

Saginaw River/Bay Area of Concern

Restoration Plan for the Habitat and Populations BUIs

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Contents

| | |
|--|-----------|
| EXECUTIVE SUMMARY | 1 |
| BACKGROUND | 3 |
| FISH AND WILDLIFE PLAN FOR DELISTING | 4 |
| SUMMARY OF PAST FISH AND WILDLIFE POPULATION ISSUES IN THE SAGINAW AOC..... | 6 |
| TOXIC CONTAMINANTS AND NUTRIENT ENRICHMENT | 6 |
| LOSS OR DEGRADATION OF COASTAL WETLANDS | 7 |
| LOSS OR DEGRADATION OF FISH SPAWNING AREAS..... | 8 |
| PREVIOUS TARGETS | 10 |
| FISH SPECIES-SPECIFIC TARGETS | 10 |
| <i>Walleye</i> | 10 |
| <i>Yellow Perch</i> | 11 |
| <i>Lake Sturgeon</i> | 11 |
| WILDLIFE-SPECIFIC RESTORATION TARGETS | 12 |
| RESTORATION TARGETS FOR DELISTING AND CURRENT STATUS | 13 |
| RESTORATION CRITERIA: A TIERED RESTORATION APPROACH..... | 13 |
| (A) <i>Loss of Fish and Wildlife Habitat</i> | 13 |
| (B) <i>Bird or Animal Deformities or Reproductive Problems</i> | 13 |
| (C) <i>Degradation of Fish and Wildlife Populations</i> | 14 |
| CURRENT CONDITIONS..... | 14 |
| <i>Loss of Fish and Wildlife Habitat BUI: Coastal Wetlands</i> | 14 |
| <i>Bird or Animal Deformities or Reproductive Problems BUI</i> | 19 |
| <i>Degradation of Fish and Wildlife Populations BUI: Fish Passage</i> | 19 |
| <i>Rationale</i> | 19 |
| SUGGESTED PRIORITIES FOR PROTECTION OR RESTORATION ACTIVITIES | 22 |
| DEGRADATION OR LOSS OF FISH AND WILDLIFE HABITAT | 22 |
| DEGRADATION OF FISH AND WILDLIFE POPULATIONS | 22 |
| <i>Chesaning</i> | 22 |
| <i>Frankenmuth</i> | 22 |
| RECENT AND ONGOING PLANNING AND RESTORATION EFFORTS..... | 24 |
| PLANNING PROJECTS | 24 |
| <i>Ducks Unlimited, 2012</i> | 24 |
| <i>United States Army Corps of Engineers, 2012</i> | 24 |
| <i>United States Army Corps of Engineers, 2011</i> | 25 |
| <i>Central Michigan University, 2010</i> | 25 |
| <i>The Nature Conservancy et al., 2010</i> | 25 |
| <i>Michigan State University Extension, 2009</i> | 26 |
| REPORTING | 27 |
| SUMMARY | 28 |
| REFERENCES..... | 29 |

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This report was developed in thoughtful consultation with members of the technical committee representing

- The Conservation Fund (TCF)
- Ducks Unlimited (DU)
- Michigan Department of Environmental Quality (MDEQ)
- Michigan Department of Natural Resources (MDNR) Fisheries Division
- Michigan Department of Natural Resources (MDNR) Wildlife Division
- The Saginaw Basin Land Conservancy (SBLC)

Additional input was provided by

- Bay County Department of Environmental Affairs and Community Development
- United States Fish and Wildlife Service

Executive Summary

This restoration plan summarizes and updates years of work that has advanced restoration of two beneficial use impairments (BUIs) in the Saginaw Bay and River Area of Concern (AOC)—physical habitat degradation and population reductions of key fish and wildlife species.

This plan also discusses the progress of restoration targets set by the Partnership for the Saginaw Bay Watershed, the local Public Advisory Council (PAC) charged with overseeing and implementing restoration efforts leading toward delisting the AOC. The first restoration targets set in 2000 include indicators for coastal wetlands and marshes and key fish and wildlife species. Analysis of data related to the targets and previously completed restoration work indicate that substantial progress has been made in preserving and protecting remaining coastal wetlands and positively impacting dependent fish and wildlife species.

These targets were assessed and revised in the 2008 *Habitat Restoration Plan* that determined that the original fish and wildlife species-specific targets were no longer a suitable proxy for AOC restoration due to the impact of invasive species and food web disruptions that have negatively affected the target species and are occurring throughout the Lake Huron system. Moreover, the 2008 plan concluded that only the coastal wetlands and marshes target remained an appropriate target for gauging AOC restoration of the *Degradation or Loss of Fish and Wildlife Habitat (Habitat)* BUI. At that time, the targets for the *Degradation or Loss of Fish and Wildlife Habitat*, and *Degradation of Fish and Wildlife Populations (Populations)* BUIs were coupled, so that restoration for both BUIs was based on coastal wetland preservation alone. In other words, once the coastal wetlands goal was achieved, it could be reasoned that the target for the *Populations* BUI would be met.

In 2010, the Partnership for the Saginaw Bay Watershed led an effort to measure progress toward restoration goals of these BUIs. During that assessment, at the recommendation of the Michigan Department of Environmental Quality (MDEQ), restoration targets for the two BUIs were decoupled because habitat restoration alone may not guarantee population restoration. The MDEQ recommended a re-evaluation of species-specific and other restoration targets for the *Populations* BUI.

This report provides an assessment of progress toward restoration targets for the *Habitat* BUI based upon a 2012 geospatial analysis conducted by Ducks Unlimited (DU), in coordination with a technical committee comprised of state, federal, and local representatives. Results indicate that 60 percent of coastal wetlands below the 585-foot contour have been protected through public ownership and permanent conservation easements pursuant to the restoration targets that were set for the *Habitat* BUI in 2000. Moreover, the remaining unprotected wetlands have been prioritized and identified by parcel for continued protection. It should be noted that uncertainty is inherent in all analysis using geospatial datasets to represent on-the-ground conditions, including the assessment of preserved wetlands adjacent to the Saginaw River and Bay AOC. Known sources of uncertainty are identified and summarized in the report. In general, sources of uncertainty that could increase or decrease wetland estimates are thought to be nominal such that they would offset one another. For example, the digital elevation model may show particular points at 585 feet above sea level while on the ground the same points may be a few feet higher and others may be a few feet lower.

This report also sets forth a new restoration target for the *Populations* BUI that was developed by the MDEQ and the technical committee. The *Populations* BUI will be considered restored when

- The Loss of Fish and Wildlife Habitat BUI is removed
- Bird or Animal Deformities or Reproductive Problems BUI is removed
- Great Lakes fish species such as walleye pass the barriers at Chesaning and Frankenmuth in significant numbers based on qualitative assessments by local fisheries managers

Along with the new restoration target suggested priorities for restoration activities are included that detail the actions that must be completed before formal removal of these BUIs can commence. The plan includes specific projects and general recommendations for completing the work with regard to fish passage at Frankenmuth and Chesaning.

While reading this document, it is important to consider that the restoration targets discussed are the *minimum* needed to remove the impaired status of the beneficial use. In order to ensure that the AOC does not backslide to “impaired “status, continued efforts to improve fish and wildlife habitat are essential. Such efforts include continuing to acquire and restore wetlands, create fish passage at dams, and address land use–related impacts on the watershed. Ongoing, long-term monitoring of the quantity and quality of protected wetlands will be extremely important to ensure the success of restoration and protection efforts.

Twelve beneficial use impairments (BUIs)¹ were identified in the Saginaw River/Bay AOC, including *Degradation or Loss of Fish and Wildlife Habitat (Habitat)*, *Degradation or Loss of Fish and Wildlife Populations (Populations)*, and *Bird or Animal Deformities or Reproductive Problems (Deformities/Reproduction)*. At the time the AOCs were designated, no quantitative criteria for listing or delisting particular BUIs existed. BUIs were often identified based on largely qualitative or anecdotal information. This is particularly true for both the *Habitat* and *Populations* BUIs.

In 2006, the Michigan Department of Environmental Quality (MDEQ) developed *Guidance for Delisting Michigan's Great Lakes Areas of Concern (Guidance)*, which was updated in 2008. The *Guidance* document includes restoration criteria for the 14 BUIs identified under the Great Lakes Water Quality Agreement. For 12 of the BUIs, the *Guidance* includes measurable targets for demonstrating restoration success across Michigan's AOCs. However, for the *Habitat* and *Populations* BUIs, it was not practical to have statewide targets for restoration because of the local and varied nature of these impairments.

The restoration criteria in the statewide *Guidance* for these BUIs are the guidelines for local Public Advisory Councils (PACs) to set locally derived restoration targets and plans for fish and wildlife habitat and populations. Local PACs, with the assistance of a technical committee, are responsible for deciding the type and location of necessary restoration activities within the AOC. The statewide *Guidance* outlines the six components required in the restoration plans (see the Fish and Wildlife Plan for Delisting section below).

The Partnership for the Saginaw Bay Watershed (Partnership) was formed in 1995 and serves as the PAC for the Saginaw River/Bay AOC. It has taken the lead on developing this fish and wildlife plan in partnership with a technical committee, originally formed in 2007 and reconvened in 2012, made up of members from the following organizations:

- The Conservation Fund (TCF)
- Ducks Unlimited (DU)
- Michigan Department of Environmental Quality (MDEQ)
- Michigan Department of Natural Resources (MDNR) Fisheries Division
- Michigan Department of Natural Resources (MDNR) Wildlife Division
- The Saginaw Basin Land Conservancy (SBLC)

Additional input was provided in 2012 by

- Bay County Department of Environmental Affairs and Community Development
- United States Fish and Wildlife Service

FISH AND WILDLIFE PLAN FOR DELISTING

The statewide *Guidance* requires the development and implementation of local restoration plans for addressing Fish and Wildlife (F&W) impairments. The F&W plan developed for each AOC with these impairments must be part of the Remedial Action Plan (RAP) for the AOC, and contain at least the following components (MDEQ, *Guidance*, 45):

¹ For the full list of BUIs and current status, please see the MDEQ information page on the Saginaw River/Bay AOC, available at http://www.michigan.gov/deq/0,1607,7-135-3313_3677_15430_57420---.00.html (accessed 9/2/12).

1. A short narrative on historical fish and wildlife habitat or population issues in the AOC, including how habitat or populations have been impaired by water quality.
2. Description of the impairment(s) and location for each aquatic habitat or population site, or for multiple sites where determined appropriate at the local level to address all habitat or population issues identified in the RAP and RAP updates.
3. A locally derived restoration target for each impacted habitat or population site. Sources of information for targets may include data from social science surveys, if appropriate. Habitat restoration targets may be based on restoration of fish and wildlife populations, if appropriate.
4. A list of all other ongoing habitat or population planning processes in the AOC, and a description of their relationship to the restoration projects proposed in the plan.
5. A scope of work for restoring each impacted aquatic habitat or population site. The scope of work should describe specific habitat or population restoration action(s) to be completed, including:
 - a. Timetable
 - b. Funding
 - c. Responsible entities
 - d. Indicators and monitoring
 - e. Evaluation process based on indicators
 - f. Public involvement
6. A component for reporting on habitat or population restoration implementation action(s) to the MDEQ.

Delisting of the *Habitat* and *Populations* BUIs will be based on achievement of full implementation of actions in the steps listed above. Habitat values and populations need not be fully restored prior to delisting, as some may take many years to recover after actions are complete. In addition, actions already implemented in AOCs are also reported and evaluated in this document.

Summary of Past Fish and Wildlife Population Issues in the Saginaw AOC

When the Saginaw River/Bay was designated as an Area of Concern (AOC) in 1987, *Degradation or Loss of Fish and Wildlife Habitat (Habitat)* and *Degradation or Loss of Fish and Wildlife Populations (Populations)* were identified as two of the 12 beneficial use impairments (BUIs) in the AOC. These two BUIs were listed for the following reasons:

- Decline and impairment of fish and wildlife populations, particularly fish-eating birds, from high levels of toxic contaminants in the water and sediments of the river and bay
- Decline in populations of key recreational and commercial fisheries due to low dissolved oxygen from nutrient enrichment in the Saginaw River and Bay
- Loss and degradation of coastal wetlands from land use change
- Loss and degradation of fish spawning areas in the bay and tributaries from sedimentation and decreased access to spawning areas when tributaries were dammed

These were the primary issues that resulted in the designation of the *Habitat and Populations* BUIs in the AOC, and they were subsequently addressed in the original 1988 Remedial Action Plan (RAP), as well as RAP updates in 1995, 2001, and 2012.

The 1988 RAP focused primarily on fish and wildlife issues related to toxic contamination and nutrient enrichment. While the vital importance of the Saginaw Bay wetland complex to fish and wildlife was discussed, none of the 101 recommendations in the original RAP were directly related to habitat preservation or restoration (MDNR 1988). By the time the 1995 RAP update was written, however, preservation and restoration of coastal wetlands and the need for restoration of critical fish spawning areas were both identified as key components of increasing and improving fish and wildlife populations in the AOC.

Great Lakes-wide factors affecting fish and wildlife populations, such as invasive species, over-fishing, and subsequent changes in the predator-prey balance of the fish community, are not part of the basis for the BUIs because their impacts are not localized within the AOC boundary.

TOXIC CONTAMINANTS AND NUTRIENT ENRICHMENT

At the time Saginaw River/Bay was designated an AOC, high levels of toxins in the water column and sediments were impacting fish and wildlife through bioaccumulation in the food chain. The effects were high tissue concentrations of contaminants and deformities and/or reproductive problems in migrating and local species of wildlife in the Saginaw Bay watershed. This issue was a primary focus of the original 1988 RAP for the Saginaw River/Bay AOC, and many of the document's 101 recommendations were aimed at addressing sediment contaminant remediation. The effects of both toxic contamination and nutrient enrichment on fish and wildlife in the AOC are addressed through two other BUIs—*Restrictions on Fish and Wildlife Consumption* and *Bird and Animal Deformities or Reproductive Problems*. Thus, they will not be a focus of the restoration plan for fish and wildlife habitat and populations for the Saginaw River/Bay AOC.

Similarly, nutrient enrichment of the Saginaw River and Bay from wastewater treatment plant discharge and runoff from the substantial agriculture surrounding the river and bay historically resulted in abundant algae growth in the bay and subsequent low levels of dissolved oxygen with

algae die-off. Fisheries were impacted by nutrient enrichment because the traditional sport fish species could not survive in the low dissolved oxygen levels in the water. This, too, was a significant focus of the original RAP and 1995 RAP update for the AOC, and significant progress has been made on this front since the Saginaw River and Bay were designated as an AOC. Since 1972, more than \$830 million has been invested in wastewater treatment systems by communities in the watershed (PSC 2012). Best management practices and watershed plans have helped reduce some of the runoff from agricultural and suburban areas within the watershed (MDNR 1995), though there remains considerable work to do on this issue. Nutrient enrichment is addressed through a separate BUI, *Eutrophication or Undesirable Algae*, which was assessed in a separate study in 2012 and is not the focus of this restoration plan.

LOSS OR DEGRADATION OF COASTAL WETLANDS

Prior to European settlement Saginaw Bay contained one of the most extensive wetland and wet prairie complexes in the Great Lakes. The Saginaw Bay watershed was estimated to be covered with roughly 700,000 acres of wetlands, with nearly 37,000 acres of emergent vegetation around Saginaw Bay. Changes in land use, as agriculture and urban development have increased, have resulted in significant losses of wetlands along the Saginaw River and Bay in the last 150 years (PSC 2000; PSC 2002).

The original 1988 RAP for the Saginaw River/Bay identified the importance of the expansive coastal wetlands in the Saginaw Bay to fisheries and migrating waterfowl, as well as to other aquatic species. The document noted that during spring and fall migration, groups of more than 250,000 ducks were counted in the bay. While there were still significant coastal wetlands within the AOC at that time, conversion to agriculture and increasing urbanization had already reduced much of this important habitat (MDNR 1988). The RAP identified the importance of protecting and restoring coastal wetlands as a measure of improving the fish and wildlife populations in the AOC. While none of the original 101 recommendations in the 1988 RAP were targeted specifically toward habitat preservation and restoration, several of the recommendations were aimed at restoring or improving hydrologic conditions and reducing nonpoint source impacts on fish and wildlife in the bay, both of which can be accomplished through restoration of historic wetlands and lakeplain prairie.

Specific recommendations for habitat conservation or restoration were not included in the RAP until subsequent updates in 1995 and 2001. In those documents, loss and degradation of habitat was identified as a significant issue in the AOC. In particular, the updated RAPs focused on the impacts to critical nursery and spawning areas of historically important fish species in Saginaw Bay, including walleye, yellow perch, lake herring, and lake trout. Waterfowl identified as most significant included mallards, teal, and Canada geese (MDNR 1995; PSC 2002).

In the 1995 RAP update, the Habitat Technical Advisory Committee identified four major categories of habitat issues that needed to be addressed in the AOC: (1) land use, (2) coastal shoreline, (3) habitat fragmentation, and (4) threatened and endangered species. While no specific habitat density targets or specific geographic areas were identified for habitat restoration within the AOC, the update emphasized the importance of coastal wetland areas and areas with threatened or endangered species (MDNR 1995).

Several reports that followed the 1995 RAP update began to focus on and prioritize specific areas and types of coastal wetland habitat in the Saginaw River and Bay for protection and restoration. In 2000, the Wildlife Stewardship Task Group of the Saginaw Watershed Initiative Network developed a Saginaw Bay Watershed Wildlife Habitat Conservation Framework, which identified

habitat lakeward/riverward of the 585-foot contour² as the highest priority for habitat conservation and restoration in the watershed. The majority of this land is near the Saginaw Bay shoreline and inland at Fish Point, Quanicassee, and Wigwam Bay, and upstream in the Saginaw River, particularly at Crow Island and Shiawassee Flats (Nelson 2000).

Also in 2000, the Partnership for the Saginaw Bay Watershed (Partnership) contracted with Public Sector Consultants Inc. (PSC) to conduct a study, *Measures of Success: Addressing Environmental Impairments in the Saginaw River and Saginaw Bay (Measures)* (PSC 2000), which described progress that had been made in addressing BUIs in the AOC since 1988 and identified specific targets for restoring the original 12 BUIs, including *Degradation or Loss of Fish and Wildlife Habitat*, and *Degradation or Loss of Fish and Wildlife Populations*.

The Partnership again worked with PSC to incorporate the targeted restored conditions developed in the 2000 *Measures* report into a 2001 RAP update for the AOC, *Targeting Environmental Restoration in the Saginaw River/Bay Area of Concern: 2001 Remedial Action Plan Update* (PSC 2002). In both of these documents, coastal wetlands were identified as a priority for preserving and restoring lost habitat for fish and wildlife within the AOC. The primary goal identified for habitat protection and enhancement was to protect existing fish and wildlife habitat, particularly wetlands and other spawning and nursery areas. Restoration of critical habitat—particularly coastal marshes and wet prairies—to make up for previous loss of wetlands was identified as a secondary goal for the AOC (PSC 2000; PSC 2002). The resulting restoration goal was set to permanently protect 60 percent of the existing wetlands in the AOC and prioritize the remaining 40 percent for protection.

The Michigan Department of Environmental Quality (MDEQ) funded a study in 2003 to evaluate potential coastal wetland habitats in Saginaw Bay for possible restoration. This report evaluated 12 sites along Saginaw Bay to determine baseline characteristics of those sites and begin to identify sites in public ownership that have the highest potential for restoration (Burton et al. 2003).

Over the last decade considerable work has been done by numerous organizations to preserve priority wetlands along the AOC boundary and track progress toward restoration goals including assessments of the amount of preserved wetlands 2002, 2005, 2008, and 2010.

In 2011 and 2012, DU worked with organizations that acquire and protect land within the Saginaw Basin to update the Conservation and Recreation Lands database and the analysis of preserved wetlands relative to AOC restoration targets in a project receiving funding support from the National Oceanic and Atmospheric Administration. The U.S. Fish and Wildlife Service contracted with PSC to review aspects of the wetland analysis, facilitate technical committee review, and summarize progress and recommendations.

LOSS OR DEGRADATION OF FISH SPAWNING AREAS

In addition to loss of wetland habitat, degradation or loss of other critical fish spawning areas has been identified as a source of fishery impairment in the Saginaw River/Bay AOC. The sedimentation of valuable rock reefs in the inner Saginaw Bay is of particular concern, as is diminished access to historic spawning areas caused by the construction of dams on many of the Saginaw River's tributaries.

² The 585-foot contour refers to record high levels of Lakes Huron and Michigan (581.10 feet, according to the U.S. Geological Survey Datum in 1986) plus about 2 feet to account for storm surge with a strong northeast wind. Thus, the 100-year floodplain in this area is 585.2' USGS. Anything below that level would be subject to flooding.

Historically, Saginaw Bay had honeycombed rock reefs, occurring in water from six to 120 feet deep, which provided valuable spawning and nursery areas for key recreational and commercial fisheries, including walleye. These areas, particularly at the mouth of the Saginaw River along the Coryeon Reef and near Charity Island, were prime spawning areas for Lake Huron fisheries as a whole (MDNR 1988). As surrounding land was developed for agricultural, suburban and urban land uses, and the hydrologic flow of the Saginaw River was altered by increased rates of storm runoff resulting from poor land-use practices, vast amounts of sediment washed into the inner Saginaw Bay and covered these rock reefs. As a result, critical fish spawning habitat was eliminated. While much progress has been made in controlling upland sediment erosion into the Saginaw River and tributaries, high sedimentation rates are still problematic in the AOC (PSC 2000). Restoration of reefs in Saginaw Bay remains an important priority from a Lake Huron fishery perspective (Lake Huron Binational Partnership 2008). However, restoration targets for removal of the BUIs are not directly related to reef restoration.

In addition to the degradation of the inner bay reefs, access to upstream spawning areas for the Lake Huron and Saginaw Bay fisheries has been severed by the construction of more than 300 dams on tributaries within the Saginaw Bay Watershed. These dams were constructed without fish passage devices, and thus eliminated tributary spawning access for walleye, lake sturgeon, and several other key fish species. Many of these dams have outlasted their original use or capacity, and have been considered for modification or removal to reconnect tributary spawning areas. In 2005 PSC conducted a study, *Enhancing Fish Passage over Low-head Barrier Dams in the Saginaw River Watershed*, which evaluated the potential for creating fish passage or removing some tributary dams as a means of opening access to historic spawning areas, primarily for walleye and lake sturgeon. The City of Frankenmuth, on the Cass River, participated as a case study for the evaluation. The Chesaning Dam on the Shiawassee River and the Dow Dam on the Tittabawassee River were also included as focus areas. The report concluded that enhancing fish passage on some of the Saginaw River's tributaries would be socially and economically acceptable, and could provide important access to historical fish spawning areas necessary to rebuild self-sustaining fish populations (PSC 2005). Based on the results of this study and others that followed, a rock ramp³ has been constructed at the site of the Chesaning dam to provide fish passage to previously inaccessible areas. Similarly, the city of Frankenmuth has advanced plans to construct a rock ramp at the site of the Frankenmuth Dam.

³“Rock ramp fishways modify the riverbed grade directly downstream of a dam crest by constructing a wedge to create a passable slope over a dam... Rock ramp fishways emulate natural rapids, and thus, not only completely eliminate the hydraulic roller and pass a wider range of fish species but also provide habitat similar to that lost due to dam construction. The rock ramp fishway approach works well on low head dams, but has practical limitations on higher head dams due to the quantity of fill material need and stability issues” (Schweiger 2011).

Previous Targets

In previous reports, individual targets were established for various fish and wildlife species to measure restoration of the *Degradation or Loss of Fish and Wildlife Populations (Populations)* beneficial use impairment (BUI); targets relating to preserved wetlands were established for the *Degradation or Loss of Fish and Wildlife Habitat (Habitat)* BUI. Due to increasingly complex ecosystem changes caused by invasive species and food web alteration, species specific targets were determined to no longer be reliable indicators of achievable restoration in the Area of Concern (AOC). The target for the *Populations* BUI was coupled with the *Habitat* BUI such that once the wetland targets were met, the impaired status for both beneficial uses would be removed because quality habitat will positively affect population levels.

During the 2010 BUI status assessment, at the recommendation of the Michigan Department of Environmental Quality (MDEQ), restoration targets for the two BUIs were decoupled because habitat restoration alone may not guarantee population restoration and there was a need to consider the contaminant issues related to wildlife specifically. The report recommended a re-evaluation of species-specific and other restoration targets for the *Populations* BUI. The targets for the *Habitat* BUI remained unchanged since they were originally developed in 2000.

FISH SPECIES–SPECIFIC TARGETS

The 2000 *Measures of Success: Addressing Environmental Impairments in the Saginaw River and Saginaw Bay (Measures)* and 2001 Remedial Action Plan (RAP) update reports included species-specific restoration targets for three fish species—walleye, yellow perch, and lake sturgeon—which were identified as the best indicator species for determining recovery of conditions necessary to sustain general fish populations in the bay. Protection and restoration of critical spawning areas for these species have been identified as key measures for attaining these targets within the Saginaw AOC.

Walleye

The goal for walleye is increased abundance in the bay, ultimately through natural reproduction, such that growth rates more closely approximate statewide averages for this species and reflect improved use of available forage in the bay. When this target was set, walleye growth rates were approximately 120–130 percent of the statewide average. This was an indication of an imbalance in the predator-prey relationship in the bay ecosystem.

Historically, walleye populations collapsed in the mid-1940s due to a combination of pollution, commercial over-fishing, and the proliferation of invasive species including alewife and rainbow smelt. Populations were rebuilt by an aggressive stocking program conducted by the Michigan Department of Natural Resources (MDNR) in cooperation with local angling groups, beginning in the late 1970s. This stocking program succeeded in producing a world-class walleye sport fishery and building a large broodstock of adult walleye that were able to take advantage of the changing bay environment and reproduce successfully. Walleye has not been stocked in the bay since 2005 because natural reproduction has met management goals. This is largely a result of the collapse of the Lake Huron population of alewife, which are extremely effective predators on the newly hatched fry of walleye and many other native fish species. The alewife collapse likely resulted from alteration of the food web due to colonization of the lake by non-native zebra and quagga mussels, which remove plankton that alewife require for food from the water. The walleye population in the bay is now entirely reliant on natural reproduction, due in large part to the availability of contiguous spawning habitat.

The measurable recovery target for walleye was set to achieve a population density such that walleye grow no faster than 110 percent of the state average mean length at age three. The walleye population met this goal for the first time in 2006, and again in 2007, but it is not known whether this goal will be sustainable in the future, as the food web continues to change. For this reason, the technical committee in 2008 and 2012 concluded that the walleye target can no longer be used as a relevant target for monitoring restoration of these BUIs. While walleye population cannot be used as a proxy for delisting, it remains an essential indicator for the health of the Saginaw Bay system overall, and is a priority for ongoing restoration extending beyond AOC delisting goals.

Yellow Perch

The recovery target initially set for yellow perch called for a sustained annual harvest of 750,000 pounds per year with increasing abundance of larger, faster-growing individuals (PSC 2000).

Since the target was set in 2000, managers have determined that the target is problematic because it focuses on sustained annual harvest rather than the overall health of the yellow perch population. In 2008, the technical committee recommended that this goal should be amended to parallel the walleye goal; it should focus on an increase in abundance, sustained natural reproduction, and a growth rate that approximates the statewide average.

Yellow perch populations have also been impacted by the recent collapse of the alewife. Perch natural reproduction has increased as a result of decreased perch fry predation by alewives. Yellow perch reproduction has resulted in extremely large hatches in recent years. However, due to the absence of alewives as food for adult walleye and other predator species, young-of-the-year perch are now subject to high rates of predation by many species.

Additionally, due to the decrease in available plankton for food resulting from the colonization of invasive mussels, many young perch do not grow fast enough during their first summer to accumulate sufficient energy reserves to survive their first winter (PSC 2000).

As a result of these factors, the perch population in the Saginaw Bay is unstable. While it does exhibit high rates of natural reproduction, survival to yearling size is poor as a result of the combined effects of food web alteration and high mortality due to predation. Growth rates of perch surviving past the age of one are very good, but numbers of larger perch are near historic lows. Based on this information it is likely that perch are impacted by predator-prey imbalances, rather than a lack of available spawning habitat.

Finally, the issues presenting challenges to the yellow perch populations of the Saginaw River and Bay are not distinguishable from those impacting populations in greater Lake Huron, including food web disruption and competition from aquatic invasive species. For this reason, the 2008 technical committee concluded that the yellow perch target can no longer be used as a relevant target for monitoring restoration of these BUIs, which was reaffirmed in 2012. While yellow perch populations cannot be used as a proxy for delisting, they remain an essential indicator essential indicator for the health of the Saginaw Bay system overall, and are a priority for ongoing restoration extending beyond AOC delisting goals.

Lake Sturgeon

The recovery target set in 2000 for lake sturgeon called for documented evidence of natural reproduction in Saginaw Bay.

In 2008, the technical committee recommended that this target should be amended to include tributaries because sturgeon may not spawn again in the bay proper. One young-of-the-year sturgeon was found in the Rifle River in 2002. Commonly, sturgeon are found singly, and no evidence of natural reproduction has been documented (PSC 2008).

Again, the challenges to the sturgeon recovery in the Saginaw River and Bay are indistinguishable from those impacting sturgeon populations beyond the AOC boundary, including lack of access to historic spawning locations and a limited population of sexually mature sturgeon. For this reason, the 2008 technical committee concluded that the sturgeon target can no longer be used as a relevant target for monitoring restoration of these BUIs, which was reaffirmed in 2012. While sturgeon cannot be used as a proxy for delisting, sturgeon populations remain an essential indicator for the health of the Saginaw Bay system overall, and are a priority for ongoing restoration extending beyond AOC delisting goals.

WILDLIFE-SPECIFIC RESTORATION TARGETS

The restoration targets established for wildlife species in previous reports focused on limitations to reproduction resulting from bioaccumulation of chemical contamination. The species of interest were fish-eating birds, specifically bald eagles and herring gulls. The chemical contamination issues are addressed under the *Bird or Animal Deformities or Reproductive Problems* BUI, which is not the focus of this report.

Restoration Targets for Delisting and Current Status

The primary types of impaired habitat in the Area of Concern (AOC) are coastal wetlands, associated upland buffers, and other fish spawning areas such as reefs and upstream tributaries. The restoration targets for *Degradation or Loss of Fish and Wildlife Habitat (Habitat)* and *Degradation or Loss of Fish and Wildlife Populations (Populations)* beneficial use impairments (BUIs) for the Saginaw AOC focus on coastal wetlands and other fish spawning areas, consistent with the restoration targets provided below.

RESTORATION CRITERIA: A TIERED RESTORATION APPROACH

Many of the BUIs in the Saginaw River and Bay AOC have overlapping causes for which they were originally identified. As noted in previous sections, the following BUIs are related: (A) *Loss of Fish and Wildlife Habitat (Habitat)*, (B) *Bird or Animal Deformities or Reproductive Problems (Deformities/Reproduction)*, and (C) *Degradation of Fish and Wildlife Populations (Populations)*.

The Michigan Department of Environmental Quality (MDEQ) determined that it would require a tiered approach to removal of these BUIs for the Saginaw River and Bay AOC such that the (A) *Habitat* and (B) *Deformities/Reproduction* BUIs must be removed before the (C) *Populations* BUI. The removal of (A) *Habitat* BUI and (B) *Deformities/Reproduction* BUI need not occur in a particular order. The restoration criteria for these BUIs in the Saginaw River and Bay AOC are as follows:

(A) Loss of Fish and Wildlife Habitat

As developed through previous planning efforts, the *Habitat* BUI will be considered restored when:

- o at least 60 percent of the coastal marsh areas (below the 585-foot contour) and adequate upland buffers representing essential fish and wildlife habitat are preserved through public ownership, covered under conservation easements, or otherwise protected under agreements with landowners; and
- o the most vulnerable portions of the remaining 40 percent of the essential coastal marsh areas have been clearly identified so that governmental agencies, local conservation/environmental organizations, and concerned citizens can monitor their status, enhance enforcement of existing laws, and conduct public educational programs to better protect these areas (PSC 2000).

(B) Bird or Animal Deformities or Reproductive Problems

The *Deformities/Reproduction* BUI will be considered restored when the following occurs:

“Restoration of this BUI will be demonstrated using two approaches, depending on availability of data in a particular AOC. The first approach evaluates restoration based on field assessment of birds and/or other wildlife in those AOCs where MDEQ or other State-approved bird and wildlife data are available. The second approach will be applied in those AOCs where bird and other wildlife data are not available, and uses levels of contaminants in fish tissue known to cause

reproductive or developmental problems as an indicator of the likelihood that deformities or reproductive problems may exist in the AOC.” For a complete description of the restoration criteria see page 22 of the *Guidance for Delisting Michigan’s Great Lakes Areas of Concern* (MDEQ 2008).

(C) Degradation of Fish and Wildlife Populations

The *Populations* BUI restoration criteria were developed by the technical committee as part of the 2012 planning effort. An assessment of the status of conditions in the AOC and rationale for the below restoration criteria is provided in the Rationale section on page 19.

- o The *Loss of Fish and Wildlife Habitat* BUI is removed
- o *Bird or Animal Deformities or Reproductive Problems* BUI is removed
- o Great Lakes fish species such as walleye pass the barriers at Chesaning and Frankenmuth in significant numbers based on qualitative assessments by local fisheries managers.

CURRENT CONDITIONS

Current conditions within the AOC relative to the restoration criteria for each of the BUIs is summarized below.

Loss of Fish and Wildlife Habitat BUI: Coastal Wetlands

In the 2000 PSC report, *Measures of Success: Addressing Environmental Impairments in the Saginaw River and Saginaw Bay*, and the 2001 RAP update for the AOC, coastal wetlands were identified as a priority for preserving and restoring lost habitat for fish and wildlife within the AOC. The primary goal identified for habitat protection and enhancement was to protect existing fish and wildlife habitat, particularly wetlands and other spawning and nursery areas. Restoration of critical habitat—particularly coastal marshes and wet prairies—to make up for previous loss of wetlands was identified as a secondary goal for the AOC.

The *habitat restoration targets* identified in these previous documents were:

- at least 60 percent of the coastal marsh areas (below the 585-foot contour) and adequate upland buffers representing essential fish and wildlife habitat are preserved through public ownership, covered under conservation easements, or otherwise protected under agreements with landowners; and
- the most vulnerable portions of the remaining 40 percent of the essential coastal marsh areas have been clearly identified so that governmental agencies, local conservation/ environmental organizations, and concerned citizens can monitor their status, enhance enforcement of existing laws, and conduct public educational programs to better protect these areas (PSC 2000).

In 2001, progress on this goal was assessed by Ducks Unlimited (DU). That research suggested that approximately 20–30 percent of coastal wetlands were protected at that time (PSC 2002).

Since then, conservation and restoration activities and periodic status assessments have continued. A 2007 DU assessment indicated that approximately 58 percent of the wetland areas below the 585-foot contour were protected under public ownership and permanent easements (PSC 2008). In 2010, the estimate was re-evaluated and showed that approximately 57 percent of wetland areas below the 585-foot contour were protected. Initially, it appeared that the amount of preserved wetlands had decreased but upon further analysis a discrepancy was found in the 2007

estimate. In 2007, some database records were double counted, which overstated the amount of preserved wetlands. The 2010 report provided a more accurate estimate and recommended that the Partnership for the Saginaw Bay Watershed and DU seek funding to update the Conservation and Recreation Lands (CARL) database, which is one of the underlying datasets used to generate the wetland preservation estimate and contains information on parcels that are permanently protected (PSC 2010).

In 2012, DU completed an effort to update the CARL database relative to the Saginaw basin. Through this effort they coordinated with federal, state, and local government agencies, as well as nonprofit groups that conserve land through acquisition of property and conservation easements. When the CARL update was completed DU reanalyzed the amount of preserved wetlands below the 585-foot contour. At this time DU revised the methodology developed for previous estimates by using more accurate and precise datasets including an updated digital elevation model to generate the estimated 585-foot contour, and municipal parcel data available from local governments in a geographic information systems (GIS)-compatible format. DU's 2012 analysis⁴ shows that 60 percent of wetlands below the 585-foot contour that are contiguous to the AOC boundary are permanently preserved and indicates that this target has been met (see Exhibits 2 and 3) (DU 2012b).

Considering Uncertainty

As is the case with any analysis that represents on-the-ground conditions using geospatial data, several factors contribute to uncertainty regarding the analysis of total and preserved wetlands. DU's analysis relies on multiple data sources compiled in a geographic information system (GIS). Underlying datasets used within the assessment include limitations that can individually affect the analysis of total wetlands and the amount of preserved wetlands positively (i.e., a greater percentage preserved) and negatively (i.e., a lesser percentage preserved). Known sources of uncertainty include:

- Not all preserved lands are included in the CARL dataset. For example, the Michigan Department of Natural Resources was unable to provide updated land acquisition information to DU before the 2012 analysis was completed. Likewise, other lands that are preserved in perpetuity by other individuals and organizations may not be reflected in the dataset. This source of uncertainty could mean that the amount of preserved wetlands is understated.
- In limited instances, the CARL dataset has previously included lands that were not preserved. DU's recent efforts worked to identify and correct these occurrences. If such lands persist in the dataset it could overstate the amount of preserved wetlands.
- The National Wetlands Inventory (NWI) dataset was used as a main source to identify wetland areas contiguous to the AOC. In a separate report, DU assessed the accuracy of the NWI dataset concluding that the dataset has a 96.4 percent accuracy rate for classifying and quantifying wetlands in Great Lakes states (DU 2012a). This accuracy rate included both false positives and false negatives and, thus, has the potential to overstate or understate the amount of preserved wetlands.⁵
- Wetland boundaries are dynamic and can change over time; short and long-term climactic conditions as well as hydrologic changes related to surrounding land use contribute to

⁴ DU's updated assessment methodology and datasets yielded different results than prior estimates, particularly regarding the universe of total wetlands. A description of the reasons for these differences is available in its 2012 *Refining and Updating the Wetland Protection Status in the Saginaw Bay Coastal Plain* report.

⁵ The 96.4 percent accuracy rate was calculated for wetlands in Ohio and Illinois. While an estimate was prepared for Michigan, the sample size was not large enough to yield reliable results. The estimate for Ohio and Illinois was considered to be transferable to Michigan (DU 2012a).

boundary changes. This source of uncertainty could overstate or understate the amount of preserved wetlands.

- The accuracy of estimates generated from geospatial data are affected by the resolution of the dataset. In general, the finer the resolution the more accurate estimates will be. In DU's 2012 analysis a finer resolution digital elevation model was used to generate the 585-foot contour line than in previous analyses. Differences between the modeled elevation and actual elevation may still occur. For example, the model may show particular points at 585 feet above sea level while on the ground the same points may be a few feet higher and others may be a few feet lower. This source of uncertainty could overstate or understate the amount of preserved wetlands meeting restoration criteria.

Since tracking first began, it was considered likely that negative and positive contributing factors of uncertainty likely offset each other. In other words, instances of false positives are generally of the same magnitude as false negatives. DU's analysis used the best available data, which overtime has generally improved. The technical committee has reviewed methods and results of DU's analysis with each iteration as progress toward BUI restoration has been tracked.

DU's 2012 assessment methodology and datasets yielded different results than prior estimates, particularly regarding the universe of total wetlands. A description of the reasons for these differences is available in its 2012 *Refining and Updating the Wetland Protection Status in the Saginaw Bay Coastal Plain* report.

EXHIBIT 2 Protected Wetlands, 2012

| Protection Type* | Wetland Type** | | | | | | Upland | Total*** |
|----------------------------------|----------------|----------|-------|------------|-------------|-------|--------|----------|
| | Forested | Emergent | Shrub | Open Water | Aquatic Bed | Mixed | | |
| Federal | 1,684 | 1,890 | 61 | 363 | 0 | 445 | 3,970 | 8,411 |
| State | 3,803 | 7,084 | 608 | 541 | 660 | 3,322 | 7,780 | 23,797 |
| County | 2 | 97 | 24 | 14 | 3 | 88 | 225 | 452 |
| Local | 2 | 11 | 2 | 38 | 0 | 49 | 406 | 509 |
| NGO | 67 | 276 | 10 | 31 | 0 | 61 | 598 | 1,043 |
| Private | 206 | 37 | 0 | 17 | 0 | 28 | 120 | 408 |
| Total wetland protected | 5,764 | 9,394 | 705 | 1,004 | 662 | 3,993 | NA | 21,522 |
| Wetlands currently not protected | 3,717 | 4,385 | 1,202 | 2,310 | 44 | 2,728 | NA | 14,386 |
| Total wetland acreage | 9,480 | 13,779 | 1,907 | 3,314 | 707 | 6,721 | NA | 35,908 |
| Percentage protected | 61% | 68% | 37% | 30% | 94% | 59% | NA | 60% |

SOURCE: Ducks Unlimited, 2012b.

*Protection Type: protection type was determined from Ducks Unlimited/TNC CARL layer for Michigan, see <http://glaro.ducks.org/CARL>.

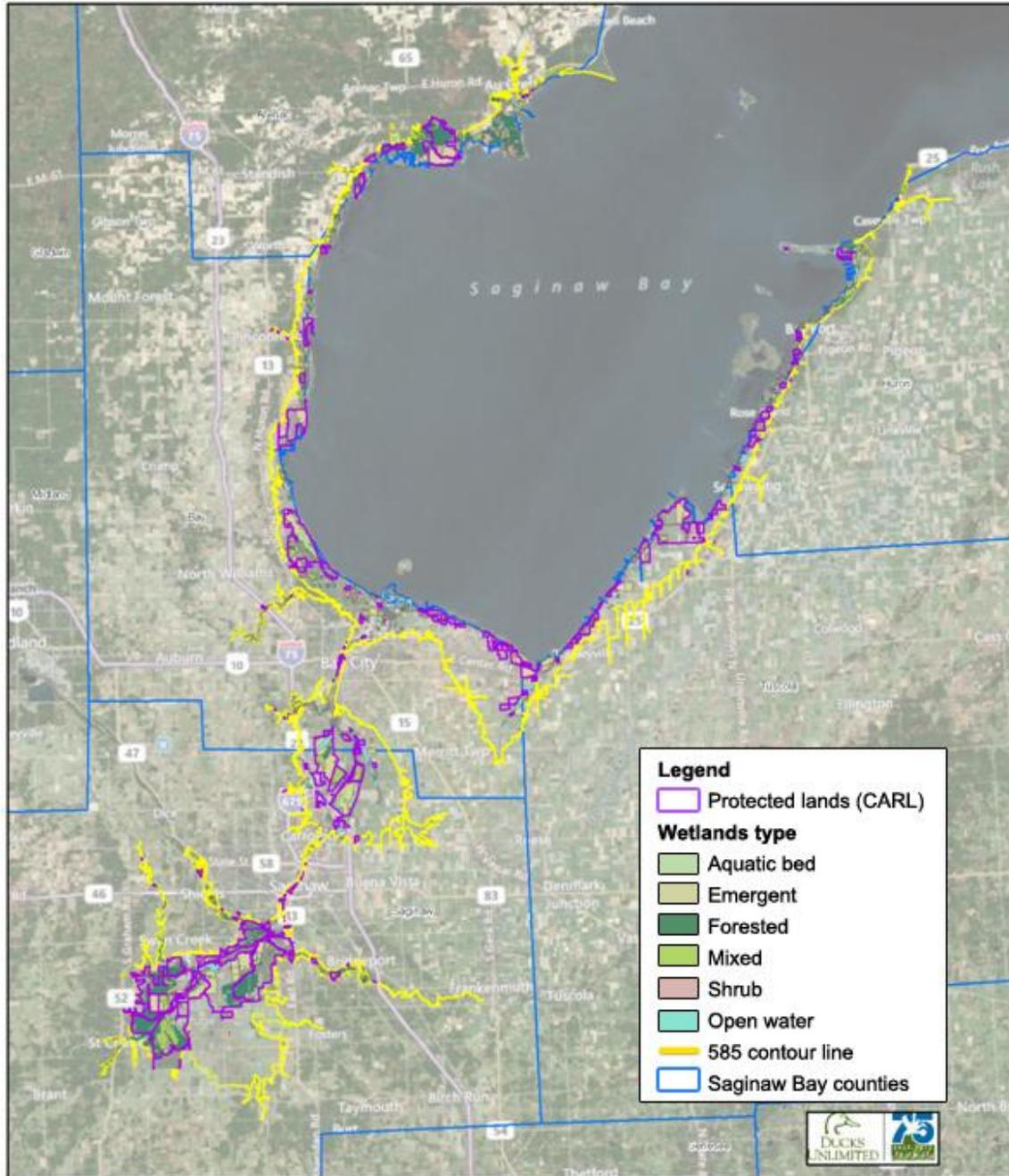
**Wetland Type: wetland type was determined by DU from their updated National Wetlands Inventory (NWI) layer.

***Totals do not sum due to rounding.

The 585-foot contour line was created from United States Geological Survey Digital Elevation Models. The shoreline boundary was created from county parcel data.

NA = Not Applicable

EXHIBIT 3
Protected Wetlands

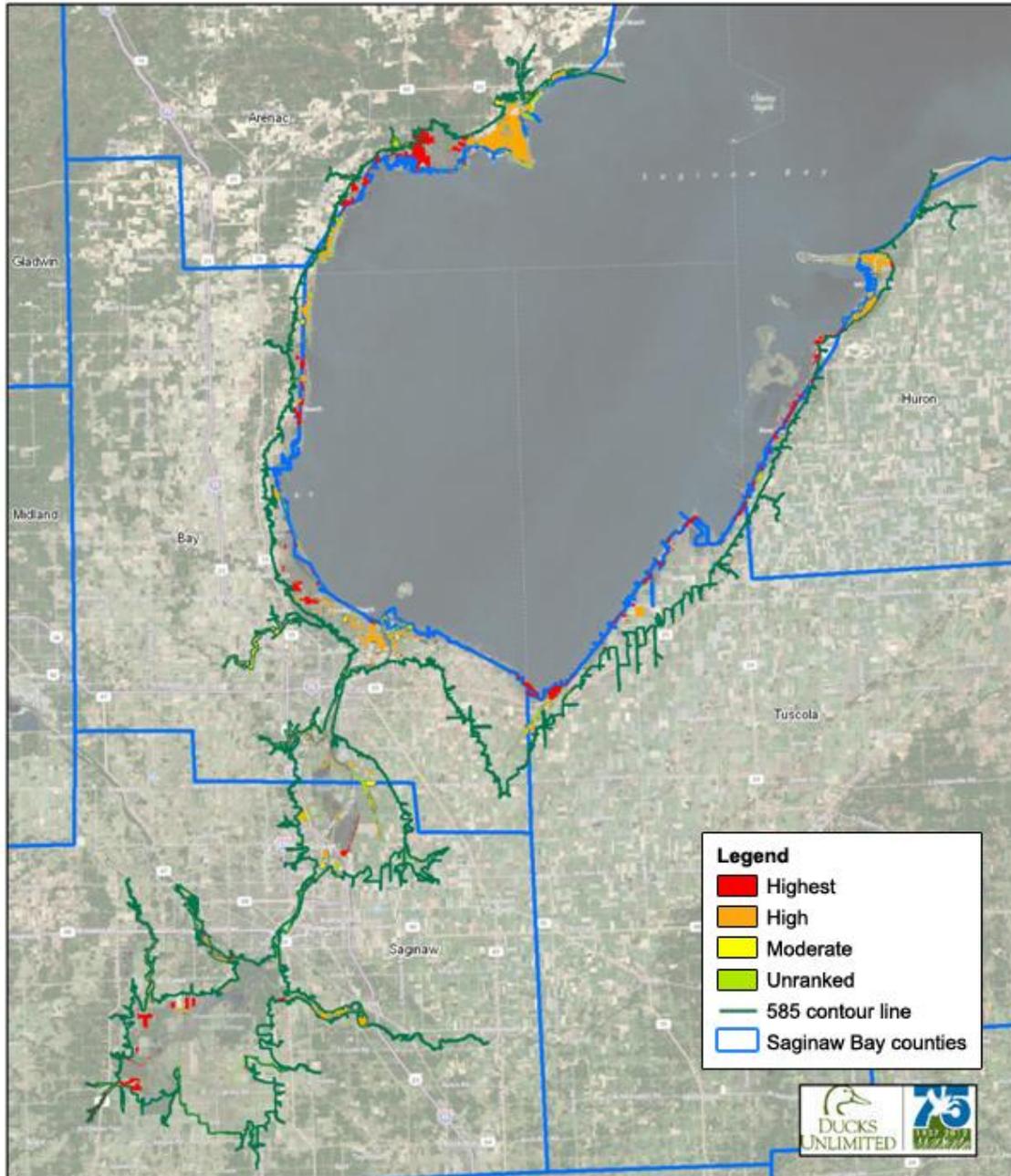


SOURCE: Ducks Unlimited, 2012b.

The second targeted restored condition for the *Habitat* BUI relates to prioritization of remaining unprotected wetlands for further protection, which was met with the 2009 publication of the *Methodology Report for Prioritizing Saginaw Bay Wetlands* (Schools et al. 2009). DU mapped the remaining unprotected wetlands applying Schools' methodology to show priority wetlands for continued preservation, as shown in Exhibit 4. Additionally, DU was able to identify individual

land owners for these areas which can be made available to groups seeking to protect wetlands. It should be noted that DU's list of priority wetland parcels for continued preservation indicates the acreage of the parcel and not the wetland acreage within the parcel. Groups continuing to preserve wetlands should evaluate these parcels further.

EXHIBIT 4 Priority Wetlands for Continued Preservation



SOURCE: Ducks Unlimited, 2012b.

Bird or Animal Deformities or Reproductive Problems BUI

The *Deformities/Reproduction* BUI is related to the *Habitat* and *Populations* BUIs but was not assessed as part of this study because the MDEQ, in coordination with the United States Fish and Wildlife Service (USFWS), concurrently assessed the status of this BUI for all Michigan AOCs for which this BUI has been identified, including the Saginaw River and Bay AOC. The results of that study were not available at the time of this writing.

Degradation of Fish and Wildlife Populations BUI: Fish Passage

Individual species-specific targets were determined to no longer be a reasonable approach to determine AOC restoration, and considering the required tiered approach for BUI removal, a new target was developed for the *Populations* BUI. The technical committee recognized that this BUI has a high degree of overlap with the *Habitat* BUI. Healthy and ample habitat is one critical component for restored populations. Healthy reproduction with only a background rate of deformities is another.

In prior assessments, fish passage along tributaries to the Saginaw River and Bay were identified as restoration goals extending beyond AOC delisting. Dams located at Chesaning (Shiawassee River), Dow (Tittabawassee River at Midland), and Frankenmuth (Cass River) have been identified in prior studies as priorities for implementing fish passage to provide access to high-quality habitat and spawning areas that enable success of strong and resilient fish populations (PSC 2005).

Based on the tiered approach described earlier (Restoration Criteria: A Tiered Restoration Approach, see page 13), the technical committee developed the following as the new targeted restored condition:

- The *Loss of Fish and Wildlife Habitat* BUI is removed
- *Bird or Animal Deformities or Reproductive Problems* BUI is removed
- Great Lakes fish species such as walleye pass the barriers at Chesaning and Frankenmuth in significant numbers based on qualitative assessments by local fisheries managers.

Rationale

The targeted restored condition for the *Population* BUI was developed after substantial consideration by technical experts and stakeholder groups that considered multiple factors in developing a new restoration criterion. Specifically, the group considered prior species-specific targets, development of new species-specific targets, the current status of barrier removal projects, and success of fish passage projects and various low-head barriers in the Saginaw Bay watershed.

Species-Specific Targets

The appropriateness of using species-specific targets developed through previous efforts was reevaluated. The technical committee reaffirmed that utilizing previously developed species-specific targets is not a good proxy to demonstrate ecosystem recovery due to complex food-web alterations and ecosystem changes related to invasive species and other factors. The technical committee then considered other potential species including American mink and various avian species that are near the top of the food web and experience the effects of biomagnification when hazardous chemicals are present in fish communities. American mink and various avian species were also considered because of Michigan State University's Tittabawassee River Wildlife project, which has collected extensive data and yielded multiple journal articles regarding these species in regions of the Saginaw Bay watershed (MSU 2012).

The MSU study indicates that mink and several bird species studied had higher levels of dioxin and furan exposure in areas downriver of Midland than the same species in areas upriver of Midland. The literature indicates that despite the contamination, population levels of mink and various bird species are not significantly impacted along the Tittabawassee River downriver of Midland in areas known to have dioxin and other contamination, when compared to populations in reference areas not known to have similar contamination. It is not known if the population in the Tittabawassee study area is a sink population or self-sustaining population. In other words, it is unknown whether the species included in this study are reproducing in the region or moving into the region from other areas.

After consideration, the technical committee noted that reproduction issues associated with contamination are best included as part of the *Bird or Animal Deformities or Reproductive Problems* BUIs. After consideration, the technical committee determined that setting targets for mink and other species included in MSU's study was not a suitable proxy because data is not uniformly available across the AOC, the likeliness of continued monitoring efforts is unknown, and prior population levels upon which a baseline can be set are not known.

Fish Passage at Low-head Barrier Dams

Fish passage at low-head barrier dams within the Saginaw Bay watershed have been the topic of numerous assessments and planning studies that have led to implementation projects at various locations in the region. In 2005, PSC conducted a study, *Enhancing Fish Passage over Low-head Barrier Dams in the Saginaw River Watershed*, documented almost 2,500 dams in Michigan, over 300 of which are located in the Saginaw Bay watershed. This report identified the Chesaning, Dow, and Frankenmuth dams as priorities for passage (PSC 2005).

The Chesaning Dam (owned by the city of Chesaning) had impeded fish passage to an estimated 37 main stem and tributary river miles. A rock ramp was installed at this location in 2008. Rock ramps have proven successful in passing fish at other locations in the country but require site-specific engineering and may require modifications after initial construction to ensure successful fish passage. The rock ramp at Chesaning is currently being monitored and evaluated to determine the success of the new structure.

The Frankenmuth Dam (owned by the city of Frankenmuth) impedes fish passage to an estimated 73 main stem and tributary river miles. A new rock ramp installation project is funded and scheduled for construction within the next five years.

The Dow Dam (owned by the Dow Chemical Company) impedes fish passage to an estimated 358 river miles along the main stem of the Tittabawassee River and connecting tributaries. Consideration was given to fish passage at the Dow Dam, which, if implemented, would open an estimated 358 main stem and tributary river miles to fish species. This dam was not included in the target because it is owned by a private rather than a public entity. Fish passage at the Dow dam and other barriers along Saginaw Bay tributaries were identified as restoration priorities extending beyond AOC delisting goals.

The fact that a rock ramp is already in place at Chesaning and plans are in the works for a similar structure at Frankenmuth begs the question as to why a target would be set related to projects that are already in progress. Passage at the Chesaning and Frankenmuth dams will open sections along two separate river systems such that risk of future degradation is decreased to augment the resiliency of the Saginaw Bay fishery. The Area of Concern program focuses on outcomes and restored conditions in AOCs, regardless of which organizations are taking actions that advance restoration or the current status of those projects. Indeed, many public and private organizations are working on projects that advance restoration of the Saginaw River and Bay. Similar to

nutrient and bacteria loading reductions associated with municipal wastewater treatment system upgrades, which are planned for, funded, and advanced by other organizations, when implemented, the projects improve environmental quality of the AOC and advance restoration of various BUIs. Thus, the *Populations* target recognizes the efforts of many groups within the region to advance fish passage projects and the importance of these projects in providing access to spawning areas and habitat in the watershed to strengthen the resiliency of the populations.

Unlike municipal wastewater treatment systems, however, where load reductions can be accurately estimated before construction, rock ramps require site-specific engineering and monitoring to ensure successful passage of Great Lakes fish species. Frequently, modifications are required to the original design. Local fishery managers indicated that a quantitative assessment would not be necessary to show success at these rock ramps through increased recruitment. Local fishery managers are well qualified to provide qualitative assessments regarding the success of the rock ramps. Once the passage projects are successfully passing fish, management actions will be in place such that the Saginaw fishery will be restored to a level consistent with non-AOC regions in the Great Lakes.

Suggested Priorities for Protection or Restoration Activities

Suggested priorities for protection or restoration are outlined for each of the *Habitat* and *Populations* beneficial use impairments (BUIs), relative to their respective restoration targets and current conditions.

DEGRADATION OR LOSS OF FISH AND WILDLIFE HABITAT

The 2012 wetlands analysis by Ducks Unlimited indicates that 60 percent of wetlands below the 585-foot contour in areas continuous to the Area of Concern (AOC) are permanently preserved and suggests that the preservation target has been met. The second restoration criterion pertaining to prioritization of the remaining unprotected wetlands for continued preservation was met through the development of *Methodology Report for Prioritizing Saginaw Bay Wetlands* (Schools et al. 2009). These lands are shown in Exhibit 4.

It is important to note that one goal of the AOC program is to restore the region to a condition that is harmonious with non-AOC regions throughout the Great Lakes. Further restoration and preservation actions are necessary to continue to advance ecosystem health in the Saginaw Bay and its watershed. The Partnership believes that it is important to continue to track land acquisition and wetland preservation.

DEGRADATION OF FISH AND WILDLIFE POPULATIONS

Beyond removal of the *Habitat* and *Deformities/Reproduction* BUIs, the new target for the *Populations* BUI requires successful fish passage at the Chesaning and Frankenmuth dams. Recommended actions for each of these sites are described below and in Exhibit 5.

Chesaning

As described above (see the Fish Passage at Low-head Barrier Dams section), a rock ramp is in place at the site of the Chesaning Dam. In 2011 modifications were made to the original design to improve the effectiveness of the rock ramp. Local fishery managers from the U.S. Fish and Wildlife Service (USFWS), the Michigan Department of Natural Resources (MDNR), and Central Michigan University are monitoring the site to determine if Great Lakes fish species are successfully passing to upstream areas. The outcome of this study will determine whether or not additional modifications to the rock ramp are necessary.

Frankenmuth

The city of Frankenmuth and the United States Army Corps of Engineers (USACE) are advancing plans to construct a rock ramp at the site of the Frankenmuth Dam. The project has been funded by the city of Frankenmuth, the USACE, and local organizations; construction is tentatively scheduled to begin in the summer of 2013. Once the rock ramp is complete, local fishery managers will be able to assess the success of the structure and work with engineers to make modifications that may be necessary.

EXHIBIT 5 Scope of Work

| | Chesaning Dam (Shiawassee River) | Frankenmuth Dam (Cass River) |
|---|---|---|
| Timetable | 1–3 years | 3–8 years |
| Funding* | Construction complete | Total project cost: \$4,134,655 Federal cost: \$2,704,326 Non-federal cost: \$1,430,329 |
| Responsible entities | <ul style="list-style-type: none"> • City of Chesaning • Army Corps of Engineers | <ul style="list-style-type: none"> • City of Frankenmuth • Army Corps of Engineers |
| Indicators and monitoring | Successful passage of Great Lakes fish species (e.g., walleye) at the rock ramp | Successful passage of Great Lakes fish species (e.g., walleye) at the rock ramp |
| Evaluation process based on indicators | Qualitative assessments by fishery managers | Qualitative assessments by fishery managers |
| Public involvement | <ul style="list-style-type: none"> • PAC coordination of activities relative to AOC restoration goals • The fish passage structure, funded partly by the federal government, qualifies as a “major federal action” that requires a public comment period on projects. | <ul style="list-style-type: none"> • PAC coordination of activities relative to AOC restoration goals • The fish passage structure, funded partly by the federal government, qualifies as a “major federal action” that requires a public comment period on projects. |

*Estimate provided by the USACE. Funding has been committed by federal and local sources.

Recent and Ongoing Planning and Restoration Efforts

Since the Saginaw River and Bay were designated as an Area of Concern (AOC) with the *Habitat* and *Populations* beneficial use impairments (BUIs), significant progress has been made in conserving and restoring habitat and enhancing populations. Numerous local, state, and federal actions have permanently protected and restored large areas of fish and wildlife habitat, and there has been significant private and nonprofit investment of time and resources to protect and restore coastal wetland and fish spawning habitat within the AOC boundary and in the contributing watershed outside the AOC boundary.

Recent and ongoing planning projects that relate to the *Habitat* and *Populations* BUIs are described below.

PLANNING PROJECTS

Ducks Unlimited, 2012

Refining and Updating the Wetland Protection Status in the Saginaw Bay Coastal Plain

Ducks Unlimited coordinated with local, state, and federal organizations to update the Conservation and Recreation Lands (CARL) database for the Saginaw Bay Watershed to identify any recently acquired or protected lands and verify existing information in the database. The CARL database is considered the most comprehensive repository of this information in Michigan. The analysis includes an updated estimate of preserved wetlands contiguous to the AOC below the 585-foot contour and identifies the highest ranked parcels for continued protection (DU 2012b).

United States Army Corps of Engineers, 2012

Frankenmuth Fish Passage Great Lakes Fishery and Ecosystem Restoration Section 506 Project, Frankenmuth, Michigan Detailed Project Report & Environmental Assessment

The United States Army Corps of Engineers (USACE) conducted an Environmental Assessment (EA) of the proposed construction of a rock ramp at the site of the Frankenmuth Dam. The EA meets the requirements of the National Environmental Policy Act (NEPA) to assess potential environmental effects of the project. The EA resulted in a preliminary finding of no significant impact (FONSI) and provides the current information about detailed information project plans (USACE 2012).

United States Army Corps of Engineers, 2011

Western Lake Huron Basin Watershed Reconnaissance Study

As described by the USACE project website,

The Western Lake Huron watershed reconnaissance study is authorized by Section 102 of the River and Harbor Act of 1966. A watershed reconnaissance study is the first phase of a larger USACE planning process. It is intended to help USACE identify impairment areas and determine if there is both federal interest and local support for conducting more detailed feasibility studies in the future. Reconnaissance studies are 100 percent federally funded. Feasibility studies are cost-shared efforts that use 50 percent federal funding and 50 percent non-federal funding, with the provision that the non-federal share may be a combination of funds and credit for eligible in-kind services necessary to complete the study. Through the watershed reconnaissance study process, USACE hopes to identify interested nonfederal cost-share partners in the WLHB” (USACE 2011).

Central Michigan University, 2010

Quantification of the Success and Potential Impacts of New Rock Ramp Fish Passages in the Saginaw Bay Watershed

Brent Murry, an assistant professor at Central Michigan University, in collaboration with the Michigan Department of Natural Resources, Michigan State University, the United State Fish and Wildlife Service, and other stakeholders, is coordinating a project to evaluate the success of the rock ramp constructed at the site of the former Chesaning Dam on the Shiawassee River and collect base line data at the site of the Frankenmuth Dam on the Cass River before the rock ramp scheduled for construction is completed. This study is expected to provide valuable information on the effectiveness of the structure which will assist local fishery managers determine the rock ramps are functioning as intended or if modification are necessary to ensure successful fish passage.

The Nature Conservancy et al., 2010

Lake Huron Biodiversity Conservation Strategy

The Nature Conservancy, in collaboration with Environment Canada, the Ontario Ministry of Natural Resources, the Michigan Departments of Environmental Quality and Natural Resources, the Michigan Natural Features Inventory, Michigan Sea Grant, and The Nature Conservancy of Canada, developed the Lake Huron Biodiversity Conservation Strategy. This collaborative effort involved over 100 government agencies, universities, and non-government organizations from Canada and the United States. The aim of the strategy was to identify priority actions to conserve and protect the ecological integrity of the Lake Huron Basin. The planning effort resulted in the selection of biodiversity features that represent ecosystem health; a ranking of threats and recommended strategies to address those threats, identification of priority conservation areas, and implementation strategies (TNC 2010).

Michigan State University Extension, 2009

Methodology Report for Prioritizing Saginaw Bay Wetlands

Michigan State University Extension, in collaboration with Ducks Unlimited, the Saginaw Bay Coastal Initiative, the Michigan Coastal Management Program, the Michigan Department of Environmental Quality, the National Oceanic and Atmospheric Administration, the Saginaw Basin Land Conservancy, The Nature Conservancy, and the United States Fish and Wildlife Service, developed a methodology to prioritize wetlands for continued preservation using biological, ecological, and social criteria. The methodology developed a key planning framework for continued restoration for wetlands within the Saginaw Bay watershed (Schools et al. 2009).

Reporting

The Partnership for the Saginaw Bay Watershed (Partnership) will take an active role in reporting any activities related to additional preservation of coastal marshes and fish passage relative to the Area of Concern (AOC) to the coordinator of the Michigan Department of Environmental Quality (MDEQ) Remedial Action Plan (RAP).

In addition, the MDEQ and the Partnership will contact relevant organizations to inquire about the status of existing, and additional restoration activities. These organizations include:

- The City of Chesaning
- The City of Frankenmuth
- The Conservation Fund
- Ducks Unlimited
- Land Conservancies and other NGOs
- Local units of government
- Michigan Department of Agriculture and Rural Development
- Michigan Department of Environmental Quality
- Michigan Department of Natural Resources
- The Nature Conservancy
- The Saginaw Basin Land Conservancy
- Saginaw Bay Coastal Initiative
- United State Fish and Wildlife Service

Summary

Substantial progress has been made toward habitat and population restoration in the Saginaw River and Bay Area of Concern. The most recent estimates show that 60 percent of wetlands below the 585-foot contour have been protected through public ownership and permanent conservation easements and the remaining unprotected wetlands have been prioritized and identified by parcel for continued protection, pursuant to the delisting criteria. In regard to the *Populations* BUI, a rock ramp is now in place at the site of the Chesaning Dam and ongoing monitoring is occurring to ensure that it is functioning as designed. Plans to construct a rock ramp at the site of the Frankenmuth Dam are also advancing, and construction could begin as early as 2013. Additionally, anecdotal evidence from local fisheries managers suggest that overall, the health of the Saginaw Bay fishery is good and improving. As a result, the removal of the impaired designation of the *Habitat* BUI may be on the horizon while efforts will continue to advance the restoration of the *Populations* BUI.

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