Final Restoration Plan & Environmental Assessment

for

Use of Remaining Funds

1998 Saginaw River and Bay Settlement

Prepared by:

The Natural Resource Trustees for the Saginaw River and Bay:

Michigan Department of Environment, Great Lakes, and Energy
Michigan Department of Natural Resources
Michigan Department of Attorney General
Saginaw Chippewa Indian Tribe of Michigan
U.S. Fish and Wildlife Service

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Estimated Lead Agency Costs to Develop the Restoration Plan & Environmental Assessment: $56,900.00

An Environmental Assessment is prepared to comply with the National Environmental Policy Act of 1969 (NEPA). The National Environmental Policy Act is the Nation's premier environmental law that guarantees every American the right to review, comment, and participate in planning of federal decisions that may affect the human environment.

This document emphasizes the use of 'clear language' to communicate the planning effort of the Saginaw River and Bay Trustee Council. The Plain Writing Act of 2010 directs federal agencies to adopt language that is "clear, concise, well-organized, and follows other best practices appropriate to the subject." Therefore, the use of acronyms is minimized.

REGULATORY NOTE: The Council on Environmental Quality (CEQ) on July 16, 2020 issued in the Federal Register a final rule updating its regulations for the National Environmental Policy Act (85 Fed. Reg. 43304, July 16, 2020). On January 20, 2021, President Joseph R. Biden issued Executive Order 13990 entitled "Protecting Public Health and the Environment and Restoring Science to Tackle the Climate Crisis" that requires agencies to immediately review promulgation of federal regulations and other actions during the previous four years to determine consistency with Section 1 of the Executive Order. This may include review by the Council on Environmental Quality of the July 16, 2020 update to the National Environmental Policy Act regulations. The goals of the July 2020 amendments to the National Environmental Policy Act regulations were to reduce paperwork, reduce delays in implementation of federal actions, and to promote better decisions consistent with the policy set forth in Section 101 of the National Environmental Policy Act. The effective date of these amended regulations was September 14, 2020. However, for actions that began before September 14th, such as this one, agencies may continue with the regulations in effect before September 14th where applying the amended regulations would cause delays to the ongoing process. The U.S. Fish and Wildlife Service began its analysis of the restoration plan before September 14th, so to reinitiate planning under the amended regulations would delay not only the analysis, but delay implementation of the restoration plan. In addition, these amended regulations may be reviewed by the Council on Environmental Quality. The Trustees for the Saginaw River and Bay believe that making significant changes to the restoration plan would be an inefficient use of settlement funds. Therefore, this final restoration plan, will continue and conclude under the National Environmental Policy Act regulations, policy, and guidance in existence prior to September 14, 2020.

EXECUTIVE SUMMARY

In 1998, the United States, the State of Michigan, and the Saginaw Chippewa Indian Tribe of Michigan, together acting as Trustees for natural resources in the Saginaw River and Bay, negotiated a settlement for natural resource damages with the General Motors Corporation, Bay City, and the City of Saginaw. The settlement provided for substantial cleanup of contamination resulting from the release of polychlorinated biphenyls[1] (PCBs) and for restoration of fish and wildlife habitats in the Saginaw River and Bay. The current Trustees for the Saginaw River and Bay Natural Resource Damage Assessment and Restoration (NRDAR) are the Michigan Department of Environment, Great Lakes, and Energy (EGLE), Michigan Department of Natural Resources (MDNR), and Michigan Department of Attorney General (MDAG); the United States Department of the Interior acting through U.S. Fish and Wildlife Service (USFWS); and, the Saginaw Chippewa Indian Tribe of Michigan (Tribe).

The 1998 settlement for NRDAR made specific provision for continued environmental monitoring in the Saginaw River and Bay at the direction of the Trustees. The Trustees will continue to support the monitoring of PCBs in order to assess the efficacy of efforts to restore natural resources.

In addition to supporting continued monitoring, sufficient funding from the 1998 settlement remains for the Trustees to undertake additional restoration actions. The Trustees released a Draft Restoration Plan for public review in late 2020 and are now publishing this Final Restoration Plan to guide the use of these remaining funds. The Trustees have approximately $5.7 Million available for implementation and administration of the Final Restoration Plan. The Final Restoration Plan describes the purpose and need for restoration, identifies the Trustees' selected alternative to guide the use of the remaining funds, describes the environment that may be affected by restoration activities, and describes the potential environmental consequences of implementing their selected alternative.

The Trustees considered four alternative approaches to the management of funds remaining from the 1998 settlement:

- No Action Alternative - taking no additional restoration actions;
- Stewardship Alternative - funding the stewardship and maintenance of projects previously implemented as a result of the 1998 settlement;
- Stakeholder Engagement Alternative – development of new restoration actions identified by stakeholders; and
- Collaborative Conservation Alternative - an alternative that incorporates elements of both the Stewardship and Stakeholder Engagement alternatives.

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[1] Polychlorinated biphenyls (PCBs) are a class of man-made compounds that do not occur in the environment naturally. The manufacture of these compounds was banned in the United States in 1979. PCBs are highly persistent in the environment and are known to cause harm to exposed animals. To limit exposure to humans, many states, including Michigan, have developed standards for fish tissue concentrations and have instituted fish consumption advisories where appropriate. Information regarding PCBs in the environment is available at https://www.epa.gov/sites/production/files/2018-11/documents/polychlorinated-pcbs-impact-fish-advisories-factsheet.pdf and at https://www.michigan.gov/documents/mdch/Bioaccumulative__Persistent_Chemicals_FINAL_354016_7.pdf

In releasing the Draft Restoration Plan for public review, the Trustees requested information regarding restoration actions for which stakeholders would likely seek support from the Trustee Council under a Stakeholder Engagement Alternative (Section 4.4). The Trustees received one written response suggesting additional restoration actions from the Saginaw Basin Land Conservancy (Appendix 10.8.4) and one request for additional information on additional restoration actions from Huron Pines (Appendix 10.8.5). Two commenters voiced support for the Stakeholder Engagement Alternative but provided no specific restoration actions for which they would seek support (Appendices 10.8.1, 10.8.2).

Given the feedback that the Trustees have received, the limited scope of stakeholder restoration actions identified during the public review process, the recognized value of the restoration actions described within the Stewardship Alternative (Section 4.3; Appendices 10.2 – 10.5), and the ability to provide maintenance funding for restoration actions, the Trustees have identified the Collaborative Conservation Alternative as their Selected Alternative. This alternative addresses the core considerations of both the Stakeholder Engagement Alternative and the Stewardship Alternative, builds the capacity of proponents to provide conservation related services, ensures the long-term maintenance of restoration actions that are consistent with the Consent Judgment for the 1998 settlement, and most evidently meets the Trustees' restoration criteria and priorities for NRDAR projects (Section 3.0).

The Final Restoration Plan, background related to the 1998 settlement, information regarding implementation of restoration projects, and additional documentation may be found at the USFWS website for the Saginaw River and Bay: www.fws.gov/midwest/es/ec/nrda/SaginawNRDA.

The administrative record for the Saginaw River and Bay NRDAR is also available for inspection by calling 517-351-2555 and making an appointment to visit the USFWS's Michigan Ecological Services Field Office:

U.S. Fish and Wildlife Service
Michigan Ecological Services Field Office
2651 Coolidge Road, Suite 101
East Lansing, MI 48823

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List of Acronyms

AOC	Area of Concern
BMP	Best Management Practice
BUI	Beneficial Use Impairment
CJ	Consent Judgment
CCP	Comprehensive Conservation Plan
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CEQ	Council on Environmental Quality
C.F.R.	Code of Federal Regulations
CWA	Clean Water Act or Federal Water Pollution Control Act
DOI	U.S. Department of the Interior
EA	Environmental Assessment
EGLE	(Michigan Department of) Environment, Great Lakes, & Energy
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
FCA	Fish Consumption Advisory
FONSI	Finding of No Significant Impact
MDAG	Michigan Department of Attorney General
MDEQ	Michigan Department of Environmental Quality
MDNR	Michigan Department of Natural Resources
MNFI	Michigan Natural Features Inventory
MOU	Memorandum of Understanding among the Trustees
NEPA	National Environmental Policy Act
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
NREPA	Natural Resources and Environmental Protection Act
NRDA	Natural Resource Damage Assessment
NRDAR	Natural Resource Damage Assessment and Restoration
NWR	National Wildlife Refuge
PCB	Polychlorinated biphenyls
PRP	Potentially Responsible Party
RP/EA	Restoration Plan/Environmental Assessment
SGA	State Game Area
SWA	State Wildlife Area
TNC	The Nature Conservancy
USACE	U.S. Army Corps of Engineers
U.S.C.	U.S. Code
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service

1.0. INTRODUCTION

1.1. History of the 1998 Settlement

Beginning in the 1940s, industrial facilities and wastewater treatment plants on the Saginaw River released polychlorinated biphenyls (PCBs) and related compounds into the Saginaw River. These compounds are industrial products that, prior to the banning of their use in the U.S. in 1979, were used in the manufacture of electrical insulators, capacitors, and electric appliances, among other industrial uses. Persistent on-site contamination of industrial facilities resulted in continued releases of these compounds following the ban of their use in manufacturing.

The release of PCBs caused environmental damage to the natural resources of the Saginaw River and Bay and was found to have impacted habitats and the fish and wildlife resources of the Saginaw River and Bay. These compounds are both persistent in the environment and bioaccumulative, meaning that species that feed on other species will tend to accumulate greater concentrations of these contaminants. Despite this, in the early 1990's state and federal response agencies were not yet pursuing remediation of contaminated sediment in the Saginaw River and similar sites.

Consequently, the Natural Resource Trustees (Trustees), consisting at the time of the U.S. Fish and Wildlife Service (USFWS), the Michigan Department of Environmental Quality (MDEQ), the Michigan Department of the Attorney General (MDAG), and the Saginaw Chippewa Indian Tribe of Michigan negotiated a settlement for natural resource damages in 1998 with General Motors Corporation, Bay City, and the City of Saginaw. The 1998 settlement was set forth in a Consent Judgment approved by the U.S. District Court for the Eastern District of Michigan on June 4, 1999 (Docket #98CV10368). The 1998 settlement provided for substantial cleanup of contaminated sediments as well as for protection and restoration of fish and wildlife habitats in the Saginaw River and Bay area (Table 1-1, Table 1-2).

As part of the settlement, the City of Saginaw, Michigan, provided two 99-year leases for the Green Point Environmental Learning Center and an associated 80 acres of adjacent riparian and upland habitats to the Shiawassee National Wildlife Refuge (NWR). The settlement also included dedicated funding in the amount of $520,000 for restoration associated with the Green Point Environmental Learning Center[2]. Given that the Green Point Environmental Learning Center is managed by the Shiawassee NWR, the 1998 settlement identified the federal trustee as the entity to "use these funds and the interest thereon at the Green Point Environmental Learning Center to restore, replace, or acquire equivalent resources consistent with CERCLA and applicable regulations." The USFWS is the Federal Trustee with responsibility for oversight and implementation of the Green Point Area Restoration Project.

[2] The 1998 Consent Judgment created a dedicated fund to be administered by the "federal Trustees." In this case, the U.S. Fish and Wildlife Service is the only federal trustee. The 1998 settlement resulted in the initial allocation of $520,000 to this fund. As of June 22, 2020, approximately $497,250 remains in this fund.

Table 1-1. Elements of the 1998 natural resource damages settlement.

Components of the 1998 Settlement	
Dredging & Dredging Design	$10.90M
Land Acquisition	$7.70M
Resource Restoration and Protection	
Restoration of lakeplain prairie/coastal wetlands	$1.00M
Enhancement of fisheries habitat at Tobico Marsh	$0.50M
Restoration and monitoring fund	$3.10M
Public Access to Natural Resources	
Construction of new boat launches (Golson, Cass) and enhancement of an existing boat launch (Jones Road)	$2.50M
Green Point Environmental Learning Center	$0.52M
Reimbursement of Trustee Assessment Costs	$2.00M

Table 1-2. Restoration actions implemented as a result of the 1998 settlement.

Restoration Actions
Dredging & Dredging Design
• removal of 342,433 cubic yards of the most contaminated sediments in the Saginaw River:
✓ including removal of approximately 6,000 pounds of PCBs
✓ dredging was completed in July, 2001
Land Acquisition
• over 1,670 acres acquired and placed in public ownership in 1999, including:
✓ most of Big and Little Charity Islands as part of Michigan Islands National Wildlife Refuge, managed by the Shiawassee NWR
✓ multiple parcels added to MDNR's Tobico Marsh Unit of the Bay City State Recreation Area, Wigwam Bay State Wildlife Area, Quanicassee State Wildlife Area, Fish Point State Wildlife Area, and Wildfowl Bay State Wildlife Area
✓ 110 acres to the Saginaw Chippewa Tribe at the mouth of the Saganing River
Resource Restoration and Protection
• 391 acres of coastal wetlands and lakeplain prairie restored on acquired lands in 2001-2
• improved hydrology in Tobico Marsh within the Bay City State Recreation Area in 2004
• monitoring of contamination in caged fish in the Saginaw River following dredging
• monitoring of the health of fish-eating birds in Saginaw Bay
• initial restoration work in the area of the Green Point Environmental Learning Center
Public Access to Natural Resources
• Green Point Environmental Learning Center – two 99 year leases from the City of Saginaw to the USFWS starting in 1999
• Edward M. Golson Jr. Boat Launch and Nature Park constructed in 2001- 2002 and operated by the City of Bay City
• Cass Avenue Boat Launch constructed in 2001-2 and operated by the City of Bay City
• Jones Road Boat Launch enhanced in 2001-2 and transferred from MDNR to Hampton Township

In May of 2014, the Shiawassee NWR received the former 135-acre Germania Town and Country Club (Germania) as a donation from The Nature Conservancy. Germania is located north of the Tittabawassee River and immediately south of the City of Saginaw, bordering the Learning Center to the north and west, enlarging the area associated with the Green Point Area Restoration Project.

Restoration associated with the Green Point Environmental Learning Center is on-going. The *Final Restoration Plan and Environmental Assessment for the Green Point Area Restoration Project – Shiawassee National Wildlife Refuge* was released by the USFWS in June of 2016. This Restoration Plan / Environmental Assessment (RP/EA) implemented a preferred alternative that provided for engagement of local community members in site-specific planning for public amenities. An initial community needs assessment and an ecological assessment, to determine the characteristics of the historic plant community on the Shiawassee NWR, have now both been completed. These assessments were intended to better inform future efforts to engage the community and to assist in the development of a site-specific restoration plan. The 2016 Green Point Area Restoration Plan and Environmental Assessment, and these other reports, are available at the Saginaw River and Bay Natural Resource Damage Assessment website: https://www.fws.gov/midwest/es/ec/nrda/SaginawNRDA/index.html.

1.2. Trustee Authority and Natural Resource Damage Assessment and Restoration (NRDAR)

Under federal law, the Trustees are authorized to act on behalf of the public to assess injuries to natural resources, and the loss of their associated services, resulting from the release of hazardous substances into the environment. The NRDAR process, formalized in the Department of Interior (DOI) regulations (43 C.F.R. Part 11), allows the Trustees to pursue claims against responsible parties for monetary damages based on these injuries in order to compensate the public. The goal of this process is to plan and implement actions to restore, replace, or rehabilitate the natural resources that were injured or lost as a result of the release of a hazardous substance, or to acquire the equivalent resources or the services they provide. The following authorities authorize federal, state, and tribal governments to act on behalf of the public as natural resource Trustees:

- The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA, commonly known as 'Superfund Law', 42 U.S.C. § 9601 *et seq*.; 43 C.F.R. § 11), as amended.
- The Federal Water Pollution Control Act, 33 U.S.C. § 1251, et seq. (more commonly known as the Clean Water Act or CWA)
- The Oil Pollution Act of 1990 (33 U.S.C. § 2701-2761 et seq.)
- Executive Order 12580 (52 Federal Register (FR) 2923; January 23, 1987), as amended by Executive Order 12777 (56 FR 54757; October 19, 1991)
- The National Contingency Plan (40 C.F.R. §§ 300.600 et seq.)

In addition, the State of Michigan has authorities for response, NRDA and mitigation under Michigan's Natural Resources and Environmental Protection Act, 1994 PA 451, as amended.

The Trustees formalized their intent to collaboratively undertake restoration planning within a Memorandum of Understanding (MOU) executed in September of 2017. The Trustee responsibilities outlined in the MOU include but are not limited to: supporting the monitoring of contaminants and evaluating the efficacy of actions already implemented under the 1998 Consent Judgment; identifying and supporting maintenance or stewardship to maintain the natural resource benefit of actions already implemented; and, restoration planning to identify additional opportunities for restoration, replacement, rehabilitation, or acquisition of the equivalent of injured natural resources.

1.3. Compliance with National Environmental Policy Act and Other Authorities

Federal environmental laws, orders, and regulations considered during the development of this Final Restoration Plan include but are not limited to: the CERCLA, as amended; the CWA; Endangered Species Act (ESA) of 1973; Migratory Bird Treaty Act of 1918; National Historic Preservation Act of 1966; Archeological and Historic Preservation Act of 1974; Fish and Wildlife Coordination Act of 1934; U.S. Fish and Wildlife Mitigation Policy of 1981; Information Quality Act of 2001; Coastal Barrier Resources Act of 1982; Executive Order 11990 on Wetlands of 1977; and Executive Order 11988 on Floodplains of 1977.

The major state environmental statutes and programs considered during the development of this Final Restoration Plan include but are not limited to Michigan's Natural Resources and Environmental Protection Act, 1994 PA 451, as amended: Part 31, Water Resources Protection; Part 91, Soil Erosion and Sedimentation Control; Part 301, Inland Lakes and Streams; Part 303, Wetlands Protection; and, Part 365, Endangered Species Protection.

Actions undertaken by the Trustees to restore natural resources, or their related services, are subject to the National Environmental Policy Act (NEPA) (42 U.S.C. § 4321 *et seq*.) and the regulations guiding its implementation at 40 C.F.R. Parts 1500 through 1517. These authorities outline the responsibilities of federal agencies for preparing environmental analyses. In general, federal agencies contemplating implementation of a major federal action must produce an environmental impact statement (EIS) if the action is expected to have significant impacts on the quality of the human environment. When it is uncertain whether a contemplated action is likely to have significant impacts, federal agencies prepare an environmental assessment (EA) to evaluate the need for the more rigorous analyses typically found within an environmental impact statement. If the environmental assessment demonstrates that the proposed action will not significantly impact the quality of the human environment, the agency issues a Finding of No Significant Impact (FONSI), which satisfies the requirements of the National Environmental Policy Act, and no environmental impact statement is required. For a proposed Restoration Plan, if a finding of no significant impact is made, the Trustees may then issue a Final Restoration Plan describing the selected restoration action or actions.

This Final Restoration Plan, written to incorporate an environmental assessment in compliance with the National Environmental Policy Act, describes the purpose and need for restoration, summarizes the current environmental setting, identifies alternative actions, assesses their applicability and potential impact on the physical, biological, and cultural environment, and outlines public participation in the decision-making process.

1.4. Public Participation

Throughout the planning process, the Trustees promoted awareness of their planning effort by meeting with stakeholders to provide presentations, to engage in discussion, and to offer background materials related to the 1998 settlement and the future use of remaining funds from the 1998 settlement. This has included participation in meetings with:

- Partnership for the Saginaw Bay Watershed
- Saginaw Basin Land Conservancy
- Open house meetings for the Shiawassee National Wildlife Refuge
- State of the Bay Biennial Meeting
- Tribal Council of the Saginaw Chippewa Indian Tribe of Michigan
- The Saginaw-Tittabawassee Rivers Contamination Community Advisory Group
- Whiting Forest of Dow Gardens Birding Festival

Presentations and background materials are publicly available and will continue to be maintained on the USFWS's website for the 1998 settlement and restoration effort: https://www.fws.gov/midwest/es/ec/nrda/SaginawNRDA.

Beyond these informal efforts to engage groups with an interest in the ecological condition of the Saginaw River and Bay, the restoration planning process required a formal effort to garner public participation in the planning process. The opportunity for public review of the Draft Restoration Plan, and the Draft Restoration Plan's associated environmental analysis, was required by the Department of Interior's NRDAR regulations (e.g., 43 C.F.R. §11.81(d)(2)). In addition, the National Environmental Policy Act, and its implementing regulations, required that federal agencies fully consider the environmental impacts of their proposed decisions and that such information be made available to the public. Public review of the Draft Restoration Plan, and comments provided, are now part of what is referred to as the 'administrative record' for this planning effort and have been incorporated into this Final Restoration Plan (Appendix 10.8, Appendix 10.9). Federal agencies are charged with maintaining these records, in part, to demonstrate the authenticity of their effort to foster public participation and consider issues and concerns voiced by the public.

When the Trustees released the Draft Restoration Plan for review by the public, they sought input related to the allocation of funding to be dedicated to stakeholder identified restoration actions. This was related to their preferred alternative, the Collaborative Conservation Alternative (Section 4.5). Specifically, the Trustees sought input to determine the amount of funding to be allocated for additional restoration proposals to be identified by and developed with stakeholders in the Saginaw River and Bay area. That decision related to stakeholder funding was necessary to determine the funding available for long-term maintenance of existing stewardship projects (Section 4.5). The Trustees regard maintenance funding as essential to sustain the desired condition of the restoration projects, particularly because of the ongoing need, among other maintenance needs, to manage invasive plants in coastal Great Lakes habitats. Accordingly, the Trustees sought input from the public and stakeholders regarding the

appropriate balance between funding for future stakeholder proposals to be developed with the Trustees and funding for future maintenance of the existing stewardship projects.

In addition to requesting general review of the Draft Restoration Plan from the public and review of the allocation of funding to maintenance and stakeholder restoration actions, the Trustees also requested information regarding the type of restoration actions for which stakeholders would likely seek support from the Trustee Council under either a Stakeholder Engagement Alternative (Section 4.4) or the Collaborative Conservation Alternative (Section 4.5). The Trustees subsequently received one project abstract from the Saginaw Basin Land Conservancy (Appendix 10.8.4). Based on the public comments and stakeholder input received on the Draft Restoration Plan, the Trustees have chosen to implement the Collaborative Conservation Alternative, which allocates $750,000 to develop and implement restoration projects identified by stakeholders. The decision process and selected alternative are described in more detail in Section 6.0.

The Trustees emphasize that they continue to encourage stakeholders to recommend ideas for additional prospective restoration projects that they believe may be of interest to the Trustees. Until the funds set aside for this purpose are exhausted, stakeholders may forward to the Trustees their proposals for the funds set aside for this purpose. The Trustees will also periodically engage stakeholders in an effort to solicit restoration proposals that may be developed in collaboration with the Trustee Council. Inquiries to the Trustee Council may be directed to the federal lead administrative trustee, currently:

Clark D. McCreedy
U.S. Fish and Wildlife Service
Michigan Ecological Services Field Office
2651 Coolidge Road, Suite 101
East Lansing, MI 48823
Email: SaginawNRDA@fws.gov

Current contact information and information for additional projects and funding remaining will be maintained on the website for the Saginaw River and Bay NRDAR:
www.fws.gov/midwest/es/ec/nrda/SaginawNRDA.

The Final Restoration Plan, information regarding implementation of the 1998 settlement, and additional documentation may be found at the USFWS's Saginaw River and Bay NRDA website:
www.fws.gov/midwest/es/ec/nrda/SaginawNRDA.

As implementation progresses, the Trustees may choose to amend the Final Restoration Plan if significant changes are made to the types, scope, or impact of the specific projects described in the Draft Restoration Plan or through the addition of a stakeholder-identified project or projects. In the event of a significant modification to the Final Restoration Plan, the Trustees will provide the public with an opportunity to review and comment on any amendment to the Final Restoration Plan.

1.5. Administrative Record

An administrative record consisting of the catalog of primary documents the Trustees used to develop this Draft Restoration Plan and to make decisions related to the NRDAR process is available online at the Service's Saginaw River and Bay website: www.fws.gov/midwest/es/ec/nrda/SaginawNRDA. The administrative record is also maintained at:

U.S. Fish and Wildlife Service
2651 Coolidge Road, Suite 101
East Lansing, MI 48823

1.6. Purpose and Need for Restoration

The purpose of the Trustees' planning effort is to advance restoration of natural resources and their associated services in the Saginaw River and Bay consistent with the 1998 Consent Judgment using funding remaining from the 1998 settlement. The need for restoration is related to the injury caused by the release of PCBs into the Saginaw River and Bay. The Final Restoration Plan identifies the "Selected Alternative" that the Trustees believe represents the interests of the public by effectively restoring, rehabilitating, replacing, or acquiring the equivalent of injured natural resources and the services those resources provide.

The Consent Judgment for the 1998 Settlement identified specific projects to be completed or funded by General Motors and the cities of Saginaw and Bay City and funding for the Trustees to conduct future monitoring and restoration. The Consent Judgment also identified funding amounts for the specific projects to be completed by the Defendants as part of the settlement (Table 1-1), with the provision that the Trustees would receive any remaining funding in the event that any of these projects were completed for less than the funding amounts specified. The Consent Judgment (paragraph 8.6) describes how any remaining funds, as well as the funds allocated for restoration and monitoring, are to be used. The identified uses of these remaining funds include the following:

- future monitoring, modeling, and studies to determine the effectiveness of dredging and restoration;
- additional activities associated with dredging or disposal of contaminated sediments, including at the Saginaw Bay Confined Disposal Facility (CDF);
- purchase and restoration of lands within the Saginaw Bay watershed;
- natural resource restoration projects designed to protect, restore, replace, enhance or acquire equivalent natural resources in the area.

The Trustees developed this Final Restoration Plan in accordance with 43 C.F.R. § 11.93 to inform the public as to the types and scale of additional restoration to be undertaken to compensate the public for injuries to natural resources with the funds remaining from the 1998 settlement. In doing so, this document includes a reasonable number of restoration alternatives, identifies a Selected Alternative, and explains how the Selected Alternative provides restoration of injured natural resources and compensatory value for the natural resources services lost to the public. Additionally, this Final Restoration Plan serves as an environmental assessment pursuant to the National Environmental Policy Act and its implementing regulations at 40 C.F.R. Part 1500 and 43 C.F.R. Part 46 in that it summarizes the current environmental setting, describes the purpose and the need for restoration, identifies potential alternative actions, assesses their applicability and their potential impact on the quality of the physical, biological and cultural environment. The Final Restoration Plan also describes how the public and stakeholder groups may continue to participate in the restoration of natural resources with the Trustees for the Saginaw River and Bay.

1.7. Organization of the Final Restoration Plan

The remainder of this document is organized as follows:

- Section 2 describes the affected environment for the area in which restoration will be implemented
- Section 3 describes the restoration criteria adopted by the Trustees and outreach
- Section 4 describes the restoration alternatives considered by the Trustees
- Section 5 evaluates the restoration alternatives, including their environmental impacts and their relationship to the Trustees' restoration criteria
- Section 6 describes the Trustees' rationale for selecting their preferred restoration alternative
- Section 7 provides a description of monitoring, performance, and adaptive management
- Section 8 lists the preparers of this document and other agencies, Tribes, and persons consulted
- Section 9 provides a list of the documentation cited in this Final Restoration Plan / Environmental Assessment
- Section 10 provides the appendices to this document which include description of the 1998 restoration actions adopted as a component of the Collaborative Conservation Alternative, public comment, and the Trustees' response to issues identified during public review

2.0. AFFECTED ENVIRONMENT

2.1. Introduction

In this section of the Final Restoration Plan, the Trustees describe the environmental setting, referred to as 'affected environment,' wherein proposed restoration actions could occur. The area of the affected environment described here includes, but is not limited to, the Assessment Area previously described in the 1998 Consent Judgement:

> "the entire Saginaw River extending from the head of the Saginaw River at the confluence of the Shiawassee and Tittabawassee Rivers to the mouth of the Saginaw River at Bay City and all of the Saginaw Bay from the mouth of the Saginaw River to its interface with open Lake Huron at an imaginary line drawn between Au Sable Point and Point Aux Barques, including the CDF. The Saginaw River is 22 miles long. Saginaw Bay covers 1,143 square miles. The Assessment Area includes all of the Saginaw River and Saginaw Bay surface waters. In addition, the Assessment Area includes the following, below the OHWM of the relevant water body: sediment, lands underlying the surface waters, and shores; provided, however, that the Assessment Area shall not include any part of a Facility. The Assessment Area also includes injured natural resources that:
>
> (a) inhabit or feed in the Assessment Area; or
>
> (b) are ecologically dependent, through trophic or other relationships or mechanisms, on resources in the Assessment Area to the extent that such injured resources sustained injury as a result of exposure to or in the Assessment Area."
>
> *Consent Judgment Section 5.5*

The Consent Judgment, with respect to the use of remaining funds, directs the Natural Resource Trustees to use these funds for the "purchase and restoration of lands within the Saginaw Bay watershed." Therefore, for the planning of the proposed restoration actions, the Trustees have identified the affected environment for this draft restoration plan as the Saginaw Bay watershed, encompassing the waters of the Saginaw River, its tributaries, and Saginaw Bay.

This section presents a description of the physical and ecological environment, and cultural resources of the affected environment, as required by the National Environmental Policy Act (42 U.S.C. §§ 4321, *et seq*.). Information on the current resources of the area will assist the Trustees in planning future restoration activities and ensure that potential restoration projects are designed to both maximize ecological and human use benefits within the Saginaw River and Bay while also minimizing or eliminating project-related adverse environmental consequences.

2.2. Physical Environment

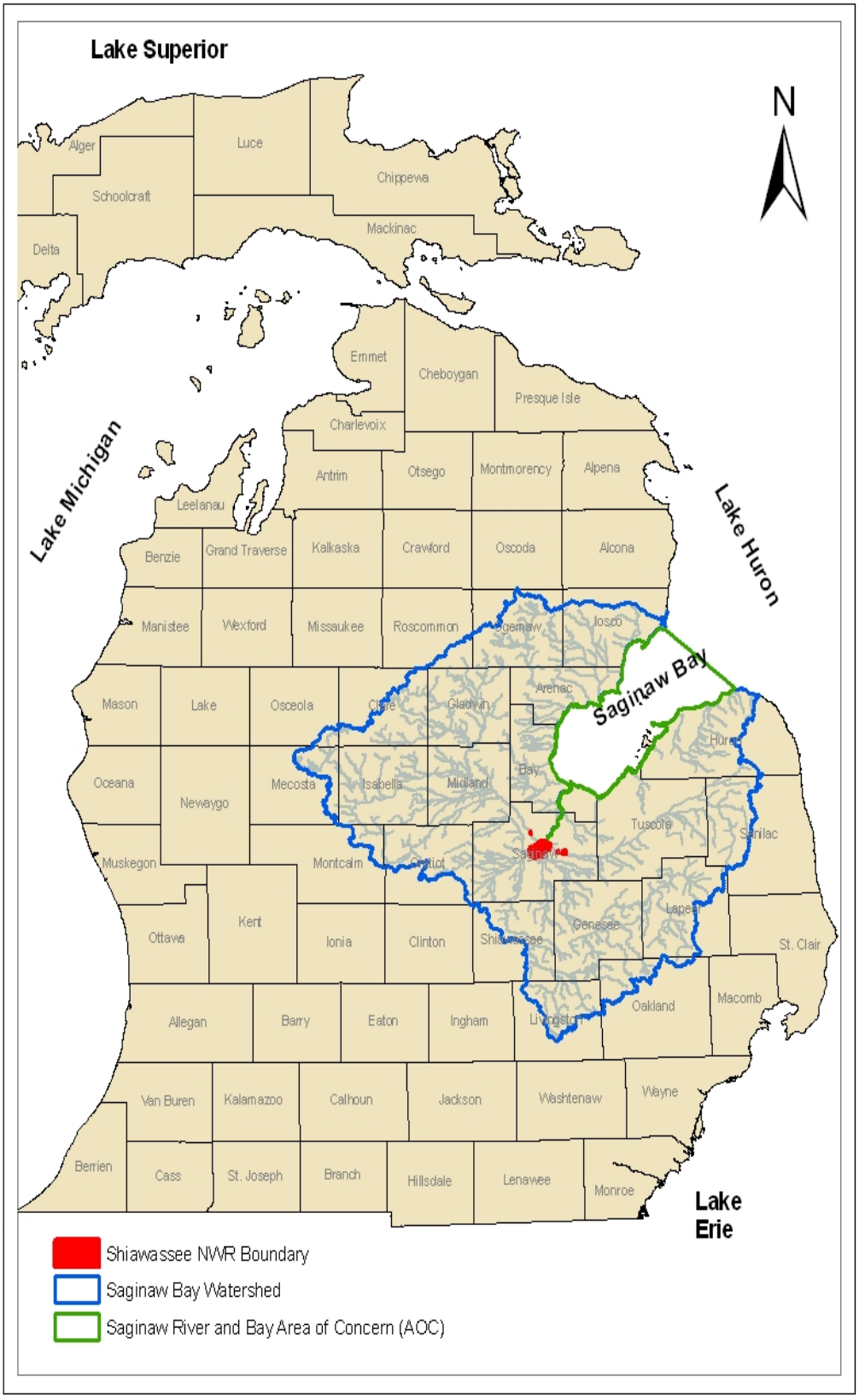
The Saginaw Bay watershed encompasses an area of approximately 8,700 squares miles over all or portions of 22 counties in the eastern portion of the lower peninsula of Michigan (Fales et al. 2016, Figure 2-1). Twenty-eight rivers, creeks, and designated drainages flow directly into Saginaw Bay, but approximately 75% of the hydraulic load from tributaries comes from the Saginaw River (Beeton et al. 1967). The watershed of the Saginaw River encompasses the watersheds of the Tittabawassee, Shiawassee, Bad, Cass, and Flint rivers. The low-lying area where these river basins converge is commonly referred to as the Shiawassee Flats Area (Buchanan et al. 2013). The drainage basins of these rivers move water to the Saginaw River which flows 22 miles from where the Tittabawassee and Shiawassee rivers converge near the City of Saginaw to its mouth at Saginaw Bay on Lake Huron. The Saginaw River runs in a generally northeasterly direction, emptying into Saginaw Bay approximately 90 miles north of Detroit, Michigan. The Saginaw River is a relatively low energy river that varies in width from 375 to 800 feet.

Saginaw Bay is on the western shore of Lake Huron (Figure 2-1). The Bay is 26 miles wide at the mouth and 51 miles long from the midpoint to the mouth of the Saginaw River. Saginaw Bay has a surface area of 1,143 square miles (MDNR 1994a). A broad shoal between Charity Island and Sand Point divides the Bay into outer and inner zones. The outer zone is considerably deeper (mean depth of 48 feet, maximum depth of 133 feet) than the inner zone (mean depth 15 feet, maximum 46 feet). The eastern shore of the outer bay is rocky and the western is sandy. The bay has several islands; the most prominent is Charity Island between Whitestone and Oak points. A group of marshy low-lying islands (North, Stony, and Katechay) lies southwest of Sand Point on the southeast shore of the Bay. These islands are surrounded by marshy shallows that provide important habitat for waterfowl (PSC 2002). This association of rivers, wetlands, and coastal freshwater marshes forms one of North America's largest freshwater wetland complexes.

The typical surface current in the Bay is counterclockwise, due to a strong Lake Huron current that flows down the western edge of the outer bay. Waters from the Saginaw River flow north along the eastern shore of the Bay toward the open waters of Lake Huron. The Bay freezes in the winter and ice flows along the deeper water west of the Coreyon Reef.

The climate of the region is generally described as continental to semi-marine (Eichenlaub et al. 1990). The Great Lakes, including the Saginaw Bay, modify air masses from the Gulf of Mexico, Canada, and the Northern Pacific (Albert et al. 1986, Albert 1995) to influence regional weather patterns. The region receives between 30 to 35 inches of precipitation per year, including an average of 36 inches of snowfall. About 50% of this precipitation occurs as rain from April through September. Long-term, regional precipitation is increasing with earlier peak spring runoff (Newman 2011). Average annual low and high temperatures are 24° and 68° F. Prevailing winds average 12 miles per hour from the southwest in early spring.

Figure 2-1. Geographic location of the Saginaw Bay watershed within the State of Michigan.



2.3. Geomorphology

Much of the Saginaw Bay watershed is in the Saginaw and Tawas Lake Plain Ecoregions with the watersheds of headwater streams extending into the Mio Plateau, Cadillac Hummocky Moraines, Lansing Loamy Plain, and Interlobate Dead Ice Moraines (U.S. EPA 2010, Figure 2-2). Glacial advance and retreat has provided the primary force shaping the dominant features of the landscape. Recent summaries of the geology within the Saginaw Lake Plain Ecoregion and the Shiawassee Flats area are provided by Buchanan et al. (2013), Heitmeyer et al. (2013), and Newman (2011). Newman (2011) provides the following summary of the geology of the area:

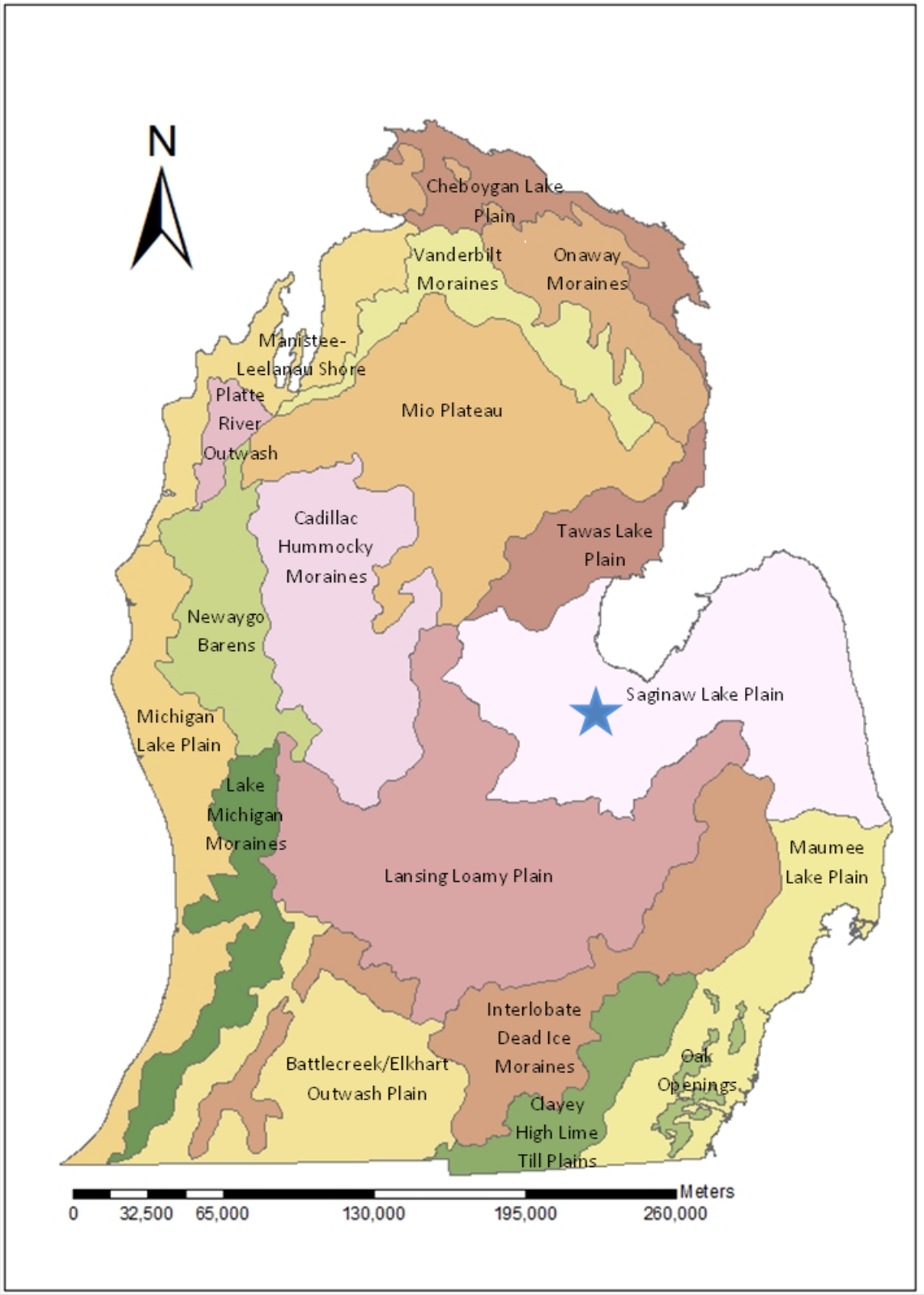
> At the end of the last glaciation, approximately 12,000 years ago, this area was covered with an inland lake and a river which connected the present day water bodies of Lake Michigan and Lake Huron. The underlying geology is primarily Pennsylvanian sandstone and shale, which is generally not exposed in this region. The upper layers were initially identified as lacustrine (e.g., lake) deposited clays and silts (Farrand and Bell 1982). However, an investigation by Westjohn and Weaver (1996) suggested that the predominant surface layer in Saginaw County is a relatively thick (>50 ft.) layer of dense, clay-rich, basal lodgment till overlying a glaciofluvial aquifer.
>
> Soil are predominately poorly drained clay and silt-clay soil types, reflecting the geologic history of the area as a glacial lake plain (Heitmeyer et al. 2013). Soils are characterized as types that experience frequent flooding (Heitmeyer et al. 2013), ranging from poorly drained to very poorly drained (Heitmeyer et al. 2013, Newman 2011).

2.4. Hydrology

The Saginaw Bay watershed can be delineated into three primary sub-basins: East Coastal, Saginaw, and West Coastal. The Saginaw sub-basin predominates, encompassing approximately 6,300 sq. mi. (Arthur et al. 1996). Four primary drainage basins move water through the Saginaw sub-basin to the Saginaw River, which discharges into Lake Huron: the Tittabawassee to the northeast, the Cass to the east, the Flint to the southeast, and the larger Shiawassee basin to the south (Heitmeyer 2013). Low-lying topography within the Saginaw sub-basin and fluctuating water levels within Lake Huron are the primary environmental factors that influence local hydrology. Long-term water levels in Lake Huron average approximately 579 feet above mean sea level with historically high water levels at approximately 582 feet above mean sea level (USACE 2020). Current water levels, as of July 17, 2020 were reported by the USACE as 582.15 feet above mean sea level[3]. Elevations within the Saginaw Lowlands physiographic region, which approximates the Saginaw Bay watershed, range from 547 to 695 feet above mean sea level (Heitmeyer et al. 2013). Consequently, high lake levels, or wind-driven fluctuation in water-levels (seiche events) may result in sustained periods of inundation within low-lying areas of the Saginaw River sub-basin (Buchanan et al. 2013, Heitmeyer et al. 2013, Newman 2011). Peak flows generally occur in March coinciding with snowmelt.

[3] https://www.lre.usace.army.mil/Missions/Great-Lakes-Information/Great-Lakes-Water-Levels/Water-Level-Forecast/Weekly-Great-Lakes-Water-Levels/, accessed 07/22/2020.

Figure 2-2. Level III and IV ecoregions of the State of Michigan, depicting the Saginaw Lake Plain Ecoregion (starred).



Upper watersheds are dominated by porous, well-drained soils that result in relatively stable river flows whereas lower watersheds generally have heavier, poorly drained soils that are tiled and ditched to promote rapid drainage of agricultural lands. These soil types and drainage alterations result in a flow regime that is characterized as 'flashy,' meaning that flows may be highly variable and may change rapidly (ATS 2007). Channelization of tributaries may contribute to the flashy character of these rivers, seasonal flood flows, and low summer baseflows.

2.5. Anthropogenic Influence – Land Use

Proximity to Lake Huron and the early avenues of commerce provided by the larger rivers explains much of the history of land use and the development of urban areas within the Saginaw Bay watershed. Chronologically, important past land uses have been timber harvest, pastoral agriculture and the transition to row-cropping, and urbanization and industrial development. A recent review of historical land use in the Saginaw Bay watershed (Buchanan et al. 2013) noted the following important changes in the watershed beginning with early settlement in the middle of the nineteenth century:

- The State of Michigan was a focal area of the eastern lumber industry during the middle of the nineteenth century. Much of the Saginaw River watershed was historically logged; current areas of forested land consist of second growth forests. Rivers and associated wetland complexes were profoundly affected. The network of rivers within the Saginaw Bay watershed (Cass, Flint, Saginaw, Shiawassee, and Tittabawassee) was fundamental to the development of the lumber industry. Rivers were routinely and repeatedly cleared of debris and snags to facilitate the movement of large volumes of logs. Substantial alterations of river and associated riparian habitat occurred in these waterways as a consequence of the development of the timber industry.

- Forest clearing and subsequent installation of drainage across the landscape allowed the conversion of bottomland forest and wetlands to rowcrop agriculture. The mechanized tillage of industrial agricultural led to increased erosion, increased runoff, and nutrient loading of waterways. These sources of impact continue to compromise watersheds within the Shiawassee Flats and the Saginaw River and Bay.

- Logging, large-scale wildfires fueled by logging slash, rowcrop tillage, and the subsequent growth of communities associated with early economic development, resulted in approximately a 72% reduction in forest cover and a 96% loss in wetland area in the period between 1830 to present day in Saginaw County.

- Agriculture and the lumber industry substantially altered the landscape, but the footprint resulting from the later development of industrial and chemical manufacturing now comprises the third largest land cover type in the Saginaw Bay watershed.

As the automobile industry replaced lumber mills, impacts associated with industrial development and the growth of urban infrastructure to support area industry increased. General Motors owned and operated four major automobile manufacturing plants along the Saginaw River beginning in the 1910s (Ritter and Allen, 2008). Municipal wastewater treatment plants are also located along the Saginaw River in the City of Saginaw and Bay City. Urbanization of the watershed, channelization of the river, active dredging, commercial shipping, and industry have all substantially altered aquatic habitats.

Industrial and chemical development, associated with the larger river systems of the Saginaw Bay watershed, is frequently associated with legacy contaminants, particularly in the Saginaw and Tittabawassee river watersheds. Industrial facilities and wastewater treatment plants on the Saginaw River, beginning in the 1940s, released PCBs and related compounds into the Saginaw River. The industrial use of PCBs was banned in the 1970s; however, the prior release of these compounds and their slow rate of degradation has resulted in their persistence in the environment. Similarly, chemical manufacturing in the Tittabawassee watershed has resulted in the release of polychlorinated dibenzo-*p*-dioxins (dioxins) and polychlorinated dibenzofurans (furans) into the environment.

The U.S. Army Corps of Engineers (USACE) has actively dredged the Saginaw River channel since the 1960s to accommodate commercial shipping (USACE 2004, 2007). Historically, dredged sediments were placed in open water of Saginaw Bay or deposited along the Saginaw River shoreline. That changed with the construction of a confined disposal facilities (CDF) in the bay in 1978. Since then, contaminated sediments dredged from parts of the navigation channel in the Saginaw River and Saginaw Bay have been placed in the Saginaw Bay CDF. More recently a dredged material disposal facility (DMDF) was constructed in the upper river for contaminated sediments dredged in upstream areas of the harbor. Both dredging activities and shipping traffic along the Saginaw River, as well as high flow events from storms, contribute to the resuspension and redistribution of contaminated sediments.

The Saginaw Bay watershed is populated by approximately 1.4 million people. Proportionately, development within the larger Saginaw Bay watershed is most predominant within the sub-basins of the Saginaw River (30%), Flint River (20%), Kawkalin River (13%), Shiawassee River (12%), Big Creek (11%), Pine River (10%), and the Tittabawassee River (10%) (Fales et al. 2016). Urban centers occur within immediate proximity of the major rivers within the larger watershed and, rurally, residences may be clustered along streambanks within floodplains. Consequently, industrial and municipal discharges, combined sewer overflows, livestock operations, and failed septic systems have been identified as persistent sources of contaminants, bacterial contamination (*Escherichia coli*, or *E. coli*), and excess nutrients to the larger watershed (MDEQ 2012, Fales et al. 2016). Physical alteration of streambanks, such as hardening with the use of riprap, and channelization of tributaries to facilitate drainage occur throughout the various sub-basins of the watershed.

In addition to legacy contaminants and bacterial contamination, excess sediment and nutrients, and in particular phosphorus, comprise some of the most significant sources of water quality impairment in the Saginaw Bay watershed. Both point and non-point sources contribute to nutrient loading in the Saginaw Bay watershed.

Point sources contributing to total phosphorus load in the Saginaw River and Bay include industrial and municipal discharges, the most significant comprised of sewage outflows. It was not until 1954 that the last major community in the watershed, Bay City, constructed a wastewater treatment plant. Smaller communities continued to discharge untreated sewage directly into the Saginaw Bay until at least 1965 (PSC 2012). With the passage of the 1972 Federal Water Pollution Control Act, commonly known as the Clean Water Act, funding was made available to communities to upgrade wastewater treatment facilities. Between 1972 and 1988, approximately $500 million was used to improve wastewater treatment facilities in the Saginaw Bay watershed (PSC 2012). Though targets continue to be exceeded, total phosphorus loads in the Saginaw River and Bay subsequently declined in response to this investment in infrastructure (PSC 2012, Stow et al. 2014).

Efforts to characterize and address non-point source pollution in the Saginaw River and Bay continues to focus on the predominant land use within the watershed, namely agriculture. Agricultural land use encompasses at least 49% of land surface area (Table 2-1). Major crops consist of corn, soybeans, and sugar beets. The largest concentration of confined animal feeding operations in the State of Michigan occurs within the eastern subbasin of the Saginaw Bay watershed. Additional confined animal feeding operations occur in the upper reaches, south-central portion, of the watershed. In addition to the use of formulated fertilizers on croplands, manure from livestock operations is commonly surface broadcast or injected within crop fields to serve as a supplemental fertilizer. In addition to the eutrophication within Saginaw Bay associated with excess phosphorus, the use of manure as a soil amendment is associated with bacterial contamination within the watershed by the pathogen *Escherichia coli*, commonly referred to as *E. coli*. Total phosphorus for the Saginaw Bay watershed, by land use cover type, has been characterized by the Saginaw Bay Coastal Initiative (2009, Table 2-2).

Table 2-1. Summary of land use in the Saginaw Bay watershed (Homer et al., 2007).

Land Use	Percent Cover
Agriculture	49%
Forest	24%
Open lands	0%
Urban	12%
Wetlands	14%
Water	1%

Table 2-2. Total phosphorus load to the Saginaw Bay Watershed by land use cover type (HD = High Density, LD = Low Density; SBCI 2009).

Land Use	Total Phosphorus Lbs. / Year	Acres	Lbs. / Acre	Percent of Load
Agricultural	1,365,222	2,486,820	0.55	90.17
Commercial	16,586	20,915	0.79	1.10
Forest	1,400	1,196,617	0.00	0.09
Grass / Pasture	613	327,201	0.00	0.04
HD Residential	40,667	58,670	0.69	2.69
LD Residential	89,612	561,603	0.16	5.92
Total	**1,514,102**	**5,525,979**	**0.27**	**100.00**

2.6. Anthropogenic Influence – Climate Change

Atmospheric concentrations of CO_2 have measurably increased since the onset of the industrial revolution, but much of the current atmospheric CO_2 burden is correlated with the growth in fossil fuel consumption dating to the 1970s (Wolff et al. 2014). The increased use of fossil fuels has substantially increased atmospheric CO_2 concentrations resulting in the trapping of heat within the earth's lower atmosphere. As of 2018, anthropogenic activities have caused an estimated increase of 1.0°C of global warming above pre-industrial levels.(IPCC 2018). This increase in mean global surface temperature has been accompanied by ocean warming, sea level rise, decline in Arctic sea ice (Richter-Menge et al. 2017), and loss of glacial ice mass as well (Wolff et al. 2014).

These climactic trends noted on a global scale, for which there is substantial scientific consensus (IPCC 2007, 2018), are similarly evident within the regional scale of the Great Lakes Basin (Andresen 2012, Hayhoe et al. 2010, Mason et al. 2016). Hayhoe et al. (2010) summarize the parameters of a changing climate within the Great Lakes region that are consistent with previously noted global trends. These trends include an increase in mean temperature (Hayhoe et al. 2010, Robeson 2002, Schwartz et al. 2006, Schwartz and Reiter 2000, Zhao and Schwartz 2003), temperature extremes (DeGaetano and Allen 2002, Palecki et al. 2001), increases in seasonal precipitation (Angel and Huff 1997, Burnett et al. 2003, Kunkel et al. 1999, Small et al. 2006), and changes in the hydrologic cycles of Great Lakes region lakes and rivers (Dyer and Mote 2006, Jensen et al. 2007).

Along with increasing temperatures, precipitation patterns and frequency of extreme weather events are expected to change over the next decades as compared to historical patterns. Annual precipitation in the Great Lakes region is expected to increase in the future as warmer air temperatures allow the atmosphere to hold more moisture, with precipitation becoming more concentrated in winter and spring months while decreasing in the summer months by 5% to 15% by the end of the century (Wuebbels et al. 2019). Heavy rainfall events are already increasing in intensity and frequency across the United States with the largest changes observed in the Midwest and Northeast, and projected climate changes are expected to continue to increase the likelihood of extreme weather events (Wuebbles et al., 2019). These changes are likely to increase flooding and erosion, putting additional stress on infrastructure such as dams, dikes, water drainage systems, sewers, roads, and other infrastructure such as landfills (Sarhadi and Soulis 2017).

Recently, others have evaluated the changing dynamics and duration of ice cover and summer surface water temperature of the Great Lakes (Andresen 2012, Mason et al. 2016, Wang et al. 2012). Systematic acquisition of climate-related data for the Great Lakes began in the 1960s and continues to date. Data for both these studies were obtained from the Canadian Ice Service and the National Oceanic and Atmospheric Administration (NOAA) National Ice Center. In both cases, the authors of these studies note substantial variability in year to year ice cover and surface temperature of the Great Lakes. However, over the period of 1973 to 2010, ice cover of the Great Lakes declined and summer surface water temperatures increased (Wang et al. 2012, Mason et al. 2016). Andresen (2012) also notes that over approximately the same period, mean annual temperature and mean winter temperature have increased within the State of Michigan, ice cover of Grand Traverse Bay has declined, the number of days of at least 20% ice cover of the Great Lakes has declined, and total annual precipitation has increased.

Though there is substantial year to year variability in the parameters used to assess climate change, it appears certain that the Great Lakes and their associated embayments, such as Saginaw Bay, will continue to experience decreased ice coverage, either in extent or in the number of days of coverage, and increasing mean water temperatures in the future. At a minimum, for shallow water embayments, such as the inner portion of Saginaw Bay, this may result in increased light penetration in the water column and at the sediment interface. Increased light penetration and increasing water temperatures may further compound the dynamics of a eutrophic system already compromised by invasive species (e.g., dreissenid mussels, *Phragmites*) and algal blooms (Mason et al. 2016).

Additionally, climate-related change may in the future foster conditions enabling colonization of the Great Lakes by new invasive fish species (Mandrak 1989) and may also result in reduced habitat suitability for particular guilds of birds (Mortsch et al. 2006, Wires et al. 2010). For example, warmer temperatures may result in species shifts, such as warm-water fish species that may encroach upon historically cool-water habitats. Reduced summer water levels in lakes, rivers, and streams may result in reductions in wet habitat, such as wetland areas. The distribution of forests and other vegetation may change, affecting the distributions of species that depend on these habitats. Food supplies may be available earlier in the year, but diminished in the hotter months of summer, affecting the ability of migratory species to find food (Kling et al. 2003, NWF 2007, Glick et al. 2011, NOAA 2011, Pryor et al.

2014, USEPA 2016b). Extreme weather events may similarly affect plant and animals species that are sensitive to winter or spring flooding, such as ground-nesting birds, or species that may be affected by summer droughts, such as amphibians.

The distribution of aquatic biota may also change. For example, warmer temperatures may result in species shifts (warm-water fish species may encroach in historically cool-water areas and the ranges of cold-water fish species may become more limited, and they may have reduced abundance), and could help invasive species to become established. Further, timing of migration and spawning events may shift in response to changes in temperature and water flow, and other stressors, such as pollution, may be exacerbated (Kling et al. 2003, Glick et al. 2011, Collingsworth et al. 2017, Myers et al. 2017). The ranges of cold-water fish species may become more limited, and their abundance may be reduced. Further, the timing of migration and spawning events may shift in response to changes in temperature and water regimes. The impacts of other stressors, such as pollution, may be increased (Collingsworth et al. 2017, Glick et al. 2011, Kling et al. 2003, Myers et al. 2017).

2.7. Ecological Environment

2.7.1. Aquatic Habitat and Fish Communities

Aquatic habitat types vary from headwater streams, to major rivers, to the Saginaw Bay and are driven by flow, depths, water quality, and bottom substrates. Substrates within both the Saginaw and Tittabawassee rivers consist of sandy, fine-grained sediments generally 1.5-7.5 feet thick, reaching up to 12 feet thick in some areas. Sediments are transported downstream during periods of high flow, commonly following large precipitation events, and deposited in the floodplain and other depositional areas within the river. The Saginaw River is a lower-energy river, with a wider channel and lower rates of sediment deposition, and has comparatively less connection with its floodplain than does the Tittabawassee River. All the rivers within the larger watershed have been affected by anthropogenic activities, beginning with logging in the mid-late 1800's, dam and berm construction in the 1900s, other infrastructure construction such as bridges and pipeline crossings throughout the 1900s, and contamination. The bottom substrate in Saginaw Bay varies from year to year but ranges from mostly cobble to silt; the relative sand content throughout the Bay has increased since the 1970s (Nalepa et al. 2003, ATS 2006, Schrouder et al. 2009, Siersma et al. 2014).

Aquatic macroinvertebrate communities found within the Saginaw River and Saginaw Bay include worms, flatworms, leaches, oligochaetes, crayfish, isopods, amphipods, mayflies, stoneflies, damselflies, caddisflies, true flies, midges, gastropods, and mussels. Aquatic invertebrates serve an important role within aquatic ecosystems by supporting important ecological functions as prey to biota and digesting and degrading plant material (MDNR 1994b, MDEQ 2008).

Fish community structure within Saginaw Bay has undergone substantial change in recent decades. Fielder and Thomas (2014) provide a recent summary of status and trends of the fish community within the Saginaw Bay. They suggest that the predominant, most recent, change within the fish community of Saginaw Bay has been the collapse of certain prey species. Alewives (*Alosa* spp.) and rainbow smelt (*Osmerus mordax*) have dramatically declined or been extirpated within Saginaw Bay while the non-native and invasive round goby (*Neogobius melanostomus*) has become well-established. The

disappearance of the invasive alewife has provided for greatly increased walleye (*Sander vitreus*) reproductive success (Fielder et al. 2007) and, in 2009, populations reached recovery targets. Reproductive success of yellow perch (*Perca flavescens*), another important species of recreational and commercial value, is evident, though recruitment has been limited by predation pressure due perhaps to the loss of alternate prey species.

Numerous fish species occur within the main stems of the Saginaw River tributaries including carp (*Cyprinus carpio*), channel catfish (*Ictalurus punctatus*), quillback (*Carpiodes cyprinus*), freshwater drum (*Aplodinotus grunniens*) white suckers (*Catostomus commersonii*), emerald shiners, (*Notropis atherinoides*) golden redhorse (*Moxostoma erythrurum*), gizzard shad (*Dorosoma cepedianum*), northern hog suckers (*Hypentelium nigricans*), northern pike (*Esox lucius*), rock bass (*Ambloplites rupestris*), shorthead redhorse (*Moxostoma macrolepidotum*), smallmouth bass, walleye, white bass (*Morone chrysops*), yellow perch, longnose gar (*Lepisosteus osseus*), and logperch (*Percina caprodes*) (Schrouder et al. 2009).

2.7.2. Floodplain Habitat

Floodplains of the Saginaw River tributaries are ecologically similar, though the Saginaw River corridor itself is more developed, with less hydrologic connection to its floodplain, as compared to other rivers in the watershed. Historic riparian forest vegetation primarily consisted of a beech-sugar maple community on clay soils. Wetter, riparian soils also supported red maple (*Acer rubrum*), American elm (*Ulmus americana*), white ash (*Fraxinus americana*), and American basswood (*Tilia americana*). Intensive agricultural production since the mid-19th century has altered the natural landscape over much of this ecoregion, including within the Saginaw River floodplains (U.S. EPA 2016).

The Shiawassee Flats Area, where five rivers converge to form the Saginaw River, contains freshwater estuarine and floodplain riparian habitats (Buchanan et al. 2013). Albert and Comer (2008) provide a summary of what would have been the likely composition of presettlement vegetative communities within the Shiawassee Flats. Based on historic General Land Office surveys, they suggest that the Shiawassee Flats may have been dominated by a core area of shrub swamp and emergent marsh encompassed within a black ash (*Fraxinus nigra*) dominated swamp forest (Albert and Comer 2008, Heitmeyer et al. 2013). Small wet prairie inclusions were historically mapped by General Land Office surveyors (Albert and Comer 2008).

The Shiawassee State Game Area and the Shiawassee National Wildlife Refuge are adjacent properties that occur within the Shiawassee Flats area near the confluence of the Shiawassee and Tittabawassee Rivers where they form the Saginaw River. Collectively, these two properties, managed by the MDNR and the USFWS, respectively, provide some of the largest remaining contiguous riparian forest in the Saginaw Bay watershed, as well as some of the most substantial areas of emergent marsh habitat, characterized by interspersed open-water and cattail. These areas are rigorously managed to minimize the occurrence of invasive plants so as to provide high quality habitats for migratory waterfowl (Dunton 2018).

2.7.3. Great Lakes Coastal Wetlands and Other Wetlands

The Saginaw Bay watershed supports substantial areas of emergent marsh, forested riparian wetlands, and one of the largest areas of freshwater coastal wetlands in the Great Lakes (Albert 2003, Albert et al. 2005). These coastal wetlands vary in type and may include lacustrine associated wetlands (shorelines and open, protected, or sand-spit embayments), riverine associated wetlands (drowned river mouths, connecting channels, and deltas), and barrier enclosed wetlands (barrier beach lagoons and swale complexes) (Albert 2003, Albert et al. 2005).

Great Lakes embayments are partially protected areas of water. They may be characterized as open embayments, protected by the curvature of the Great Lakes shoreline, or they may be characterized as protected embayments, which receive some additional protection from wave action due to features such as sand spits. Saginaw Bay open embayment wetlands are generally low in diversity, dominated by three-square (*Schoenoplectus americanus*), a bulrush that can tolerate the force of wave action along the shoreline. Sand spit embayments support dense beds of submergent and emergent marsh vegetation such as blue-joint grass (*Calamagrostis canadensis*) and tussock sedges (*Carex stricta*).

Wetlands associated with river deltas form with downstream flow and accumulation of sediments at a river mouth. Deltas typically form wide, slower moving areas of current that allow sediments to settle, forming islands and bars. This frequently forms a branched system of waterways of shallow pools or flats. The Saganing River mouth (Appendix 10.2) is an example of a river delta wetland habitat. Drowned river mouth wetlands are characterized by a permanent channel within a flood plain. A drowned river mouth is typically separated from the body of the Great Lakes by sandy or rocky spits. Marshes often form in areas behind spits and may provide spawning and nursery areas for fish such as northern pike and resting or foraging habitat for migrating waterfowl.

Dune and swale habitats (barrier enclosed wetlands) are unique in that they feature alternating sand ridges that encompass depressional wetlands that form parallel to the lake shore. These areas formed with glacial retreat and are typically isolated wetlands sheltered from wave and wind action.

Emergent marshes are closely related to coastal wetlands and are closely linked to fluctuating Great Lakes water levels. When water levels fall, mudflats may be exposed and may be subsequently colonized by vegetation, creating an emergent marsh. These areas are among the most productive of all Great Lakes coastal habitats for waterfowl and other waterbirds. Many of the properties managed by the Michigan Department of Natural Resources (Appendix 10.4) feature Great Lakes emergent marsh habitats. Large marshes or marshes within a wetland complex often support a diverse breeding bird community because of the variety of habitat conditions. Periods of declining water levels, particularly in areas characterized by sandy substrates, have been associated with the rapid colonization and dominance of coastal marshes in the Great Lakes and Saginaw Bay by the highly invasive and non-native species *Phragmites australis* (Tulbure and Johnston 2010).

2.7.4. Upland Habitat

The Saginaw Bay watershed predominately lies within the Saginaw Lake Plain subregion of the Huron / Erie Lake Plains Ecoregion (U.S. EPA, 2010). This ecoregion is a broad, fertile, nearly flat plain punctuated by relic sand dunes, beach ridges, and glacial end moraines.

The Shiawassee National Wildlife Refuge has attempted to reconstruct pre-European settlement vegetative cover using Michigan Natural Features Inventory data derived from historic (circa 1800s) General Land Office surveys. Presettlement land cover, likely representative of the Shiawassee Flats area within this ecoregion, may have consisted of beech-sugar maple forest (37%), shrub/swamp emergent marsh (28%), mixed hardwood swamp (27%), lake/river (6%), with inclusions of wet prairie (2%) within in other habitat types. Oak savanna would have been typically restricted to sandy, well-drained dune and beach ridges.

Timber harvesting began in the early-1800's; sawmills were established on all major rivers in the Saginaw Valley (Foehl and Hargreaves 1964). By the mid-1800's timber harvest of primarily white pine (*Pinus strobus*) was the primary economic activity in the state (Fitting 1970, Heitmeyer et al. 2013); by 1900 most of the mature stands of native forest had been cut-over. As timber harvest diminished, agriculture became more important in the region. Cleared land was typically used for corn and wheat production and native wet prairies were hayed or grazed (Heitmeyer et al. 2013). At present, agriculture is the predominant land use within the Saginaw Bay watershed, accounting for approximately 49% of the land area. Agricultural land use differs widely by sub-basin, comprising approximately 8% of land use within the Tawas River watershed and approximately 86% in the Sebewaing River watershed (Fales et al. 2016). Crop production is predominated by corn, soybeans, and sugar beets (USDA NASS 2014). The northern half of larger Saginaw Bay watershed contains a greater proportion of forested lands, while the southern half of the watershed is dominated by agricultural land use (Fales et al. 2016). The largest remaining single contiguous forest within the Tittabawassee watershed, one of the main tributaries of the Saginaw River, is located within the Shiawassee NWR, consisting of approximately 3,500 acres (USFWS 2001).

2.7.5. Migratory Birds

The Saginaw Bay watershed is encompassed by Bird Conservation Region 12 – Boreal Hardwood Transition, but lies just north of the boundary of Bird Conservation Region 23 – Prairie Hardwood Transition. The Bird Conservation Regions (BCRs) are broad ecological units identified by the North American Bird Conservation Initiative (USFWS 2008). BCR 12 is characterized by both coniferous and northern hardwood forests, generally nutrient poor soils, numerous lakes, bogs, and rivers. BCR 23 was once dominated by prairies in the west and south portion of the BCR, beech-maple forests in the northern portion of the BCR, and areas of oak savannah between these two other ecotypes. Because of the variation in ecotypes within these two BCRs, and the intersection of large rivers that may serve as migratory corridors for birds, a substantial number of avian species are known to seasonally occur in the area, as documented by the Shiawassee National Wildlife Refuge. The Refuge lies at the junction of the Shiawassee and Tittabawassee rivers, located centrally within the larger Saginaw Bay watershed. The

Refuge's birding checklist notes 281 bird species and indicates their seasonal habitat use on the Refuge (Web link: Birds of the Shiawassee National Wildlife Refuge).

In order to facilitate the conservation of migratory birds, the USFWS has identified Birds of Conservation Concern. These are species that without additional conservation action are likely to become candidates for listing under the Endangered Species Act of 1973, as amended. In the State of Michigan, 37 species have been identified as Birds of Conservation Concern (USFWS 2008; Table 2-3); many of these species occur seasonally within the Shiawassee Flats. In addition, the Audubon Society has identified habitats of particular value to migratory birds within the Saginaw Bay watershed (Table 2-4). Two habitat areas have been designated as globally important. This includes portions of Saginaw Bay that provide notable areas of colonial waterbird habitat.

All migratory birds are protected under the Migratory Bird Treaty Act of 1918 whether or not they have been designated as a listed species under either the Endangered Species Act or the State of Michigan Natural Resources and Environmental Protection Act. In addition, the Bald and Golden Eagle Protection Act of 1940 provides bald eagles (*Haliaeetus leucocephalus*) and their nests further protections beyond that provided by the Migratory Bird Treaty Act of 1918.

Table 2-3. Migratory Birds of Conservation Concern (FWS 2008) that occur within the State of Michigan in Bird Conservation Regions 12 (Boreal Hardwood Transition), or 23 (Prairie Hardwood Transition).

Species	Bird Conservation Region	State Status	Primary Habitat Type(s)	Threats Identified in Michigan Wildlife Action Plan
Acadian Flycatcher *Empidonax virescens*	BCR 12 BCR 23		Hardwood, riparian-floodplain corridor	fragmentation, invasive plants and animals
American Bittern *Botaurus lentiginosus*	BCR 12 BCR 23	SC	Prairie, Lowland shrub, bog, wetland	conversion to agricultural land, wetland alteration
Bald Eagle *Haliaeetus leucocephalus*	BCR 12 BCR 23	SC	Hardwood, conifer, dunes, inland lakes,	conversion to agricultural land, dams, dredging
Black Tern *Chlidonias niger*	BCR 12 BCR 23	SC	Wetlands, inland lakes, ponds	conversion to agricultural land, competition
Black-billed Cuckoo *Coccyzus erythropthalmus*	BCR 12 BCR 23		Pastures, forests	conversion to agricultural land, grazing patterns
Black-crowned Night-heron *Nycticorax nycticorax*	BCR 12 BCR 23		Lowland shrub, wetland, inland lakes	conversion to agricultural land, grazing patterns
Blue-winged Warbler *Vermivora pinus*	BCR 12 BCR 23		Shrub, hardwood, conifer, forest opening	incompatible resource mgmt., invasive species
Bobolink *Dolichonyx oryzivorus*	BCR 12 BCR 23		Prairie, hayland, wetlands, fields	altered fire regimes, fragmentation, grazing patterns
Brown Thrasher *Toxostoma rufum*	BCR 12 BCR 23		shrub, hardwood, conifer, forest opening	altered fire regimes, biological interactions
Canada Warbler *Wilsonia canadensis*	BCR 12 BCR 23		shrub, hardwood, conifer, floodplain corridor	conversion to agricultural land, altered fire regime
Cerulean warbler *Dendroica cerulea*	BCR 12 BCR 23		Hardwood, floodplain corridor	conversion to agricultural land, fragmentation
Common Tern *Sterna hirundo*	BCR 12 BCR 23	T	Wetlands, inland lakes, dunes, floodplain corridor	parasites, altered hydrologic regimes, competition

Species	Bird Conservation Region	State Status	Primary Habitat Type(s)	Threats Identified in Michigan Wildlife Action Plan
Dickcissel *Spiza americana*	BCR 12 BCR 23		Prairie, hayland, fence row	grazing/mowing patterns, pesticides, invasive species
Field Sparrow *Spizella pusilla*	BCR 12 BCR 23		Prairie, fence row, shrub, forest opening	altered fire regime, grazing patterns, industrialization
Golden-winged Warbler *Vermivora chrysoptera*	BCR 12 BCR 23		Shrub, hardwood, forest opening, bog	conversion to agricultural land, altered fire regimes
Grasshopper Sparrow *Ammodramus savannarum*	BCR 12 BCR 23	SC	Prairie, hayland, pasture	conversion to agricultural land, altered fire regimes
Henslow's Sparrow *Ammodramus henslowii*	BCR 12 BCR 23	E	Prairie, hayland, pasture	conversion to agricultural land, altered fire regimes
Horned Grebe - nonbreeding *Podiceps auritus*	BCR 12 BCR 23		Prairie, wetlands, inland lakes, ponds	conversion to agricultural land
Least Bittern *Ixobrychus exilis*	BCR 12 BCR 23		Lowland shrub, wetland, inland lakes	conversion to agricultural land, dredging, parasites
Marsh Wren *Cistothorus palustris*	BCR 12 BCR 23		Wetlands, ponds, inland lakes	conversion to agricultural land, grazing patterns
Migrant loggerhead shrike *Lanius ludovicianus migrans*	BCR 12 BCR 23		Pasture, shrub, hardwood	conversion to agricultural land, altered fire regime
Northern Flicker *Colaptes auratus*	BCR 12 BCR 23		Pasture, wetland, hardwood, conifer, swamp	biological interactions (nest (site competition)
Olive-sided Flycatcher *Contopus cooperi*	BCR 12		Hardwood, conifer, wetlands, inland lakes	conversion to agricultural land, altered fire regime
Peregrine Falcon *Falco peregrinus*	BCR 12 BCR 23		Great Lakes nearshore, floodplain corridor	disease, parasites, industrialization, pesticides
Pied-billed Grebe *Podilymbus podiceps*	BCR 12 BCR 23		Wetlands, inland lakes, ponds, floodplain corridor	climate change, conversion to agricultural land

Species	Bird Conservation Region	State Status	Primary Habitat Type(s)	Threats Identified in Michigan Wildlife Action Plan
Prothonotary Warbler *Protonotaria citrea*	BCR 23		Hardwood, swamp, floodplain corridor	invasive species, wetland alterations
Red-headed Woodpecker *Melanerpes erythrocephalus*	BCR 12 BCR 23		Prairie, hardwood, conifer, forest opening	conversion to agricultural land, altered fire regime
Rusty Blackbird - nonbreeding *Euphagus carolinus*	BCR 12 BCR 23		Ponds, wetlands, shrubby shoreline	conversion to agricultural land
Short-billed Dowitcher - nonbreeding *Limnodromus griseus*	BCR 12 BCR 23		Mudflats, creeks	conversion to agricultural land
Short-eared owl Asio flammeus	BCR 12 BCR 23	E	Prairie, pasture, bog, wetland, hayland	conversion to agricultural land, fragmentation
Solitary Sandpiper - nonbreeding *Tringa solitaria*	BCR 12 BCR 23		Swamps, ponds, woodland streams	conversion to agricultural land
Upland Sandpiper Bartramia longicauda	BCR 12 BCR 23		Pastures, fields, grasslands	grazing/mowing patterns, pesticides, invasive species
Whip-poor-will *Caprimulgus vociferus*	BCR 12 BCR 22 BCR 23		Hardwood, conifer, forest opening	conversion to agricultural land, competition
Willow Flycatcher *Empidonax traillii*	BCR 12 BCR 23		Swamps, pastures, lakeshores	conversion to agricultural land
Wood Thrush *Hylocichla mustelina*	BCR 12 BCR 23		Hardwood, swamp, floodplain corridor	fragmentation, invasive plants and animals
Yellow Rail *Coturnicops noveboracensis*	BCR 12		Hayland, bog, wetland, fen	altered fire & hydrologic regime, urbanization

State Status : E = Endangered, T = Threatened, SC = Special Concern
Summer Status – Shiawassee NWR: C = common; U= uncommon; O = occasional; R = rare; I = incidental.

Table 2-4. Audubon designated Global and State Important Bird Areas within, or partially within, the Saginaw Bay watershed.

Name	Designation
Kirtland's Warbler Management Units & Guide's Rest	Globally Important Bird Area
Saginaw Bay	Globally Important Bird Area
Gladwin Lake Plain	State Important Bird Area
Lower Au Sable River & Iosco Co. N. Goshawk IBA	State Important Bird Area
Murphy Lake State Game Area	State Important Bird Area
Nayanquing Point State Wildlife Area	State Important Bird Area
Saginaw Bay Tawas Bay	State Important Bird Area
Shiawassee National Wildlife Refuge	State Important Bird Area
Shiawassee River State Game Area	State Important Bird Area
Wigwam Bay Marshes & Rifle River Mouth	State Important Bird Area

2.7.6. Threatened and Endangered Species

Species designated as federally threatened or endangered under the Endangered Species Act that may occur within the Saginaw Bay watershed include two species of bats, two bird species, one snake species, three mussel species, two butterfly species, and two flowering plants. Occurrence was determined by consulting publicly available records from the Information and Planning and Consultation system (IPaC, USFWS 2020) for the following counties: Arenac, Bay, Clare, Genesee, Gladwin, Gratiot, Huron, Iosco, Isabella, Lapeer, Livingston, Midland, Mecosta, Montcalm, Oakland, Ogemaw, Osceola, Roscommon, Saginaw, Sanilac, Shiawassee, and Tuscola counties (Table 2-5). Critical habitat for the Piping plover (*Charadrius melodus*) occurs in the northeast area of Saginaw Bay within the boundaries of the Tawas Point State Park. Federally designated threatened and endangered species are legally protected under the Endangered Species Act.

Similar to species designated as threatened or endangered elsewhere, virtually all of the federally listed species that may occur within the Saginaw Bay watershed are to some degree associated with unique habitats or are habitat specialists. The two bat species use unique hibernacula with narrow temperature and humidity requirements; the three birds species use narrowly specific habitat types that differ substantially among the species; the two snake species use unique wetland types; in addition to water quality, the three mussel species require specific bottom substrates as habitats; the butterflies are associated with unique habitats and may be associated with unique plant species that provide egg laying sites; and, the listed plants are associated with rare habitats (e.g., the Pitcher's thistle (*Cirsium pitcheri*) occurs only in dune environments).

The only designated critical habitat for an endangered species in the vicinity of the Saginaw Bay is an area of habitat for the piping plover. Critical habitats are identified and designated when they are regarded as essential to the recovery of an endangered species. Critical habitat for the endangered piping plover occurs within the Tawas Point State Park, in the northeast portion of Saginaw Bay. Approximately 2.0 miles of shoreline in the park, extending 500 meters inland, is designated as critical habitat for the piping plover. The entire area of this designated critical habitat occurs within the state ownership of the park.

A substantial number of species have been designated as state threatened, endangered, or of special concern under the State of Michigan's Endangered Species Act, Part 365 of the Natural Resources and Environmental Protection Act (Public Act 451 of 1994, as amended). A comprehensive list of these species, organized by county, has been compiled and is available for review at https://www.fws.gov/midwest/es/ec/nrda/SaginawNRDA. Internet links to life history information, summarized by the Michigan Natural Features Inventory, as well as habitat associations for state listed species, is included within this list of state threatened, endangered, or special concern species.

Species designated as federally threatened or endangered are also identified as State of Michigan listed species. Species that are designated by the State of Michigan as threatened or endangered under the Natural Resources and Environmental Protection Act of 1994 are protected under Michigan statute. Species designated as of special concern are not afforded legal protection, but receive management emphasis because of their declining or relict populations in the state.

Table 2-5. Federally listed threatened and endangered species, along with their state listing status in Michigan, that may occur within the Saginaw Bay watershed.

Species	Federal Status	State Status	Habitat Associations
Indiana Bat *Myotis sodalis*	Endangered	Endangered	Small to medium rivers with well-developed riparian woods; woodlots within 1-3 miles of rivers and streams; upland forests. Caves and mines as hibernacula.
Northern Long-Eared Bat *Myotis septentrionalis*	Threatened	Special Concern	Hibernates in caves and mines-swarming in surrounding wooded areas in autumn. Roosts and forages in upland areas.
Piping Plover *Charadrius melodus*	Endangered	Endangered	Uses wide, sandy beaches that are flat and have very little vegetation. Nesting territories include small creeks and wetlands.
Piping Plover - Critical Habitat	Critical		Approximately 2.0 km (1.2 mi) of Lake Huron shoreline in Iosco County, Michigan. The entire designated area is part of Tawas Point State Park.
Rufa Red Knot *Calidris canutus rufa*	Threatened		Large wetland complexes during the migratory window of May 1-Sep. 30.
Eastern Massasauga Rattlesnake *Sistrurus catenatus*	Threatened	Special Concern	Shallow wetlands or shrub swamps in spring. Crayfish towers or small animal burrows which are adjacent to drier upland open shrub forest sites. During summer, massasaugas move to drier upland areas.
Northern Riffleshell *Epioblasma torulosa rangiana*	Endangered	Endangered	Found in small to large streams. Buries itself in bottoms of firmly packed sand or gravel.

Species	Federal Status	State Status	Habitat Associations
Rayed Bean *Villosa fabalis*	Endangered	Endangered	Small headwater creeks or large rivers and wave-washed areas of glacial lakes. Prefers gravel or sand substrates.
Snuffbox Mussel *Epioblasma triquetra*	Endangered	Endangered	Found in small creeks to large lakes, and inhabiting areas with a swift current. Adults burrow in sand, gravel, or cobble substrates.
Karner Blue Butterfly *Lycaeides melissa samuelis*	Endangered	Threatened	Pine barrens and oak savannas on sandy soils containing wild lupines.
Poweshiek Skipperling *Oarisma poweshiek*	Endangered	Threatened	High quality tallgrass and mixed prairie grass. Found in prairie fens.
Eastern Prairie Fringed Orchid *Platanthera leucophaea*	Threatened	Endangered	Mesic to wet prairies and meadows.
Pitcher's Thistle *Cirsium pitcher*	Threatened	Threatened	Grows on the open sand dunes and low beach ridges of Great Lakes shores. Found in near-shore plant communities or non-forested areas of dune systems.

2.7.7. Cultural and Historic Resources

The Saginaw Bay watershed contains historical and cultural resources from both prehistoric cultures and European settlement since the 1800s. The National Register of Historic Places (NRHP) is the official list of the Nation's historic places worthy of preservation and in Michigan the National Register of Historic Places list of sites is maintained by the State Historic Preservation Office (SHPO) in Lansing. The State Historic Preservation Office list of sites in the Saginaw Bay watershed contains 96 archeological sites that are either listed on the National Register of Historic Places or eligible for listing, with over two-thirds of these occurring in Midland, Saginaw, and Bay counties (Table 2-6). Archeological sites in the Saginaw Bay watershed include camps, villages, petroglyphs, mounds, cemeteries, trading posts, missions, and homesteads that date from the prehistoric periods through the Archaic and Woodland periods to the historic period (Halsey, 1999). Additional historic sites consisting of structures that still exist above ground include private homes, commercial and government buildings, manufacturing facilities, churches, bridges, navigational structures, and historic districts. Archaeological and above ground sites generally tend to be located in towns and cities that date back to the 1800s and are clustered along past routes of transportation, especially along rivers and railroads.

Areas bordering the Tittabawassee and Shiawassee rivers within the Shiawassee NWR are considered to be among the most archaeologically rich sites in the State of Michigan (Castle Museum 2013). The Shiawassee NWR has conducted a comprehensive assessment of cultural resources within the administrative boundary of the Refuge (Robertson et al. 1999). As related within the Refuge's Comprehensive Conservation Plan (USFWS 2001), the Refuge has identified 31 cultural resource sites on the Refuge and an additional 42 sites on additional lands within the expansion area of the Refuge. These include prehistoric archaeological sites, historic archeological sites (Native American and Western), industrial and mining sites, farmsteads, and timbering sites. Evidence for early Paleo-Indian cultures (10,000-8000 B.C.) consists of fluted points in private collections. Other prehistoric cultures are represented in the archeological record: Archaic (8000-550 B.C.) and Woodland (600 B.C.-1600 A.D.).

Table 2-6. Archaeological sites considered eligible for listing or listed on the National Register of Historic Places for the Saginaw Bay watershed (J. Yann, Michigan SHPO, personal communication with L. Williams, July 19, 2017).

County	Total Sites	Brief Site Descriptions
Arenac	10	Prehistoric to Late Woodland camps and quarry
Bay	15	Prehistoric to 1900's camps, dump, hunting club
Genesee	4	Paleo-Indian, Late Archaic, Late Woodland camps and mid-1800's mission
Gratiot	6	Prehistoric to Late Woodland camps
Iosco	4	1900's logging and work camps, barn
Lapeer	2	Prehistoric through 1800's camp, village, cemetery
Midland	20	Prehistoric through 1800's camps, mound, cemetery, village, trading post, homestead
Oakland	1	Prehistoric, undetermined
Ogemaw	1	Late Woodland earthwork
Saginaw	31	Prehistoric through 1800's camps, burial/cemetery, village, cabin
Sanilac	1	Prehistoric petroglyphs and camp
Tuscola	1	Late Archaic camp

2.7.8. Natural Resource Based Recreation

Of the 22 counties in the Saginaw Bay watershed, all except Iosco, Roscommon, and Sanilac counties have publicly available recreational master plans to aid in maintaining recreational opportunities within their respective counties. Six of the 22 counties border Saginaw Bay: Arenac, Bay, Huron, Iosco, Saginaw, and Tuscola (Table 2-7). All the counties, and in particular those that border Saginaw Bay, make substantial note of the role of natural resource based recreation as a fundamental driver of tourism within their respective economies.

The Michigan Department of Natural Resources makes a planning aid available to County Park and Recreation Departments to assist in the development of these plans: *Guidelines for the Development of Community Park, Recreation, Open Space, and Greenway Plans*[4]. Consequently, county recreation plans typically contain consistent information regarding an inventory of recreational assets and opportunity within the counties. This also typically includes the recreational inventories of townships and cities within the respective counties. In addition, many townships and cities have developed their own respective Parks, Recreation, and Open Space Plans in accordance with the guidelines developed by the Michigan Department of Natural Resources.

Three Department of Natural Resources divisions provide substantial opportunities for natural resource based recreation in the six counties that border Saginaw Bay: the Forest Resources Division, Wildlife Division, and the Parks and Recreation Division (Table 2-8). In addition to providing public access to recreational lands or waterways for activities such as hunting, fishing, or bird-watching, the MDNR provides recreational opportunities associated with managed facilities such as State Forest and State Park campgrounds; hiking, bicycle, equestrian, and ski trails; designated ATV/ORV trails; snowmobile trails; and, access to the Michigan Cross Country Cycle Trail.

State-owned lands available for recreation within the Saginaw Bay watershed include those managed by the Forest Resources Division: 220,000 acres within the Gladwin Management Unit (Arenac, Bay, Clare, Gladwin, Isabella, and Midland counties); 275,000 acres within the Roscommon Unit (Ogemaw and Roscommon counties); and portions of the Grayling Unit in Iosco County. State recreation sites within close proximity to Saginaw Bay include Port Crescent State Park, Sleeper State Park, Sanilac Petroglyphs Historic State Park, Bay City State Recreation Area, Black Creek State Forest Campground, Ambrose Lake State Forest Campground, Rifle River Recreation Area, and Tawas Point State Park.

Federal lands managed for natural resource values include sites within the Huron-Manistee National Forest, Michigan Islands NWR, and the Shiawassee NWR. The Shiawassee NWR provides recreational opportunities for hunting, fishing, trapping, hiking, bicycling, cross country skiing, wildlife observation, photography, environmental education and interpretation, and other uses as described in more detail in the Shiawassee NWR CCP (USFWS 2001). In 2006, it was determined that the Refuge received 117,500 recreational visits. This was comprised of approximately 84,400 visits by residents of the State of Michigan and 34,100 visits by non-residents (Carver and Caudill 2007). Primary recreational use consisted of non-consumptive recreational activities such as hiking and wildlife observation.

[4] https://www.michigan.gov/documents/dnr/IC1924_338125_7.pdf

Table 2-7. Availability of county-wide recreational plans for Saginaw County and the six counties bordering the Saginaw Bay.

County	County Recreation Plan and Availability
Arenac	2015 Arenac Co. Parks and Recreation Master Plan; available only by inspection at the Arenac County Bldg., 120 N. Grove St., Standish, MI 48658
Bay	Bay County Area Recreation Plan: 2014-2018; available online at: Web link: Bay County Recreation Plan
Clare	2014 Parks and Recreation – Clare County; available online at: Web link: Clare County Recreation Plan
Huron	Huron County Recreation Plan 2018-2022; available online at: Web link: Huron County Recreation Plan
Iosco	Recreation plan currently in development.
Saginaw	Saginaw County Recreation Plan 2014-2018; available online at: Web link: Saginaw County Recreation Plan
Tuscola	Tuscola County Parks and Recreation Master Plan 2017 – 2021; available online at: Web link: Tuscola County Recreation Plan

Table 2-8. Managed State Game Areas (SGAs) and State Wildlife Areas (SWAs) within the six counties bordering the Saginaw Bay.

County	State Game Areas (SGAs) and State Wildlife Areas (SWAs)
Arenac	Wigwam Bay SWA
Bay	Crow Island SGA (northern portion), Fraser Township No.1 (Townline Road) SGA, Fraser Township No.2 (Kitchen Road) SGA, Nayanquing Point SWA, Pinconning Township SGA, Quanicassee SWA (western portion; majority), Tobico Marsh Game Unit of Bay City State Recreation Area
Huron	Brookfield Township 1 & 2 SGA, Gagetown SGA, Oliver Township SGA, Rush Lake SGA, Verona SGA, and Wildfowl Bay SWA.
Iosco	No designated State Game or Wildlife areas.
Saginaw	Crow Island SGA (southern portion; majority), Gratiot-Saginaw SGA (eastern portion), Shiawassee River SGA
Tuscola	Almer Township SGA, Cass City SGA (western portion; majority), Clark Lake SGA, Columbia Township SGA, Deford SGA, Denmark Township SGA, Elmwood Township SGA, Fish Point SWA, Gagetown SGA (southern portion; majority), Murphy Lake SGA, Quanicassee SWA (eastern portion), Tuscola SGA, Vassar SGA

Recently, the Michigan Department of Natural Resources designated eight waterways as water trails, including a portion of the Flint River that is within the Saginaw Bay watershed[5]. The Department of Natural Resources also makes related community-based information available to recreational paddlers[6]. Similarly, user groups have identified locations or trails related to recreational bird-watching. For example, the Saginaw Basin Land Conservancy and Michigan Audubon have developed a Saginaw Bay Birding Trail that identifies birding opportunities around Saginaw Bay in Arenac, Bay, Huron, Iosco, Saginaw, and Tuscola counties[7].

The National Survey of Fishing, Hunting, and Wildlife Associated Recreation (USDOI et al. 2013) provides basic information regarding the economic impact of wildlife associated recreation in the State of Michigan. In 2011, anglers contributed $2.47 B to Michigan's economy, hunters added $2.34 B, and recreationists that participated in wildlife watching spent $1.23 B in Michigan, totaling approximately $6.1 B in expenditures in 2011 related to wildlife-based recreation.

Few studies have directly addressed the economic impact associated with natural resource related recreation specifically in the Saginaw Bay area. Regarding recreational visits just to the Shiawassee NWR, Carver and Caudill (2007) estimated that in 2006 the Refuge received 117,520 visits, and returned $2.42 in economic benefit in return for each dollar expended. Based on a 2006 survey, approximately 60% of the general public in the Saginaw Bay watershed visits the Saginaw Bay or coastal marsh area multiple times a year for outdoor recreation, primarily for fishing, but also for boating, beach-going, nature observation, hunting, or a variety of other activities (Whitehead et al. 2006). With respect to just the resource value associated with Saginaw Bay Great Lakes coastal wetlands, Whitehead et al. (2009) estimated that the present value of each acre of Saginaw Bay coastal marsh for the purpose of recreation was $1870 and an additional $551 for non-recreationists. That is, they estimated that the total present value of Saginaw Bay coastal marsh could be as high as $2421 per acre. The recreation plans noted above (Table 2-7) similarly note the role of natural resources in supporting local economies within the counties encompassing the Saginaw River and Bay.

2.7.9. Saginaw River and Bay Area of Concern

The Great Lakes Water Quality Agreement was first signed by the federal governments of the United States and Canada in 1972 to restore and maintain the chemical, physical, and biological integrity of the waters of the Great Lakes. It has been amended and revised several times since then, most recently in 2012 (MDEQ 2012). The 1987 amendment directed the Parties to designate Areas of Concern, which are defined as geographic areas that fail to meet water quality objectives of the Agreement, and cause impairment of beneficial uses or of the area's ability to support aquatic life. The International Joint Commission, working with the Parties and coordinating with state and provincial governments, designated 43 areas of concern in eight Great Lakes states and two Canadian provinces around that time, including the Saginaw River and Bay Area of Concern[8].

[5] https://www.michigan.gov/dnr/0,4570,7-350-79133_79206_83617-485656--,00.html

[6] http://www.michiganwatertrails.org/

[7] http://www.saginawbaybirding.org/

[8] https://www.epa.gov/glwqa

The 1987 Amendments to the Great Lakes Water Quality Agreement defined beneficial use impairments and directed the Parties to develop and implement remedial action plans for each area of concern, in cooperation with the state and provincial governments. The original remedial action plan for the Saginaw River and Bay Area of Concern was finalized in September 1988 and was instrumental in guiding efforts to implement remedial actions related to the beneficial use impairments. Updated remedial action plans were completed in 1995, 2002, 2008, and 2012 (MDEQ 2008, MDEQ 2012). The remedial action plans, as well as additional information about the Saginaw River and Bay Area of Concern, are publicly available at https://www.michigan.gov/egle/0,9429,7-135-3313_3677_95060-506904--,00.html.

Designation of areas of concern within the Great Lakes area in 1987 was based on environmental degradation related to 14 specific beneficial use impairments. Impairment within the Saginaw River and Bay Area of Concern was based on ecological conditions that impacted 12 of the 14 beneficial use impairments. Impairment was related to excess nutrients (eutrophication), elevated bacteria levels, aquatic habitat loss, and chemical contaminants such as PCBs, dioxins, and furans. While significant progress has been made, and three of the beneficial use impairments have been officially removed for the Saginaw River and Bay Area of Concern, remaining beneficial use impairments still include restrictions on fish or wildlife consumption, eutrophication or undesirable algae, degradation of fish and wildlife populations, beach closings, degradation of aesthetics, bird or animal deformities or reproductive problems, degradation of benthos, degradation of phytoplankton and zooplankton populations, and restriction on dredging activities (ECCC and the U.S. EPA. 2018).

Along with previous projects from the 1998 settlement, natural resource agencies and their partners have implemented significant restorations of Saginaw Bay coastal wetlands and habitats in the Saginaw Bay watershed with funding from the Great Lakes Restoration Initiative, North American Wetlands Conservation Act Program, and other public and private sources. Based on an analysis completed in 2012, over 63% of the wetlands below the 585' contour line had been protected by then (Selzer et al. 2014), meeting one of the goals for removing the beneficial use impairment for loss of habitat. Natural resource agencies and their partners have also removed barriers to fish movement in the watershed, prioritizing among over 300 barriers to fish passage in the Saginaw Bay watershed (Selzer et al. 2014). Two of the most significant barriers to fish passage in the watershed were addressed with the installation of a series of rock ramps at the Chesaning Dam on the Shiawassee River (Selzer et al. 2014) and the Frankenmuth Dam on the Cass River (The Nature Conservancy 2017). Periodic monitoring will determine how successful these projects have been in enabling fish passage. The Dow Dam on the Tittabawassee River remains a significant impediment to fish passage on the Tittabawassee River system and its upstream tributaries that include the Pine and Chippewa rivers, but a NRDAR settlement with Dow Chemical Company, recently approved by the U.S. District Court for the Eastern District of Michigan, will provide for fish passage at the Dow Dam within the next five years.

3.0. RESTORATION CRITERIA

3.1. Introduction

The Trustees have adopted two tiers of NRDA-related criteria based on the regulations guiding the NRDAR process (43 CFR § 11.82; 15 CFR §§ 990.54 and 990.55) to evaluate proposed restoration actions or alternatives: threshold eligibility criteria and outcome-based criteria. Because this Final Restoration Plan also serves to meet the requirements of the National Environmental Policy Act, criteria specific to this process have also been incorporated by the Trustees. Under the Act, federal agencies must identify and evaluate the effects, as well as cumulative effects, of the alternative actions they have formulated for public review (see CEQ 2007). The significance criteria of the Act are intended to assist federal agencies in the evaluation of the significance of actions under their consideration. In addition, the Trustees have added additional criteria with which to evaluate proposed restoration alternatives. Thus, criteria with which the Trustees will evaluate restoration actions or alternatives are four-fold:

1. Natural Resource Damage Assessment and Restoration threshold eligibility criteria
2. Natural Resource Damage Assessment and Restoration outcome-based criteria
3. National Environmental Policy Act significance criteria
4. Trustee-defined restoration criteria

3.2. NRDAR Restoration Criteria – Threshold Eligibility

The eligibility criteria will be used to screen out projects that do not meet the minimum standards described in federal regulations. Threshold eligibility criteria indicate whether a proposed project meets minimum standards of relevance to injured resources or natural resource services, achieves a beneficial outcome, and complies with applicable laws (including the ability to obtain any necessary regulatory permits). A restoration action or alternative must meet all of the threshold eligibility criteria to be considered further. The eligibility criteria are described in Table 3-1 below. The category of eligibility criteria is defined as:

Eligibility: Criteria that relate to whether a proposed project meets minimum standards of relevance to injured resources or services, achieves a beneficial outcome, and complies with applicable and relevant laws including the ability to obtain any necessary regulatory permits. A project must meet all of these criteria to be considered further.

Table 3-1. Natural Resource Damage Assessment and Restoration (NRDAR) threshold eligibility criteria used to evaluate restoration alternatives.

Eligibility	Criteria	Interpretation
Pass/Fail	E1: Complies with applicable/relevant federal, state, local, and tribal laws and regulations.	Project must be legal, able to be permitted, and must not jeopardize public health and safety.
Pass/Fail	E2: Benefits natural resources injured by hazardous substances released to the Saginaw River and Bay, or natural resource services[9] lost because of those injuries.	Projects will be evaluated as to whether they restore, rehabilitate, replace, or acquire the equivalent of injured natural resources and services.
Pass/Fail	E3: Is technically feasible.	Projects must have a high likelihood of success.

3.3. NRDAR Restoration Criteria – Outcome-Based Criteria

If a restoration action or alternative meets threshold eligibility criteria, as described above, the Trustees consider additional criteria intended to evaluate the *focus* of a proposed action, the *feasibility* of the proposed action, and the nature and extent of conservation *benefit* likely to be achieved by a restoration action or alternative.

Focus: These are criteria intended to assess the alignment of an action or alternative with the goals and objectives identified by the Trustees (Table 3-2)

Feasibility: These criteria are used to evaluate elements of an action or alternative related to likelihood of implementation, cost-effectiveness, methodology, and monitoring of project implementation (Table 3-3)

Benefit: Criteria that relate to the types, timing, and permanence of benefits provided by a project (Table 3-4)

[9] Services includes ecological services, such as storage of flood waters, and services related to public use of natural resources, such as bird-watching or boating.

Table 3-2. Natural Resource Damage Assessment and Restoration (NRDAR) focus-related criteria intended to aid the Natural Resource Trustees in the evaluation of a proposed restoration action or alternative.

Priority	Criteria	Interpretation
Higher	F1: Restores, rehabilitates, replaces, or acquires the equivalent of injured natural resources and services.	Restoration or rehabilitation are preferred strategies to recover lost resources and services.
Medium	F2: Addresses or incorporates restoration of targeted natural resources and services as documented by Trustee mandates and priorities.	Priorities will be based on the resources injured and extent of injury. Targeted resources include fish and wildlife and their habitats with emphasis on floodplain, marsh, and riverine habitats, habitat continuity, water quality, soil and sediment quality, public lands, threatened and endangered species, native species, recreationally significant species, and culturally significant resources.
Lower	F3: Targets resources or services that are unable to recover to baseline without restoration action, or that will require a long time to recover naturally (e.g., > 25 years).	Projects that target resources or services that will be slow to recover will be favored over projects that target resources or services that will recover quickly naturally. Acquisition of the equivalent resources is the least preferred strategy.

Table 3-3. Natural Resource Damage Assessment and Restoration (NRDAR) feasibility-related criteria intended to aid the Trustees in the evaluation of a proposed restoration action or alternative.

Priority	Criteria	Interpretation
High	F1: Is cost-effective, including planning, implementation, and long-term operation, maintenance, and monitoring activities.	Projects are preferred that have a high ratio of expected benefits to expected cost. Projects will be evaluated relative to other projects that benefit the same resource. Cost-sharing, e.g., for monitoring or maintenance, will be considered in evaluating expected costs.
High	F2: Benefits can be measured for success by evaluation/comparison to baseline, and can be scaled to the appropriate level of resource injury or loss.	Projects will be evaluated in terms of whether the benefits can be quantified and the success of the project determined. Projects can be scaled to provide restoration of appropriate magnitude. Small projects that provide only minimal benefit relative to lost injury/service or larger projects that cannot be appropriately reduced in scope are less favored.
Medium	F3: Uses established, reliable methods/technologies known to have a high probability of success.	Projects will be evaluated for their likelihood of success given the proposed methods. Factors that will be considered include whether the proposed technique is appropriate to the project, whether it has been used before, and whether it has been successful. Projects incorporating experimental methods, research, or unproven technologies will be given lower priority.
Medium	F4: Takes into account completed, planned, or anticipated response actions.	Projects that restore or enhance habitat impacted by response actions will be preferred over those not associated with response actions. Projects proposed in areas likely to be impacted by response actions must be coordinated with response actions to provide cost savings and to take advantage of the availability of mobilized equipment on site during response actions, if possible, and to avoid damage to the restoration project by any subsequent response actions.
Medium	F6: Is consistent with regional planning.	Projects will be evaluated for consistency with regional planning, especially planning that has been publicly reviewed and/or formally adopted. Examples of relevant regional plans include species recovery plans and fish and wildlife management plans.
Lower	F5: If the project involves source control, it reduces exposure of natural resources to hazardous substances, including reduction of volume, mobility, or toxicity.	Projects that address source control will be evaluated in terms of the extent to which they reduce exposure to hazardous substances, including by reducing volume, mobility, and/or toxicity.

Table 3-4. Natural Resource Damage Assessment and Restoration (NRDAR) benefit-related criteria intended to aid the Trustees in the evaluation of a proposed restoration action or alternative.

Priority	Criteria	Interpretation
Higher	B1: Provides the greatest scope of ecological, cultural, and economic benefits to the largest area or population.	Projects that benefit more than one injured resource or service will be given priority. Projects that avoid or minimize additional natural resource injury, service loss, or environmental degradation will be given priority.
Higher	B2: Provides benefits not being provided by other restoration projects being implemented or funded under other programs.	Preference is given to projects that are not already being implemented or have no planned funding under other programs. Although the Trustees will use restoration-planning efforts by other programs, preference is given to projects that would not otherwise be implemented without NRDA restoration funds.
Higher	B4: Maximizes the time over which benefits accrue.	Projects that provide benefits sooner are preferred. Projects that provide longer-term benefits are preferred.
Medium	B3: Aims to achieve environmental equity and environmental justice.	A restoration program should benefit low-income and ethnic populations (including Native Americans) in proportion to the impacts to these populations. A restoration program should not have disproportionate high costs or low benefits to low-income or ethnic populations. Further, where there are specific service injuries to these populations, such as impacts on subsistence fishing, restoration programs should target benefits to these populations.

3.4. Priorities Identified by the Trustees

The Trustees have added additional criteria to reflect priorities that they believe are consistent with their commitment to represent the interests of the public. These criteria include the following:

- Durable conservation benefit. The Trustees have emphasized the importance of long-term maintenance of conservation value and services. The Trustees plan to place a priority on restoration actions or alternatives that incorporate measures of certainty that ensure the long-term durability of conservation benefit and the availability of natural resource services for the public. The Trustees will regard restoration actions preferentially that demonstrate a likelihood of continued maintenance that will result in the perpetuation of conservation benefit, where there is a substantial likelihood that desired ecological condition will be maintained in perpetuity. Restoration actions that are expected to be resilient to effects of climate change and contribute to resiliency in the area (e.g. providing flood storage capacity) will be preferred over projects that do not. The Trustees have chosen to refer to this criteria, where applicable, as the 'likelihood of durable conservation benefit.'
- Financial leveraging to expand conservation benefit. Most often, the concept of leveraging refers to the addition of financial resources brought to a proposed project by multiple partners. The Trustees strongly support the idea of partnership that provides financial leveraging to increase or improve the likelihood of achieving desired ecological condition or extent of durable conservation benefit.
- Strategic leveraging to expand conservation benefit. In this case, the Trustees endorse the concept of thoughtful placement of conservation on the landscape to increase or improve the likelihood of conservation benefit. For example, a single project that connects existing conservation properties provides benefit well beyond the footprint of any single property. Similar benefits can be visualized by considering an upstream project within a watershed that improves downstream ecological condition. This emphasizes achieving benefit beyond project boundaries.

3.5. National Environmental Policy Act Evaluation Criteria

As described above, actions undertaken by the Trustees to restore natural resources or services under federal laws are subject to the National Environmental Policy Act (42 U.S.C. § 4321 *et seq*.) and the regulations guiding its implementation at 40 C.F.R. Parts 1500 through 1517. In undertaking their analysis, the Trustees are required to evaluate the potential significance of proposed actions, considering both context and intensity. For the actions considered in this Draft Restoration Plan, the appropriate context for considering potential significance of the action is at the local or regional level, as opposed to national, or worldwide.

National Environmental Policy Act regulations (40 C.F.R. 1508.27) require consideration of ten factors in determining significance of a proposed action:

1. Likely impacts of the proposed project
2. Likely effects of the project on public health and safety
3. Unique characteristics of the geographic area in which the project is to be implemented
4. Controversial aspects of the project or its likely effects on the human environment
5. Degree to which possible effects of implementing the project are highly uncertain or involve unknown risks
6. Effect of the project on future actions that may significantly affect the human environment
7. Possible significance of cumulative impacts from implementing this and other similar projects
8. Effects of the project on National Historic Places, or likely impacts to significant cultural, scientific, or historic resources
9. Degree to which the project may adversely affect endangered or threatened species or their critical habitat
10. Likely violations of environmental protection laws

4.0. RESTORATION ALTERNATIVES

4.1. Restoration Strategy

The Trustees currently have approximately $5.7M remaining from the 1998 settlement. The 1998 Consent Judgment provided direction to the Trustees for the use of these remaining funds:

- future monitoring, modeling, and studies to determine the effectiveness of dredging and restoration;
- additional activities associated with dredging or disposal of contaminated sediments, including at the Saginaw Bay Confined Disposal Facility (CDF);
- purchase and restoration of lands within the Saginaw Bay watershed;
- natural resource restoration projects designed to protect, restore, replace, enhance or acquire equivalent natural resources in the area.

Substantial time has passed since the implementation of the 1998 settlement and the reinitiation of restoration planning by the Trustees. The Trustees, aware of the response action being administered by the Environmental Protection Agency (EPA) for releases from the Dow Chemical Company to the Tittabawassee River[10], felt it was strategically appropriate to delay restoration planning associated with the use of remaining funds until such a time as when response actions would be sufficiently complete to prevent any response action from impacting a restoration project that might be implemented by the Saginaw River and Bay Trustee Council. For example, the EPA has identified Sediment Management Areas in the Tittabawassee River adjacent the Shiawassee National Wildlife Refuge, in the Green Point Area, which includes the Green Point Environmental Learning Center that is specifically identified within the 1998 Consent Judgment as a focal area for restoration. As the response action reaches the Refuge, the staging of equipment and operations may occur in the Green Point Area. Operations, however, are likely to be complete within the next few years, allowing the subsequent implementation of restoration administered by the Saginaw River and Bay Trustee Council.

Given that the response action is nearing the confluence of the Shiawassee and Tittabawassee rivers and likely to be complete in the foreseeable future, the Trustees for the Saginaw River and Bay determined that it was appropriate to reinitiate restoration planning.

Based on criteria discussed above (Section 3.0), the Trustees have developed four distinct approaches, or alternatives, for the use of remaining funds from the 1998 settlement. These alternatives consist of the following, in brief:

- a No Action Alternative that would result in the limited monitoring of contaminants in the Saginaw River and Bay and continued investment of restoration funding until the Trustees felt there was a compelling reason to reinitiate restoration planning,

[10] https://cumulis.epa.gov/supercpad/cursites/csitinfo.cfm?id=0503250

- a Stewardship Alternative whereby the Trustees would use remaining funds to improve the ecological condition of projects implemented under the 1998 settlement, using the balance of funding to maintain the desired condition of these projects into the future,
- a Stakeholder Engagement Alternative wherein the Trustees would rely on stakeholders to identify suitable restoration actions for remaining funds to be administered by the Saginaw River and Bay Trustee Council, and
- a Collaborative Conservation Alternative that would encompass the stewardship of previously implemented restoration actions and would designate a portion of remaining funding to implement restoration actions identified as a result of stakeholder engagement in the restoration planning process.

The three action alternatives (Stewardship, Stakeholder, and Collaborative alternatives) share certain common elements. These include reporting and monitoring requirements, reasonable flexibility in project implementation, the use of adaptive management based on monitoring results, flexibility in year-to-year funding amounts and budget categories for projects, and Trustee management of funds and oversight of projects. Each of these is described in more detail below.

Prior to the release of funding for a particular project, the Trustees would review workplans provided by project proponents that detail the elements and schedule of project implementation. As part of any workplan, the Trustees would anticipate at least an annual reporting of actions implemented by the proponent. This reporting will include implementation monitoring as a record of actions implemented by the proponent, including for projects that may span multiple years and may encompass many project elements. In addition, outcome-based monitoring will document the progress achieved in producing the intended or desired conditions that are the objectives of the project. For example, a proponent may report that they treated 100 acres of coastal marsh for non-native and invasive species (implementation) and that non-native species occurrence was reduced, by coverage, by 90% over the 100 acres (outcome).

The Trustees recognize that, for long-term stewardship projects, environmental conditions (as well as other factors) may vary to such a degree that the techniques or time required to achieve a particular outcome may need to be modified by proponents and that implementation techniques available to proponents are likely to change over time. As a part of any of the action alternatives, the Trustees would support some measure of flexibility in project implementation in the interest of cost-effectively maximizing the beneficial outcomes of the restoration while minimizing adverse impacts to natural resources.

Moreover, the Trustees would support the rigorous evaluation of different methodologies to achieve the objectives of a restoration project. This should provide proponents a degree of flexibility in terms of methodologies used to achieve project objectives, should allow project proponents and the Trustees to evaluate various methodologies over time, and may allow for the identification of improved practices for achieving desirable outcomes. For example, proponents may desire to evaluate the efficacy of multiple techniques to treat a particular non-native species, with the intent of lowering costs or minimizing the risk of ecological impact. These considerations form the basic structure of what has been described as adaptive management.

Adaptive management may be described as:

> An adaptive approach involves exploring alternative ways to meet management objectives, predicting the outcomes of alternatives based on the current state of knowledge, implementing one or more of these alternatives, monitoring to learn about the impacts of management actions, and then using the results to update knowledge and adjust management actions. Adaptive management focuses on learning and adapting, through partnerships of managers, scientists, and other stakeholders who learn together how to create and maintain sustainable resource systems[11].

The Trustees suggest that the practice of adaptive management would provide the framework by which flexible approaches to implementation would yield information leading to improved efficiencies or better outcomes.

Similarly, all of the action alternatives include expenditures over time. As timelines become longer, uncertainty regarding certain costs, such as maintenance, may increase (and, particularly considering the effects of climate change in Great Lakes coastal wetlands). The Trustees are estimating costs for stewardship elements of the alternatives with the best available information at the time of this writing while acknowledging uncertainty in future costs, interest rates, techniques available, and the need for climate adaptation. As such, alternatives with stewardship components include a contingency when estimating how long the funding for those components might last. This estimate of time, while not exact, provides a common basis for estimating the relative times over which benefits will be provided by each alternative so that the public can make comparisons among the alternatives. The Trustees acknowledge that maintenance costs are likely to vary from year to year, with some years requiring less maintenance funding, and some years requiring greater expenditures. The Trustees would work closely with proponents to ensure that maintenance, broadly defined to include equipment, infrastructure, and ecological condition, is achieved while the Trustees work to ensure fiscal responsibility for the funds they oversee. As the needs of projects change over time, the Trustees may also consider shifting some funds from one project to another within the selected alternative.

The funds that are administered by the Trustees are held within accounts maintained by the Department of the Interior's Office of Restoration and Damage Assessment. Funds derived from settlements may be invested in U.S. Treasury bills that yield a return depending on the term of the investment. For all the alternatives, the Trustees would strategically invest funding so as to maximize returns on investment according to the timeline for expenditures under each alternative.

Trustee oversight activities may include, but would not necessarily be limited to, collaborative development of proposals with stakeholders, project selection and planning, monitoring project progress, managing contracts and agreements, managing investment and disbursement of funds, and working with stakeholders, project managers, and the public to achieve restoration of natural resources injured by the release of PCBs into the Saginaw River and Bay.

Fundamentally, the Proposed Action under consideration by the Saginaw River and Bay Trustees is to restore, replace, or rehabilitate the natural resources that were injured or lost as a result of the release

[11] Williams, B. K., R. C. Szaro, and C. D. Shapiro. 2007. Adaptive Management: The U.S. Department of the Interior Technical Guide. Adaptive Management Working Group, U.S. Department of the Interior, Washington, DC.

of a hazardous substance, or to acquire the equivalent natural resources or the services they provide (CERCLA, 42 U.S.C. § 9601 *et seq*.; 43 C.F.R. Part 11). In this case, the Trustees are considering alternatives that would provide remedies for natural resource injuries, and the loss of natural resource services, associated with the release of PCBs into the environment. The Trustees are evaluating the extent and means by which the four different alternatives described below may achieve their proposed action of natural resource restoration.

4.2. The No Action Alternative

In addition to the consideration of a range of alternatives that may accomplish a proposed action, the National Environmental Policy Act of 1969 (42 U.S.C. §§4321-4370h) requires that federal agencies consider the outcomes associated with the implementation of a No Action Alternative. In this case, the No Action Alternative would forego the expenditure of remaining funds either for the purpose of improving ecological condition of previously implemented projects or to implement additional restoration actions in the Saginaw River and Bay.

Under the No Action Alternative, the Trustees would implement a strategy for the long-term investment of existing funds. Funding would remain in chosen investment accounts until the Trustees perceived of a compelling need to reinitiate restoration planning. In essence, following the earlier implementation of restoration actions described within the 1998 Consent Judgment, the Trustees have implemented a No Action Alternative so as to avoid complicating restoration actions with an EPA-led remedial action within the floodplain of the Tittabawassee River.

If the Trustees were to adopt the No Action Alternative as their most appropriate course of action going forward, the on-going monitoring of contaminants in the Saginaw River and Bay, as described within the Consent Judgment, would likely continue under the administration of the Trustees. Dedicated funding, though limited, for restoration within the Green Point Area on the Shiawassee National Wildlife Refuge, also identified within the 1998 Consent Judgment, would be used to improve ecological condition within the Green Point Area, as described in a separate Restoration Plan / Environmental Assessment (USFWS 2016). The Trustees, however, would forego the restoration and maintenance of actions implemented following the 1998 settlement or the implementation of any new restoration actions under the No Action Alternative. Trustee oversight costs would be low under this alternative.

4.3 The Stewardship Alternative

The Trustees have identified a Stewardship Alternative where remaining funds from the 1998 settlement would be used to improve and maintain the ecological condition of restorations that were implemented following the 1998 settlement. Like many past restoration actions throughout the country, the 1998 settlement did not include specific funding to address costs of state, federal, and tribal natural resource agencies, such as staff, equipment, and supplies, necessary to maintain the condition of restorations. Consequently, the ecological condition of properties identified or acquired as restorations for the 1998 settlement, in many cases, have not been maintained in their desired condition, or may not have fully achieved them. Therefore, the Trustees have identified actions that would improve the ecological condition of restorations undertaken following the 1998 settlement. These would include:

- **Saginaw Chippewa Tribe Saganing River Mouth Restoration – Building Restoration Capacity**

  This proposal would build the restoration capacity of the Tribe by adding staff, equipment, and maintenance funding to improve the condition of the 110 acre Saganing River Mouth Property (Appendix 10.2).

- **Shiawassee National Wildlife Refuge - Green Point Area Restoration Project**

  The Green Point Area encompasses the Green Point Environmental Learning Center, specifically identified within the 1998 Consent Judgment as a focal area for restoration. This project would add restoration and maintenance capacity to the Shiawassee National Wildlife Refuge to enable the restoration of habitat areas that include a former golf course. The Refuge would restore and maintain native habitats in an area that adjoins the City of Saginaw (Appendix 10.3).

- **State of Michigan Acquired Restoration Properties – Restoration and Maintenance Capacity**

  This proposal would provide additional restoration and maintenance capacity to the State of Michigan, Department of Natural Resources, by providing staff training, contract support, and equipment to be shared among state-owned conservation properties that occur along the shoreline of Saginaw Bay. This would enable substantial effort to treat invasive species in coastal wetland habitats (Appendix 10.4).

- **Michigan Islands National Wildlife Refuge – Restoration, Maintenance, Monitoring**

  The Charity Islands, now part of the Michigan Islands National Wildlife Refuge, administered by the Shiawassee National Wildlife Refuge, were acquired as a result of the 1998 settlement. This proposal would provide funding to achieve restoration, maintain ecological condition, and expand monitoring on the islands which provide habitat for colonial waterbirds and species designated as threatened or endangered under the Endangered Species Act (Appendix 10.5).

- **Contaminant Monitoring in the Saginaw River and Bay**

  As a component of the Trustee's Stewardship Alternative, monitoring of contaminants in the Saginaw River and Bay may include the on-going monitoring of contaminants in fish, monitoring of contaminants in colonial waterbirds, the assessment of contaminant uptake in mallard ducks on the Saginaw Confined Disposal Facility and, monitoring of contaminants in bald eagles within the Saginaw Bay watershed (Appendix 10.6). The Trustees will support monitoring programs in the Saginaw River and Bay based on the availability of alternative funding sources such as the Great Lakes Recovery Initiative.

Under the Stewardship Alternative, funds would initially be allocated to achieve primary restoration of the stewardship properties. This may include, for example, treatment of non-native invasive species on the properties and may include treatment of source populations, as appropriate, of non-native and invasive species to provide resilience to the stewardship properties. The balance of funds would then be allocated among the properties to maintain the desired condition of the stewardship properties into the future. The Trustees anticipate that the available remaining funds could support implementation of stewardship restoration at an estimated cost of $2,600,000 and 40 years of maintenance of the stewardship properties at an estimated cost of $1,300,000 (Table 4-1). The allocation of remaining funds includes allotments for Trustee oversight and contingency, in addition to funding for the monitoring of contaminants that is common to all alternatives.

Table 4-1. Allocation of funds remaining from the 1998 settlement under the Stewardship Alternative for the Saginaw River and Bay.

Total Funding	**$5,700,000**
Implementation	**$2,600,000**
Contaminant Monitoring	**$1,100,000**
Administration & Contingency	**$700,000**
Balance of Funds	**$1,300,000**
Maintenance / Year	**$33,000**
Years of Maintenance	**40**

4.4. The Stakeholder Engagement Alternative

The Trustees recognize that state and federal agencies, non-governmental organizations, and stakeholder groups have invested substantial effort and expertise to develop regional and area plans that address ecological condition within the Saginaw Bay watershed. The Stakeholder Engagement Alternative would emphasize the consideration of stakeholder identified restoration actions that would utilize remaining funds available to the Trustees. Under this alternative, the Trustees would actively engage stakeholders and the community of conservation practitioners to identify potential restoration actions. The Trustees may use a number of methods to engage stakeholders to identify and develop restoration actions, including directed outreach to stakeholders, conservation planning workshops, social media notification, and notices delivered to local media outlets. The Trustees would then identify restoration actions, advocated by stakeholders, which may be further developed in partnership with the Trustees. This model of project identification and development with the Trustee Council may allow the Trustees to identify opportunities to expand partnerships that may result in additional financial leverage and additional conservation benefit.

The Trustees, at the time of the 1998 settlement, focused significant effort on the restoration of coastal wetland habitats and enhancing recreational opportunity associated with these habitats. Then, as now, the Trustees referred to the NRDAR restoration criteria to evaluate the suitability of restoration action (Sections 3.2. and 3.3.). Future consideration of restoration actions identified by stakeholders will adhere to the principal where restoration actions are selected and developed to address natural resource injuries related to the release of PCBs into the Saginaw River and Bay.

Under this alternative, the stewardship projects from the 1998 settlement would also be considered by the Trustees if identified and recommended by stakeholders, but would be evaluated using the same criteria applied to any other project advocated by other stakeholders. That is, the Trustees would uniformly apply project selection criteria to all projects identified by stakeholders. Given the substantial interest among stakeholders regarding the ecological condition of the Saginaw River and Bay, the Trustees anticipate that remaining funds (Table 4-2) would be depleted over five to ten years, depending on the types of projects selected and their respective maintenance requirements.

Table 4-2. Allocation of funds remaining from the 1998 settlement under the Stakeholder Engagement Alternative for the Saginaw River and Bay.

Total Funding	**$5,700,000**
Implementation	**$3,900,000**
Contaminant Monitoring	**$1,100,000**
Administration & Contingency	**$700,000**
Balance of Funds	**$0**

4.5. The Collaborative Conservation Alternative

In addition to considerations for contaminant monitoring and investment of funds which are common to all alternatives, the Collaborative Conservation Alternative incorporates certain additional elements of the preceding alternatives. This alternative includes implementation of restoration and maintenance of the 1998 stewardship projects, annual maintenance of the stewardship projects, and allocation of funding to allow for consideration of restoration projects developed collaboratively with stakeholders. The Collaborative Conservation Alternative is the Trustees' selected alternative (Section 6.0) with an initial allocation of $550,000 dedicated for the future maintenance of the stewardship projects and approximately $750,000 that could be used at the Trustees' discretion for the future collaborative development of stakeholder identified restoration projects. Dedicated maintenance funding in the amount of $550,000 is expected to be sufficient to maintain the desired condition of the stewardship projects for approximately 17 years.

The Trustees support the proposed stewardship of restorations undertaken as a result of the 1998 settlement. There is substantial evidence to suggest that the desired outcomes of restoration associated with the 1998 settlement have not been entirely achieved or maintained. This alternative incorporates the actions within the Stewardship Alternative described above, substantially improving the likelihood that prior restoration actions will reach their intended condition and be maintained for a significant length of time into the future.

The Trustees also support the collaborative engagement of local stakeholders to improve restoration outcomes. In this Collaborative Conservation Alternative, the Trustees will incorporate, as appropriate and as they are financially able to support, stakeholder-identified projects to further improve ecological condition within the Saginaw River and Bay. As described within Section 4.4, appropriate additional restoration actions would provide benefits for injured natural resources and lost services related to the release of PCBs into the Saginaw River and Bay as in the Stakeholder Engagement Alternative, but balanced with ensuring restoration and maintenance of the stewardship projects. In selecting additional restoration projects, the Trustees will prioritize projects developed with stakeholders based on the NRDAR Restoration Criteria and additional criteria identified by the Trustees in Section 3.0 as well as evaluate the projects relative to the effects or impacts associated with the National Environmental Policy Act.

Ultimately, the Trustees will have the responsibility to determine which projects to fund, but the Trustees hope that the public will contribute to this discussion regarding the allocation of these funds now in order to guide these future decisions.

The Trustees propose to develop additional restoration actions by stakeholders, but acknowledge that funding may be used to address unforeseen circumstances such as critical maintenance that may arise as a result of severe storm events.

Depending earnings realized from the investment of the remaining funds, savings realized during project implementation, or the acquisition of alternate funding, the Trustees may revise their proposed allocation for dedicated funding for the maintenance of the stewardship projects. As a result, funds for the maintenance of stewardship projects may either increase or decrease. In the case where funding for maintenance would decrease, the number of years of continued conservation benefit, and certainty of continued conservation benefit, would similarly decrease for the stewardship projects. The Trustees, however, have placed a priority on achieving the desired condition of restoration projects and then maintaining that condition into the future. It is the hope of the Trustees, whether by using a portion of the remaining funds from the 1998 settlement or by identifying financially capable partnerships, to ensure the long-term maintenance of the stewardship projects.

Table 4-3. Allocation of funds remaining from the 1998 settlement under the Collaborative Conservation Alternative for the Saginaw River and Bay. An initial allocation of $750,000 dedicated to the collaborative development of stakeholder restoration projects will result in the availability of approximately $550,000 for on-going maintenance of the stewardship projects.

Funding Allocation	**$5,700,000**
Stewardship Implementation	**$2,600,000**
Contaminant Monitoring	**$1,100,000**
Administration & Contingency	**$700,000**
Stakeholder Projects	**$750,000**
Balance of Funds	**$550,000**
Maintenance / Year	**$33,000**
Years of Maintenance	17

5.0. EVALUATION OF THE ALTERNATIVES

The intent of this section is to provide a comparative evaluation of the proposed restoration alternatives. The four alternatives are first screened using the three NRDAR Threshold Eligibility Criteria. Each of the proposed restoration alternatives is then evaluated with respect to the NRDAR Outcome-based Criteria and the Trustee-defined Restoration Criteria identified within Section 3.0 of this document. These evaluations are meant to provide a broad overview of expected outcomes and impacts.

Following consideration of the NRDAR related criteria, the Trustees provide an evaluation of the alternatives with respect to the National Environmental Policy Act. This evaluation begins with a consideration of the Act's ten significance criteria. The significance criteria are substantive benchmarks used to inform a subsequent evaluation of potential direct, indirect, and cumulative negative impact of the Trustees' proposed alternatives on the human environment. Conversely, the Act also identifies categories of actions that are acknowledged, by regulation, to have no significant impact to the environment. These are referred to as 'categorically excluded actions.' These types of projects or practices are generally not considered in detail within analyses such as those described here because they typically do not contribute negative impact to the environment. Environmental restorations, such as those proposed within this restoration plan, typically fall within the scope of these categorically excluded actions because they typically provide ecological benefit in the absence of what are termed 'extraordinary circumstances.' Unique habitats that may be negatively impacted, the presence of an endangered species, or an issue that may be controversial are examples of extraordinary circumstances. The National Environmental Policy Act significance criteria (Section 3.5) reflect the extraordinary circumstances considered in an analysis such as this one [12] (but typically would not be anticipated to occur in the course of actions intended specifically to enhance the environment).

In addition to these broad evaluations of the alternatives, the Trustees evaluated the Green Point Restoration Project in more detail because this project, considered in two of the alternatives, has specific features that merit additional consideration. This project may involve earth moving within the floodplain of the Tittabawassee River on the Shiawassee National Wildlife Refuge. In addition, the Refuge proposes to treat non-native invasive species by using the aerial application of herbicides in order to restore bottomland hardwood forest habitats.

Prior to implementation, any of the restoration projects considered within the alternatives may undergo additional reviews related to the National Environmental Policy Act, the Endangered Species Act, or the National Historic Preservation Act, as necessary. These project-specific, and site-specific, evaluations then become part of the administrative record maintained by the Trustees and available to the public.

[12] Categorical exclusions and extraordinary circumstances are addressed within the federal regulations that direct the NEPA process at 40 CFR § 6.204.

5.1. NRDAR Threshold Eligibility of the Alternatives

The NRDAR threshold eligibility criteria are threefold and intended to ensure that any action contemplated by the Trustees will be consistent with applicable laws and regulations, will appropriately contribute to the remedy of natural resource injuries or service losses, and is considered technically feasible to implement.

5.1.1. The No Action Alternative - NRDAR threshold eligibility criteria.

The No Action Alternative would result in the continued investment of restoration funding until the Trustees felt there was a compelling reason to reinitiate restoration planning. Under the No Action Alternative, limited monitoring of contaminants in the Saginaw River and Bay and limited implementation of restoration associated with the Green Point Environmental Learning Center would occur. However, the No Action Alternative would not result in the restoration of habitats or enhancement of services lost as a result of the release of PCBs into the Saginaw River and Bay. Consequently, the Trustees believe that the No Action Alternative does not meet the NRDAR threshold eligibility criteria.

5.1.2. The Stewardship Alternative - NRDAR threshold eligibility criteria.

The Stewardship Alternative is comprised of restoration actions, or maintenance of restoration actions, that were previously identified in the 1998 settlement. These proposed restoration and maintenance actions meet all three of the threshold eligibility criteria.

5.1.3. The Stakeholder Engagement Alternative - NRDAR threshold eligibility criteria.

The Stakeholder Engagement Alternative would be comprised of actions identified by stakeholders, selected by and developed with the Trustees. The Trustees, however, would ensure consistency with the threshold eligibility criteria by making compliance a prerequisite for the consideration of any stakeholder recommended restoration project. Consequently, the Stakeholder Engagement Alternative would meet the threshold eligibility criteria.

5.1.4. The Collaborative Conservation Alternative - NRDAR threshold eligibility criteria.

Collaborative Conservation Alternative is a synthesis of the Stewardship Alternative and the Stakeholder Engagement Alternative and would likewise meet the threshold eligibility. This alternative proposes to move the stewardship projects toward their desired condition while making provision for the consideration of additional restoration actions recommended by stakeholders, selected by and developed with the Trustees.

The Trustees believe that the Stewardship Alternative, Stakeholder Engagement Alternative, and Collaborative Conservation Alternative, meet the threshold eligibility criteria (Table 5-1). These alternatives would not conflict with existing laws and regulation, they address the natural resource injuries related to the release of PCBs into the Saginaw River and Bay, and these three alternatives pose no technical challenge for implementation.

The three action alternatives are essentially equivalent with respect to meeting the NRDAR threshold eligibility criteria. The No Action Alternative, however, does not provide restoration that would remedy natural resource injuries associated with the release of PCBs into the Saginaw River and Bay. The No Action Alternative is also inconsistent with existing regulations and policy related to the control of non-native and invasive species.

Table 5-1. Applicability of the Natural Resource Damage Assessment and Restoration (NRDAR) Threshold Eligibility Criteria relative to the No Action, Stewardship, Stakeholder Engagement, and Collaborative Conservation alternatives. A check mark (✓) indicates the alternative meets the respective criteria; a dash '-' indicates that the alternative may not meet the criteria.

NRDAR Threshold Eligibility Criteria	No Action Alternative	Stewardship Alternative	Stakeholder Alternative	Collaborative Alternative
Compliance with federal, tribal, state, and local laws and regulation	✓	✓	✓	✓
Consistency with the identified natural resource injury or service loss	-	✓	✓	✓
Technical feasibility	✓	✓	✓	✓

5.2. NRDAR Outcome-based Criteria – Focus, Feasibility, Benefit

5.2.1. NRDAR Outcome-based Criteria – Focus

The focus-related criteria are intended to indicate the degree to which the respective alternatives address the restoration of natural resources and natural resource services that were affected by the historic release of PCBs into the Saginaw River and Bay. The Trustees, in 1998, identified restoration actions that they felt uniquely compensated the public in such a way that the natural resources that were injured, or the services those resources provided the public, were replaced or restored. The focus criteria serve as a tool to evaluate the measure to which the alternatives provide the public the same sort of resources or resource services that were injured or lost as a result of the release of PCBs in the Saginaw River and Bay.

The Stewardship and Collaborative Conservation alternatives incorporate the 1998 restoration actions that were previously regarded to have ranked highly relative to the focus criteria, compared to other alternatives at that time. Should the Trustees engage stakeholders in the development of additional restoration actions, as described within the Stakeholder and Collaborative Conservation alternatives, the Trustees' would prioritize the development of restoration actions that would focus on the restoration of those resources and services that were injured as a result of the release of PCBs. Trustees would evaluate projects identified by stakeholders relative to the criteria of focus and likely select only those that rank highly. All criteria would be weighed for all stakeholder projects, those that rank highly would be prioritized to ensure future conservation benefit.

With respect to the focus criteria, all the action alternatives rank positively (Table 5-2). The Stakeholder Engagement Alternative is ranked below the Stewardship and Collaborative Conservation Alternatives due to the uncertainty of the exact character of restoration actions likely to be recommended to the Trustees by stakeholders.

Table 5-2. Natural Resource Damage Assessment and Restoration (NRDAR) focus-based criteria related to the Stewardship, Stakeholder, and Collaborative restoration alternatives. Evaluations are based on relative rank. All the alternatives provide focused ecological benefit and therefore are ranked positively. Relative rank is indicated by '+', '++', or '+++' to indicate increasing rank relative to the focus criteria. Criteria that are either neutral or not applicable to an alternative are indicated by '±'.

NRDAR focus-based Criteria	Stewardship Alternative	Stakeholder Alternative	Collaborative Alternative
Restores, rehabilitates, replaces, or acquires the equivalent of injured natural resources and services.	+++ Restoration focused on substantial portfolio of coastal wetland properties, habitats and resources injured as a result of the release of PCBs.	++ Restoration likely to include coastal habitats, as directed by the Trustees, but exact focus uncertain at present	+++ Restoration focused on substantial portfolio of coastal wetland properties, habitats and resources injured as a result of the release of PCBs.
Addresses or incorporates restoration of targeted natural resources and services as documented by Trustee mandates and priorities.	+++ Restoration focused on coastal wetland habitats & river mouth habitats, habitat priorities within the Great Lakes basin.	++ Restoration likely to include coastal habitats, as directed by the Trustees, but exact focus uncertain at present.	+++ Restoration focused on coastal wetland habitats & river mouth habitats, habitat priorities within the Great Lakes Basin.
Targets resources or services unable to recover to baseline without restoration action, or that will require a long time to recover naturally (e.g., > 25 years).	+++ Restoration focus on coastal habitats impacted by non-native species. Restoration without intervention highly improbable.	++ Restoration may focus on resources unable to recover to baseline at the direction of the Trustees, but uncertain at present.	+++ Restoration focus on coastal habitats impacted by non-native species. Restoration without intervention highly improbable.

5.2.2. NRDAR Outcome-based Criteria – Feasibility.

The feasibility-related criteria are intended to provide a comparative assessment of the degree to which the respective alternatives address practical considerations related to the implementation of the alternatives. These measures include cost-effectiveness, the measure of outcomes, reliability of techniques to be used, consideration of contaminant sources and response, and consistency with existing regional conservation plans (Table 5-3).

The Stewardship and Collaborative Conservation alternatives incorporate the 1998 restoration actions that were previously regarded to have ranked highly relative to these criteria. Should the Trustees solicit and develop additional restoration proposals with the assistance of stakeholders, as described within the Stakeholder and Collaborative Conservation alternatives, the Trustees would encourage development of stakeholder proposals that take into account the feasibility criteria. Trustees would evaluate projects identified by stakeholders relative to the criteria of feasibility and likely select only those that rank highly. All criteria would be weighed for all stakeholder projects, prioritizing those that rank highly would serve to ensure future conservation benefit.

Both the Stewardship and Collaborative Conservation alternatives take into account the response actions previously conducted in the Saginaw River and those related to the ongoing response to address the release of hazardous substances from Dow to the Tittabawassee River, Saginaw River, and Saginaw Bay. Prior to funding restoration actions, the Trustees would work with the EPA and the Michigan Department of Environment, Great Lakes, and Energy (EGLE) to evaluate the impact of any residual contamination and the likelihood that additional response actions may occur at or near the proposed restoration actions.

The monitoring components of the alternatives (Section 7.0) specifically contribute to the evaluation of the long-term effectiveness of the remedial response actions. The proposed actions in the Green Point Area of the Shiawassee NWR have already been discussed with EGLE's remedial project management to ensure coordination with response actions planned in the adjacent Tittabawassee River and to ensure that characterization of the area was sufficient to indicate that the proposed earth-moving and other actions proposed for the Green Point area are feasible and will not exacerbate risks to human health or the environment. With respect to the feasibility-based criteria, the Stewardship and Collaborative Conservation alternatives are nearly equivalent. In comparison, the Stakeholder Alternative lacks some certainty in meeting this NRDAR criterion.

Table 5-3. Natural Resource Damage Assessment and Restoration (NRDAR) feasibility-based criteria related to the Stewardship, Stakeholder, and Collaborative restoration alternatives. Evaluations are based on relative rank. Implementation of any of the action alternatives is likely to be feasible and therefore all are ranked positively. Relative rank is indicated by '+', '++', or '+++' to indicate increasing rank relative to the focus criteria. Criteria that are either neutral or not applicable to an alternative are indicated by '±'.

NRDAR feasibility-based Criteria	Stewardship Alternative	Stakeholder Alternative	Collaborative Alternative
Is cost-effective, including planning, implementation, and long-term operation, maintenance, and monitoring.	+++ Experienced in-house staff, added capacity, maintenance funding, substantial work done in-house to ensure cost-effectiveness	++ Some uncertainty regarding comparable efficiency or commitment to long-term maintenance	+++ Experienced in-house staff, added capacity, maintenance funding, substantial work done in-house to ensure cost-effectiveness
Benefits can be measured by comparison to baseline, and can be scaled to resource injury or loss.	+++ Injury well-characterized, restoration objectives readily measurable	+++ Injury well-characterized, restoration objectives may be similar to the other alternatives.	+++ Injury well-characterized, restoration objectives readily measurable
Uses established, reliable methods/technologies known to have a high probability of success.	+++ Well-established techniques, personnel experienced, added capacity to increase probability of success	++ Techniques, methodologies may be similar, some uncertainty related to types of restoration that may be advanced by stakeholders	+++ Well-established techniques, personnel experienced, added capacity to increase probability of success
Takes into account completed, planned, or anticipated response actions.	+++ Takes into account response action on the Tittabawassee River at the Shiawassee National Wildlife Refuge	± May not be applicable to stakeholder identified restorations.	+++ Takes into account response action on the Tittabawassee River at the Shiawassee National Wildlife Refuge
If the project involves source control, it reduces exposure of natural resources to hazardous substances.	+++ Contaminated soils in the Tittabawassee River floodplain, at Shiawassee National Wildlife Refuge, to be retained on-site - BMPS to stabilize disturbed soils, restoration without remobilizing contaminants	± May not be applicable to stakeholder identified restorations.	+++ Contaminated soils in the Tittabawassee River floodplain, at Shiawassee National Wildlife Refuge, to be retained on-site - BMPS to stabilize disturbed soils, restoration without remobilizing contaminants
Is consistent with regional planning.	+++ Regional plans, such as the Saginaw River and Bay Remedial Action Plan, emphasize similar resources, similar actions	+++ Given broad concern for aquatic habitats and resources, likely to be consistent with regional plans, such as the Saginaw River and Bay Remedial Action Plan	+++ Regional plans, such as the Saginaw River and Bay Remedial Action Plan, emphasize similar resources, similar actions

5.2.3. NRDAR Outcome-based Criteria – Benefit.

The benefit-related criteria are used to evaluate the amount and types of ecological and natural resource services benefits provided by the alternatives, including both ecological and natural resource service benefits provided by the alternatives, including how they incorporate the principles of environmental justice (Table 5-4). Executive Order 12898 (February, 1994)[13] and the related implementing Presidential Memorandum[14] directs federal agencies to "make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations." This is also intended to ensure that federal agencies give consideration to Tribes in their decision making.

The Stewardship and Collaborative Conservation alternatives incorporate the 1998 restoration actions that were selected based on the benefits that they provided relative to other available alternatives at that time. Currently, the Trustees have determined that additional investment and effort to bring these projects to their desired condition is likely to result in significant ecological benefit and the return of ecological services to the Saginaw Bay watershed.

Should the Trustees initiate the development of additional restoration proposals with stakeholders, as described within the Stakeholder and Collaborative Conservation alternatives, they would weigh future restoration proposals against the benefit criteria and so as to select only those that rank highly. Though all criteria would be weighed for all stakeholder projects, prioritizing those that rank highly based on this criterion would serve to ensure future conservation benefit.

Moreover, the Trustees intend to actively, at regular intervals, monitor the progress of implementation using measures of performance that indicate the extent to which beneficial outcomes are being achieved and work with stakeholders to make adaptations to improve success over time.

Among the action alternatives, the Collaborative Conservation Alternative addresses the condition of the 1998 settlement projects, but also describes the Trustees' intent to engage stakeholders to identify and develop additional projects that may be implemented in the Saginaw Bay watershed. Because this could broaden the scope of restoration benefits, the Collaborative Conservation Alternative has the greatest potential to maximize conservation benefit using the remaining funds from the 1998 settlement.

The Stewardship and Collaborative Conservation alternatives both address enhancements to the 1998 settlement projects that have not been eligible for funding through other programs. These include provisions for training, substantial purchases of equipment to build capacity, and funding intended to achieve long-term maintenance of desired ecological condition. The Trustees support these aspects of ecological restoration that are likely to ensure long-term ecological benefit, and, with respect to building capacity, create benefit that is likely to extend beyond project boundaries.

Both the Stewardship and Collaborative Conservation alternatives address the issue of environmental justice and equity, this is less certain a consideration in the Stakeholder Alternative. Both the former

[13] https://www.archives.gov/files/federal-register/executive-orders/pdf/12898.pdf

[14] https://www.epa.gov/sites/production/files/2015-02/documents/clinton_memo_12898.pdf

alternatives incorporate two of the 1998 settlement projects which address these issues. The Green Point Area Restoration Project is set within an area of the City of Saginaw that is under-served and economically disadvantaged. The Green Point Area encompasses the Green Point Environmental Learning Center which provides outreach to area schools and communities. Similarly, the Saganing River Mouth Restoration provides ecological and cultural value to the Saginaw Chippewa Indian Tribe of Michigan. In addition, through the Collaborative Conservation alternative, the Trustees could look for additional restoration projects that also contribute to environmental justice and equity.

Both the Stewardship Alternative and the Collaborative Conservation Alternative are likely to result in substantial ecological benefit. Of the action alternatives, the Stewardship Alternative is likely to extend that benefit over the longest time period. The Collaborative Conservation Alternative would provide for a shorter maintenance period for the 1998 settlement projects than would the Stewardship Alternative, but is likely to achieve a greater scope of conservation benefits. Both the Stewardship Alternative and the Collaborative Conservation Alternative, with commitments to maintenance, may provide some resilience to the stressors of climate change, such as severe precipitation events. The Stakeholder Engagement Alternative is likely to achieve conservation benefit, but at present the extent and duration of that benefit are unclear, and the duration of maintenance of condition is similarly unclear at present.

Table 5-4. Natural Resource Damage Assessment and Restoration (NRDAR) benefit-based criteria related to the Stewardship, Stakeholder, and Collaborative restoration alternatives. Evaluations are based on relative rank. Implementation of any of the action alternatives is likely to provide ecological benefit and therefore all are ranked positively. Relative rank is indicated by '+', '++', or '+++' to indicate increasing rank relative to the benefit criteria. Criteria that are either neutral or not applicable to an alternative are indicated by '±'.

NRDAR Benefit-based Criteria	Stewardship Alternative	Stakeholder Alternative	Collaborative Alternative
Provides the greatest scope of ecological, cultural, and economic benefits to the largest area or population.	++ Provides substantial benefit to publicly accessible habitats throughout the Saginaw Bay area, rare habitats, culturally significant habitats	+ Likely to provide ecological and economic benefit, may not encompass the range and extent of habitats within the other action alternatives.	+++ Provides substantial benefit to publicly accessible habitats throughout the Saginaw Bay area, rare habitats, culturally significant habitats, in addition to restorations identified by stakeholders
Provides benefits not being provided by other restoration projects being implemented or funded under other programs.	+++ Includes habitats that harbor endangered species, significant colonial waterbird nesting habitat, culturally significant habitat at the Saganing River mouth	++ May provide unique social or ecological benefit – some uncertainty as to extent and character of restorations at present	+++ Includes habitats that harbor endangered species, significant colonial waterbird nesting habitat, culturally significant habitat at the Saganing River mouth
Aims to achieve environmental equity and environmental justice.	+++ Includes restorations located within an economically disadvantaged urban area and includes restoration of an area culturally significant to the Saginaw Chippewa Indian Tribe of Michigan	+ May provide elements of equity and environmental justice, but uncertain as to extent to which these values may be incorporated in stakeholder identified restoration actions	+++ Includes restorations located within an economically disadvantaged urban area and includes restoration of an area culturally significant to the Saginaw Chippewa Indian Tribe of Michigan
Maximizes the time over which benefits accrue. In addition to time, this factor should take into account the potential resilience, particularly with respect to climate change, that alternatives or projects may incorporate	++ All funds remaining following implementation dedicated to maintenance. Offers the longest period of maintenance funding, but lacks opportunity to incorporate additional features to enhance resilience.	++ Maintenance funding will be emphasized by the Trustees, but uncertain as to extent to which maintenance or resilience may be incorporated by stakeholders for their identified restoration actions. Trustees would rank highly those projects that include considerations of maintenance and resilience.	+++ Following implementation of restoration, funding allocated between maintenance and funding of stakeholder identified restoration actions. Offers substantial maintenance but likely less than the Stewardship Alternative. Flexibility to allow for prioritization and incorporation of features to enhance resilience

5.3. Trustee-defined Criteria – Durable Benefit, Financial Leverage, Conservation Leverage

Criteria identified by the Trustees are intended to emphasize attributes of restoration that would result in lasting landscape-level conservation of habitats within the Saginaw Bay watershed. Those attributes include the likelihood of achieving long-term conservation benefit where the desired condition of restoration areas is maintained over time; financial leveraging of conservation funding that leads to expanded conservation effort across broader areas of habitat; and strategic conservation leveraging where conservation effort is placed on the landscape in such a way that the conservation benefit of an action extends well beyond the footprint of any individual project (Table 5-5).

In this case, both the Stewardship Alternative and the Collaborative Conservation Alternative make provision for the long-term maintenance of the desired condition of restoration actions. Though less certain, it is possible that stakeholders would make provision for maintenance of proposed actions, particularly given that the Trustees will emphasize maintenance of ecological condition as a factor the Trustees will consider in identifying stakeholder project proposals to develop with the Trustees.

Under the Collaborative Conservation Alternative, the Trustees have identified an initial allocation for the maintenance of the 1998 stewardship projects of $550,000. This would provide the Trustees a discretionary fund of $750,000 that may be used to develop stakeholder identified projects while ensuring the maintenance of the 1998 stewardship projects for a period of approximately 17 years. Considering the conservation outcomes of the stewardship projects, combined with those of stakeholder projects, the Collaborative Conservation Alternative may achieve both strategic conservation benefit in the Saginaw Bay watershed while ensuring the durability of that effort.

Table 5-5. Consideration of the Trustees' Restoration Criteria with respect to the three action alternatives under consideration by the Trustees. Evaluations are based on relative rank. Implementation of any of the action alternatives is likely to provide ecological benefit and therefore all are ranked positively. Relative rank is indicated by '+', '++', or '+++' to indicate increasing rank relative to the benefit criteria. Criteria that are either neutral or not applicable to an alternative are indicated by '±'.

Trustees' Restoration Criteria	Stewardship Alternative	Stakeholder Alternative	Collaborative Alternative
Durability of conservation benefit. This is intended to gauge the likelihood that a desired condition will be maintained into the future.	+++ Provides the greatest commitment to maintenance of desired condition of restoration projects	+ Commitment to long-term maintenance of desired condition to be emphasized by Trustees, but unclear at present what resources stakeholders may provide to ensure long term maintenance of restoration.	++ Provides substantial commitment to maintenance of desired condition of restoration projects
Financial leveraging to achieve additional conservation benefit. This measure is used to gauge the likelihood that funds beyond settlement dollars may be used to expand conservation effort.	+++ Partnerships likely to provide additional restoration funding to increase benefit	+++ Partnerships likely to provide additional restoration funding to increase benefit	+++ Partnerships likely to provide additional restoration funding to increase benefit
Strategic Conservation leveraging (project design) to provide added conservation benefit. This measure is used to express the likelihood that conservation benefit may extend beyond project boundaries	++ Projects to consist of those identified in the 1998 settlement – the stewardship projects would not offer additional design elements beyond those identified prior to implementation in 1998.	+ Identification of restoration actions unclear at present, unclear whether there may any coordination among stakeholders to increase conservation benefit across project boundaries	+++ Projects include those identified within the 1998 settlement, coordination between stakeholders and the Trustees likely to result in greater landscape conservation benefit

5.4. National Environmental Policy Act Effects Analysis

National Environmental Policy Act analyses, typically considered in terms of negative impact or harm, consists of a consideration of significance criteria, direct effects, indirect effects, and the cumulative effects of a proposed action. Direct effects are those "which are caused by the action and occur at the same time and place" (40 C.F.R. § 1508.8 (a). Indirect effects are "caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable" (40 C.F.R. § 1508.8 (b). Cumulative effect is the "impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions" (40 C.F.R. § 1508.7).

The consideration of effects with respect to the National Environmental Policy Act also incorporates consideration of a prior programmatic, broad scale analysis conducted by the National Oceanic and Atmospheric Administration (NOAA 2015) to inform restoration planning efforts, such as this one. This analysis characterizes restoration practices that may be implemented in the course of the restoration of coastal and wetland habitats. It may be used as a reference that provides substantial information regarding potential effects of various restoration practices – practices that are similar to those likely to be implemented as a part of this restoration planning effort.

5.4.1. Significance Criteria – The No Action Alternative.

Though the No Action Alternative does not meet the NRDAR threshold eligibility criteria, federal agencies are required, by regulation, to consider a No Action Alternative. Federal agencies are required to contrast the outcomes of taking no action with the outcomes of their action alternatives. Under the No Action Alternative, limited restoration within the Green Point Area of the Shiawassee NWR, as detailed within the 1998 Consent Judgment and a separate Final Restoration Plan for the Green Point Area[15] (USFWS 2016), would occur. Some on-going contaminant monitoring would continue under the No Action Alternative. Because actions in the scope of the 2016 Green Point Area Restoration Plan were previously considered, they are not addressed within the following discussion.

In this case, the consequences of taking no action are most readily envisioned with respect to the perpetuation of non-native invasive species within coastal habitats of the Saginaw River and Bay. This is indicated by a negative character ('-') within the category of 'Likely impacts of the proposed project' (Table 5-6). Great Lakes coastal wetlands are, in fact, unique habitats and to adopt a No Action Alternative may be controversial when it is within the Trustees' ability to affect positive outcomes for the Saginaw River and Bay. And, at least one of the properties has cultural significance for the Saginaw Chippewa Indian Tribe of Michigan. These considerations suggest that the adoption of a No Action Alternative would, in fact, have discernible negative outcomes with respect to the unique habitats within the Saginaw River and Bay and with respect to culturally significant lands.

[15] *2016 Final Restoration Plan and Environmental Assessment for the Green Point Area Restoration Project, Shiawassee National Wildlife Refuge*. This Restoration Plan is available at www.fws.gov/midwest/es/ec/nrda/saginawNRDA/.

5.4.2. Significance Criteria – Stewardship, Stakeholder, Collaborative Alternatives.

The three action alternatives are similar with respect to the National Environmental Policy Act Significance Criteria (Table 5-6). Under these alternatives, actions would likely occur within the unique coastal habitats of the Saginaw River and Bay, but these actions would result in ecological outcomes that would be beneficial. The Stewardship and Collaborative alternatives include restoration actions that would occur within a culturally significant area (the Saganing River mouth), and would result in beneficial ecological and cultural outcomes. These considerations may be similarly true for the Stakeholder Engagement Alternative, but are at present unknown.

Per the 1998 Consent Judgment, property acquisition may be considered as a means to acquire the equivalent of resources that were injured as a result of the release of PCBs into the Saginaw River and Bay. Depending upon the circumstances, property acquisition may be moderately controversial. For example, the Trustees are aware that there may be a concern that the acquisition of recreational properties may diminish a community's property tax base, affecting local budgets. The Trustees address this later in this document (Appendix 10.9). The Trustees have determined that land acquisition provides their least preferable means to achieve restoration in the public interest (Table 3-2). Acquisition could be proposed under the Stakeholder and Collaborative Conservation alternatives. Only where the Trustees believed that property acquisition substantively served the public interest would property acquisition be considered as a project selected for future funding.

The significance criteria (Table 5-6) are used to identify projects that may require the rigorous evaluation typical of an Environmental Impact Statement (EIS). In this case, there are considerations identified by the significance criteria, including sensitive habitats and areas of significant cultural value. The Trustees describe restoration actions that will occur within Great Lakes Coastal habitats, habitats that should be considered ecologically sensitive and significant. Because the proposed actions are intended to improve ecological condition within these habitats, the Trustees believe that they are in compliance with the National Environmental Policy Act and the appropriate use of the significance criteria to characterize the alternatives within an Environmental Assessment. Similarly, the Stewardship and Collaborative Conservation alternatives incorporate a restoration action that would occur in an area of substantial cultural value to the Saginaw Chippewa Indian Tribe of Michigan. However, the proposed action would be conducted by the Tribe and is intended to enhance the cultural and ecological value of the Saganing River mouth property. In these cases, the Trustees have chosen to acknowledge the significance of these issues, but believe that the proposed actions would enhance the value or improve the condition of these resources.

Table 5-6. Applicability of the National Environmental Policy Act (NEPA) Significance Criteria to the management alternatives under consideration by the Trustees for the Saginaw River & Bay. Where impacts can reasonably be anticipated, the relationship of the criteria to the particular alternative is characterized as either positive or applicable (+), neutral, not applicable, or unknown (±), or negative (-).

NEPA Criteria	No Action Alternative	Stewardship Alternative	Stakeholder Alternative	Collaborative Alternative
Likely impacts of the proposed project.	—	+	+	+
Likely effects of the project on public health and safety.	±	±	±	±
Unique characteristics of the geographic area in which the project is to be implemented.	+	+	+	+
Controversial aspects of the project or its likely effects on the human environment.	+	±	+	+
Degree to which possible effects of implementing the project are highly uncertain or involve unknown risks.	±	±	±	±
Effect of the project on future actions that may significantly affect the human environment.	±	±	±	±
Possible significance of cumulative impacts from implementing this and other similar projects.	±	±	±	±
Effects of the project on National Historic Places, or likely impacts to significant cultural, scientific, or historic resources.	—	+	±	+
Degree to which the project may adversely affect ESA listed species or their critical habitat.	—	+	±	+
Likely violations of environmental protection laws.	±	±	±	±

Because both the Stakeholder Engagement Alternative and the Collaborative Conservation Alternative may include restoration proposals to be developed with stakeholders, the Trustees may receive a proposal to acquire property. Acquisition of property may be controversial, an additional consideration identified by the NEPA significance criteria. The Trustees have acknowledged that acquisition is their least preferred methodology to achieve restoration. In order to alleviate the potential for conflict, if asked to consider the purchase of property as a result of a recommendation from stakeholders, as with any other proposed project, the Trustees would evaluate the potential public benefit before any consideration of acquisition. The results of any evaluation of a potential purchase would be made publicly available and would be subsequently added to the administrative record for the Saginaw River and Bay. As such, the Trustees believe that they are fully in compliance with the National Environmental Policy Act and the use of the significance criteria to characterize the outcome of proposed actions.

5.4.3 Direct and Indirect Effects – The No Action Alternative.

There would be no direct effects to the human environment associated with the adoption of the No Action Alternative. Considering indirect effects, left untreated, non-native and invasive species would continue to occur, or expand, within unique and sensitive habitats of the Saginaw River and Bay, including those restoration areas identified within the 1998 Consent Judgment. Consequently, these areas may be ecologically impaired, may continue to be ecologically impaired, and may not provide the full complement of ecological services that these habitats might otherwise provide residents and visitors to the Saginaw River and Bay.

5.4.4. Direct and Indirect Effects – Stewardship, Stakeholder, and Collaborative Alternatives.

The Trustees believe that the restoration actions within the Stewardship Alternative, and incorporated within the Collaborative Conservation Alternative, are also representative of the types of actions that may be identified as a result of future engagement and development of projects with stakeholders (Stakeholder Engagement and Collaborative Conservation alternatives). Moreover, these types of restoration actions have already been substantively characterized within programmatic analyses intended for use by the broader community of restoration practitioners (NOAA 2015)[16]. The NOAA programmatic analyses provide thorough characterizations of restoration practices and their possible impacts to the human environment. Restoration practices identified by NOAA (2015) that may be implemented as elements of the action alternatives for the Saginaw River and Bay are referenced in Table 5-7. The Trustees regard the descriptions and characterization of these restoration practices by NOAA (2015) to be applicable to the planning effort for the Saginaw River and Bay as described within this Draft Restoration Plan / Environmental Assessment. Therefore, the Trustees consider the NOAA (2015) analyses to be 'incorporated by reference' into this Final Restoration Plan.

[16] The NOAA Restoration Center Programmatic Environmental Impact Statement is available at: www.fisheries.noaa.gov/resource/document/restoration-center-programmatic-environmental-impact-statement

Moreover, within the context of ecological restoration, the U.S. Fish and Wildlife Service, like other federal management agencies, recognizes that efforts to restore habitats, in general, and certain restoration practices in particular, are associated with beneficial ecological outcomes. Consequently, the USFWS, as well as other federal agencies, has recognized that the use of these practices, including those that may result in temporary disturbance, do not result in significant impacts to the human environment. Therefore, certain restoration practices that result in benefit have been identified as 'categorically excluded' from National Environmental Policy Act analyses that receive subsequent public review. In those cases where categorically excluded actions may be implemented, action agencies such as the USFWS are not obligated to conduct analyses of the use of these practices.

In this case, however, the Trustees have elected to describe their proposed restoration actions, which largely do fall within the USFWS's scope of categorically excluded practices, in this Final Restoration Plan / Environmental Assessment in the interest of ensuring that the public is informed regarding planned restoration actions.

Practices that are categorically excluded from analysis, and considered to be beneficial in the absence of extraordinary circumstances, are detailed within the Department of Interior's National Environmental Policy Act guidance[17]. Many of the practices contemplated within the action alternatives, such as the use of prescribed fire, the treatment of non-native and invasive species, re-establishment of native species, wetland restoration, and maintenance actions, are within the scope of Fish and Wildlife USFWS's use of categorical exclusions. The Trustees acknowledge that these restoration practices may result in direct effects that are temporary in nature, but these practices will indirectly and cumulatively result in the restoration of ecologically important habitats, such as coastal wetlands, and may enhance the services that these habitats provide.

[17] www.doi.gov/sites/doi.gov/files/uploads/doi_and_bureau_categorical_exclusions_july2019_508_1_1.pdf

Table 5-7. Restoration practices that may be implemented under the Stewardship and Collaborative Conservation alternatives, and likely to be implemented under a Stakeholder Alternative. As an aid to restoration planners and practitioners, these practices have been described, and their environmental impacts characterized, by the National Oceanic and Atmospheric Association (2015) in a programmatic environmental impact statement.

Restoration Practice	NOAA (2015) Reference	Description
Planning, Feasibility Studies, Design Engineering, and Permitting	2.2.1.1	Studies conducted to characterize the environment or to formulate restoration approach
Implementation and Effectiveness Monitoring	2.2.1.2	Monitoring activities to evaluate implementation effectiveness
Fish and Wildlife Monitoring	2.2.1.3	Gathering of data for fish, wildlife, and habitats frequently undertaken to characterize habitat or restoration quality
Debris Removal	2.2.2.2	Removal of abandoned or discarded debris or infrastructure to improve habitat quality
Dam and Culvert Removal, Modification, or Replacement	2.2.2.3.1	The removal of infrastructure such as dams, culverts, berms that impedes the passage of aquatic organisms
Construction of nature-like fishways	2.2.2.3.2	Placement of natural materials such as stone that provides a series of stepped pools that allow fish to move up stream
Invasive Species Control	2.2.2.4.1	Treatment of non-native species to promote native communities of plants or animals
Prescribed Burns and Forest Management	2.2.2.4.2	The use of managed fire to achieve natural resource restoration
Species enhancement	2.2.2.4.3	The re-establishment of native species by stocking or re-planting
Channel Restoration	2.2.2.5.1	The restoration of complex in-stream habitats
Bank Restoration and Erosion Reduction	2.2.2.5.2	Actions within the riparian zone of streams and rivers to improve riparian vegetation, bank stability, and water quality
Road Upgrading and Decommissioning; Trail Restoration	2.2.2.7	Decommissioning or upgrading of roads or trails to improve or protect sensitive habitats such as wetlands or streams
Signage and Access Management	2.2.2.8	The installation of temporary or permanent signage, gates, fencing, or barriers to protect or conserve sensitive resources
Levee and Culvert Removal, Modification, and Set-Back	2.2.2.1.1	The removal or modification of levees, dikes, culverts, or similar infrastructure to improve hydrology
Fringing Marsh and Shoreline Stabilization	2.2.2.11.2	Actions along shorelines to stabilize coastal habitats
Sediment Removal	2.2.2.11.3	Sediment removal to improve wetland structure or function
Sediment/Materials Placement	2.2.2.11.4	Placement of sediment to improve wetland structure or function where sediment has been lost
Wetland Planting	2.2.2.11.5	The planting of native vegetation to stabilize or restore native plant communities
Land Acquisition	2.2.3.1	Fee-simple purchases or easements that conserve restoration habitats

5.4.5. Direct and Indirect Effects - Green Point Area Restoration Project.

The Green Point Area Restoration Project is proposed within both the Stewardship and Collaborative Conservation alternatives. This project would also likely be proposed and considered by the Trustees should they choose to implement the Stakeholder Engagement Alternative. Consequently, for the purpose of this analysis, the Trustees consider this project to be common to all three of the action alternatives.

Because the Green Point Area Restoration Project includes elements that may result in temporarily restricting public access during certain periods of implementation, may involve soil disturbance, and may use the aerial application of herbicides to control the highly invasive and non-native shrub common buckthorn, and other non-native species, the Trustees have provided a broader consideration of issues related to the National Environmental Policy Act. Additional issues considered here (Table 5-8) were identified as a result of public outreach during development of the Refuge's Comprehensive Conservation Plan[18] and, more recently, as a result of community outreach conducted as a planning effort for the Green Point Area Restoration Project[19]. For each of the issues identified within Table 5-8, outcomes of the No Action Alternative are contrasted with outcomes of the Green Point Area Restoration Project, which is described in detail within Appendix 10.3.

Public Access. Over four miles of asphalt cart paths occur throughout the former Germania site portion of the Green Point Area (Appendix 10.3, Figure 10-3). In many cases, the cart paths are broken by trees that have grown through the paths, the paths are cracked or fractured in many locations, and, in the case of the East Pond area, the paths are falling into the pond as its steeply walled banks erode (Appendix 10.3, Figure 10-5). The condition of these cart paths is such that they cannot be maintained in any safe, useable condition and would be prohibitively expensive to repair. Also, recreational path use on the Refuge does not require the density of paths that were present for the former golf course. Therefore, the Refuge proposes to remove the cart paths and design a new trail system that will complement the mission of the Refuge.

Some displacement of recreational use may occur during the construction of new trails or access sites within the Green Point Area. The trail system that transects the two forested tracts of the Green Point Area would remain available for use by patrons of the Refuge during the majority of the time in which the existing cart path system is removed and a new trail system is installed, allowing continued local trail use for many Refuge visitors. The proposed action will result in the removal of a currently decaying, in places unsafe, trail system that the Refuge has no ability to maintain with a trail system designed to enhance wildlife and nature-related experiences for Refuge visitors. The outcome of the proposed action within the Green Point Area should result in enhanced user experience that is more aligned with the Refuge's mission of natural resource conservation.

[18] www.fws.gov/midwest/planning/shiawasse/ccp/fullccp.pdf

[19] www.fws.gov/midwest/es/ec/nrda/SaginawNRDA/documents/SNWR_GreenPointArea_CommunityNeedsAssessment_SurveyReport.pdf

Soil Disturbance. In all cases involving the disturbance or movement of soils, soil would not be removed from the site, maintaining the in-place distribution of floodplain sediments that may contain contaminants resulting from historic releases originating from the Dow Midland plant. Moreover, when soils at Green Point were assessed for contaminants prior to the acquisition of the former Germania Golf Course, only two of 42 soil samples approached the Environmental Protection Agency threshold for residential remediation of 250 parts per trillion (ppt) for total dioxin equivalents (AKTPeerless 2012, USEPA 2014). All but three of the 42 samples were below 51 ppt. The threshold for remediation of recreational properties, such as the Green Point Area, is actually 2000 ppt (USEPA 2014). The results of these analyses suggest that levels of contaminants in soils within the Green Point Area are low, and low enough to be characterized as well below levels requiring remediation on recreational properties. Nonetheless, all restoration actions in the Green Point Area would incorporate soil best management practices, such as the use of an annual cover-crop to stabilize soils, preventing their loss due to erosion. The management of contaminants in-place will minimize the movement of contaminants, eliminating the possibility of off-site exposures.

Some soil disturbance would occur during the installation of a new trail system and the construction of additional access points for Refuge visitors. In all cases, soil moved during the construction process would remain on site and as necessary would be repurposed to add additional topographical features such as gently sloped mounds that would be planted with native species. Material from the existing cart paths, if at all possible, would be retained, stock-piled remotely on the Refuge, pulverized, and repurposed as substrate for portions of a new Refuge trail system or as substrate for additional parking or access sites. Recycling this material on-site would reduce the need for new material and save the expense of transporting and disposing of the old material at a local landfill. Minimal soil disturbance would occur as a result of removal of the existing cart paths.

In the case of the Bourdow property, recently acquired by the Refuge (Appendix 10.3, Figure 10-3), this area may be improved to allow for additional parking within immediate proximity to portions of a new trail system. Substrate for the parking area may be obtained as the repurposed material resulting from the removal of the existing cart paths.

Both of the existing impoundments within the Germania Tract within the Green Point Area (Appendix 10.3, Figure 10-4, and Figure 10-5) were designed as irrigation structures for the former golf course. In the case of Long Pond on the west side of the property (Figure 10-4), banks of the impoundment are nearly vertical for much of the structure. Consequently, the impoundment at present has almost no functional wetland value and presents a hazard to visitors that may approach steeply walled banks of the impoundment. The Refuge proposes to slope banks of the impoundment outward to create a gradual transition from open water, to emergent wetland vegetation, to moist soil shrub community, and, to the south, to hardwood forest in proximity to the Tittabawassee River and, to the north, a similar vegetative transition to a lakeplain prairie plant community. Substantial earth moving would occur to create the wetland area. All earth moved would remain on site to create varied topography, such as nesting islands. It is unlikely that additional flood storage would be realized as a result of the reconstruction of the impoundment. The likely outcomes in this case would be markedly improved public safety, substantially enhanced recreational opportunity in the vicinity of the reconstructed

wetland area, particularly with the addition of a newly designed trail system, and notably improved habitat for native wildlife and plants associated with wetlands.

Similarly, the East Pond impoundment was designed as an irrigation structure. Introduced fish persist in East Pond due to an area exceeding 10 feet in depth that provides a refuge for fish during freezing temperatures. Like Long Pond, there are few natural wetland features evident within this smaller impoundment. Banks are steep-walled and lined with riprap, and on the east side of the impoundment the existing cart path is now eroding into the impoundment. Reconstruction of the impoundment to provide wetland features would require earth moving to slope banks outward and provide adjacent depressional areas that would serve as ephemeral wetlands, temporarily holding water following rains or flood events and supporting wetland vegetation. Features such as these provide critical foraging areas for wetland birds and breeding habitat for reptiles and amphibians. All earth moved during the reconstruction of the impoundment would remain on site and repurposed to provide varied topography within the adjacent area. While public access would be restricted within the area of construction for a time, the likely outcomes in this case would be improved public safety, substantially enhanced recreational opportunity would occur within the vicinity of the reconstructed wetland area, particularly with the addition of a newly designed trail system, and markedly improved habitat for native wildlife and plants associated with wetlands.

The EPA is currently over-seeing Superfund Program response actions to stabilize or remove bank and river sediments in the vicinity of the Shiawassee National Wildlife Refuge[20]. Restoration involving soil disturbance in the vicinity of response actions would only be initiated following completion of actions by the EPA.

Non-native and Invasive Species. With respect to the treatment of non-native and invasive species, common buckthorn predominates within the understory of the two forested tracts in the Green Point Area, the Hickey Tract and the Learning Center Tract, and is pervasive throughout the project area. This species displaces native plants and may affect species such as ground-nesting birds, small mammals, reptiles, and amphibians that may use these habitats (Knight et al. 2007). In addition, common buckthorn produces compounds that may inhibit the reproduction of reptiles and amphibians that may breed in ephemeral wetlands or moist soil areas of the forested tracts (Sacerdote 2009, Sacerdote and King 2014). The 140-acre forested area is inaccessible by vehicle and the density of common buckthorn makes treatment by backpack sprayers impractical. Therefore, the Refuge has proposed to use aerial application of the herbicide Trycera® (Triclopyr: 3,5,6-trichloro-2-pyridinyloxyacetic acid) in the fall after overstory trees have entered dormancy (Appendix 10.3). Buckthorn retains its leaves at this time and this provides a window of opportunity to treat this non-native shrub while minimizing damage to native tree species.

In addition to complying with applicable regulations and herbicide label requirements, the Refuge is required by USFWS policy to develop a Pesticide Use Proposal (PUP) to use restricted pesticides. The Refuge's Pesticide Use Proposal must be reviewed and approved by the USFWS's Regional Integrated Pest Management Coordinator. In addition, the Refuge must prepare a National Environmental Policy

[20] https://cumulis.epa.gov/supercpad/SiteProfiles/index.cfm?fuseaction=second.Cleanup&id=0503250

Act review (this document), Endangered Species Act Section 7 consultation as necessary, and develop an Integrated Pest Management Strategy prior pesticide application. The Pesticide Use Proposal and the Integrated Pest Management Strategy identify the conditions and procedures, including the best management practices (Appendix 10.3), that the Refuge will use to enhance the efficacy and minimize any risk associated with the aerial application of herbicides. The Integrated Pest Management Strategy, which identifies the conditions and procedures that the Refuge will use to enhance the efficacy and minimize any risk associated with the aerial application of herbicides, including best management practices (Appendix 10.3), accompanies the Pesticide Use Proposal for review. The USFWS's regional reviews of the Pesticide Use Proposal and the Integrated Pest Management Strategy provide independent, interdisciplinary review of the use of restricted use pesticides in order to ensure that their use is warranted and any associated risks are minimized.

Adherence to criteria such as those regarding wind direction and velocity (Appendix 10.3) will ensure that residential areas are not affected by the aerial application of herbicides. Application of herbicides will, however, result in temporary restriction of access to the forested tracts within the Green Point Area, though other trails within the Refuge are likely to remain open for use. Application of herbicides in the fall, when native overstory trees have entered dormancy, is likely to reduce the risk of injury to native plants. Depending on efficacy, treatments may be repeated or may be followed by conventional backpack spraying of individual plants. Similarly, timing of application will occur substantially past the breeding season of forest birds and it is likely that most species will have begun their southern migration at the time of application. The use of best management practices to avoid conditions that would result in herbicide drift to waterways would minimize the likelihood of impact to resources. The outcomes of the Refuge's proposed use of herbicides to treat common buckthorn are likely to be an improved native understory plant community, improved habitat for native wildlife species, and, in particular, improved habitat for native reptiles and amphibians. Consequently, recreational opportunities related to wildlife viewing and appreciation of native plant communities may be improved.

Table 5-8. Impact summary with respect to implementation of either a No Action Alternative or the Trustee's Preferred Alternative at the Green Point Area.

Issue	Impact Summary	
	No Action Alternative	**Preferred Alternative**
Environmental Justice	The City of Saginaw has been characterized as a historically industrial, economically disadvantaged community. Abandoned industrial sites, or 'brownfield areas' occur within the vicinity of the Green Point Area. -Implementation of the No Action Alternative would not contribute to Environmental Justice.	Implementation of the Preferred Alternative may provide additional recreational and environmental education opportunities to residents of the City of Saginaw and specifically to the adjacent neighborhoods that are within walking distance of the Green Point Area. These opportunities would be provided at no cost to the local community and would contribute to environmental justice to economically disadvantaged community members.
Cultural Resources	The Shiawassee National Wildlife Refuge has an on-going partnership with the Castle Museum of Saginaw County History to conduct cultural and archaeological surveys. No change to the evaluation or curation of cultural resources within the Green Point Area would occur under the No Action Alternative.	The Preferred Alternative would likely result in movement of earth to improve wetland values in two constructed irrigation structures (Long Pond, East Pond). These areas have been repeatedly disturbed over time, transitioning from forest, to agriculture, to urban golf course. Nonetheless, no activity would occur without consideration of National Historic Preservation Act compliance and coordination with the Castle Museum of Saginaw County History.
Law Enforcement	The Shiawassee National Wildlife Refuge is currently staffed with a Fish and Wildlife Service Federal Wildlife Officer. No change would occur to law enforcement activities under the No Action Alternative.	Law enforcement staffing would not change under the Preferred Alternative. With improved delineation of refuge boundaries, gating and fencing, signage, and designation of recreational access sites, unmanaged or unauthorized access to the Green Point Area may decline. This may result in circumstances that require fewer law enforcement contacts with visitors to the Green Point Area.
Public Use: Recreational Access	The No Action Alternative would not result in any improvement of recreational access to the Green Point Area or an existing system of decaying cart paths currently used by the public. The public would continue to use the area despite the continued decay of the cart paths.	A small parcel (the Bourdow tract), formerly a business location, would be repurposed to provide additional parking and access where the Green Point Area borders the City of Saginaw. Additional gating, fencing, signage and boundary markers may encourage recreational access consistent with the Refuge's mission and inhibit unmanaged access.
Public Use: Trails & Walking	In the absence of management action, trails within the Green Point Area, consisting of abandoned cart paths, would continue to decay and degrade. Unsafe conditions currently exist within several areas of the Green Point Area.	Under the Preferred Alternative, decaying cart paths would be removed. A new trail system, designed with public input, would be constructed. Access to the trail system would also be improved. Trail system safety would be improved.

Issue	Impact Summary	
	No Action Alternative	**Preferred Alternative**
Public Use: Wildlife Viewing	The Green Point Area consists of old-field habitats dominated by non-native ornamental shrubs and trees, invasive shrubs, and non-native turf grasses. Wildlife viewing opportunities associated with these habitats would continue in the near term. The Green Point Area would become increasingly overgrown and likely become less attractive to visitors.	Under this alternative, native habitats and an improved diversity of habitats would be restored within the Green Point Area. A greater diversity of wildlife viewing opportunities would occur and would be maintained under the Trustee's Preferred Alternative.
Public Use: Outreach & Education	Operations of the Green Point Environmental Learning Center would remain unchanged under a No Action Alternative.	Under the Preferred Alternative, improved access and restored native habitats within the Green Point Project Area would likely result in improved or additional environmental outreach and educational opportunities. Demonstration plantings such as pollinator plantings or rain gardens, in association with the Environmental Learning Center or a redesigned trail system, may occur under the preferred alternative.
Resources: Sediment Contaminants	The Green Point Area is located within the floodplain of the Tittabawassee River, within an on-going EPA led cleanup effort related to contaminants historically released from the Dow Midland Plant. Under the No Action Alternative, the EPA-led cleanup effort would continue, including in those areas of the Green Point Area that border the Tittabawassee River.	Under the Preferred Alternative, the EPA-led cleanup effort along the Tittabawassee River would continue until completed, including those areas that border the Green Point Restoration project area. In compliance with soil movement restrictions in the 8 year floodplain of the Tittabawassee River, soil moved within the Green Point Area would remain on site. Restoration designs would include provisions to manage contaminated soils, such as the use of annual cover crops to prevent erosion and stabilize soils, or covering contaminated soils with other stock-piled soils.
Resources: Non-native Species	The Green Point Area is dominated by non-native species including non-native turf grasses, ornamental trees and shrubs, and common buckthorn within the understory of wooded tracts in the Green Point Area. Under the No Action Alternative, without additional resources, and without additional staffing, no increase in treatment of invasives would occur. Moreover, it is likely that non-native and invasive species would likely persist, expand, or new infestations occur, within the Green Point Area.	Under the Preferred Alternative, common buckthorn would be treated using the aerial application of herbicides. Non-native and invasive species, ornamental shrubs and trees, would be replaced by plant communities native to the Shiawassee Flats ecosystem.

Issue	Impact Summary	
	No Action Alternative	**Preferred Alternative**
Resources: Mosquitoes	Under the No Action Alternative, no change to the treatment of habitats for mosquitoes within the Refuge would occur. Under a Special Use Permit issued by the Refuge, the Saginaw County Mosquito Control Board treats certain waterways and wetlands within the Refuge. The Saginaw County Mosquito Control Board treats waterways throughout Saginaw County using techniques that include aerial application to control mosquitoes.	Under the Preferred Alternative, minor change to the treatment of habitats for mosquitoes within the Refuge may occur. The Saginaw County Mosquito Control Board would continue treatment of Refuge waterways to control mosquitoes within the guidelines of their Special Use Permit. Depending upon water levels, treatment of restored Long and East ponds for mosquitoes may continue.
Resources: Endangered Species	No species listed under the Endangered Species Act have been documented within the Green Point Project Area. The Northern long-eared bat is likely an infrequent summer resident. The history of disturbance at the site, habitats dominated by non-native species, and frequency of public visitation make it unlikely that listed species are likely to occur within the Green Point Area. Under the No Action Alternative, no changes to the status of listed species within the Green Point Project Area would occur.	No species listed under the Endangered Species Act have been documented within the Green Point Project Area. The Northern long-eared bat is likely an infrequent summer resident. The history of disturbance at the site, habitats dominated by non-native species, and frequency of public visitation make it unlikely that listed species are likely to occur within the Green Point Area. Under the Preferred Alternative, no changes to the status of listed species within the Green Point Area are likely to occur. However, habitat suitability for species such as the Eastern prairie fringed orchid (*Platanthera leucophaea*) would improve and the Refuge could consider introducing listed species of plants in the Green Point Area.
Resources: Sensitive Species	Several species identified by the State of Michigan as sensitive species are likely to occur within the Green Point Area. Sensitive species likely to occur within the project area include the pickerel frog (*Lithobates palustris*), Blanding's turtle (*Emydoidea blandingii*), and spotted turtle (*Clemmys guttata*). It is likely that non-native and invasives would persist in the project area; suitability of these habitats for sensitive species would likely decline. This may be of particular relevance to amphibian habitats that are impacted by the highly invasive species common buckthorn.	Under the Preferred Alternative, substantial wetland restoration would occur in the vicinity of existing irrigation impoundments. Ephemeral wetlands within wooded tracts would be improved with the treatment of common buckthorn, a species known to release allelochemicals that may impact amphibian reproduction. Sensitive species associated with these habitats, and sensitive species associated with habitats such as lakeplain prairie (e.g., bumble bees (*Bombus* spp.)), would likely benefit under the Preferred Alternative.

Issue	Impact Summary	
	No Action Alternative	**Preferred Alternative**
Resources: Wetland Values	The Green Point Area lies within the floodplain of the Tittabawassee River; consequently, wooded tracts have retained some characteristics of bottomland hardwood forests. However, these areas are pervasively dominated by common buckthorn within understories of the tracts. Existing irrigation impoundments have little wetland value. Under the No Action Alternative, there would be no change to the degraded wetland values within the project area.	Under the Preferred Alternative, treatment of common buckthorn in wooded tracts of the Green Point Area would substantially improve wetland values for a rare habitat, namely wooded ephemeral wetlands. Irrigation impoundments would be substantially altered to restore wetland value. Long Pond would be reconnected to the Tittabawassee River; restoration would feature a gradation of habitats from open water, emergent wetland, moist shrubland, to either floodplain forest or lakeplain prairie, which would improve wetland character.
Maintenance: Dikes	Under the No Action Alternative, no change would occur to an existing dike and control structure that allows water from the Tittabawassee River to enter the impoundment referred to as Long Pond. Existing steep sidewalls of Long Pond and East Pond, which present a public safety hazard, would not be altered.	Under the Preferred Alternative an existing dike and control structure that connects the Long Pound impoundment to the Tittabawassee River would be removed, allowing water levels in a reconstructed Long Pond to vary directly with water levels of the Tittabawassee River. Sidewalls of Long Pond and East Pond would be sloped to provide a gradual, more natural, transition from open water to upland or forested habitats, improving public safety as well as ecological condition. East Pond slopes may be similarly sloped to provide shallow water habitat areas.
Maintenance: Flood Storage	No change to flood storage capacity would occur as a result of a decision to implement the No Action Alternative.	Soils moved to alter the character of the existing irrigation impoundments would remain on site within the Green Point Project Area to provide variation in topography. Consequently, no change in flood storage capacity would be accrued as a result of implementation of the Preferred Alternative.
General: Cultural Diversity	The City of Saginaw has been characterized as an economically disadvantaged community. Saginaw is also a multi-ethnic community. No additional opportunities that would address cultural diversity or economic disparity would occur as a result of a decision to implement the No Action Alternative.	Under the Preferred Alternative, access to the Green Point Area would be improved. Elimination of unsafe and decaying cart paths, replaced with a maintained trail system, may provide additional nature-based recreational opportunities that promote culturally diverse visitation of the Refuge as a result of a decision to implement the Trustee's Preferred Alternative.
General: Habitat Monitoring	No change to the Shiawassee National Wildlife Refuge's existing program of monitoring would occur as a result of a decision to implement the No Action Alternative.	Under the Preferred Alternative, all phases of the Green Point Restoration Project would provide for additional monitoring related to both implementation of the various phases of the proposed project, and the anticipated outcomes of the proposed project. Implementation monitoring would allow the Trustee's to verify what has been implemented; outcome-based monitoring would evaluate the degree to which the proposed actions achieved their intended ecological or sociological benefits.

5.4.6. Cumulative Effects – The No Action Alternative.

The No Action Alternative has some foreseeable negative impacts to the human environment associated with the untreated perpetuation of non-native and invasive species in the Saginaw Bay watershed. In the long-term, untreated populations of species such as common buckthorn, *Phragmites*, or bush honeysuckle (*Lonicera maackii*) likely contribute to the proliferation of these non-native species on adjacent properties – to the detriment of native plant and animal communities throughout the Saginaw Bay watershed. Untreated populations of non-native species, which would occur under the No Action Alternative, are likely to function as source populations that contribute to the spread of non-native species in the Saginaw Bay watershed. Overall, under the No Action Alternative, the public would not receive any increase in their use and enjoyment from improved habitats and fish and wildlife populations from the 1998 settlement that was reached on behalf of the public.

5.4.7. Cumulative Effects – The Action Alternatives.

The action alternatives may result in the temporary, short-term disruption of ecological services such as wildlife watching during implementation, or soil disturbance in the case of maintenance of wetland infrastructure, or soil movement in previously disturbed areas, such as is proposed in Green Point Area on the Shiawassee NWR. By design, however, restoration projects associated with the Stewardship, Stakeholder, or Collaborative Conservation alternatives are designed so as to provide long-term ecological benefits and contribute ecological services for the communities and visitors to the Saginaw River and Bay. Alternatives comprised of restoration actions that provide ecological and cultural benefits to the human environment without negative impacts, by definition then, do not contribute to negative cumulative impacts such as the impacts attributable to other stressors, such as nutrient inputs, in the Saginaw River and Bay. The net effect of the restoration actions is intended to reduce the cumulative impact of stressors such as non-native and invasive species in the Saginaw Bay watershed.

5.4.8. National Environmental Policy Act – Summary and Determination.

The National Environmental Policy Act significance criteria are ten-fold and address issues primarily related to negative impact on the human environment. There are notable differences between the alternatives. These include: likely impacts of the proposed alternatives, impact to culturally significant areas, and, to a lesser degree, controversial aspects of the alternatives.

The action area encompasses a substantial area of Great Lakes coastal wetlands and riparian corridors in the Shiawassee Flats region. Though restorations are planned within this unique geographic area, it should also be noted that the proposed alternatives are intended to achieve the restoration of natural resources, resulting in ecological benefit, within the larger Saginaw Bay watershed. Adoption of the No Action Alternative would result in perpetuation of non-native invasive species in coastal wetlands of the Saginaw River and Bay. Similarly, the No Action Alternative would result in continued occupation by invasive species of culturally significant lands. Though the Stewardship, Stakeholder Engagement, and Collaborative Conservation alternatives would each result in temporary disturbance in coastal wetland habitats, outcomes would be beneficial to sensitive habitats and culturally significant areas.

Both the Stakeholder and Collaborative Conservation Alternative may occasion moderate controversy associated with possible stakeholder proposals to acquire additional properties for conservation. However, both the State of Michigan[21] and the National Wildlife Refuge System[22] have revenue sharing mechanisms in place to annually compensate local governments for lost property tax revenues associated with the acquisition of conservation properties by state and federal land management agencies. Nonetheless, for the funds remaining from the 1998 settlement, the Trustees have determined that the acquisition of additional conservation properties is generally less preferable than other approaches to achieving restoration in the public interest.

The restoration actions to be implemented as elements of the Stewardship Alternative, the Stakeholder Engagement Alternative, or the Collaborative Conservation Alternative (identified as the Trustees' preferred alternative in the Draft Restoration Plan), such as wetland restoration and the treatment of non-native and invasive species fall within the scope of the USFWS's use of categorical exclusions. Considering in detail the restoration practices and relevant issues related to the Green Point Restoration Project, the outcomes of this proposed action are similar to those of categorically excluded actions. These actions are designed and intended to result in beneficial ecologic, economic, or social outcomes. Consequently, with respect to the National Environmental Policy Act, the USFWS, as the federal administrative trustee, with the Trustees' concurrence, has determined that implementation of either the Stewardship Alternative, the Stakeholder Engagement Alternative, or the Collaborative Conservation Alternative, would not significantly impact the human environment.

5.5. Summary of NRDAR Alternative Evaluation

5.5.1. NRDAR Outcome-based Criteria - Focus-related Criteria.

The three action alternatives considered by the Trustees are roughly equivalent with respect to the focus related criteria (restoration equivalency, targeted resources, restoration dependency). The Trustees would communicate any criteria to stakeholders to ensure that restorations advanced by stakeholders and developed with the Trustees would rank highly with respect to focus-related criteria.

5.5.2. NRDAR Outcome-based Criteria - Feasibility-related Criteria.

The three alternatives considered by the Trustees are roughly equivalent with respect to the six feasibility related criteria (cost-effectiveness, reference to baseline, established methodology, response actions, source control, regional planning). Two of these criteria, comparison to baseline and source control, are not applicable to this analysis in that the restoration plan is focused on the use of remaining funds to be expended well beyond the initial implementation of the 1998 settlement where these criteria would have been more relevant.

The Stewardship Alternative and the Collaborative Conservation Alternative take into account the ongoing EPA led response action along Tittabawassee River[23]; and, the Trustees would not consider a Stakeholder Alternative that did not take into account response actions. This is, at present, most

[21] https://www.michigan.gov/dnr/0,4570,7-350-79136_79262_80437---,00.html

[22] https://www.fws.gov/refuges/realty/rrs.html

[23] https://cumulis.epa.gov/supercpad/cursites/csitinfo.cfm?id=0503250

relevant to the Green Point Area Restoration Project. Restoration planning has been delayed to accommodate response actions that may affect this project area. Other than this exception, the action alternatives are approximately equivalent with respect to the feasibility criteria.

5.5.3. NRDAR Outcome-based Criteria - Benefit-related Criteria.

Perhaps the greatest degree of separation among the alternatives is evident in considering the four elements of benefit criteria (greatest scope, unique benefits, environmental justice, and duration of benefit). The Collaborative Conservation Alternative would provide significant benefits related to each of these criteria, though duration of benefit under this alternative is likely to be less than that of the Stewardship Alternative. The Stewardship Alternative is likely to result in the greatest duration of maintained conservation benefit among the alternatives. The Stakeholder Engagement Alternative provides the least degree of certainty as to the degree to which the benefits described in these criteria would be achieved. However, given that the Collaborative Conservation Alternative encompasses both the Stewardship Alternative and Stakeholder Engagement Alternative, it is likely that this alternative would provide the greatest overall scope and degree of benefits.

Both the Stewardship Alternative and the Collaborative Conservation Alternative directly incorporate projects that address issues related cultural values or environmental justice in the context of ecological restoration. The Green Point Area Restoration Project is located within an urban environment where a substantial number of citizens are under-served or economically disadvantaged. This restoration project would provide unique natural resource based educational and recreational opportunity for this community. The Saganing River Mouth Restoration will provide unique recreational and educational opportunities related to cultural values for the Saginaw Chippewa Indian Tribe of Michigan.

5.5.4. Trustee Defined Restoration Criteria.

Similar to consideration of the NRDAR Outcome-based Criteria, the Stakeholder Engagement Alternative provides the least degree of certainty with respect to these criteria. The Trustees' Criteria include the durability of conservation benefit, financial leveraging, and strategic leveraging. Both the Stewardship Alternative and the Collaborative Conservation Alternative incorporate maintenance to extend conservation benefit. Both alternatives add capacity to proponents of restoration to expand the benefit of ecological restoration beyond project footprints. Both alternatives incorporate consideration of adjacent conservation lands to, in effect, enlarge the conservation impact of respective restoration projects. The Collaborative Conservation Alternative may perhaps be unique in the potential to exercise strategic landscape conservation design (conservation leveraging) that would add benefit to the existing portfolio of restoration effort in the Saginaw River and Bay Area, including the 1998 settlement restoration projects.

6.0. SELECTED ALTERNATIVE

The Trustees evaluated four restoration alternatives. These included a No Action Alternative, a Stewardship Alternative, a Stakeholder Engagement Alternative, and a Collaborative Conservation Alternative. Common to all the alternatives, including the No Action Alternative, would be the on-going monitoring of contaminants as described within the Consent Judgment, as well as limited restoration of the Green Point Area using funds designated for that purpose within the Consent Judgment and described within a separate restoration plan (USFWS 2016). Briefly, these alternatives can be summarized as the following:

- a No Action Alternative that would allow for continued investment of remaining funds from the 1998 settlement until the Trustees felt there was a compelling reason to reinitiate restoration planning.

- a Stewardship Alternative wherein the Trustees would use the remaining funds to improve the ecological condition of projects implemented under the 1998 settlement. Any remaining funds would be used to maintain the condition of the stewardship projects until those funds were exhausted.

- a Stakeholder Engagement Alternative wherein the Trustees would allocate the remaining funds from the 1998 settlement to the development and implementation of stakeholder identified restoration projects developed collaboratively with the Trustees.

- a Collaborative Conservation Alternative wherein the Trustees would use the remaining funds for the stewardship and maintenance of previously implemented 1998 settlement restoration projects for a period of approximately 17 years and, with a portion of the funding, the implementation of additional restoration actions identified as a result of stakeholder engagement in the restoration planning process.

The Trustees released their Draft Restoration Plan to the public for review, asking for feedback related to these alternatives and requesting that local stakeholders provide examples of restoration actions they may offer to the Trustees for their consideration.

Given the feedback that the Trustees received, the limited scope of stakeholder restoration actions identified during the public review process, the recognized value of the restoration actions described within the Stewardship Alternative (Section 4.4; Appendices 10.2 – 10.5), and the ability to provide maintenance funding for restoration actions, the Trustees have identified the Collaborative Conservation Alternative as their Selected Alternative. This alternative addresses the core considerations of both the Stakeholder Engagement Alternative and the Stewardship Alternative, builds the capacity of proponents to provide conservation-related services, ensures the long-term maintenance of restoration actions that are consistent with the Consent Judgment for the 1998 settlement, and most evidently meets the Trustees' restoration criteria and priorities for NRDAR projects (Section 3.0).

In selecting to implement the Collaborative Conservation Alternative, the Trustees will allocate funds remaining from the 1998 Settlement to ensure implementation of the restoration actions identified within the Stewardship Alternative ($2.6M), dedicate funds for the maintenance of the stewardship projects ($0.55M), reserve funding for collaborative development of stakeholder-identified restoration projects ($0.75M), support the continuing monitoring of contaminants within the Saginaw River and Bay ($1.1M), and reserve $0.7M to account for the administrative costs of the Trustees and to serve as a contingency fund.

As implementation of the Final Restoration Plan proceeds, the remaining funds from the 1998 Settlement will be held in federal interest bearing accounts, invested in U.S. Treasury bonds, notes, or mixture of the two depending on interest rates and anticipated timing of withdrawals. The Trustees anticipate that as projects are implemented, or as monitoring is refined, savings of the remaining funds in various categories may occur. Under the selected alternative, the Trustees reserve the right to repurpose earnings or savings to address unforeseen circumstances (contingency), to augment the stewardship projects as needed, or to fund additional stakeholder identified restoration actions.

In accordance with the design of the Collaborative Conservation Alternative, the Trustees will work with stakeholders to collaboratively identify, develop, and implement future restoration projects with the $0.75M set aside for this purpose. Stakeholders may continue to submit specific ideas for restoration actions to the Trustees at any time, and the Trustees will use a number of means to ensure that the public and stakeholders are periodically informed of the opportunity to share their restoration priorities with the Trustees. As appropriate, this may include media outreach, online webinars, workshops, or in-person meetings.

As implementation progresses, the Trustees may choose to amend the Final Restoration Plan if significant changes are made to the types, scope, or impact of the specific projects described in the Draft Restoration Plan or through the addition of a stakeholder-identified project or projects. In the event of a significant modification to the Final Restoration Plan, the Trustees will provide the public with an opportunity to review and comment on any amendment to the Final Restoration Plan.

As necessary, the Trustees will review the environmental impacts of future stakeholder-identified restoration projects to ensure compliance with the National Environmental Policy Act and Section 7 of the Endangered Species Act. Additionally, the USFWS, as a federal Trustee, will assure compliance with Section 106 of the National Historic Preservation Act and document compliance prior to the allocation of funding for project implementation.

The Trustees will publish an annual fiscal report to be housed on the Saginaw River and Bay NRDAR website (www.fws.gov/midwest/es/ec/nrda/SaginawNRDA/index.html). Financial decisions made by the Trustee Council will also be memorialized in Trustee Council Resolutions. Reports and resolutions will become part of the publicly available administrative record for the Saginaw River and Bay NRDAR.

7.0. MONITORING, PERFORMANCE, AND ADAPTIVE MANAGEMENT

The Trustees will oversee the development and implementation of protocols that address three tiers of project-related monitoring: implementation, effectiveness or outcome, and validation monitoring associated with the practice of adaptive management.

Implementation Monitoring. Implementation monitoring answers the basic questions related to the achievement of the proposed tasks included in the plan for implementing the restoration project or action. These are the tasks that provide the project elements intended to achieve a particular outcome. For example, the implementation workplan may include three consecutive years of expansive area-wide treatment of non-native species. Implementation monitoring would summarize this effort relative to the planned schedule and area of treatment.

Effectiveness Monitoring. Effectiveness monitoring is used to determine whether an identified outcome has actually been achieved. For example, an objective for the treatment of non-native species might be to reduce the distribution or coverage of non-native species in a project area to less than 10% of the total project area after three years. Project effectiveness monitoring would be conducted to evaluate the distribution or coverage of non-native species in each year to evaluate the degree to which the treatments were effective in reaching the stated objective. Effectiveness monitoring may also include assessment of project outcomes relative to the stressors related to climate change such as extreme precipitation events and water level fluctuations.

Validation Monitoring and Adaptive Management. Adaptive management, the use of which is supported by the Trustees, uses effectiveness monitoring to change, that is, adapt, a treatment protocol to improve the likelihood that an intended outcome will be achieved. Validation monitoring is intended to evaluate whether or not a change based on previous monitoring was an appropriate course of action. For example, managers might evaluate the effectiveness of a particular herbicide for the treatment of non-native species and decide that another herbicide would be more effective. Validation monitoring, in this case, would be used to evaluate the decision to change a treatment protocol (herbicide). Validation monitoring tends to be 'hypothesis-driven', meaning managers may rigorously evaluate, using statistical procedures, the outcome of a particular treatment versus the outcome of another. Validation monitoring would not be typical of the restoration projects, but may occur at the direction and with the support of the Trustees.

Monitoring and the Development of Project Workplans. This section of the Final Restoration Plan communicates the expectations of the Trustees regarding the development of project-specific workplans and the inclusion of monitoring plans for projects. This is applicable to the 1998 stewardship projects as well as future stakeholder projects that may be developed collaboratively with the Trustees.

With the finalization of the Restoration Plan, or in the case where the Trustees have developed additional restoration projects with stakeholders, project managers will be requested to develop project workplans that describe the project's implementation and reporting schedule, implementation benchmarks, expected ecological outcomes and related performance measures, monitoring plan, and a project budget. The Trustees would work with proponents and managers as they develop workplans. Workplans typically describe stages of project implementation with interim approvals and reporting.

Once the Trustees have reviewed and approved project workplans, funding will be released and project implementation will begin. For longer projects, funding may be released in installments following interim progress reports that describe completion of tasks and expenditure of funding.

8.0. PREPARERS, AGENCIES, AND PERSONS CONSULTED

8.1 Preparers

Clark D. McCreedy, U.S. Fish and Wildlife Service, East Lansing, MI

8.2 Agencies Consulted

Federal Agencies
Bureau of Indian Affairs, Washington, D.C.
U.S. Army Corps of Engineers, Detroit, MI
U.S. Fish and Wildlife Service, Michigan Ecological Services Field Office, East Lansing, MI
U.S. Fish and Wildlife Service, Shiawassee National Wildlife Refuge, Saginaw, MI
U.S. National Park Service, East Lansing, MI

Tribes
Saginaw Chippewa Indian Tribe of Michigan

State Agencies
Michigan Department of Attorney General
Michigan Department of Environment, Great Lakes, & Energy, Water Resources Division
Michigan Department of Natural Resources, Fisheries Division
Michigan Department of Natural Resources, Wildlife Division

Local Agencies, Non-Governmental Organizations, and Others
Bay County Board of Commissioners
Bay County Environmental Affairs and Community Development
Bay County Executive Branch
Bay County Hampton Township, Charter Township
Michigan Natural Features Inventory, Michigan State University
Partnership for the Saginaw Bay Watershed
Saginaw Basin Land Conservancy
Saginaw River and Bay Area of Concern
Saginaw-Tittabawassee Rivers Contamination Community Advisory Group

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10.0. APPENDICES

Appendix 10.1. State-listed Species for Counties within the Saginaw Bay Watershed

This appendix can be found online at www.fws.gov/midwest/es/ec/nrda/SaginawNRDA

Appendix 10.2. Saganing River Mouth Restoration – Building Restoration Capacity

Appendix 10.3. Shiawassee NWR - Green Point Area Restoration Project

Appendix 10.4. Michigan Acquired Properties – Restoration and Maintenance Capacity

Appendix 10.5. Michigan Islands NWR – Restoration, Maintenance, Monitoring

Appendix 10.6. Contaminant Monitoring in the Saginaw River and Bay

Appendix 10.7. Summary of Anticipated Costs – Stewardship Projects

Appendix 10.8 Comment Received From the Public

Appendix 10.9 Trustee Response to Public Comment

Appendix 10.2. Saganing River Mouth – Building Restoration Capacity

Project Proponent: Saginaw Chippewa Indian Tribe

Project Description: The 106 acre Saganing River Mouth (Roney) Property (Figure 10-1) was conveyed to the Saginaw Chippewa Indian Tribe as a component of the 1998 settlement for natural resource damages in the Saginaw River and Bay. The following proposal is intended to build capacity within the Environmental Unit of the Tribe to enable restoration of the Saganing River Mouth Property.

Following the 1998 settlement, in 2002, a conceptual plan for the Saganing River Mouth Property was drafted to initiate discussion of restoration and future use of the property. However, funding and staffing within the Environmental Unit have precluded the possibility of taking on the additional restoration associated with the Saganing River Mouth Property.

Historically, the property likely supported a diverse native plant community. Based on the Michigan Natural Features Inventory, habitat communities on the property, or historically evident on the property, include Lakeplain Wet Prairie, a Southern Hardwood Swamp community, a Dune Ridge Plant Community, Great Lakes Coastal Marsh, Scrub-shrub community, Early Successional Shrub Swale Plant Community, Old Field Plant Community, and the Saganing River itself that forms the southern and western boundaries of the property. That is, historically, the property likely supported a diverse native plant community.

Like other coastal areas of the Great Lakes, non-native species such as *Phragmites* and Amur honeysuckle (*Lonicera maackii*), are a substantial management issue (Figure 10-2). Unlike many other coastal marsh habitats that include a bottomland hardwood component, common buckthorn is not a substantial management issue on the property. Non-native honeysuckle, however, as well as other non-native species, forms nearly impenetrable areas throughout much of the property (Figure 10-2).

The Environmental Unit of the Tribe manages a substantial portfolio of properties maintained for their ecological and cultural value to the Tribe. This proposal is intended to build the capacity of the Environmental Unit of the Tribe to enable restoration of tribal coastal properties. Restoration capacity would be achieved by providing staffing support; funding for power equipment; funding for materials, herbicides, and fuel; funding for staff training; and, by providing a fund to enable on-going maintenance of the Saganing River Mouth Property. Cost estimates were developed assuming a 20 year project timeframe to identify maintenance costs in addition to implementation costs (Table 10-1). Final allocation of maintenance funding would be determined following public review of the Draft Restoration Plan. The Trustees recognize that the addition of Tribal capacity will likely result in improvement of ecological condition on tribal properties beyond the boundaries of the Saganing River Mouth property, elsewhere in the Saginaw Bay watershed.

The Trustees anticipate that restoration of the property will require an implementation period of three to five years. The restoration of the property will consist primarily of control of non-native and invasive species, removal of refuse or remnant structures as needed, removal of dead ash overstory trees, and re-establishment of native species. Maintenance of desired ecological condition will likely occur on an annual basis. To ensure the durability of conservation benefit, the Trustees have supported incorporating consideration of maintenance actions over a project timeframe of 20 years, inclusive of implementation.

Figure 10-1. The Saganing River Mouth Property is situated at the mouth of the Saganing River which forms the southern and western boundary of the property. The property extends to a ditch adjacent to residential development to the east and is bounded by a county road to the north.

Figure 10-2. Representative density of non-native bush honeysuckle stems (*Lonicera maackii*) that occur throughout much of the Saganing River Mouth Property. Native shrub dogwoods (*Cornus* spp.; red stems in photo) occur intermittently within the property.

Table 10-1. Components of the Saganing River Mouth Restoration Project with cost estimates over time. In the final row, blue-shaded boxes show subtotals for implementation phase costs and the green-shaded box shows the subtotal for 15 years of maintenance costs.

Tribal Conservation Properties - Restoration Capacity								
Year	Staffing	Heavy Equipment[1]	Training	Tools & Supplies	Equipment Maintenance	Contract Services	Indirect	Summary of Costs by Year
2021	$86,459	$0	$5,450	$9,200	$6,500	$5,000	$22,856	$135,465
2022	$89,060	$0	$5,450	$3,000	$6,500	$5,000	$22,092	$131,102
2023	$91,730	$51,075	$5,450	$3,000	$6,500		$22,659	$180,414
2024	$94,489	$0	$5,450	$3,000	$6,500		$23,245	$132,684
2025	$97,340	$0	$5,450	$3,000	$6,500		$23,850	$136,140
2026		$0	$0	$1,500	$3,500		$1,062	$6,062
2027		$0	$0	$1,500	$3,500		$1,062	$6,062
2028		$0	$0	$1,500	$3,500		$1,062	$6,062
2029		$0	$0	$1,500	$3,500		$1,062	$6,062
2030		$0	$0	$1,500	$3,500		$1,062	$6,062
2031		$0	$0	$1,500	$3,500		$1,062	$6,062
2032		$0	$0	$1,500	$3,500		$1,062	$6,062
2033		$0	$0	$1,500	$3,500		$1,062	$6,062
2034		$0	$0	$1,500	$3,500		$1,062	$6,062
2035		$0	$0	$1,500	$3,500		$1,062	$6,062
2036		$0	$0	$1,500	$3,500		$1,062	$6,062
2037		$0	$0	$1,500	$3,500		$1,062	$6,062
2038		$0	$0	$1,500	$3,500		$1,062	$6,062
2039		$0	$0	$1,500	$3,500		$1,062	$6,062
Totals	**$459,078**	**$51,075**	**$27,250**	**$42,200**	**$81,500**	**$10,000**	**$129,570**	**$800,673**
					Implementation			**$715,805**
					Maintenance			**$84,868**

[1]The Tribe has successfully obtained extramural funding for heavy equipment that was originally a part of the proposal.

Appendix 10.3. Shiawassee NWR - Green Point Area Restoration Project

Project Proponent: Shiawassee National Wildlife Refuge, Saginaw Michigan.

Project Description:

As a result of the 1998 settlement, the Shiawassee National Wildlife Refuge received a 99-year lease for the Green Point Environmental Learning Center and an adjoining 80 acres of riparian and upland habitats. They also received an option to renew this lease for an additional 99 years. In May of 2014, the Refuge received the former 135-acre Germania Town and Country Club (Germania) golf course as a donation from The Nature Conservancy. Germania is located to the immediate north of the Tittabawassee River and borders the Learning Center to the north and west (Figure 10-3). In 2018 and 2019, the Refuge received two additional parcels, the Bourdow and Kohl properties, adding an additional 13 acres to the project area. The Kohl property borders the Tittabawassee River to the southeast of the Learning Center. The Bourdow property occurs to the north of the Learning Center and borders Maple Street to the west. These acquisitions were preceded in 1994 by the purchase of the 'Hickey Tract', an approximately 60 acre parcel to the west of the 80 acre Learning Center parcel (Figure 10-3).

In addition to the lease described above, the 1998 settlement required that a dedicated sum of $520,000 be set aside to "use these funds and the interest thereon at the Green Point Environmental Learning Center to restore, replace, or acquire equivalent resources consistent with CERCLA and applicable regulations." Some restoration actions, described within an earlier restoration plan (USFWS 2016), have already been implemented within the Green Point Area. These include the removal of decaying infrastructure associated with the former Germania golf course and treatment of non-native invasive species. At present, of this original sum, approximately $492,500 remains to advance additional restoration associated with the Green Point Area (Table 10-2).

Project Area: The Green Point Area is managed by the Shiawassee National Wildlife Refuge, one of the Nation's few National Wildlife Refuges recognized as occurring within an urban setting. The Refuge is positioned to the immediate south of the City of Saginaw and borders the Southwest Neighborhood Association of the City of Saginaw. The Green Point Area consists of five adjacent tracts associated with the Green Point Environmental Learning Center: the Germania Tract, Hickey Tract, Learning Center Tract, Bourdow property, and the Kohl property (Figure 10-3). The Green Point Area encompasses approximately 275 acres situated between the Tittabawassee River and the Southwest neighborhood of the City of Saginaw (Figure 10-3). The Germania tract is the largest of the tracts, consisting of about 135 acres.

The Germania Tract has been highly altered, reflecting its past use as a public golf course. Prior to this, the Germania Tract was logged, cleared, and converted to agriculture. This tract now consists of non-native turf grasses and ornamental trees and shrubs associated with the former use of the tract. The Tittabawassee River shoreline along the Germania Tract has been hardened by the placement of impervious material such as concrete and rock. Bank height exceeds 10 feet above typical summer flow levels of the river for much of the riparian area that borders the Green Point Area.

Forested stands within the Green Point Area, particularly in the Hickey and Learning Center tracts, have well established populations of invasive species such as common buckthorn, garlic mustard (*Alliaria petiolata*), and a variety of other non-native invasive species. Dominant overstory trees within these tracts include silver maple (*Acer saccharinum*) and green ash (*Fraxinus pennsylvanica*); ash trees are largely dead or dying due to infestation by the non-native emerald ash borer (*Agrilus planipennis*).

Floodplain hydrology is the predominant factor that determines, or will determine, the composition of native floral communities within the Green Point Area. The Green Point Area occurs within the Shiawassee Flats region which is comprised of the converging watersheds of the Cass, Flint, Shiawassee, and Tittabawassee rivers. These four rivers then form the Saginaw River which empties into Saginaw Bay of Lake Huron. Though many drainage structures remain in-place, portions of the Green Point Area routinely flood on nearly an annual basis depending upon the extent of precipitation and wind events. Wind-driven seiche events, which push water from Lake Huron into the Saginaw River causing water levels to rise throughout the lower Saginaw River watershed, occasionally reach the Refuge upstream. A recent evaluation of ecological land-typing, taking into account soil type, area hydrology, and historic patterns of vegetation within the Shiawassee Flats, will be used to guide the ecological restoration of the Green Point Area (Putt 2019, Putt and Kashian 2019).

Restoration: The Green Point Restoration Project can be thought of in four over-lapping phases: 1) removal of abandoned infrastructure; 2) community engagement and site-specific planning for amenities such as trails, boardwalks, or observation platforms; 3) treatment of non-native and invasive species; and, 4) wetland and landscape restoration. Implementation is likely to be phased over seven years, depending on funding and the pace of restoration and maintenance (Table 10-2).

Restoration practices likely to be implemented include those that have been characterized within the *Final Programmatic Environmental Impact Statement for Habitat Restoration Activities Implemented Throughout the Coastal United States*[24] (NOAA Programmatic EIS, NOAA 2015). This broadly applicable analysis is intended for the use by restoration planners and practitioners working under similar circumstances and comparable environments, such as Great Lakes Coastal wetlands. In order to efficiently conduct environmental analyses under NEPA, land managers may 'tier' their analyses to these broader analyses, meaning that they can refer to and rely on these programmatic analyses to characterize the practices to be implemented at a proposed site-specific restoration. In this case, the Trustees for the Saginaw River and Bay have tiered this Restoration Plan to the NOAA Programmatic analysis. Though the NOAA analysis is applicable to all the stewardship projects described in this Restoration Plan, the restoration practices described in the NOAA Programmatic EIS are particularly applicable to the Green Point Area Restoration Project. Practices that may be adopted include:

- Planning, Feasibility Studies, Design Engineering, and Permitting
- Implementation and Effectiveness Monitoring
- Fish and Wildlife Monitoring
- Debris Removal

[24] National Oceanic and Atmospheric Administration, NOAA Restoration Center, Final Programmatic Environmental Impact Statement for habitat restoration activities implemented throughout the coastal United States, is available at https://casedocuments.darrp.noaa.gov/southwest/vogetrader/pdf/4005_NOAA_Restoration_Center_Final_PEIS.pdf.

- Dam and Culvert Removal, Modification, or Replacement
- Construction of nature-like fishways, such as stepped pools formed by rock
- Invasive Species Control
- Prescribed Burns and Forest Management
- Species enhancement
- Channel Restoration
- Bank Restoration and Erosion Reduction
- Road Upgrading and Decommissioning; Trail Restoration
- Signage and Access Management
- Levee and Culvert Removal, Modification, and Set-Back
- Fringing Marsh and Shoreline Stabilization
- Sediment/Materials Placement
- Wetland Planting

In addition to the NOAA Programmatic EIS, the USFWS has also published a Restoration Plan / Environmental Assessment for the Green Point Area (Green Point RP/EA; USFWS, 2016). The selected alternative in the Green Point RP/EA provided for the following actions to be implemented:

- Forest inventory and ecological classification on the Refuge to be used as reference to guide future reforestation work
- A community needs assessment to characterize community interest for public amenities in the Green Point Area, largely occurring *east* of Maple Street
- Demolition and removal of existing buildings within the Germania Tract.
- Non-native, invasive species treatment across the entire Green Point Area.
- Restoration of native habitats / reforestation *west* of Maple Street
- Restoration of native habitats / reforestation *east* of Maple Street, if indicated by design
- Restoration of hydrology – removal or destruction of drainage tiles.
- Connecting existing trail systems in the GPA.
- Removal of existing asphalt golf cart paths within the Germania Tract.
- The construction of new trails within the Germania Tract.
- Hiring of a landscape architect, or partner with landscape architecture program at a local University, to design an area *east* of Maple Street, informed by the community needs assessment, that will be inviting to the public

Under the 2016 Green Point RP/EA, the Shiawassee National Wildlife Refuge has already initiated the removal of infrastructure related to the former Germania golf course, some work on invasive species control, a forest assessment, and a community needs assessment. The Refuge plans to conduct an additional community-based outreach initiative to further inform the integration of public amenities, recreational opportunity, and ecological restoration, and identify opportunities to acquire community support for the development of amenities that are compatible with the mission of the Refuge.

Elements of the future ecological restoration to be undertaken within the Green Point Area Restoration Project would include actions typical of other restorations within bottomland hardwood and wetland ecotypes, including the restoration of wetland function in the western portion of the Germania Tract and

an additional wetland restoration in the eastern portion of the Germania Tract. The former would involve substantially modifying a former irrigation impoundment commonly referred to as Long Pond (Figure 10-3). Long Pond is a deep, steep-walled, constructed ditch with a water control structure that connects the irrigation ditch to the Tittabawassee River. The restoration of Long Pond would involve removal of the current control structure to allow water to recede naturally with the level of the Tittabawassee River rather than being retained within the ditch at the level determined by the control structure. The sides of the ditch would be sloped outward to create a gradual transition from open water in the re-constructed ditch, to emergent wetland vegetation, to moist soil shrubs (such as button bush, *Cephalanthus occidentalis*), to a re-established bottomland hardwood forest as the restoration approaches the Tittabawassee River. To the north of the restored Long Pond, the restoration would transition to a Lake Plain Prairie habitat type. Soil may be returned to Long Pond. Soil that is moved elsewhere during the re-construction of Long Pond would remain on site and be used to create varied topography within the site. Cover crops and soil erosion control practices would be used to minimize any loss of soil during and following construction.

On a lesser scale, the pond within the eastern portion of the Germania tract may be modified to improve both open water and shallow water, ephemeral wetland habitats (Figure 10-5). At present, East Pond is steep-walled, is rimmed with a decaying asphalt former cart path, lacks woody vegetation that would shade portions of the pond, and lacks aquatic habitat diversity such as shallow areas or woody debris.

Substantial effort would be made to establish native plant communities within the Green Point Area. The National Wildlife Refuge System is directed by statute, regulation, and policy, to the control non-native and invasive species such as is proposed for the Green Point Area Restoration Project. These multiple authorities recognize the threat and impact that non-native species pose to the human and natural environment. A brief summary follows to emphasize the purpose and need to control non-native species and thereby restore native ecosystems.

The Plant Protection Act of 2000, the Noxious Weed Control and Eradication Act of 2004, and their predecessor the Federal Noxious Weed Act of 1974, enjoin federal agencies to use their resources, in cooperation with state agencies, to "eradicate, suppress, control, prevent, or retard the spread of any noxious weed." Though these statutes had their origin in the support of agriculture, it is noteworthy that common buckthorn, pervasive in the wooded tracts of the Green Point Area, is not only a threat to native habitats, but may also serve as a host for alfalfa mosaic virus and crown fungus, and may be a host for the soybean aphid (MNFI 2012). And, while the National Wildlife Refuge System Improvement Act of 1977 provides immediate direction to conserve native habitats, in the case of common buckthorn, seeds of which are dispersed by birds, it is compelling to note that this species may also impact agricultural as well as conservation lands.

At least four Presidential Executive Orders provide additional direction regarding the management of non-native and invasive species on National Wildlife Refuge System Lands. Executive Orders 11988 (Floodplain Management) and 11990 (Protection of Wetlands) direct Federal agencies to enhance foodplain and wetland values. Executive Orders 13112 (Invasive Species) and Executive Order 13751 (Safeguarding the Nation from the Impact of Invasive Species) direct federal agencies to minimize the economic, ecological, and human health impacts attributable to invasive species. In this case, the treatment of common buckthorn would enable the restoration of bottomland hardwood habitats within the floodplain of the Shiawassee River, with the goal of restoring habitats native to the Shiawassee Flats Region.

Numerous Department of Interior or Fish and Wildlife Service policies provide direction to the individual refuge field offices regarding the conservation of native habitats and the related issue of invasive species management. These include Interior Departmental Manual, Part 524 – Invasive Species Prevention and Control; the National Wildlife Refuge System - National Strategy for Management of Invasive Species; National Wildlife Refuge System Biological Integrity, Diversity, and Environmental Health Policy; and, the National Wildlife Refuge System Integrated Pest Management (IPM) Policy. These policies uniformly advance the goal of conserving native habitats while acknowledging that non-native and invasive species pose a substantial threat to native habitats within the National Wildlife Refuge System, and the properties adjacent to Refuge System lands.

The former Germania golf course is dominated by non-native turf grasses and interspersed ornamental trees and shrubs. Mechanical treatments, such as grinding, may be used to treat woody ornamentals; the use of prescribed fire, mowing, and herbicide application may be used to restore understory vegetation within the former golf course. Because of the open character of the former golf course, boom spraying of non-native grasses, and spot-spraying of woody vegetation using backpacks or vehicle mounted spray equipment, may be sufficient to treat non-native species.

Common buckthorn now nearly uniformly occurs throughout the understory of the wooded tracts of the Green Point Area and significantly decreases the habitat values there, but the 140 acre forested area is inaccessible by vehicle and the density of common buckthorn makes treatment by backpack sprayers impractical. Therefore, aerial spraying of herbicides would be used to control common buckthorn.

Buckthorn is known to release what are known as allelochemicals, commonly referred to as plant secondary compounds. These are chemicals released by buckthorn that inhibit the growth of other plant species (Knight et al. 2007, Warren et al. 2017). The allelochemicals of buckthorn may also inhibit the growth and survival of amphibians that are likely to breed in ephemeral wetlands within these bottomland hardwood habitats (Bucciarelli et al. 2014, Sacerdote 2009, Sacerdote and King 2014, Sacerdote et al. 2014).

Because buckthorn occurs within the understory of heavily wooded tracts, over a substantial area, land managers propose to exploit the leaf phenology of the plant to more effectively and efficiently treat this aggressive non-native shrub. Treatment will use aerial application of approved herbicides following the onset of dormancy of native overstory tree species. A similar strategy to exploit leaf phenology and the aerial application of herbicides has been used elsewhere to control invasive honeysuckle (*Lonicera* spp.;

Leahy et al. 2018), Chinese privet (*Ligustrum sinense*) (Benez-Secanho et al. 2018), and giant salvinia (*Salvinia molesta*) (Sartain and Mudge 2018).

Under this RP/EA, the Refuge would treat the wooded tracts (Hickey Tract, Learning Center Tract) in the Green Point Area with herbicides in the fall when overstory trees have lost their leaves, but while buckthorn remains in full leaf, using an aerial application method. In this case, the Shiawassee National Wildlife Refuge has proposed to use Trycera® (Triclopyr: 3,5,6-trichloro-2-pyridinyloxyacetic acid) to control common buckthorn in the understory of forested stands within the Green Point Area. Trycera® is a registered pesticide labeled for use in the State of Michigan to control common buckthorn. Use of this herbicide by the Refuge has previously been approved; review of the aerial application of this herbicide will supplement their current approval for other application methods.

Aerial application of herbicides for the control of *Phragmites* and aerial application of insecticides for the control of mosquitos both already commonly occur commonly throughout Great Lakes coastal habitats, including the Saginaw Bay watershed. Aerial application is a conventional means of pest control in this part of Michigan; this will, however, be a new use of this methodology for the control of invasive plants, including common buckthorn, on the Refuge. Best management practices would be used for aerial application, these would include measures to control drift and measures to safeguard and inform the public. These would include:

Best Management Practices – Aerial Application of Herbicides:

- **Application Height** - Applications should not be made at a height greater than 10 feet above the top of the largest plants unless a greater height is required for aircraft safety. Making applications at the lowest height that is safe reduces exposure of droplets to evaporation and wind.
- **Swath Adjustment** - When applications are made with a crosswind, the application swath will be displaced downwind. Therefore, on the up and downwind edges of the field, the applicator must compensate for this displacement by adjusting the path of the aircraft upwind. Swath adjustment distance should increase, with increasing drift potential (higher wind, smaller drops, etc.).
- **Temperature Inversions** - Applications must not occur during local, low level temperature inversions because drift potential is high. Temperature inversions restrict vertical air mixing, which causes small suspended droplets to remain in a concentrated cloud that may move in unpredictable directions due to light variable winds common during inversions. Temperature inversions are characterized by increasing temperatures with altitude and are common on nights with limited cloud cover and light to no wind.
- **Wind** - Drift potential is lowest between wind speeds of 2 to 10 mph. The USFWS's standard of practice is to limit application to conditions where wind speed is below 7 mph. Local terrain can influence wind patterns. Every applicator should be familiar with local wind patterns and how they affect spray drift. On site wind monitoring should be used.
- **Temperature and Humidity** - When making applications in low relative humidity, set up equipment to produce larger droplets to compensate for evaporation. Droplet evaporation is most severe when conditions are both hot and dry.
- **Adjuvant use** – where needed, adjuvants that promote adhesion, retard drift, enhance droplet size, or promote absorption, may be added to the herbicide spray mixture to improve efficacy of herbicide action. Adjuvant use would be restricted to those compounds with no or negligible effects to aquatic organisms.
- **Volume** - Use high flow rate nozzles to apply the highest practical spray volume. Nozzles with higher rated

flows produce larger droplets.

- **Pressure** - Do not exceed the nozzle manufacturer's recommended pressures. For many nozzle types, lower pressure produces larger droplets. When higher flow rates are needed, use higher flow rate nozzles instead of increasing pressure.
- **Number of Nozzles** - Use the minimum number of nozzles that provide uniform coverage.
- **Nozzle Orientation** - Orienting nozzles so that the spray is released parallel to the airstream produces larger droplets than other orientations and is the recommended practice. Significant deflection from horizontal will reduce droplet size and increase drift potential.
- **Nozzle Type** - Use a nozzle type that is designed for the intended application. With most nozzle types, narrower spray angles produce larger droplets. Consider using low-drift nozzles. Solid stream nozzles oriented straight back produce the largest droplets and the lowest drift.
- **Droplet size** – select boom type and spray nozzles and operate application equipment with low boom pressures such that coarse (341 – 403 microns) sized spray droplets are produced. Thickening agents may be used to aid the production of coarse spray droplets. This serves to minimize drift and enhances adherence to target vegetation.
- **Boom Length** - For some use patterns, reducing the effective boom length to less than 3/4 of the wingspan or rotor length may further reduce drift without reducing swath width.
- **Sensitive Areas** - The pesticide must only be applied when the potential for drift to adjacent sensitive areas (e.g., residential areas, bodies of water, known habitat for threatened or endangered species, non-target crops) is minimal (e.g., when wind is blowing away from the sensitive areas).

Best Management Practices – Communication for the Aerial Application of Herbicides:

- Identify primary stakeholders likely to have an interest in implementation of aerial application.
- Prepare a communication plan that identifies messages, communication outlets, and timing of delivery of messaging. As necessary, this should be developed collaboratively with the USFWS's regional public affairs staff and partner agency public affairs staff.
- Identify points of access, managed and unmanaged, where signage will be placed to indicate closure of the area prior to aerial application.
- Implement notification per your communications plan. Notification should consider:
    1. Description of the process of aerial herbicide application, sequence of events, best management practices used to safeguard local residents and the environment
    2. Identification of the area to be sprayed, road and area closures, and staffing to be located at access points to prevent public access to the area during operations.
    3. Proposed dates and anticipated duration of the spray operation.
    4. The objectives and anticipated outcome of the operation.
    5. Any warnings regarding re-entry to the area of application, and timing of opening the area.
    6. Identify a spokesperson, to serve as a point of contact for the public and stakeholders. Provide email and contact for the spokesperson.
    7. Prepare local radio announcements and media releases should be broadcast the week before and on the morning of the spraying operation.

Additional actions anticipated as eventual elements of the Green Point Area Restoration Project, as funding allows, include the following:

- development of site-specific plans to provide detail regarding location and extent of components of the ecological restoration
- development of a site-specific plan to provide detail regarding the location and character of public amenities, consistent with the Refuge's mission of wildlife conservation and role as an urban wildlife refuge
- the removal of remaining golf course related infrastructure such as tee markers, steps, shelters, ball washers, and benches
- the removal or on-site compatible disposal of heavier, decaying infrastructure such as pumps, irrigation pipe, electrical poles, bridge abutments, abandoned building foundations, or existing construction waste materials
- the removal of decaying asphalt cart paths; this material may be stockpiled and re-used as trail or parking area substrate
- the construction of new trails, boardwalks, fishing or observation platforms
- control of non-native and invasive species, removal of non-native ornamental trees and shrubs, control of understory non-native shrubs in forested areas; treatment of common buckthorn in the understory may include the aerial application of herbicides when overstory trees have lost their leaves and entered dormancy
- the construction of public amenities, such as walkways or pavilions that may be used for education or outreach, compatible with the Refuge's mission of conservation and outreach
- planting of grasses, shrubs, and trees that are consistent with the hydrology of the site and native to the Shiawassee Flats region
- construction of amenities such as rain or pollinator gardens that may be used for the purpose of environmental education or outreach
- the use of prescribed fire to inhibit invasive species or to promote the re-establishment and growth of native species
- the construction of new fencing, signage, information kiosks, and gates
- the removal of hazard trees that are dead or decaying, that may pose a risk to visitors to the Green Point Area
- maintenance or construction of buildings, the maintenance of facilities and public amenities
- habitat management actions designed to maintain the desired condition of native habitats, including the on-going control of invasive species, and planting of native species
- site-specific monitoring to evaluate the efficacy of implemented actions to achieve stated objectives. For example, this would include pre- and post-treatment evaluation of efforts to control non-native species such as common buckthorn, as well as other restoration actions

Several of the actions described above, such as construction of buildings or recreational amenities, will occur only in the event that additional funding unrelated to the 1998 settlement is obtained by the Refuge. Elements of the Green Point Area Restoration Project currently being considered for funding by the Trustees under this Restoration Plan are described in Table 10-2 and Table 10-3.

Figure 10-3. Aerial photo depicting the lands within the Green Point Area, Shiawassee National Wildlife Refuge. The Germania Tract encompasses 135 acres formerly used as a municipal golf course. The Hickey Tract (60 acres) and the Learning Center Tract (80 acres) consist of hardwoods with an understory dominated by the non-native common buckthorn (*Rhamnus cathartica*).

Figure 10-4. Preliminary visualization of conceptual ecological restoration elements within the western portion of the Green Point Area, Shiawassee National Wildlife Refuge. Though not depicted here, separate efforts will evaluate community interest in the design of recreational amenities such as board walks, observation platforms, or new trails.

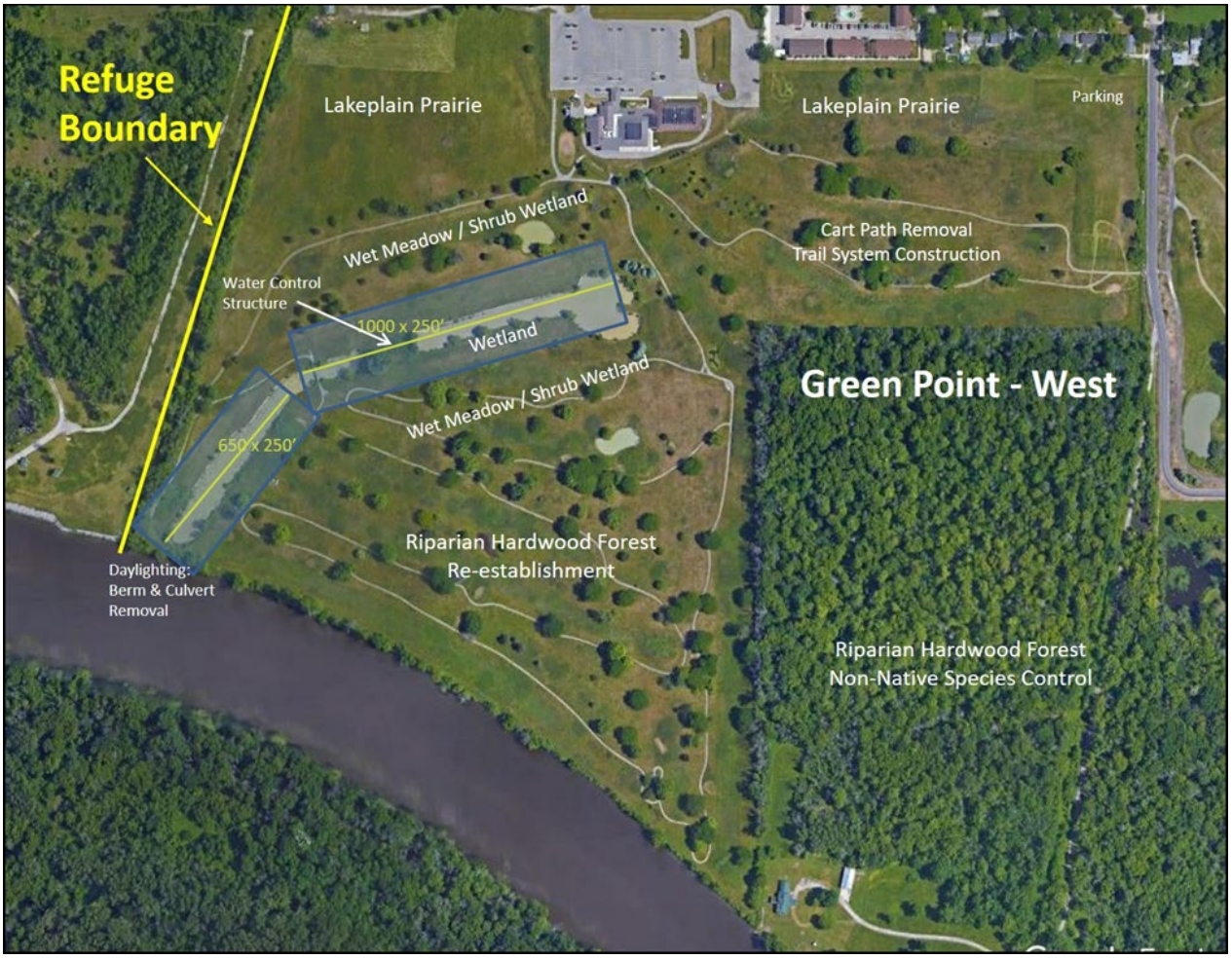

Figure 10-5. Conceptual ecological restoration elements within the eastern portion of the Green Point Area, Shiawassee National Wildlife Refuge. Though not depicted here, separate efforts will evaluate community interest in the design of recreational amenities such as board walks or new trails. The area to the north of the Learning Center has been identified by the Shiawassee National Wildlife Refuge as a potential focal area for the development of recreational amenities. Lakeplain prairie habitats, or other demonstration habitats may occur within this area as well.

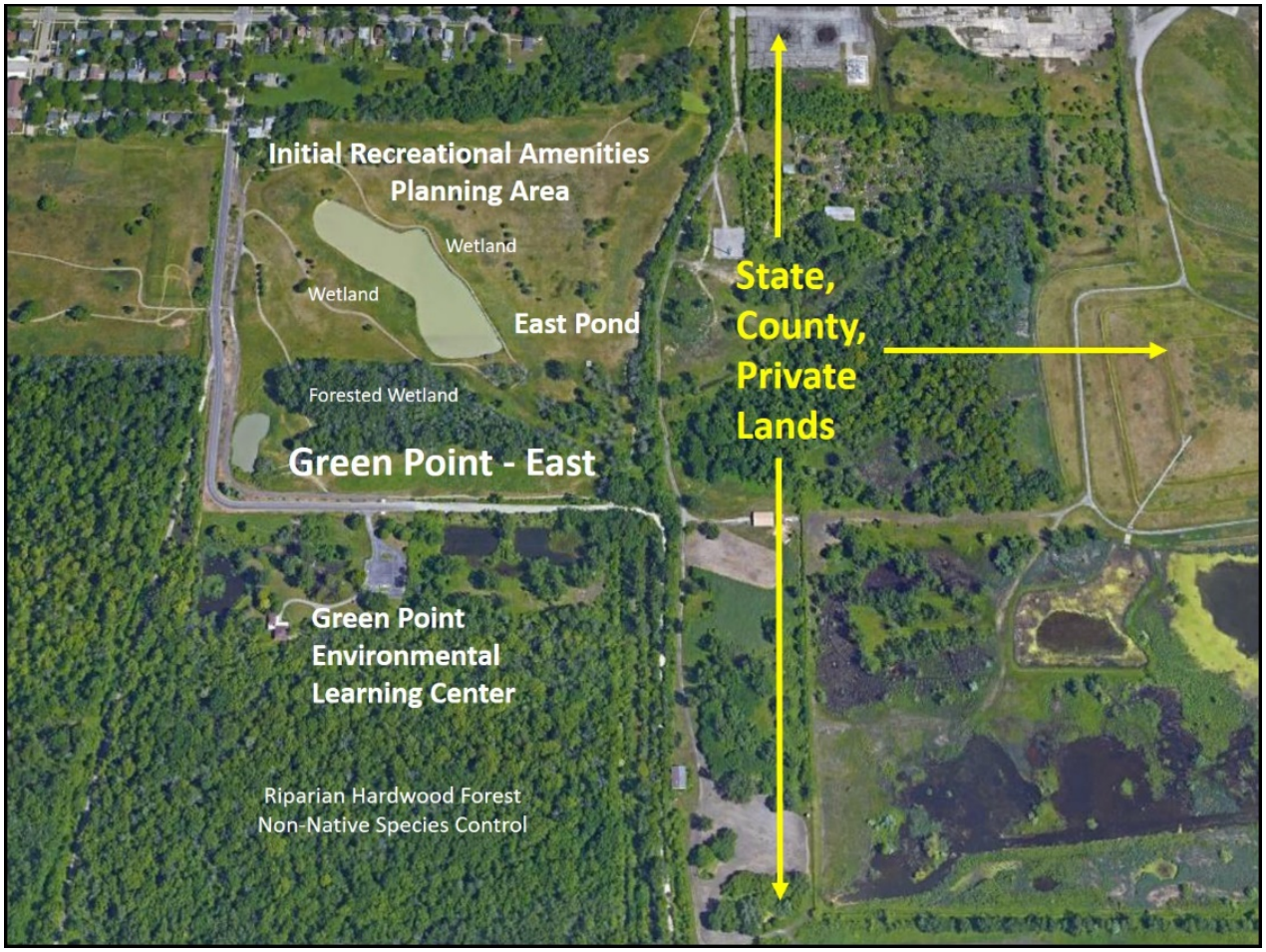

Table 10-2. Elements of the Green Point Area Restoration Project proposed for funding. Cost estimates incorporate wetland restorations, treatment of woody non-native and invasive species, conversion of non-native turf grasses and ornamentals to native plant communities, restoration of wetlands and bottomland hardwood forest. Cost estimates developed assuming a 20 year project timeframe to identify maintenance costs in addition to implementation costs.

Green Point Area Restoration Project - Shiawassee National Wildlife Refuge											
Year	SNWR Personnel[1]	SNWR Staff Support[2]	Planning Contractual[3]	Infrastructure Removal[4]	Long Pond Restoration[5]	East Pond Restoration[6]	Invasive Plant Treatment[7]	Landscape Restoration[8]	Maintenance & Supplies[9]	Equipment[10]	Sum of Costs by Year
2021	$0	$5,000	$101,500	$7,500	$0	$0	$10,000	$0	$5,000	$29,300	$158,300
2022	$66,872	$5,000	$0	$102,500	$0	$0	$25,000	$0	$5,000	$0	$204,372
2023	$67,875	$5,000	$0	$0	$502,200	$0	$15,000	$52,500	$5,000	$0	$647,575
2024	$68,893	$5,000	$0	$0	$30,000	$0	$10,000	$97,500	$5,000	$0	$216,393
2025	$69,927	$5,000	$0	$0	$0	$146,700	$5,000	$97,500	$5,000	$0	$329,127
2026	$70,976	$5,000	$0	$0	$0	$30,000	$5,000	$97,500	$5,000	$0	$213,476
2027	$72,040	$5,000	$0	$0	$0	$0	$5,000	$97,500	$5,000	$0	$184,540
2028	$0	$5,000	$0	$0	$0	$0	$2,500	$0	$5,000	$0	$12,500
2029	$0	$5,000	$0	$0	$0	$0	$2,500	$0	$5,000	$0	$12,500
2030	$0	$5,000	$0	$0	$0	$0	$2,500	$0	$5,000	$0	$12,500
2031	$0	$5,000	$0	$0	$0	$0	$2,500	$0	$5,000	$0	$12,500
2032	$0	$5,000	$0	$0	$0	$0	$2,500	$0	$5,000	$0	$12,500
2033	$0	$5,000	$0	$0	$0	$0	$2,500	$0	$5,000	$0	$12,500
2034	$0	$5,000	$0	$0	$0	$0	$2,500	$0	$5,000	$0	$12,500
2035	$0	$5,000	$0	$0	$0	$0	$2,500	$0	$5,000	$0	$12,500
2036	$0	$5,000	$0	$0	$0	$0	$2,500	$0	$5,000	$0	$12,500
2037	$0	$5,000	$0	$0	$0	$0	$2,500	$0	$5,000	$0	$12,500
2038	$0	$5,000	$0	$0	$0	$0	$2,500	$0	$5,000	$0	$12,500
2039	$0	$5,000	$0	$0	$0	$0	$2,500	$0	$5,000	$0	$12,500
2040	$0	$5,000	$0	$0	$0	$0	$2,500	$0	$5,000	$0	$12,500
Totals	**$416,583**	**$100,000**	**$101,500**	**$102,500**	**$532,200**	**$176,700**	**$107,500**	**$442,500**	**$100,000**		**$2,116,283**
										Total Cost Estimate	**$2,116,283**
										Funds on Hand (06/22/2020)	**$497,250**
		Implementation			**$1,456,533**				**Request**		**$1,619,033**
		Maintenance			**$162,500**						

Table 10-3. Cost categories, and estimated total expenditures by cost category, for the Green Point Area Restoration Project. Costs are calculated over a 20-year project schedule; implementation occurring in years one to seven, and maintenance occurring thereafter.

Estimated Costs by Category	
Staff - implementation, one position, six years, salary and benefits[1]	$416,583
Shiawassee NWR Maintenance Staff Salary Support[2]	$100,000
Planning - Contractual Wetland Engineering, Community Engagement, Site Plan[3]	$101,500
Infrastructure Removal - Cart paths, bridge abutments, fences, culverts[4]	$102,500
Long Pond Restoration - Excavation, slope, contour, control structure[5]	$532,200
East Pond Restoration - Excavation, slope, contour, control structure[6]	$176,700
Invasive Species Treatments, woodland and turf grasses[7]	$107,500
Landscape Restoration - Plant Community Restoration[8]	$442,500
Maintenance and Supplies Funding[9]	$100,000
Equipment[10] and Supplies	$29,300
Subtotal:	**$2,116,283**
Current Funding Green Point NRDAR Restoration Fund	**($497,250)**
Restoration Total:	**$1,619,033**

Notes:

1 Addition of a GS-9 Biotech to oversee development of contracts and agreements, site plans, and contribute to implementation of the Green Point Area Restoration. Added capacity would allow the refuge to maintain operations elsewhere while adding conservation value to the Green Point Area.

2 Allocation of salary for Refuge staff to contribute to implementation and maintenance for the Green Point Area Restoration Project. This would include full time technical staff as well as seasonal Biotech time.

3. Includes a community engagement proposal ("Natural Bridges") to be implemented by the Saginaw Basin Land Conservancy. This proposal will be aimed at developing site-specific recommendations for public amenities in the Green Point Area (Year 2020 - 2021). This category also includes provision for funding of engineering design of components of the ecological restoration of the Green Point Area such as the restoration of Long Pond and East Pond within the Germania Tract.

4. Infrastructure removal includes the removal of remaining infrastructure related to the former Germania golf course. This would include unsafe bridge abutment structures, rapidly decaying asphalt cart paths, and other small structures such as old fencing. Cost may be reduced if material may be repurposed and stored on refuge lands.

5. Long Pond Restoration is a major wetland development project intended to add wetland function to a highly degraded irrigation ditch / pond within the former Germania Golf Course. This project is intended to produce wetland habitats that transition from open water, to emergent wetland, to moist soil wetland shrubs. The Refuge plans to use a Refuge System Maintenance Action Team (MAT) to implement the Long Pond Restoration.

6. East Pond Restoration is intended to add wetland value to a former irrigation pond within the east area of the former Germania golf course. The Refuge may use current fulltime, equipment qualified staff on the Refuge to implement the restoration of East Pond within the Germania Tract.

7. Invasive plant treatments are intended to result in bottomland hardwood forest tracts that are relatively free of invasive species such as common buckthorn. This component of the project would also focus on the removal of ornamental species and the re-establishment of native vegetation in areas now dominated by turf grasses.

8. Re-establishment of native vegetation would be the focus of the landscape restoration component of this project. This would include the planting of bottomland hardwood forest in areas now composed of ornamentals and non-native turf grasses. This may also include the planting of areas to emulate Lake Plain Prairie habitats in appropriate areas such as the northern tier of the former Germania Golf Course.

9. Expenditures related to anticipated maintenance of equipment; the repair of fencing, signage, gates; maintenance of structures, fuel for vehicles, routinely purchased supplies to support daily operations of the Refuge.

10. Equipment purchase to consist of a hydraulic tree shear / grapple ($19,500) and the necessary hydraulic mechanism and controls to install the tree shear on the Refuge's heavy equipment ($9,800).

Appendix 10.4. Michigan Acquired Properties – Restoration and Maintenance Capacity

Project Proponent: Michigan Department of Natural Resources

Project Description: The State of Michigan acquired a substantial inventory of conservation and recreational properties as a result of the 1998 settlement. Properties were acquired in proximity to existing lands owned and managed by the Michigan Department of Natural Resources (MDNR) throughout the Saginaw Bay area (Table 10-4). The 1998 settlement did not include funding to support the capacity of the MDNR to sufficiently maintain or advance ecological restoration on these properties. The MDNR proposes to expand their capacity to manage coastal restoration properties with the acquisition of equipment capable of operating in a wetland environment. Two pieces of specialized equipment, a Marsh Master Amphibious Tractor and a compact John Deere Track Loader, in addition to equipment-specific trailers capable of hauling this equipment, would be acquired to enable staff to more effectively treat non-native invasive species, implement prescribed fire, control woody species in lakeplain prairie habitats, and maintain the integrity of dikes, levees, and access roads and trails. The estimated costs for this project also include equipment maintenance costs of $5,000 each year over 20 years to maintain this specialized equipment (Table 10-5). The Trustees provide maintenance estimates, for this project and others, to emphasize their intent to maintain ecological value into the future. Concurrently, the Trustees acknowledge that they may exercise flexibility in funding future maintenance effort depending on both the availability of funding and the actual need for future funding of the project proponents.

This restoration project would improve the ecological condition of state properties acquired as a result of the 1998 settlement, as well as contributing to potential improvement in nearby areas. The MDNR manages numerous properties within the vicinity of the Saginaw River and Bay in addition to these restoration properties. For efficient restoration and maintenance of the restoration properties as well as nearby conservation properties like those owned by the MDNR, the proposed project would also include some funding for contract services to provide additional capacity to treat non-native and invasive species in the Saginaw River and Bay area. A comprehensive, landscape-based approach to treating non-native and invasive species will reduce seed sources from nearby properties, serving to better maintain and improve the ecological condition of the restoration properties.

Estimated costs to build restoration capacity for the MDNR in the vicinity of Saginaw River and Bay are provided within Table 0-5. In order to account for the on-going need for maintenance, both with respect to equipment and continued treatment of non-native invasive species, costs are projected out to 20 years. Final allocation of maintenance funding will be determined based on funding available in the selected alternative. Though prospective annual costs are provided in Table 0-6, these costs may vary substantially from year to year. The Trustees anticipate that more funds may be spent during initial efforts to control invasive species; lesser amounts may be spent as ecological condition improves within the various properties.

Marsh Master Amphibious Tractor:

- This specialized piece of equipment would be used for wetland enhancement and restoration practices across Wildlife Division managed properties within the Saginaw Bay Area. Use would include the treatment and removal of invasive species, propagation of native species, water quality improvement, maintenance of wetland infrastructure, and maintenance of accessibility to natural resource based recreation.

- The proposed Marsh Master would provide unique wetland habitat tools, including prescribed fire capabilities, herbicide application, and wetland and moist soil manipulation. Wetland infrastructure maintenance and monitoring would also be enabled with this specialized equipment. This would include maintenance of water control structures, access trail maintenance, wetland flora and fauna surveys, and invasive species monitoring.

- The Marsh Master's specialized capability for prescribed fire would be used on Wildlife Division managed properties in cooperation with the Forest Resources Division, which is responsible for implementation of prescribed fire activities. Wildlife Division funding is used to implement any prescribed fire activities on Wildlife Division lands. Available funds limit how many acres can be allocated to fire annually. This added capacity may allow the Forest Resource and Wildlife Divisions to expand the use of prescribed fire within state-managed lands in the Saginaw Bay area, thus adding additional wetland and recreational value to these lands.

- As a conservative estimate, the added capacity provided by this equipment and associated training has the potential to annually impact 700 to 1,000 acres of lands managed by the MDNR Wildlife Division.

- Currently, the Wildlife Division uses contract services for wetland enhancement and restoration work at an approximate rate of $200/acre depending upon equipment required and distance traveled by contractors. Given the number of Wildlife Division-owned lands in the Saginaw Bay area, at this typical contract services rate, the added capacity provided by acquisition of equipment proposed here could potentially provide the equivalent of approximately $140,000 of annual contract service. Over the anticipated 20 year lifespan of the equipment, added capacity would provide the equivalent of $2.8 million of contract habitat services.

- Additionally, this equipment would allow the Wildlife Division to be more flexible than a contractor would be in terms of timing of treatments, and to be more responsive, in terms of early detection and rapid response (EDRR) to novel invasive species or new infestations of existing invasive species. With current MDNR Wildlife Division budget restrictions, in the absence of the proposed added capacity, the Wildlife Division's ability to maintain the ecological condition of restoration properties would be inadequate. The added capacity proposed here would create greater certainty that the Wildlife Division would be able to treat substantial areas and to better maintain the ecological condition of these properties into the foreseeable future.

John Deere Track Loader:

- The proposed track loader is a highly mobile small track-driven tractor that, with its associated implements, can be used to accomplish a wide variety of land management tasks. The variety of attachments that can be added to this small tractor make it ideal for the treatment of woody material on levees, road and trail maintenance, and treatment of woody non-native invasive species.

- Because this loader is a tracked vehicle, it can perform under a variety of soil conditions where wheeled vehicles would either be incapable of maneuvering or where use of typical wheeled vehicles would result in rutting and site damage.

- This piece of equipment would allow MDNR to reclaim areas that have become overgrown with woody brush or other undesirable species, namely in locations where management objectives include the intent to reclaim, reestablish, or establish lakeplain prairie habitats.

- Low-maintenance trails for natural resource based recreation are desired public amenities offered on properties managed by the MDNR. This piece of equipment would allow cost-effective establishment of trails and facilitate the maintenance of these trails ensuring their continued availability to recreationists on lands acquired as a result of the 1998 settlement.

Table 10-4. Properties acquired by the State of Michigan as a result of the 1998 settlement and managed by the Michigan Department of Natural Resources for conservation and recreational benefit.

Property	Acres	Unit	Management Notes
Badour 1	34	Bay City State Park	Could benefit from invasives control
Badour 2	107	Bay City State Park	Could benefit from invasives control
Fritz	40	Bay City State Park	Could benefit from invasives control
Eastman/ KBC Tool	130	WigWam Bay SWA	Need for large-scale invasive species treatment and removal, especially in coastal areas; specialized equipment (e.g. Marsh Master) likely necessary to implement control
Robinson	204	WigWam Bay SWA	Need for invasive species control in Lakeplain Prairie habitats
Sieja	280	WigWam Bay SWA	Need for large-scale invasive species treatment and removal, especially in coastal areas; specialized equipment (e.g. Marsh Master) likely necessary to implement control
Hughes/ Wild	182	Quanicassee SWA	Management objectives require treatment of woody invasives and treatment of non-natives including *Phragmites*
Collon	40	Fish Point SWA	Lakeplain prairie and other habitats need treatments for woody species and *Phragmites* control
Timmons	9.5	Fish Point SWA	Lakeplain prairie and other habitats need treatments for woody species and *Phragmites* control
Blount/Burroughs	138	Wildfowl Bay SWA	Bottomland hardwood forests not requiring treatment presently
Rievert	46	Wildfowl Bay State Wildlife Area	The Rievert site needs treatment to address *Phragmites* and woody invasives
Gunden	100	Wildfowl Bay SWA	Bottomland hardwood forests not requiring treatment presently

Table 10-5. Cost estimate for the management of State of Michigan properties acquired as a result of the 1998 settlement. The addition of equipment will add to the capacity of state land managers to manage State of Michigan properties in the Saginaw Bay watershed. Cost estimates developed assuming a 20 year project timeframe to identify maintenance costs in addition to implementation costs. Expenditure for maintenance and treatment of invasive species may vary from year to year.

Management of State Acquired Conservation Properties Building Capacity for Restoration, Maintenance, and Enhancement				
Heavy Equipment	**Number**	**Cost**	**Years**	**Extended**
Marsh Master (MM-2CE-LX, trailer, implements)	1	$225,000		$225,000
Secure Trailer Tool Box (Marsh Master)	1	$2,500		$2,500
John Deer Compact Loader (Loader, Brush Grapple, Mulching Head, Rotary Cutter)	1	$135,000		$135,000
Equipment Trailer (Compact Loader)	1	$15,000		$15,000
Secure Trailer Tool Box (Compact Loader)	1	$2,500		$2,500
Implements (Compact Loader)	1	$10,000		$10,000
Heavy Equipment Training and Certification				
Marsh Master / Marsh Master Wildland Fire Operations	3	$5,000		$15,000
Commercial Driver's License (CDL) Certification	3	$1,500		$4,500
Annual Maintenance				
Heavy Equipment Service and Repair		$5,000	20	$100,000
Supplies				
Herbicides - Non-native and invasive species treatments		$5,000	20	$100,000
Contract Services				
Non-native and invasive species treatments		$5,000	20	$100,000
			Total	**$709,500**

Table 10-6. Cost estimate on an annual basis for the management of State of Michigan properties acquired as a result of the 1998 settlement. Years one to three considered as implementation phase of the proposal (acquisition of equipment, training, annual materials and supplies); maintenance to occur thereafter. Expenditure for maintenance and treatment of invasive species may vary from year to year.

State Conservation Properties - Restoration Capacity						
Year	Heavy Equipment	Training	Tools & Supplies	Equipment Maintenance	Contract Services	Summary of Costs by Year
2021	$390,000	$6,500	$5,000	$5,000	$5,000	$411,500
2022	$0	$6,500	$5,000	$5,000	$5,000	$21,500
2023	$0	$6,500	$5,000	$5,000	$5,000	$21,500
2024	$0	$0	$5,000	$5,000	$5,000	$15,000
2025	$0	$0	$5,000	$5,000	$5,000	$15,000
2026	$0	$0	$5,000	$5,000	$5,000	$15,000
2027	$0	$0	$5,000	$5,000	$5,000	$15,000
2028	$0	$0	$5,000	$5,000	$5,000	$15,000
2029	$0	$0	$5,000	$5,000	$5,000	$15,000
2030	$0	$0	$5,000	$5,000	$5,000	$15,000
2031	$0	$0	$5,000	$5,000	$5,000	$15,000
2032	$0	$0	$5,000	$5,000	$5,000	$15,000
2033	$0	$0	$5,000	$5,000	$5,000	$15,000
2034	$0	$0	$5,000	$5,000	$5,000	$15,000
2035	$0	$0	$5,000	$5,000	$5,000	$15,000
2036	$0	$0	$5,000	$5,000	$5,000	$15,000
2037	$0	$0	$5,000	$5,000	$5,000	$15,000
2038	$0	$0	$5,000	$5,000	$5,000	$15,000
2039	$0	$0	$5,000	$5,000	$5,000	$15,000
2040	$0	$0	$5,000	$5,000	$5,000	$15,000
Totals	**$390,000**	**$19,500**	**$100,000**	**$100,000**	**$100,000**	**$709,500**

Implementation	**$454,500**
Maintenance	**$255,000**

Appendix 10.5. Michigan Islands NWR – Restoration, Maintenance, Monitoring

Project Proponent: Shiawassee National Wildlife Refuge

Background:

The Charity Islands are located in Arenac County within Saginaw Bay, Lake Huron, southeast of the village of Au Gres, MI. The Charity Islands lie approximately 33.5 miles north – northeast of the mouth of the Saginaw River. They occur midway between Au Gres on the north side of Saginaw Bay and the Village of Caseville on the south side of Saginaw Bay (Figure 0-6).

Little Charity Island is undeveloped and measures about 11 acres. About half of the island is wooded with small trees and shrubs, with a sparse understory of grasses and forbs and the other half is more open. Big Charity Island encompasses approximately 223 mostly wooded acres, with approximately 20 acres in private ownership. The Charity Islands are two of eight islands in Lakes Michigan and Huron that comprise the Michigan Islands National Wildlife Refuge. The Charity Islands are managed by the Shiawassee National Wildlife Refuge, Saginaw, MI. The National Wildlife Refuge System acquired the Charity Islands in 1999 as an outcome of the 1998 settlement.

Both the islands can be characterized as unique with respect to natural resource values. Big Charity Island harbors a population of Pitcher's thistle, a species designated as federally threatened, nesting bald eagles, and numerous neotropical migratory birds. Little Charity Island supports numerous species of colonial nesting waterbirds. Species change over time and have included species such as ring-billed and herring gulls, great blue herons, great egrets, black–crowned night herons, double-crested cormorants and Caspian and common terns. Because of their distance to main land habitats, both islands provide unique habitats for colonial nesting birds and stopover migratory habitats for passerines, and likely for eastern forest bats, as well.

Like much of coastal Saginaw Bay, shallow water coastal habitats on Big Charity Island are infested by substantial areas of *Phragmites*. Other non-native and invasive plants that occur on the Charity Islands include spotted knapweed (*Centaurea stoebe*) and European frogbit (*Hydrocharis morsus-ranae*). On-going partnerships (e.g. with Huron Pines; https://huronpines.org/) are in-place and have been instrumental in beginning treatments for *Phragmites* and other invasives on the islands. An on-going partnership with the Au Gres school system conducts annual monitoring, propagation, and restoration of the federally threatened Pitcher's thistle on Big Charity Island.

Project Area: The proposed project area is comprised of the entirety of the publicly owned portions of both Big and Little Charity Islands (Figure 10-6), excluding only the privately owned area of Big Charity Island.

Project Description: Implementation would be phased over five years, dependent on funding, and will include elements of resource assessment, infrastructure removal, invasive species treatments, restoration of a rare plant community (Pitcher's thistle), resource monitoring, and installation of boundary markers and informational kiosks. Resource assessments include characterization of plant communities on both islands, evaluation of seasonal use of the islands by neotropical migratory songbirds, seasonal use of the Big Charity Island by Eastern Forest Bats, and an assessment of *Phragmites* genetics related to herbicide resistance and source identification for *Phragmites* stands on Big Charity Island. These efforts are intended to improve the continued effort to manage *Phragmites* in proximity to the Charity Islands. Costs are calculated over a 20 year project schedule with implementation primarily occurring in years one to five, followed by maintenance and monitoring thereafter (Table 10-7).

Figure 10-6. Geographic relationship of the Charity Islands within Saginaw Bay, Lake Huron. The Charity Islands are lands within the Michigan Islands National Wildlife Refuge. The Charity Islands are managed by the Shiawassee National Wildlife Refuge, Saginaw, MI. Inset map depicts the general location of the Charity Islands within Saginaw Bay.

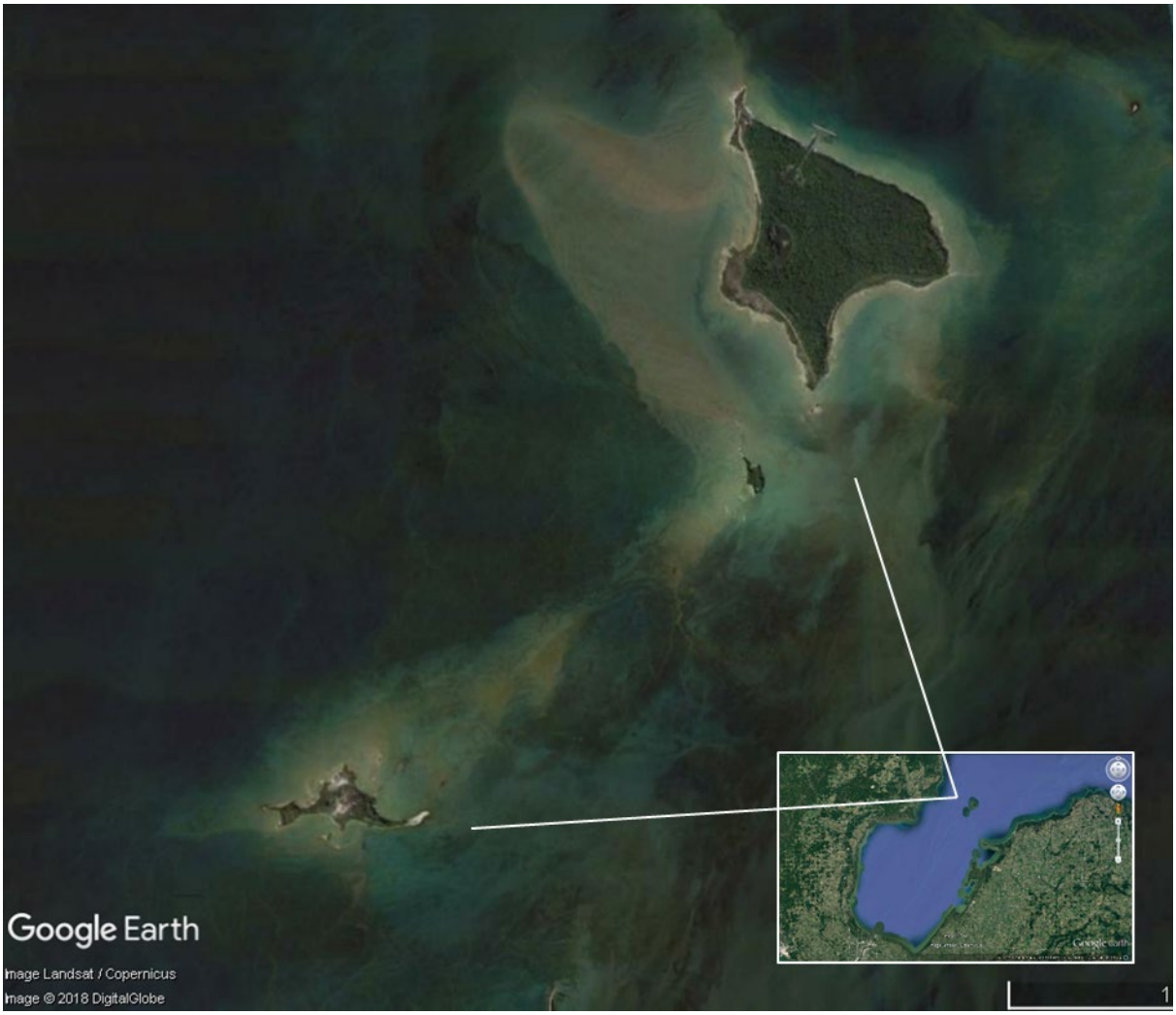

Table 10-7. Estimation of costs for maintenance and management elements for the Charity Islands. Cost elements include delineation and marking of boundaries, installation of informational kiosks, non-native species treatments, conservation actions for the Pitcher's thistle, assessment of native plants, monitoring of migratory birds and eastern forest bats, *Phragmites* research, and on-going maintenance. Cost estimates developed assuming a 20 year project timeframe to identify maintenance costs in addition to implementation costs.

Charity Islands - Maintenance and Monitoring									
Year	Infrastructure & Boundary Delineation[1]	Non-Native Species Treatment[2]	Pitcher's Thistle Conservation[3]	Plant Community Assessment[4]	Neotropical Bird Surveys[5]	Eastern Forest Bat Surveys[6]	Phragmites Genetics[7]	Maintenance Funding	Sum of Costs by Year
2021	$5,000	$15,000	$2,500	$22,500	$1,500	$6,000	$3,000	$500	$56,000
2022	$5,000	$15,000	$2,500	$0	$0	$0	$3,000	$500	$26,000
2023	$5,000	$15,000	$2,500	$0	$0	$0	$3,000	$500	$26,000
2024	$0	$3,000	$2,500	$0	$0	$0	$3,000	$500	$9,000
2025	$0	$3,000	$2,500	$0	$0	$0	$3,000	$500	$9,000
2026	$0	$3,000	$2,500	$0	$1,500	$0	$0	$500	$7,500
2027	$0	$3,000	$2,500	$0	$0	$1,500	$0	$500	$7,500
2028	$0	$3,000	$2,500	$0	$0	$0	$0	$500	$6,000
2029	$0	$3,000	$2,500	$0	$0	$0	$0	$500	$6,000
2030	$0	$3,000	$2,500	$0	$0	$0	$0	$500	$6,000
2031	$0	$3,000	$2,500	$0	$1,500	$0	$0	$500	$7,500
2032	$0	$3,000	$2,500	$0	$0	$1,500	$0	$500	$7,500
2033	$0	$3,000	$2,500	$0	$0	$0	$0	$500	$6,000
2034	$0	$3,000	$2,500	$0	$0	$0	$0	$500	$6,000
2035	$0	$3,000	$2,500	$0	$0	$0	$0	$500	$6,000
2036	$0	$3,000	$2,500	$0	$1,500	$0	$0	$500	$7,500
2037	$0	$3,000	$2,500	$0	$0	$1,500	$0	$500	$7,500
2038	$0	$3,000	$2,500	$0	$0	$0	$0	$500	$6,000
2039	$0	$3,000	$2,500	$0	$0	$0	$0	$500	$6,000
2040	$0	$3,000	$2,500	$0	$0	$0	$0	$500	$6,000
Total	**$15,000**	**$96,000**	**$50,000**	**$22,500**	**$6,000**	**$10,500**	**$15,000**	**$10,000**	**$225,000**

Implementation	**$108,000.00**
Maintenance	**$117,000.00**

[1]Infrastructure improvements, construction of information kiosks at marina and beach, boundary markers

[2]Treatment of *Phragmites*; 3 years aerial treatment @ $15,000/yr; Huron Pines AmeriCorps Strike Team or similar @ $3,000/yr.

[3]Propagation of Pitcher's thistle, removal of non-natives from Pitcher's thistle habitat, transportation to the island.

[4]Baseline plant community assessments for Big and Little Charity Islands, Michigan Natural Features Inventory.

[5]Neotropical migratory bird surveys on Big Charity Island.

[6]Eastern forest bat surveys on Big Charity Island. Resident and migratory use of island habitats. Survey conducted by FWS staff.

[7]*Phragmites* genetic assessment, herbicide resistance and source populations. Saginaw Valley State University.

Appendix 10.6. Contaminant Monitoring in the Saginaw River and Bay

The 1998 settlement incorporated provisions to continue the monitoring of contaminants in the Saginaw River and Bay resulting from the release of polychlorinated biphenyls:

> (a). Designated Uses. To the extent necessary, the Trustees shall use Three Million Dollars ($3,000,000) of the Restoration Account, established and funded under Paragraphs 6.2 and 6.3, for future monitoring, modeling, and studies of the Assessment Area to determine the effectiveness of the dredging, restoration and other activities performed pursuant to this Consent Judgment and to identify the need, if any, for further remedial or restoration efforts; provided, however, that no more than Two Hundred Thousand Dollars ($200,000) may be spent on modeling efforts without the approval of the Trustees. Ten (10) years after the Trustees have provided the Dredging Completion Notice in accordance with Paragraph 8.4, and biennially thereafter, the Trustees shall reassess the monitoring and modeling efforts to date. To the extent the Trustees determine that funds designated under this Paragraph 8.6(a) are no longer needed for monitoring and/or modeling activities, the remaining funds shall be considered surplus funds under Paragraph 8.6(c).
>
> *1998 Consent Judgment Section 8.6(a)*

Much of this funding initially dedicated to monitoring remains available to be administered by the Trustees for the Saginaw River and Bay. Per the provisions within the Consent Judgment, these funds are now considered "remaining funds" that may be used at the discretion of the Trustees for the purposes described within Section 8.6(c) of the 1998 Consent Judgment. These listed purposes include additional monitoring and the Trustees intend to use at least some of these funds to continue to monitor the efficacy of restoration efforts and the fate and effects of contaminants such as PCBs, as well as to further the restoration of natural resources in the Saginaw River and Bay. To that end, the Trustees propose to continue or augment four currently in-place programs to monitor contaminants in the Saginaw River and Bay (Table 10-8). These include:

- State of Michigan EGLE - Caged Fish Study in the Saginaw River and Bay
    - Study conducted approximately every 5 years to evaluate trends in contaminant uptake in caged fish, although the Trustees would consider an alternate schedule in order to provide funds in years following extreme events like the flooding in 2020 caused by the failure of dams in the Tittabawassee River
    - Costs for tissue contaminant analysis
    - Approximately $60,000 per every 5 years (most recently supported in 2017)
    - Point of Contact: Brandon Armstrong, Michigan EGLE
- Calvin College - Evaluation of Contaminant Exposure and Effects to Colonial Waterbirds
    - Investigation conducted annually
    - Study sites include the Saginaw CDF, Little Charity Island, Reference sites
    - Species: Herring Gull, Caspian Tern, Black-crowned Night-Heron
    - Parameters / Metrics:
        i. Productivity (embryonic viability, fledging success)
        ii. Nestling Growth
        iii. Immune function (T-cell mediated; antibody response)

iv. Egg contaminant concentrations

- Expansion of study to include contaminant analysis of Caspian Tern and Black-crowned night heron eggs to augment analysis of herring gull eggs
- Great Lakes Restoration Initiative, EGLE, Environment Canada currently providing support of approximately $100,000 per year, but these are expected to decline over time
- Saginaw River and Bay Trustee Council would support funding of up to approximately $25,000 per year
- Point of Contact: Dr. Keith Grasman, Calvin College

- State of Michigan EGLE - Bald Eagle Study of Productivity and Contaminant Exposure
  - Annual survey flights and triennial analysis of contaminants in eagle plasma
  - Costs for contaminant analysis currently provided by Michigan EGLE
  - Costs for flight time currently provided by the Great Lakes Restoration Initiative
  - Costs for nest observers currently provided by Michigan EGLE
  - Saginaw River and Bay Trustee Council would support funding approximate costs of $30,000 per every three years.
  - Point of Contact: Joe Bohr & Dennis Bush, Michigan EGLE

- U.S. Fish and Wildlife Service - Mallard Contaminant Uptake Study on the Saginaw CDF
  - Investigation to be conducted approximately every 10 years
  - Costs for investigator, supplies, tissue contaminant analysis, reports
  - Saginaw River and Bay Trustee Council would support funding up to approximately $100,000 per every 10 years
  - Point of Contact: Lisa Williams & Clark McCreedy, USFWS

In the event that additional support outside of the 1998 settlement is obtained for these or other monitoring studies, the Trustees would re-evaluate, and likely re-apportion, the allocation of funding in support of contaminant monitoring in the Saginaw River and Bay to other projects monitoring the recovery of natural resources in the Saginaw River and Bay area or to other types of restoration projects consistent with the Restoration Plan.

Table 10-8. Estimated costs for proposed contaminant monitoring in the Saginaw River and Bay. Costs extended in anticipation of providing approximately 20 years of support for contaminant monitoring.

Saginaw River and Bay Contaminants Monitoring Plan					
Year	**Caged Fish Study**	**Colonial Waterbirds**	**Mallard Uptake CDF**	**Bald Eagles**	**Cost per Year**
2021					$0
2022			$100,000		$100,000
2023	$60,000			$30,000	$90,000
2024					$0
2025		$25,000			$25,000
2026		$25,000		$30,000	$55,000
2027		$25,000			$25,000
2028	$60,000	$25,000			$85,000
2029		$25,000		$30,000	$55,000
2030		$25,000			$25,000
2031		$25,000			$25,000
2032		$25,000	$100,000	$30,000	$155,000
2033	$60,000	$25,000			$85,000
2034		$25,000			$25,000
2035		$25,000		$30,000	$55,000
2036		$25,000			$25,000
2037		$25,000			$25,000
2038	$60,000	$25,000		$30,000	$115,000
2039		$25,000			$25,000
2040		$25,000			$25,000
Totals	**$240,000**	**$400,000**	**$200,000**	**$180,000**	**$1,020,000**

Appendix 10.7. Summary of Anticipated Costs – Stewardship Projects

Table 10-9. Summary of estimated costs for the implementation phase of the stewardship projects and the program of contaminant monitoring included in the Trustees' Stewardship Alternative and Collaborative Conservation Alternative. In addition to these costs, under the Stewardship Alternative, approximately $1.3 M would be used for maintenance of the stewardship projects while under the Collaborative Conservation Alternative, the approximately $1.3 M would be apportioned between maintenance of the stewardship projects and stakeholder identified restoration projects.

Saginaw River and Bay **Cost to Implement Restoration Stewardship Projects (exclusive of maintenance)**	
Restoration Projects	**Cost**
Saganing River Mouth - Building Tribal Restoration Capacity	$715,805
Shiawassee National Wildlife Refuge - Green Point Restoration	$1,456,533
Michigan Conservation Properties - Restoration Capacity	$454,500
Michigan Islands NWR - Restoration, Maintenance, Monitoring	$108,000
Subtotal	**$2,734,837**
Contaminant Monitoring (20 year duration)	**Cost**
Caged Fish Contaminants	$240,000
Colonial Waterbird Contaminants	$400,000
Mallard Contaminant Uptake - Saginaw CDF	$200,000
Bald Eagle Contaminants	$180,000
Subtotal	**$1,020,000**
Total	**$3,754,837**

In all of the cost estimates described here and in Appendices 10.2 – 10.6, current costs were used. The Trustees assume that costs will generally increase over time because of inflation, but that those cost increases can be addressed with the interest earned on the funding from the 1998 settlement.

Appendix 10.8. Comment Received from the Public

Summary

The Trustees received comment from five entities:

- Bay County Department of Environmental Affairs & Community Development
- The Conservation Fund – Great Lakes Office
- The Saginaw Basin Land Conservancy
- The U.S. Army Corps of Engineers – Detroit Office
- Huron Pines

In addition to requesting general review of the restoration plan from the public, the Trustees also requested information regarding restoration actions for which stakeholders would likely seek support from the Trustee Council under either a Stakeholder Engagement Alternative (Section 4.4) or the Collaborative Conservation Alternative (Section 4.5). The Trustees received one project abstract from the Saginaw Basin Land Conservancy (Appendix 10.8.4).

Two commenters voiced support for the Stakeholder Engagement Alternative but provided no indication of restorations actions for which they would seek future support (Appendices 10.8.1, 10.8.2). These commenters identified issues related to the role of 'local trustees', did not support the use of herbicides to control Phragmites except for the maintenance of public access, questioned the use of NRDAR settlement funds to maintain the 1998 acquired properties, but, in agreement with the Trustees, voiced support for project planning and commitment to long-term maintenance actions with respect to the treatment of non-native and invasive species.

The U.S. Army Corps of Engineers provided comments specifically related to the Saginaw Confined Disposal Facility (CDF), which is identified as a potential focal area of ecological enhancement in the 1998 Consent Judgment. The USACE suggested changes to the description of the USACE dredging project and identified the necessity of collaborative engagement with the USACE prior to any consideration of the CDF as a focal area of restoration. The USACE also noted that most likely a Section 408 review and approval would be required in order to undertake actions or monitoring that would occur on a facility managed by the USACE.

Huron Pines provided comment voicing support for the Trustees' effort to advance restoration in the Saginaw River and Bay.

10.8.1 Bay County Department of Environmental Affairs & Community Development

BAY COUNTY
DEPARTMENT OF
ENVIRONMENTAL AFFAIRS
& COMMUNITY DEVELOPMENT

515 Center Avenue, Suite 501
Bay City, Michigan 48708

Phone 989- 895-4135
Fax 989-895-4068
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http://www.baycounty-mi.gov

JAMES A. BARCIA
County Executive

LAURA OGAR, DIRECTOR
ogarl@baycounty.net

Community Initiatives
Geographic Information Systems
Gypsy Moth Suppression Program
Mosquito Control
Saginaw Bay Coastal Initiative (SBCI)
Transportation Planning

December 18, 2020

Clark D. McCreedy,
U.S. Fish and Wildlife Service
Michigan Ecological Services Field Office
2651 Coolidge Road, Suite 101
East Lansing, MI 48823
SaginawNRDA@fws.gov

RE: Comments on Proposed Restoration Plan & Environmental Assessment for Use of the Remaining Funds; 1998 Saginaw River and Saginaw Bay Settlement

Dear Mr. McCreedy:

Please accept the following comments in review of the proposed draft Restoration Plan (Plan) described above for the Saginaw River and Saginaw Bay and for use of the remaining surplus $5.7M from the 1998 natural resource damages settlement.

Bay County appreciates the proposed updated Restoration Plan being put out for public review and comment as so much of this original work occurred so long ago. The 1998 settlement provided substantial cleanup of contaminated river sediment, monitoring and restoration of fish and wildlife habitats along the Saginaw River and Bay shoreline. Much of this original Trustee work 'set the stage' for the subsequent development of local conservation organizations, improved state and local collaborative restoration efforts and engaged community stakeholders.

Much has changed over the past 20 years and Bay County is now a central part of a larger Saginaw Bay focused region (Great Lakes Bay Region) with active stakeholders from diverse community sectors such as local government, commerce, tourism, health services, and local private foundations etc. who have taken a lead role in promoting restoration activities for the Saginaw River and Bay throughout this time.

It is for these reasons that we support the Stakeholder Engagement Alternative to allow for 'local trustees' representing the affected public and diverse community leaders to identify 'last mile' restoration actions that are needed in our local assessment area. Of the four (4) Alternatives, the Stakeholder Engagement alternative offers the greatest opportunity for the injured community to guide restoration activities to address local priority needs. The Stakeholder Engagement alternative would advance partnerships while increasing potential financial and strategic leveraging to expand greater durability and sustainable, long term conservation benefits.

The Plan describes the Trustees anticipating previously implemented restoration projects under the 1998 settlement will require annual restoration funding to fully achieve their desired condition largely due to impairment by invasive species. **We have significant concerns with this potential expenditure of restoration funds for the following reasons:**

1) The 1998 settlement land conveyance documents of the approximately 1,600 acres to public (Trustee) ownership describe legal obligations to preserve, protect, and restore current or potential habitat for fish and wildlife in perpetuity. **The recipient Trustee landowners may have an on-going obligation to maintain these properties separate from this restoration fund therefore use of these funds for maintenance at these properties could be duplicative.**
2) Much has been learned about invasive species since the 1998 settlement and there exists today a broad depth of local partners with technical experience working to control and manage invasive species (IS) along the Saginaw Bay coastal area, particularly invasive *Phragmites* and *Typha*, both very aggressive, highly resilient invasive plant species. **We have seen that effective invasive species control can only be achieved through active implementation of targeted IS Management Plans having clear, (limited) geographic boundaries, with realistic restoration**

outcomes that commit to long term, multiyear control actions. Without a firm commitment by a Landowner to a Targeted IS Adaptive Management Control Plan no restoration funding should be spent on invasive species control.

3) A number of IS collaborative partnerships now exist which did not in 1998, primarily the Partners for Wildlife through the US Fish and Wildlife Service through the Shiawassee National Refuge, the Michigan Invasive Species Program administered through DNR, and regional Cooperative Invasive Species Management Areas (CISMA) comprised of local partners. These resources should be consulted **if Trustee restoration lands need invasive species treatment at limited areas for the purpose of restoring lost values for public access to the Saginaw Bay or River resource.**
4) The 1998 NRDA Settlement and Consent Judgment was necessitated due to toxic chemical releases into the Saginaw Bay and River causing harm and damaging our natural resources. **We find it incongruent for the restoration funds to be considered for any new, chemical application in the same Assessment Area to treat invasive species. We would not be opposed to use of the settlement funds for mechanical equipment (i.e. Marsh Master) to control IS in these areas. To further clarify, we would not be opposed to these restoration lands having limited IS chemical treatment using other non-Settlement funding sources to restore public access values, but only on condition of a Targeted IS Adaptive Management Control Plan being in place (see #2 above)**

Bay County appreciates that our previous communication (Mr. J. Barcia) to the Trustees is acknowledged in the Plan - that land acquisition for wildlife habitat purposes can have a significant and cumulative adverse fiscal impact to local government and public services as these taxable lands are converted to public tax-exempt conservation lands. **Bay County agrees with the Trustee recommendation to avoid additional land purchases. We may be supportive of a new land acquisition activity if a community Stakeholder Alternative was presented as a necessary component for future public use and human benefit, not for additional conservation or wildlife habitat acres.**

The Trustees request comment on different financial distributions between restoration funding and maintenance funding in use of the remaining surplus funds, however Bay County suggests that this discussion would be better understood to occur as part of the Stakeholder Engagement activities.

Lastly, we believe the Stakeholder Engagement Alternative meets or exceeds the benefit ranking of the Collaborative Conservation and Stewardship Alternatives as well as the No Action Alternative for the NRDAR feasibility and benefit based criteria and the Trustees Restoration Criteria. We strongly believe the Stakeholder Engagement Alternative will much better reflect and inform the potential significance of any proposed actions at the local or regional level as required by NEPA.

Thank you for this opportunity to comment on the Plan. If you have any questions, please contact me at 989-895-4135 or at ogarl@baycounty.net.

Sincerely,

Laura Ogar

Laura Ogar, Director
Bay County Environmental Affairs and Community Development Department

cc: James Barcia, Bay County Executive
Mike Duranczyk, Chair, Board of Commissioners
Matt Felan, CEO, Great Lakes Bay Regional Alliance
Ryan Tarrant, CEO, Bay Area Chamber of Commerce
Dr. Annette Rummel, CEO, Great Lakes Bay Convention and Visitors Bureau
Diane Fong, CEO, Bay Area Community Foundation
Mike Kelly, Director, Saginaw Bay Watershed Initiative Network

10.8.2 The Conservation Fund – Great Lakes Office

THE CONSERVATION FUND

GREAT LAKES OFFICE
P.O. BOX 734
BAY CITY, MICHIGAN 48707
(989) 892-9171
FAX (989) 892-7172
www.conservationfund.org

December 18, 2020

Mr. Clark D. McCreedy
Contaminants Specialist
U.S. Fish and Wildlife Service
2651 Coolidge Road, Suite 101
East Lansing, MI 48823

Dear Mr. McCreedy:

Thank you for the opportunity to comment on the Draft Restoration Plan for the use of remaining funds from the 1998 Natural Resources Damage Assessment. I appreciate the time that you and the Trustees have spent putting it together.

Having reviewed the document and the proposed alternatives, my opinion is that we should lean more heavily on the "Stakeholder Engagement Alternative", rather than the preferred "Collaborative Conservation Alternative".

These funds, totaling $5.7 million, have been sitting essentially dormant for more than 20 years. That would indicate that there is no particular hurry to expend them. In that time, many projects, most of which were community driven, including dam removals, public access sites, reef construction and more have occurred in the watershed. All of these projects would have benefitted from accessing these funds. I am concerned that by not including the public as much as possible (as indicated in the "stakeholder engagement alternative") you may miss projects that are the highest priority to those living in the region and most directly benefitting from restoration investment.

I did note in the document that there seems to be an interest in investing in non-native species management on properties already acquired through this settlement. Perhaps you could clarify whose responsibility this is, as it is my understanding that property acquisition and projects implemented through the original settlement had a requirement that project owners assumed responsibility for future maintenance. For example, if funds are going to be used on already purchased properties for invasives treatment, shouldn't Bay City, for example, have access to these funds to improve boat launches that were funded through the original settlement?

I would be glad to discuss this further, and our office stands willing to assist in the successful implementation of this project is whatever capacity we can.

Sincerely,

Michael Kelly, Director
Great Lakes Office
Saginaw Bay Program

10.8.3 The U.S. Army Corps of Engineers – Detroit District

Mccreedy, Clark D

From: Harrington, Hal F CIV USARMY CELRE (USA) <Hal.F.Harrington@usace.army.mil>
Sent: Friday, December 18, 2020 12:49 PM
To: Mccreedy, Clark D
Cc: Uhlarik, Charles A CIV USARMY CELRE (USA); Allerding, Paul H CIV USARMY CELRE (USA)
Subject: [EXTERNAL] FW: Public invited to review of the draft restoration plan for the Saginaw River and Bay

This email has been received from outside of DOI - Use caution before clicking on links, opening attachments, or responding.

Clark -- USACE comments on the public review of the draft restoration plan.

Page 28 " The U.S. Army Corps of Engineers has actively dredged the Saginaw River channel since the 1960s to accommodate commercial shipping (USACE 2004). Dredged sediments have either been placed in open water in Saginaw Bay, deposited along the Saginaw River shoreline, or deposited in one of two confined disposal facilities (CDFs). Contaminated sediments dredged from parts of the navigation channel in the Saginaw River and Saginaw Bay have been placed in these confined disposal facilities since 1978 when the facility in Saginaw Bay was constructed (USACE 2007).

Both dredging activities and shipping traffic along the Saginaw River contribute to the resuspension and redistribution of contaminated sediments."

I would suggest that, to be fair, the report needs to indicate that besides dredging and shipping resuspending contaminated sediments, storms and high flow events also do the same.

Recommended wording as follows:

" The U.S. Army Corps of Engineers has actively dredged the Saginaw River channel since the 1960s to accommodate commercial shipping (USACE 2004). Historically, dredged sediments were placed in open water of Saginaw Bay or deposited along the Saginaw River shoreline. That changed with the construction of a confined disposal facilities (CDF) in the bay in 1978. Since then, contaminated sediments dredged from parts of the navigation channel in the Saginaw River and Saginaw Bay have been placed in the Bay CDF. More recently a dredged material disposal facility (DMDF) was constructed in the upper river for contaminated sediments dredged in upstream areas of the harbor. Both dredging activities and shipping traffic along the Saginaw River, as well as high flow events from storms, contribute to the resuspension and redistribution of contaminated sediments."

The identified uses of these remaining funds include the following:

* future monitoring, modeling, and studies to determine the effectiveness of dredging and restoration;
* Contaminant Monitoring in the Saginaw River and Bay As a component of the Trustee's Stewardship Alternative, monitoring of contaminants in the Saginaw River and Bay may include the on-going monitoring of contaminants in fish, monitoring of contaminants in colonial waterbirds, the assessment of contaminant uptake in mallard ducks on the Saginaw Confined Disposal Facility and, monitoring of contaminants in bald eagles within the Saginaw Bay watershed (Appendix 11.6). The Trustees will support monitoring programs in the Saginaw River and Bay based on the availability of alternative funding sources such as the Great Lakes Recovery Initiative. A link to the existing studies, conclusions and studies underway or planned should be provided to determine what has been learned and what data gaps exist.

What studies have been done to date?

What are the conclusions?

What studies are underway.

When do we expect a draft report.

What studies are planned?

If studies are proposed on Corps CDF facilities, those study parameters need to be reviewed by the Corps Research Lab in Vicksburg, MS (ERDC) and our contaminants researches need to be included in the study design, data evaluation, review and write up of the report for QA/QC.

Any activities that occupy, alter, or use a Federal Civil Works project, it will likely require a Section 408 review and approval. Visit
https://gcc02.safelinks.protection.outlook.com/?url=https%3A%2F%2Fwww.usace.army.mil%2FMissions%2FCivil-Works%2FSection408%2F&data=04%7C01%7Cclark_mccreedy%40fws.gov%7C1ee08cb5c6b84799ff8708d8a37d4ea3%7C0693b5ba4b184d7b9341f32f400a5494%7C0%7C0%7C637439105893815825%7CUnknown%7CTWFpbGZsb3d8eyJWIjoiMC4wLjAwMDAiLCJQIjoiV2luMzIiLCJBTiI6Ik1haWwiLCJXVCI6Mn0%3D%7C1000&sdata=3WjRVp0%2BAdH9I8C TBaCquj616r7zSz6Jxq4qhCkd8dc%3D&reserved=0

for further information.

Thanks you for the opportunity to comment on the proposal.

Hal F. Harrington (Acting for)
Charles A. Uhlarik
Chief, Environmental Analysis Branch
US Army Corps of Engineers,
Detroit District 477 Michigan
Avenue
Detroit, MI 48226-2550

Office: 313.226.2476
Cell: 313.405.2647

10.8.4 Saginaw Basin Land Conservancy

December 18, 2020

Clark McCreedy, *Fish and Wildlife Biologist*
US Fish & Wildlife
Service East Lansing
Field Office 2651
Coolidge Road
East Lansing, MI 488223

Re: Revised Saginaw Bay & River NRDA stakeholder identified project abstract for the Saginaw Basin Land Conservancy's Saginaw Bay Coastal Wildlands project

Dear Clark,

Thank you for contacting us regarding the draft Saginaw River and Bay NRDA restoration plan and the remaining funds from the 1998 General Motors settlement. We appreciate the opportunity to submit a revised project abstract in response to the draft plan for consideration by NRDA stakeholders. We understand that this funding may be utilized for the stewardship and ecological restoration of lands that previously benefited from the availability of settlement funding.

We have successfully launched our Saginaw Bay Coastal Wildlands project in northern Bay and Arenac counties and we believe the scope outlined here presents a worthwhile investment for these remaining funds, as it would support the long-term coordinated care and improvement of lands owned and managed by the SBLC that are open to the public. We are seeking $47,500 to support the new baseline of stewardship established by the Saginaw Bay Coastal Wildlands project.

The Saginaw Bay Coastal Wildlands project at a glance

Saginaw Bay Coastal Wildlands (SBCW) is an initiative by the Saginaw Basin Land Conservancy (SBLC), in partnership with the Saginaw Chippewa Indian Tribe (SCIT). SBCW consolidated and re-branded a collection of fragmented nature preserves owned and managed by the SBLC. The project created a single, mostly contiguous, landscape-level coastal wildlife sanctuary and outdoor recreation destination surrounding the Saganing River Delta. The project consists of:

- Habitat enhancement work including invasive species control work, native species planting, and habitat structures installed throughout the SBCW.

- User experience improvements including new trailheads, extensive wayfinding maps and signage, updates to existing trails, and new trails and trail amenities throughout.

- Site interpretation including through interpretive signs highlighting site-specific natural and historical features.

The presence and protection of high-quality natural areas and the access to nature that they provide in our communities is invaluable. We can position the work of our partnership to improve habitat through collective, coordinated management, draw tourism, support investments in rural Bay and Arenac Counties, and more meaningfully improve the quality of life for residents and business owners by emerging as a source of pride.

We have secured funding for this project from the Saginaw Bay Watershed Initiative Network, Northwoods Wholesale Outlet in Pinconning, and the Bay Area Community Foundation. We were also successful in our funding request in collaboration with Standish Township for 2% funding from the Saginaw Chippewa Indian Tribe.

NRDA-supported continued stewardship objectives & costs

Beyond the SBCW project, the SBLC recognizes the necessity for future stewardship funding to maintain and expand these restoration efforts. Continued invasive species control and planting and maintaining new and existing native species restoration areas will be critical after the scope of the project is completed.

Preliminarily, our long-range management planning suggest a series of ecological enhancements and management priorities, described by the following goals:

- Continued invasive species control - $25,000

    - Ongoing monitoring, treatment, and removal will be necessary to maintain the high quality of habitat desired for SBCW properties. Species such as phragmites, autumn olive, common and glossy buckthorn, honeysuckles, provide management challenges that will be monitored and addressed in the future with best management practices. Funding will cover direct and labor costs associated with the treatment and removal work as well SBLC staff time to monitor for occurrences of new invasive species identified elsewhere in the Saginaw Bay Watershed that continue to propagate, such as European frog-bit. This work will be implemented across the SBLC's 227 acres of fee-owned SBCW property. The SBLC and SCIT share a critical goal of targeting invasive species on the properties they own and manage. Management of invasive species will be a focal point of the jointly developed plan.

- Native vegetation establishment and maintenance - $20,000

    - The continued removal of invasive species creates opportunities for restoration with wildlife-beneficial native species. Native wildflowers and grasses, including

common milkweed, purple coneflower, and little bluestem, will be utilized to revegetate areas cleared of invasives. Additional milkweed species, such as butterfly weed and swamp milkweed, will also be prioritized to create additional Monarch butterfly habitat in suitable areas. Recent reports of drastic Monarch population declines further underline the critical need for habitat protection and creation. Shrubs and trees specifically selected for site conditions will also be implemented in areas where cover of this type is deemed practical. The funding will cover the direct costs of seed, plugs, and bare root or balled tree stock along with site preparation and planting work necessary for each respective approach. The collective management plan will highlight this objective and determine the best species and restoration techniques based on site conditions.

- Long-range collective management plan - $2,500

    - A plan jointly developed by the SBLC and SCIT will establish a landscape-level management strategy after the completion of the first phase of the SBCW project. This will ensure that the SBCW's natural and built amenities are cooperatively managed and in line with the overall goals of the SBCW.

We have reduced the funding goal outlined in a previous proposal that included development of additional outdoor recreation amenities, such as trails and additional signage. Our intent is to focus GM settlement funding on ecological restoration of SBLC-controlled lands and on the cooperative planning effort between the SBLC and the SCIT. The SCIT is initiating long-range analysis for its Roney property, which is an essential central connection of the SBCW overall project area. The funding already secured for the SBCW project is being invested on components of the overall effort that benefit both the SCIT and the SBLC lands within the project, including signage, trail work, gates and fences, and initial habitat work. Should the NRDA funds from the GM settlement be awarded to the SBLC for long-range work on the SBCW area, it would permit us to significantly expand these efforts.

Given that the SCIT has invested in the project and has demonstrated a high degree of buy-in, we anticipate a successful first effort to coordinate long-range planning for the management of the SBCW lands owned both by the SBLC and SCIT. The SBCW project benefits both the community and the environment. It will have an increased economic impact and will support investment in the surrounding area. We believe this project has significant added value and leverages dollars previously spent on permanent land protection.

It is our understanding that the SCIT is investigating restrictions or limitations on the use of their lands within the SBCW project area, Roney included. As we continue the improvements to the habitat and user experience within the SBCW project area, we aim to demonstrate to the SCIT and others how we can provide a project that provides mutually beneficial outcomes. The

$2,500 planning funding within this proposal would allow for professionally-driven planning to help facilitate SBLC and SCIT's coordination.

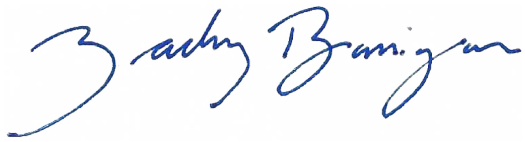
Stewardship funding

The SBLC maintains an endowment at the Bay Area Community Foundation to ensure a continued source of revenue for the basic stewardship and monitoring needs of our nature preserves and conservation easements. The SBCW project and perpetual stewardship objectives create a greater demand for increased levels of maintenance on SBCW lands.

In conclusion

This revised and reduced scope represented in this abstract will allow the SBLC to continue critical stewardship activities, amplify previous investment from the GM settlement, help us build even stronger bridges with the SCIT, and fund planning for long-range management. We appreciate the consideration and welcome any questions or feedback you might have regarding this abstract.

Regards,



Zachary Branigan, Executive
Director Saginaw Basin Land
Conservancy 706 S. Euclid Avenue
Bay City, MI 48706
(989) 891-9986

Saginaw Bay Coastal Wildlands

Saginaw Bay NRDA abstract project map

10.8.5 Huron Pines

Mccreedy, Clark D

From: Samantha Nellis <samantha@huronpines.org>
Sent: Friday, December 18, 2020 12:57 PM
To: Saginawnrda, FW3
Subject: [EXTERNAL] Draft Restoration Plan comments

Dear Mr. McCreedy,

On behalf of Huron Pines, I would like to offer support for the preferred alternative option that the Trustees identified in the Draft Restoration plan. We feel that this combination of predetermined stewardship activities and stakeholder input will have a large, positive input on the Saginaw Bay region. Huron Pines has partnered with the U.S. Fish and Wildlife and other stakeholders since 2015 to protect and restore the unique habitats on Big Charity Island. We are excited to continue this important work and support from 1998 Saginaw River and Bay Settlement funds will allow this work to continue in the long term.

We also see the value in the long term monitoring and maintenance opportunities. We hope that maintenance/monitoring funds will be set aside for the next 10-15 years. Substantial funds in the short term, however, are crucial to tackle some of the larger problems such as invasive species. We know by now that attempting to control invasive species little by little is a losing battle. We are confident that the Trustees will decide on an appropriate balance.

Thank you for your time and efforts on this.

Samantha

--
Samantha Nellis

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Appendix 10.9. Trustee Response to Public Comment – Substantive Issues

Issue: One commenter raised the issue of the respective roles of the Trustee Council and area stakeholders ('local trustees'). This would be relevant to both the Stakeholder Engagement and Collaborative Conservation alternatives (see: Bay County Department of Environmental Affairs & Community Development).

Response from the Trustees:

The Trustees feel that there may be a need to clarify the respective roles of the Natural Resource Trustees and the local stakeholders in contributing to either a Stakeholder Alternative or the Collaborative Conservation Alternative given one commenter's reference to 'local trustees'. Both alternatives incorporate local stakeholder participation in restoration planning and delivery, and the Trustees wish to confirm that they strongly support local stakeholder participation in restoration planning and delivery.

The specific role of serving as Natural Resources Trustees in conducting the NRDAR process is defined by statute and regulation. This role is defined as being limited to federal natural resource management agencies, state agencies designated by Governors, and federally recognized Tribes, as described in the Code of Federal Regulations at 43 CFR 11.14:

> 43 CFR § 11.14 - Definitions.
>
> (rr) Trustee or natural resource trustee means any Federal natural resources management agency designated in the NCP[25] and any State agency designated by the Governor of each State, pursuant to section 107(f)(2)(B) of CERCLA, that may prosecute claims for damages under section 107(f) or 111(b) of CERCLA; or an Indian tribe, that may commence an action under section 126(d) of CERCLA. Trustee means any Federal natural resources management agency designated in the NCP and any State agency designated by the Governor of each State, pursuant to section 107(f)(2)(B) of CERCLA, that may prosecute claims for damages under section 107(f) or 111(b) of CERCLA; or an Indian tribe, that may commence an action under section 126(d) of CERCLA.

The Trustees offer this explanation of their role to ensure an understanding among stakeholders that the Trustee Council bears the fundamental responsibility to oversee and administer NRDAR settlement funds. This also includes the requirement to evaluate proposed restoration actions that stakeholders may offer in the future to the Trustee Council for their consideration.

[25] National Oil and Hazardous Substances Pollution Contingency Plan (NCP). The National Contingency Plan (40 CFR 300) may be referenced at https://www.govinfo.gov/content/pkg/CFR-2011-title40-vol28/pdf/CFR-2011-title40-vol28-part300.pdf.

Issue: Two commenters raised the issue of emphasizing 'local priority needs' in the restoration planning process. This would pertain to both the Stakeholder Engagement and Collaborative Conservation alternatives (see: Bay County Department of Environmental Affairs & Community Development and The Conservation Fund).

Response from the Trustees:

The Trustees do seek to collaborate with local stakeholders and acknowledge that local stakeholders have priorities that reflect multiple interests of their communities. The Trustees, however, in seeking to collaborate with local stakeholders, are bound by regulations that require them to pursue restoration that is uniquely aligned with the injury that has occurred.

> 43 CFR 11.82 Damage determination phase - alternatives for restoration, rehabilitation, replacement, and/or acquisition of equivalent resources.
>
> (a) Requirement. The authorized official shall develop a reasonable number of possible alternatives for (i) the restoration or rehabilitation of the injured natural resources to a condition where they can provide the level of services available at baseline, or (ii) the replacement and/or acquisition of equivalent natural resources capable of providing such services.

This relationship between the injury that has occurred and the restoration proposed is frequently referred to as the 'restoration – injury handshake' (Conner 1993). This requirement to align the character of restoration and injury is the most fundamental regulatory requirement that guides the activities of the Natural Resource Trustees. As such, the Trustees seek input from local stakeholders on restoration actions that can align with both local interests and the requirements and objectives of the Natural Resource Damage Assessment and Restoration process.

The Trustees hope to develop future restoration actions collaboratively with stakeholders, prioritizing those actions that best meet the restoration criteria described in Section 5.0 of the Restoration Plan to ensure that the actions effectively benefit natural resources injured as a result of releases of polychlorinated biphenyls in the Saginaw River and Bay.

Issue: Two commenters raised the issue of an obligation of Trustee landowners to maintain lands acquired as a result of the 1998 Settlement with non-settlement funding, suggesting that using settlement funds for this purpose could be duplicative (see: Bay County Department of Environmental Affairs & Community Development and The Conservation Fund).

Response from the Trustees:

The 1998 Consent Judgment did not create an obligation for agencies to maintain lands acquired through the settlement in any specific level of ecological functioning with non-settlement (i.e. taxpayer) funds. In three instances, the 1998 Consent Judgment identified the source of funds for future maintenance or restoration actions, but none of these were for habitat restoration or preservation projects. In the first two cases, the properties in question consist of the facilities known as the Bay City Boat Launch (Consent Judgment 7.9(a)) and the Cass Avenue Boat Launch (Consent Judgment 7.9(b)):

> 7.9 (c) Bay City shall own, operate; and maintain, at its sole cost and expense, the facilities and properties described in Paragraphs 7.9 (a) and (b) for at least ninety-nine (99) years.

In the third case, as detailed within the Consent Judgment, the Settlement required the following with respect to the Jones Road Boat Launch:

> 7.9 (d) Within thirty (30) days after the second (2nd) anniversary of the entry of this Consent Judgment, Defendants shall submit to the Trustees for approval an initial plan to create, and thereafter create in accordance with the approved final plan, a recreational area on MDNR land at the north termination of Jones Road in Bay County as described in Appendix I. The public uses shall include an improved boat launch facility and parking, any may include interpretive signage, and the design thereof shall minimize impacts on existing wetlands at the site. This facility shall be owned, operated and maintained by MDNR or its designee at its sole cost and expense.

The Consent Judgment acknowledges "potential restoration and enhancement of the wetland" associated with the Bay City and Cass Avenue boat launches, but stipulates no requirement that Bay City undertake restoration.

The Jones Road Boat Launch was subsequently conveyed by the MDNR to Hampton Township of Bay County and is now listed in their inventory of recreational sites[26].

In the years since the settlement, the agencies that acquired lands for habitat restoration and preservation as a result of the settlement have not been able to fund the restoration or maintenance of these properties at a level that provides for full ecological function. This is particularly true since the arrival, unforeseen at the time of the 1998 Settlement, of the non-native invasive subspecies of *Phragmites australis*. To improve ecological function of these properties it is necessary to provide funding for this purpose. The Trustees believe that using settlement funds for these purposes is not duplicative.

The Trustees are confident in their interpretation of the Consent Judgment and the appropriateness of advancing the restoration and maintenance of the properties acquired as a result of the 1998 Settlement.

[26] Bay County Area Recreation Plan 2019 – 2023. Available at www.baycounty-mi.gov/Docs/Recreation/2019-2023%20Recreation%20Plan%20Final.pdf

Issue: One commenter raised the issue of the role of existing partnerships, and consultation with the partners, in the targeted, long-term treatment of non-native invasive species in the Saginaw Bay area (see: Bay County Department of Environmental Affairs & Community Development).

Response from the Trustees:

The Trustees appreciate this recommendation to consult with existing partnerships for the targeted, long-term control of invasive species, with a focus on public lands. Four of the five Natural Resource Trustees for the Saginaw River and Bay are actively involved in the control and management of non-native invasive species, particularly *Phragmites*, in the Saginaw Bay area (U.S. Fish and Wildlife Service, Michigan Department of Natural Resources, Michigan Department of Environment, Great Lakes, and Energy, and the Saginaw Chippewa Indian Tribe of Michigan). The Trustees acknowledge the on-going contribution and guidance provided by cooperatives such as the Great Lakes Phragmites Cooperative, the Michigan Invasive Species Coalition, and the Cooperative Invasive Species Management Areas. In particular, the Michigan Department of Natural Resources and the Michigan Department of Environment, Great Lakes, and Energy have been instrumental in the development of protocols for the control of *Phragmites* currently in use by the various cooperatives[27]. And, the Michigan Department of Environment, Great Lakes, and Energy has been instrumental in providing base funding for the Cooperative Invasive Species Management Areas through the Michigan Invasive Species Grant Program. Both the USFWS and the MDNR participate on the Advisory Committee for the Great Lakes Phragmites Collaborative which has advanced the Phragmites Adaptive Management Framework.

The Trustees affirm that it is their intent to continue to work with, benefit from, and support these partnerships in their effort to control non-native invasive species in the Saginaw Bay area. Moreover, the Trustees believe that their effort to build regional capacity to treat non-native invasive species in the Saginaw Bay area, in terms of staffing, training, and equipment, along with being able to commit to consistent annual funding, is likely to benefit on-going partnerships in the region. These contributions by the Trustees will provide additional benefits to natural resources beyond what the existing partnerships would be able to accomplish without funding from the 1998 Settlement.

[27] For example, *A Guide to the Control and Management of Invasive Phragmites*. Available at https://www.michigan.gov/documents/invasives/egle-ais-guide-phragmites_708909_7.pdf;

Issue: One commenter raised the issue of adopting a non-native invasive species treatment strategy that should be limited to the purpose of improving public access as opposed to ecological restoration (see: Bay County Department of Environmental Affairs & Community Development).

Response from the Trustees:

The Trustees acknowledge that public access to natural resources was, and remains, a valid component of the effort to protect, restore, replace, enhance or acquire equivalent natural resources injured as a result of the release of polychlorinated biphenyls into the Saginaw River and Bay. The Trustee's preferred alternative, in fact, substantially addresses public access in that significant restoration and maintenance effort is directed to state properties that are managed for the purpose of providing public access to natural resources and natural resource based recreation.

Issue: One commenter raised the issue of the necessity to develop site-specific, targeted management plans for the treatment of invasive species that incorporate a commitment to long-term adaptive management control plans (see: Bay County Department of Environmental Affairs & Community Development).

Response from the Trustees:

The Trustees agree that site-specific, targeted management plans with a commitment to long-term management are necessary for the effective control of aggressive invasive species like *Phragmites*. The Restoration Plan details the requirements of project managers to develop workplans to be reviewed by the Trustee Council that incorporate project objectives, an implementation schedule, monitoring of implementation and outcomes, reporting schedule, and estimated costs (Section 7.0). Required outcome-based monitoring is intended to inform adaptive management.

In addition, the Restoration Plan provides for long-term commitments to multi-year control actions as a fundamental aspect of restoration project design. The Trustees have identified maintenance funding as a critical consideration within both the Stewardship and Collaborative Conservation alternatives as described within the Restoration Plan. In addition to these considerations, because the Collaborative Conservation Alternative also incorporates the development of additional restoration actions developed with stakeholders, it is the Trustees preferred alternative.

Issue: One commenter expressed concerns about using chemical control methods with settlement funding, but would support limited chemical treatment using other funding sources as part of a targeted adaptive management control plan. (see: Bay County Department of Environmental Affairs & Community Development).

Response from the Trustees:

The Trustees agree with the observation noted by the Bay County Department of Environmental Affairs & Community Development that much has changed in the Saginaw Bay Area in the over 20 years since the 1998 Settlement. The Trustees suggest that one of the most obvious changes in the region has been the proliferation of non-native invasive species, and in particular the highly invasive non-native subspecies of common reed, *Phragmites australis*.

At the time of the Settlement in 1998, the naturally occurring native subspecies of common reed in the Saginaw Basin would have been a component of a diverse wetland plant community. At present, the non-native subspecies of *Phragmites* now pervasively dominates wetlands within the Saginaw Bay area. Few plant invasions have altered and diminished wetland habitat values as substantially as has non-native *Phragmites*. Conversely, few restoration actions, such as the on-going control of *Phragmites* and the re-establishment of native plant communities, offer more substantial ecological and social benefit.

The Trustees acknowledge and appreciate the commenter's emphasis on the use of integrated pest management for the control of non-native invasive species. The Trustees support the mission of cooperatives such as the Great Lakes Phragmites Collaborative that advocate for the use of integrated pest management. At present, in areas of broad infestations, the use of chemical herbicides typically provides the most effective treatment[28] with the greatest probability of durable beneficial outcomes. Unlike the PCBs that resulted in the 1998 Settlement, chemical herbicides are available that have limited persistence in the environment and do not biomagnify in the food web. As such, the Trustees will consider the use of chemical herbicides as part of an integrated pest management strategy. Herbicides would be carefully selected for their efficacy and limited persistence in the environment and their use would incorporate best management practices to avoid or minimize impacts to non-target species. In addition, the Trustees have made provision for the use of adaptive management, informed by outcome-based monitoring, that would allow project managers to modify techniques over time to further limit the use of chemical herbicides if other methods are shown to be more cost-effective and have reduced risk of non-target impacts (Section 7.0).

[28] For example, see Great Lakes Phragmites Collaborative, Management Techniques at https://www.greatlakesphragmites.net/management/techniques/

Issue: One commenter raised the concern that land acquisition for conservation or wildlife habitat purposes can have adverse fiscal impacts to local governments (see: Bay County Department of Environmental Affairs & Community Development).

Response from the Trustees:

Though the 1998 Consent Judgment gives the Trustee Council the latitude to consider the acquisition of additional lands to recover or restore natural resources or services, the Trustees have affirmed that land acquisition represents one of their less preferred means to accomplish natural resource restoration with the remaining settlement funds (e.g., Sections 3.3, 5.4.2, 5.4.8).

In addition to restoring injured resources, the 1998 Settlement facilitated the acquisition of restoration lands to ensure the restoration and recovery of natural resource services. Those services include numerous activities that are associated with nature-based tourism – a significant contributor to the Saginaw Bay area economy. Wildlife viewing, hunting, fishing, hiking, and boating are but a few of the services that these acquisitions were intended to address. All of the lands acquired as a result of the 1998 Settlement were selected to ensure that in addition to recovering injured resources, these lands would facilitate the delivery of related natural resource services to local communities and visitors to these communities.

Local economies are expected to benefit from jobs, purchases, and associated economic outputs during restoration activities. A recent study indicates that for every $1 million invested in ecosystem restoration, approximately 12 to 32 job-years are generated, and approximately $2.2 to $3.4 million in total economic output is produced (Thomas et al. 2016)[29]. In addition, property values have been shown to increase when associated with proximity to conservation areas (Reeves et al. 2018)[30].

As to the question of the direct loss of property tax revenues on parcels acquired for conservation, the State of Michigan and the federal agencies who serve as the stewards of public lands have explicitly addressed the issue of the loss of property tax revenues through their respective programs of payment in lieu of taxes. Information regarding the annual payments that the State of Michigan makes to local communities, including Bay County, is available at:

https://www.michigan.gov/dnr/0,4570,7-350-79136_79262_80437---,00.html

By way of example, in 2019, Bay County received $115,895.88 to compensate the county for the loss of property tax revenue associated with the state's stewardship of 5,888.84 acres of publicly available land in the county.

[29] Thomas, C. C., C. Huber, K. Skrabis, and J. Sidon. 2016. Estimating the Economic Impacts of Ecosystem Restoration—Methods and Case Studies. U.S. Geological Survey Open-File Report 2016–1016. 98 pp.
[30] Reeves, T., B. Mei, P. Bettinger, and J. Siry. 2018. Review of the effects of conservation easements on surrounding property values." Journal of Forestry 116(6): 555-62.

Though no similar federal lands occur within Bay County, in 2019 the City of Saginaw and area townships received $34,155 through the National Wildlife Refuge System's program of payment in lieu of taxes. Statewide, Refuge System payments to local governments totaled $124,259.00 in 2019. Information related to the National Wildlife Refuge System's payment in lieu of taxes program is available at:

https://www.fws.gov/refuges/realty/pdf/4RevShareWebLocalGovtSummaryUpdate508.pdf

The Trustees believe it is important to clarify this issue so as to ensure the public that their interests continue to be considered in this regard.

Issue: One commenter asked for additional details about contaminant monitoring, particularly with respect the Saginaw Bay Confined Disposal Facility (CDF) and requested that any plans for studies at the CDF be coordinated with the U.S. Army Corps of Engineers' Environmental Research Lab (see: U.S. Army Corps of Engineers – Detroit District).

Response from the Trustees:

As described within the Draft Restoration Plan, the Trustees have made provision for a broad program of monitoring to assess the efficacy of efforts to remediate contaminants in the Saginaw River and Bay, consistent with the direction provided the Trustees in the 1998 Consent Judgment. The Trustees also believe this program of monitoring can complement partner agency programs such as the Great Lakes Areas of Concern program.

The Trustees have supported the efforts of partner agencies to periodically monitor contaminants in the Saginaw River and Bay. The Michigan Department of Environment, Great Lakes and Energy (EGLE) has at regular intervals conducted cage fish studies in the Saginaw River and Bay to evaluate the accumulation of contaminants in fish and the Trustees have provided funding for sample analysis for these studies several times. This information is used "to evaluate spatial and temporal differences in water quality" (MDEQ 2018[31]). Most recently, the Trustees for the Saginaw River and Bay provided funding to support a 2017 caged fish study by the Michigan Department of Environmental Quality (now EGLE) and offered to provide similar support for a caged fish study conducted in 2020.

The Saginaw Confined Disposal Facility (CDF) has served as the repository of contaminated sediments removed from the Saginaw River and Bay following the 1998 Settlement. The 1998 Consent Judgment directs the Trustees to consider the CDF as a focal area of monitoring or ecological enhancement. The Trustees affirm the comment provided by the USACE regarding their prerequisite role as a participant in any consideration of the Saginaw CDF as a site for future activities conducted under the direction of the Trustees. The Trustees believe this to be equally applicable to other facilities under the stewardship of the USACE within the Saginaw Bay watershed. The Trustees also confirm any activities conducted in collaboration with the USACE will adhere to all applicable permitting requirements.

The Trustees look forward to continued collaboration with the USACE to develop a forward looking strategy that accommodates the mission of the USACE while ensuring the long-term conservation of natural resources associated with the CDF.

The USACE also provided the Trustees with recommended editorial changes regarding dredging and sediments within the Saginaw River and Bay. The Trustees have adopted these recommendations.

[31] Bohr, J. 2018. Michigan Department of Environment, Great Lakes, and Energy Water Resources Division Staff Report. A Caged Fish Study of the Pine, Tittabawassee, and Saginaw Rivers September 2-October 18, 2017. Michigan Department of Energy, Great Lakes, and the Environment. 22 pp. Available online at https://www.fws.gov/midwest/es/ec/nrda/SaginawNRDA

Issue: Two commenters expressed a preference for the Stakeholder Engagement Alternative.

Response from the Trustees:

In releasing the Draft Restoration Plan for public review, the Trustees requested information regarding restoration actions for which stakeholders would likely seek support from the Trustee Council under a Stakeholder Engagement Alternative (Section 4.4). The Trustees received one written response suggesting additional restoration actions from the Saginaw Basin Land Conservancy (Appendix 10.8.4) and one request for additional information on additional restoration actions from Huron Pines (Appendix 10.8.5). Two commenters voiced support for the Stakeholder Engagement Alternative but provided no specific restorations actions for which they would seek support (Appendices 10.8.1, 10.8.2).

Given the feedback that the Trustees have received, the limited scope of stakeholder restoration actions identified during the public review process, and the recognized value of the restoration actions described within the Stewardship Alternative relative to the restoration project selection criteria for NRDAR (Section 4.4; Appendices 10.2 – 10.5), the Trustees have identified the Collaborative Conservation Alternative as their Selected Alternative. This alternative addresses the core considerations of both the Stakeholder Engagement Alternative and the Stewardship Alternative, builds the capacity of proponents to provide conservation-related services, and ensures the long-term maintenance of restoration actions that are consistent with the Consent Judgment for the 1998 settlement and most evidently meet the Trustees' restoration criteria and priorities for NRDAR projects (Section 3.0).