to assess progress toward the goals both of presence and abundance of wildlife and the effects of contaminants on targeted wildlife species. Part of the restoration plan will need to address this issue for potential delisting of the BUIs for wildlife in this area.

Table 4. Fish and Wildlife Consumption Restrictions, and Restrictions on Dredging
Gary Kincaid (WDNR) and Kathy Clayton (EPA)

Discussion at the table focused mainly on the ongoing Fox River PCB contaminated sediment remediation project and included the following questions:

- How long will the cleanup take?
- How will the cleanup be evaluated/ how know if contamination remains?
- Will other contaminants of concern be tested (i.e. mercury)?

The PCB remediation project is ongoing and remediation is expected to occur over the next nine years. Follow-up monitoring will take place over many years, recognizing that fish tissue will need time to show a response to the clean-up (PCBs are persistent bioaccumulative toxins). Other contaminants known to be in the sediments are expected to be removed or contained by the PCB clean-up.

Table 5. Recreational Restrictions/Beach Closings, Degraded Aesthetics, and Restrictions on Drinking Water/Taste or Odor Problems Table
Kendra Axness (UW-Extension) and Rick Stoll (WDNR)

This table was the best attended and discussion covered the following points:

- Suggestion to change 95% to 98% in the following target: "Public swimming beaches are open for 95% of the time between Memorial Day and Labor Day…"
- Suggestion to increase number of monitoring sites for beach monitoring; also increase the frequency of sample collection at beaches.
- Concerns about the process of writing delisting targets being rushed and inadequate public notice for the meeting. Suggestion to send information about AOC meetings and milestones to the "Fox River Currents" mailing list.
- Concern that the threshold for delisting the BUIs doesn't take the bay all the way to the "desired future state" as described in the Remedial Action Plan. Perception that the delisting targets constitute a substantial change to the RAP.

Conclusion

Steve Galarneau then offered some closing remarks to the group. He noted that establishing beneficial use impairment delisting targets is a necessary step in the Area of Concern program. Now is a good the time for agencies and other groups to be thinking about projects that will help restore the uses in the Area of Concern. It appears that there will be substantial funding available for Great Lakes Restoration Projects in the coming years including $475 million proposed in EPA's 2010 budget for a "Great Lakes Restoration Initiative".

Those in attendance were offered a chance to submit comments on the Beneficial Use Impairment delisting targets either on a form provided at the meeting or by mail to Erin Hanson by August 6th, 2009.

Meeting adjourned at 8:30 pm.

Appendix B. Summary of Comments on Draft Delisting Targets

Wisconsin Department of Natural Resources (WDNR) and area stakeholders drafted Beneficial Use Impairment (BUI) delisting targets for the Lower Green Bay and Fox River Area of Concern (AOC) over the course of several meetings in spring of 2009. A public input session was held July 23rd, 2009 and twenty-five comments on the draft targets were received during the following two week comment period. Of these, twenty were signed form letters distributed in the Clean Water Action Council of Northeast Wisconsin's newsletter.

Following is a summary of the significant citizen concerns raised during the public comment period for the draft BUI delisting targets.

General Concerns

1. Some individuals would have preferred an alternate format for the July 23rd public meeting and were concerned that the selected meeting format restricted discussion.

Response: The meeting format was chosen to maximize the opportunity for informing and obtaining input from the public on the different BUI delisting targets. Allowing for multiple, concurrent conversations provided an efficient way to cover the wide range of problems in the AOC.

2. A misconception that by establishing BUI delisting targets WDNR is attempting to remove the AOC designation prematurely, before remedial activities have been completed, by defining the problems away.

Response: EPA required all AOCs in the Great Lakes to establish BUI delisting targets. The delisting targets allow for documentation of progress towards restoration of beneficial uses and serve as planning goals for continued cleanup and restoration as resources are available. WDNR recognizes that it may take many years to fully implement activities to meet the delisting targets. Monitoring to document sustained attainment of the delisting target conditions will also be needed before the Lower Green Bay and Fox River AOC is delisted.

3. Metrics and/or monitoring needed to document achievement of BUI delisting targets have not been fully defined and new metrics not currently being measured should be identified as such. Criteria should specify the amount and length of monitoring necessary to demonstrate sustained (at least 5 years) improvement before delisting.

Response: Agreed. WDNR will continue to meet with Lower Green Bay and Fox River stakeholders when appropriate to more fully define the metrics and monitoring needs for each BUI delisting target.

4. There should be no delisting of BUIs or removal of the AOC designation until human health studies of the local population, directly related to river and bay quality, are conducted due to the concern that PCBs have caused human health problems. Beach Closings, Fish and Wildlife Consumption Advisories, and Restrictions on Drinking Water are directly related to human health concerns and local exposure is unique and complex.

Response: These BUI delisting targets are consistent with State and Federal standards (drinking water, contaminated sediment remediation, and fish and wildlife consumption) which were established based on human health studies and are designed to prevent long-term adverse effects and allow long-term exposure. Furthermore, fish and wildlife consumption advisories are established cooperatively between the Wisconsin Department of Natural Resources and

Wisconsin Department of Public Health. Meeting these standards is an ultimate goal that will be very protective against associated harmful effects. In addition, studies of local human populations would be extremely difficult, costly and typically do not provide succinct evidence due to complications in studying human populations.

5. A perception that proposed delisting targets are: political, fall below the RAP's intentions, and will be further loosened in the future (due to politics, budgets, or special interests).

Response: Setting delisting targets was a necessary step required by EPA. Care was taken to ensure that the targets were consistent with ongoing restoration programs (including the PCB remedial actions and Lower Fox Total Maximum Daily Load). Many of the proposed targets are also based on existing promulgated standards that are designed to prevent long-term adverse effects and allow long-term exposure.

Achieving the delisting targets will require substantial restoration efforts over the course of many years. Furthermore, the targets are flexible so that periodic review (in consultation with local stakeholders) will allow for strengthening the targets if evidence is available that the uses are still impaired (US Policy Committee 2001). Any changes, if contemplated, would require scientific consensus, public involvement, and need to meet regulatory requirements.

Specific Concerns: Degraded Fish and Wildlife Populations

6. The lake sturgeon target should be revised to clarify that 750 refers to the number of fish spawning in the Lower Fox River, not residing there.

Response: language changed from "A minimum of 750 sexually mature lake sturgeon in the Lower Fox River" to "Lake Sturgeon population that spawns in the Lower Fox River has a minimum of 750 mature adults".

7. Typographical error in second paragraph should be corrected to read "water clarity" or "light penetration".

Response: language changed from "light clarity" to read "water clarity".

8. Delisting should only occur after recovery plans are written and successfully implemented to establish sustainable populations of rare listed species which were historically present in the AOC.

Response: No change to delisting target language. The delisting target for Degraded Fish and Wildlife Populations references "healthy, self-sustaining, naturally reproducing, and diverse populations" of fish and wildlife species. Writing and implementing fish and wildlife habitat management and restoration plans will be one way of achieving this target, and is noted as such in the suggestions following the delisting targets. Habitat for State or Federally listed species (special concern, threatened, or endangered) is also specifically identified in the Loss of Fish and Wildlife Habitat delisting target.

Beach Closings / Recreational Restrictions

9. The delisting target should include all waters or all beaches as being safe for swimming for 98% of the time.

Response: Although only one beach is currently monitored by Brown County Health Department, future stakeholder workgroup meetings to refine monitoring needs can identify other locations in the AOC requiring monitoring. Language changed in suggestions section to read "Evaluate the need for monitoring other areas commonly used for recreation including both the east and west shores of Green Bay, Long Tail Point, and the Lower Fox River".

The 95% target is based on the U.S. Great Lakes Strategy objective for clean and healthy beaches, aiming for high priority Great Lakes beaches to meet bacteria standards for 95% of the swimming season. The Lower Fox stakeholder workgroup that met to discuss this target did not feel that setting the delisting target above this objective would be reasonable.

10. Incorrect date listed for Bay Beach Closure.

Response: Date changed from 1943 to 1938, based on historic summary of Bay Beach Amusement Park available at www.ci.green-bay.wi.us/BayBeach/History/index.html

11. The delisting target should include a measure of the public's attitude about recreation in and on the waters of the AOC, perhaps using St. Norbert College Survey Center's "Quality of Life" surveys in the Green Bay metropolitan area to collect this information.

Response: Public perception of the suitability of the AOC for recreation will be subjective depending on the individual's preference for recreation locations (for example: some may value proximity to the city for reduced travel time, others may not) and tolerance for development. This BUI delisting target will be limited to measures of the suitability of water in the AOC for recreational use.

12. EPA will be putting together guidance for states in the future (possibly 2012) for AIS and blue-green algae requirements for 303(d) listing. The blue-green algae indicator should be consistent with EPA's guidance.

Response: Language added in suggestions section stating "These delisting targets should be revised and updated as appropriate to ensure consistency with future guidance on blue-green algae standards from EPA or the State of Wisconsin."

Degradation of Aesthetics

13. This BUI target is subjective and should include a metric that involves public participation either through an attitude survey or collection of data (activities such as an annual wade-in). Aesthetics should include smells, views, plentiful wildlife, and the sense that fish, ducks, and geese are safe to eat. The survey should be a professional survey of a random, representative sample of 1,000 people living within the AOC community and who come in contact with the waterways. The population surveyed should include boaters, visitors, property owners, hunters and anglers.

Response: Public perception of the aesthetic quality of the AOC will be subjective and difficult to quantify in a survey based on the possible range of what could be considered aesthetically pleasing to an individual and a person's tolerance and attitudes about development.

Restrictions on Fish and Wildlife Consumption

14. This BUI should only be delisted when there are no fish or wildlife consumption advisories needed in the Area of Concern.

Response: Fish and wildlife consumption advisories may remain in place after the completion of PCB remedial actions due to the time needed for the system to recover from residual contamination. There may be a period of "recovery designation" where no further active intervention is needed until evaluation shows that the BUI delisting targets are achieved.

Contaminants originating from outside of the Area of Concern (e.g. atmospheric deposition or migrating fish or wildlife) may also result in continued fish and/or wildlife consumption advisories after completion of PCB remedial actions. By comparing fish and wildlife

consumption advisories within the Area of Concern to comparable portions of the Great Lakes (without known contaminated sediments) it will be possible to determine when the advisories are no longer more restrictive in the Area of Concern and when this BUI may be removed or changed in accordance with guidance existing at that time.

Restrictions on Dredging Activities

15. This BUI should only be delisted when dredging for shipping and boat channels, marinas, transportation projects, utilities, recreation, wildlife habitat improvement or other purposes is no longer restricted or more expensive due to sediment contaminants or artificial obstructions placed on the river or bay bed.

Response: Dredging in waters of the State of Wisconsin is never unrestricted; permits are required under Chapter 30 of Wisconsin State Statute and require dredged materials to be tested for contaminants. The ongoing PCB remedial actions will require institutional controls to be placed in some areas where protective caps are required to prevent disturbance of these engineered remedial actions. Dredging would still be allowed with requirements to appropriately address the risk of disturbing the capped contaminants and would require re-establishing the protective cap. Sediment with PCB concentrations of 1 ppm or greater will be remediated in some way, so the BUI will have been addressed relative to state and federal requirements. Dredged sediment less than 1 ppm may still have disposal restrictions.

16. Delisting should only occur when it is safe.

Response: The goal of current PCB remedial actions in the Lower Fox River is to reduce PCB concentrations in the area being remediated to a level that is safe for humans, fish and wildlife. This BUI will not be delisted until "All remediation actions for known contaminated sediment sources are completed and monitored according to the approved remediation plans, the remedial action goals have been achieved, and institutional controls have been implemented."

Restrictions on Drinking Water

17. Delisting should only occur when the water is clean enough for use in ways that Lake Michigan water is used.

Response: Natural differences between the Area of Concern and Lake Michigan may restrict comparison between the two for the purposes of evaluating use of the AOC as a drinking water source. The delisting target language refers to "comparable portions of the Great Lakes which are not degraded" to account for expected natural differences between the AOC and Lake Michigan.

18. Treatment cost should be included in the target.

Response: Language in third bullet of target changed from "Treatment needed to make raw water suitable for drinking …" to "Treatment and costs needed to make raw water suitable for drinking…". Treatment and costs should be evaluated against a comparable area of the Great Lakes which is not degraded; the communities adjacent to the AOC draw water from Lake Michigan which may not be a comparable area for the purposes of evaluating this use.

Bird or Animal Deformities or Reproductive Problems

19. Delisting should only occur when the birds and animals are no longer suffering from these problems and when no deformities or reproductive problems are found in river and bay wildlife.

Response: The delisting target specifies in detail that the BUI can only be delisted when scientific evidence is available that these problems do not exist at levels above what might be

expected naturally in a population and when contaminant concentrations indicate that the risk of these problems is low.

Fish Tumors or Other Deformities

20. Delisting should only occur when no more tumors or other deformities can be found, or when studies of fish in the AOC prove that they no longer have tumors or other deformities above natural background levels.

Response: This was a suspected impairment when the RAP was established. EPA has indicated that delisting targets for suspected impairments are not required, nor will projects to monitor for this impairment be a top funding priority.

Tainted Fish and Wildlife Flavor

21. Delisting should occur after a sampling of anglers and hunters find no tainted flavors. The survey should be a professional survey of a random, representative sample of 1,000 people living within the AOC community and who come in contact with the waterways.

Response: This was a suspected impairment when the RAP was established. EPA has indicated that delisting targets for suspected impairments are not required, nor will projects to monitor for this impairment be a top funding priority.

Numerous general comments were received, which did not address specific concerns about the proposed delisting targets, and therefore no additional responses are provided.