

# Rouge River Mystery Oil Spill

## Draft Damage Assessment and Restoration Plan



Photo Credit: Lisa Williams, United States Fish and Wildlife Service

September 14, 2015

Trustee Review Incorporated

[before review by NPFC – prior to releasing Draft DARP to public]

Prepared by:

United States Fish and Wildlife Service  
Michigan Department of Natural Resources  
Michigan Department of Environmental Quality  
Michigan Department of the Attorney General  
Lighthouse Technical Consultants, Inc.  
Applied Science Associates, Inc.



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**DRAFT**  
**Damage Assessment and Restoration Plan**

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**Suggested Citation**

Rouge River Mystery Oil Spill Trustees. 2015. *Rouge River Mystery Oil Spill Draft Damage Assessment and Restoration Plan*. Prepared by United States Fish and Wildlife Service, Michigan Department of Natural Resources, Michigan Department of Environmental Quality, Michigan Department of the Attorney General, Lighthouse Technical Consultants, and Applied Science Associates, Inc.

## FACT SHEET

### Draft Damage Assessment and Restoration Plan for the Rouge River Mystery Oil Spill

#### Trustee Agencies:

- United States Fish and Wildlife Service
- Michigan Department of Natural Resources
- Michigan Department of Environmental Quality
- Michigan Department of the Attorney General

**Abstract:** The Natural Resource Trustee Agencies (Trustees) present a description and quantification of the injuries and the proposed restoration projects to compensate for the impacts of the Rouge River Mystery Oil Spill that occurred in Detroit, Michigan on April 9 and 12, 2002. The spill affected wildlife and habitat in the Rouge and Detroit Rivers as well as western Lake Erie. The Trustees propose four projects for compensation of the injured resources. The proposed projects are:

- *Humbug Marsh Wetland Restoration / Monguagon Creek Habitat Improvements*
- *Gibraltar Wetland Restoration*
- *Lake Erie Metropark - Great Lakes Marsh Restoration*
- *Pointe Mouillee Wetland Restoration*

The Trustees are seeking comments from the public on this Draft Damage Assessment and Restoration Plan. The Trustees will consider the comments received as they make the final selection of projects and complete the final Damage Assessment and Restoration Plan. They will then seek funding to implement the restoration projects from the Oil Spill Liability Trust Fund.

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<http://www.fws.gov/midwest/es/ec/nrda/RougeRiver/index.html>

## **Executive Summary**

On April 9 and April 12, 2002, a mixture of diesel fuel and used motor oil was discharged from the Baby Creek Outfall into the Rouge River near Dearborn, Michigan. The spill resulted in the release of an estimated 322,820 gallons of the oil mixture. Oil was observed along three miles of the Rouge River from the Dix Street Bridge to the Detroit River and along 17 miles of the Detroit River from its confluence with the Rouge River to western Lake Erie. Ten miles of Canadian shoreline along the Detroit River was also impacted by the oil spill. Federal and state authorities conducted extensive investigations, but were unable to identify a Responsible Party. The United States Coast Guard led cleanup operations funded by the Oil Spill Liability Trust Fund. Cleanup included booming, skimming, vacuuming and removal of oiled vegetation. Oil recovery efforts continued through early May 2002, yielding 66,359 gallons of the oil mixture. The Rouge River was closed to navigation during the cleanup; 24-hour continuous operations resumed in early May of 2002.

The Rouge River Mystery Oil Spill Trustee Agencies (Trustees) consist of the U.S. Fish and Wildlife Service, the Michigan Department of Natural Resources, the Michigan Department of Environmental Quality, and the Michigan Department of the Attorney General. The Trustees have conducted a Natural Resource Damage Assessment to determine the extent of injuries resulting from the discharge of oil and are seeking compensation in the form of restoration projects. Under the authority of the Oil Pollution Act of 1990, the Trustees are the designated natural resource stewards for their respective jurisdictions. The Trustees will act on behalf of the public, under state and Federal law, to plan and implement actions to restore, rehabilitate, replace, or acquire the equivalent of the affected natural resources injured by the Rouge River Mystery Oil Spill (Spill).

### **Damage Assessment and Restoration Plan**

The Trustees have prepared this draft Damage Assessment Restoration Plan (DARP). The purpose of the DARP is to assess, document, and quantify natural resource injuries arising from the Spill and to promulgate a plan for appropriate resource restoration. The goal of restoration is to make the public and the environment whole for injuries to natural resources resulting from the Spill. Restoration will be accomplished by returning injured natural resources and associated lost services to their baseline condition, the condition they would have been in had the spill not occurred, and by compensating the public for the interim loss of resources and services. To achieve this goal, the Trustees are authorized to restore, rehabilitate, replace, or acquire the equivalent of the damaged natural resources.

The Trustees are seeking public comment on this draft DARP. Comments may be submitted in writing or via e-mail to the U.S. Fish and Wildlife Service during the 30-day public comment period which will begin with the publication of this draft DARP. Availability of the draft DARP will be announced via e-mail using a mailing list compiled for the Detroit River International Wildlife Refuge, by press release provided to local media, and provided on the website of the U.S. Fish and Wildlife Service (<http://www.fws.gov/midwest/es/ec/nrda/RougeRiver/index.html>). The Trustees will consider public comments in preparing and issuing the final DARP for the 2002 Rouge River Mystery Oil Spill.

### **What was injured?**

The spill caused significant impacts to wildlife and wildlife habitat.

- **Birds:**

Investigators recovered 11 dead birds. Total avian mortality was estimated to be 5,348 birds, including 4,106 greater and lesser scaup.

- **Mammals:**

An estimated 308 muskrats were killed.

- **Amphibians and Reptiles:**

An estimated 78 amphibians and 114 reptiles were killed.

- **Fish:**

228 kg of fish biomass was estimated to have been lost due to oil associated mortality and decreased future production potential.

- **Shoreline Habitats:**

24.9 acres of shoreline were impacted; 10.2 acres received a coating of oil 1 mm or greater, the critical threshold for injury to vegetation and animals.

### **What restoration projects will compensate the public for these injuries?**

Fifty-six restoration projects were initially evaluated as possible projects for compensatory restoration. The Trustees determined that 14 of these projects met the initial screening criteria. Of these projects, four were selected for further evaluation. These four proposed projects best met the restoration criteria set forth by the Trustees under Oil Pollution Act regulations. The proposed projects are designed to restore, replace, or acquire the equivalent of the injured or lost resources through active restoration projects. The proposed projects are:

- Humbug Marsh / Monguagon Creek Bank Habitat Improvements
- Gibraltar Wetland Restoration
- Great Lakes Marsh Restoration
- Pointe Mouillee Wetland Restoration

### **How will these projects be funded?**

Under the Oil Pollution Act, the Responsible Party is liable for the cost of implementing restoration projects, as well as the costs incurred by the Trustees to undertake this damage assessment. After extensive investigation, no Responsible Party has been identified for the 2002 Rouge River Mystery Oil Spill. If no Responsible Party is identified by the time this draft DARP is finalized, the Trustees will submit a restoration claim to the National Pollution Fund Center for restoration funding from the Oil Spill Liability Trust Fund. Administered by the National Pollution Fund Center, these monies are acquired through oil industry taxes and penalties paid by oil spill Responsible Parties. The Oil Spill Liability Trust Fund provides resources for emergency spill response and, for cases in which the Responsible Parties remain unidentified, it provides funding for the assessment, planning, and restoration of spill-related injuries. If the costs of restoration identified in the final DARP are paid from the Oil Spill Liability Trust Fund, any Responsible Party identified in the future shall be held liable for the assessment and restoration costs, plus any associated administrative costs incurred by the Trustees.

## Abbreviations

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Claim	Rouge River Mystery Oil Spill Assessment Claim
Spill	2002 Rouge River Mystery Oil Spill

## Acronyms

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CAA	Clean Air Act
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CWA	Clean Water Act
CZMA	Coastal Zone Management Act
DARP	Damage Assessment and Restoration Plan
DOI	United States Department of the Interior
DRIWR	Detroit River International Wildlife Refuge
DSAY	Discounted Service Acre Years
EA	Environmental Assessment
EFH	Essential Fish Habitat
EIS	Environmental Impact Statement
ESA	Endangered Species Act
FONSI	Finding of No Significant Impact
FWCA	Fish and Wildlife Coordination Act
HEA	Habitat Equivalency Analysis
LAT	Lead Administrative Trustee
LEMP	Lake Erie Metro Park
MDEQ	Michigan Department of Environmental Quality
MDAG	Michigan District Attorney General
MDNR	Michigan Department of Natural Resources
MNFI	Michigan National Features Inventory
NCP	National Contingency Plan
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NOI	Notice of Intent
NPFC	National Pollution Funds Center
NPS	National Park Service
NRDA	Natural Resource Damage Assessment
NREPA	National Resource and Environmental Protection Act
OPA	Oil Pollution Act of 1990
OSHA	Occupational Safety and Health Act
OSLTF	Oil Spill Liability Trust Fund
REA	Resource Equivalency Analysis
RP	Responsible Party
SCAT	Shoreline Cleanup and Assessment Team
SIMAP	Spill Impact Modeling Analysis Package
USCG	United States Coast Guard
USDA	United States Department of Agriculture
USFWS	United States Fish and Wildlife Service

## Common and Scientific Names

Mammals	
Indiana bat	<i>Myotis sodalis</i>
Long-eared bat	<i>Myotis septentrionalis</i>
Mink	<i>Neovison vison</i>
Muskrat	<i>Ondatra zibethica</i>
Raccoon	<i>Procyon lotor</i>
Woodchuck	<i>Marmota monax</i>
Birds	
American coot	<i>Fulica americana</i>
Bald eagle	<i>Haliaeetus leucocephalus</i>
Blue-winged teal	<i>Anas discors</i>
Bonaparte's gull	<i>Larus philadelphia</i>
Broad-winged hawk	<i>Buteo platypterus</i>
Bufflehead	<i>Bucephala albeola</i>
Canada goose	<i>Branta canadensis</i>
Canvasback	<i>Aythya valisineria</i>
Common goldeneye	<i>Bucephala clangula</i>
Common merganser	<i>Mergus merganser</i>
Common tern	<i>Sterna hirundo</i>
Cooper's hawk	<i>Accipiter cooperii</i>
Double-crested cormorant	<i>Phalacrocorax auritus</i>
Dunlin	<i>Calidris alpina</i>
Great blue heron	<i>Ardea herodias</i>
Great egret	<i>Ardea alba</i>
Greater scaup	<i>Aythya marila</i>
Greater yellowlegs	<i>Tringa melanoleuca</i>
Green-winged teal	<i>Anas crecca</i>
Herring gull	<i>Larus argentatus</i>
Hooded merganser	<i>Lophodytes cucullatus</i>
King rail	<i>Rallus elegans</i>
Least bittern	<i>Botaurus lentiginosus</i>
Lesser scaup	<i>Aythya affinis</i>
Lesser yellowlegs	<i>Tringa flavipes</i>
Long-billed dowitcher	<i>Limnodromus scolopaceus</i>
Mallard	<i>Anas platyrhynchos</i>



Osprey	<i>Pandion haliaetus</i>
Peregrine falcon	<i>Falco peregrinus</i>
Pintail	<i>Anas acuta</i>
Red-breasted merganser	<i>Mergus serrator</i>
Redhead	<i>Aythya americana</i>
Ring-billed gull	<i>Larus delawarensis</i>
Ruddy duck	<i>Oxyura jamaicensis</i>
Rufa red knot	<i>Calidris canutus</i>
Sharpshinned hawk	<i>Accipiter striatus</i>
Short-billed dowitcher	<i>Limnodromus griseus</i>
Spotted sandpiper	<i>Actitis macularia</i>
Trumpeter swan	<i>Cygnus buccinator</i>
Tundra swan	<i>Cygnus columbianus</i>
Wood duck	<i>Aix sponsa</i>

#### **Fish**

Black buffalo	<i>Ictiobus niger</i>
Common carp	<i>Cyprinus carpio</i>
Lake sturgeon	<i>Acipenser fulvescens</i>
Lake whitefish	<i>Coregonus clupeaformis</i>
Largemouth bass	<i>Micropterus salmoides</i>
Muskellunge	<i>Esox masquinongy</i>
Northern madtom	<i>Noturus stigmosus</i>
Northern pike	<i>Esox lucius</i>
Pugnose minnow	<i>Opsopoeodus emiliae</i>
Rock bass	<i>Ambloplites rupestris</i>
Smallmouth bass	<i>Micropterus dolomieu</i>
Steelhead trout	<i>Oncorhynchus mykiss</i>
Striped shiner	<i>Luxilus chrysocephalus</i>
Walleye	<i>Stizostedion vitreum</i>
White bass	<i>Roccus chrysops</i>
White perch	<i>Roccus Americana</i>
Yellow perch	<i>Perca flavescens</i>

#### **Reptiles**

Eastern fox snake	<i>Elaphe gloydi</i>
Map turtle	<i>Gratemys geographica</i>
Spotted turtle	<i>Clemmys guttata</i>

**Amphibians**

American toad	<i>Bufo americanus</i>
Bullfrog	<i>Rana catesbeiana</i>
Chorus frog	<i>Pseudacris triseriata</i>
Small-mouthed salamander	<i>Ambystoma texanum</i>

**Invertebrates**

Black sandshell	<i>Ligumia recta</i>
Eastern pond mussel	<i>Ligumia nasuta</i>
Lilliput	<i>Toxolasma parvus</i>
Northern riffleshell	<i>Epioblasma torulosa rangiana</i>
Rayed bean	<i>Villosa fabalis</i>
Snuffbox	<i>Epioblasma triquetra</i>
Threehorn wartyback	<i>Obliquaria reflexa</i>

**Plants**

American lotus	<i>Nelumbo lutea</i>
Arrowhead	<i>Sagittaria montevidensis</i>
Buckthorn	<i>Rhamnus spp.</i>
Bulrush	<i>Scirpus spp.</i>
Common cattail	<i>Typha latifolia</i>
Eastern prairie fringed orchid	<i>Platanthera leucophaea</i>
European frogbit	<i>Hydrocharis morsus ranae</i>
Flowering rush	<i>Butomus umbellatus</i>
Goldenseal	<i>Hydrastis Canadensis</i>
Honeysuckle	<i>Lonicera</i>
Lake sedge	<i>Carex lacustris</i>
Purple loosestrife	<i>Lythium salicaria</i>
Reed canary grass	<i>Phalaris arundinacea</i>
Sullivan's milkweed	<i>Asclepias sullivantii</i>
Wild celery	<i>Vallisneria Americana</i>
Woodland lettuce	<i>Lactuca floridana</i>

## List of Tables

Table 1.	Species of concern believed to inhabit the Rouge and Detroit River watersheds at the time of the 2002 Rouge River Mystery Oil Spill.....	11
Table 2.	Current species of concern which may occur in Rouge and Detroit River watersheds.....	12
Table 3.	Injury assessment for greater and lesser scaup resulting from the 2002 Rouge River Mystery Oil Spill....	19
Table 4.	Injury assessment for birds other than the greater and lesser scaup resulting from the 2002 Rouge River Mystery Oil Spill.....	20
Table 5.	Injury assessment for wildlife (mammals, reptiles, and amphibians) resulting from the 2002 Rouge River Mystery Oil Spill.....	21
Table 6.	Injury assessment for fish resulting from the 2002 Rouge River Mystery Oil Spill.....	22
Table 7.	Estimated area (m <sup>2</sup> ) of each substrate type impacted by different thicknesses of oil and total shoreline effected (m <sup>2</sup> and acres) (Appendix 3 Table 6-2).....	25
Table 8.	Summary of wildlife, fish and habitat injuries, estimated as the interim loss of animals and the equivalent loss of young (Appendix 3: Tables 2 - 4), with compensatory restoration of marsh habitat needed to address each injury. Example compensatory marsh discounted service acre years (DSAYs) are based on the productivity gains from complete restoration of cattail marshes, sedge marshes, or co-dominant cattail-sedge marshes (Appendix 4).....	29
Table 9.	Summary of the initial analyses (Tier 1) of all proposed restoration projects under the criteria proposed in Section 5.2.1. Highlighted projects were retained for Tier 2 analysis.....	32
Table 10.	Evaluation & ranking of Rouge River proposed restoration projects: Each project is numerically ranked (3 = strong; 2 = moderate; 1 = weak; 0 = not applicable) with respect to each Tier 2 evaluation criterion. Highlighted proposed projects were retained for restoration scaling.....	42
Table 11.	Estimated costs to implement and provide project maintenance over the 30 year life of the proposed Humbug Marsh & Monguagon Creek Bank Habitat Improvements Project. Present value calculated by incorporating inflation and return on investment over a 30 year period (Appendix 6).....	47
Table 12.	Estimated costs to implement and provide project maintenance over the proposed 30 year life of the proposed Gibraltar Wetland Restoration Project. Present value calculated by incorporating inflation and return on investment over a 30 year period (Appendix 6).....	50
Table 13.	Estimated costs to implement and provide project maintenance over the proposed 30 year life of the proposed Great Lakes Marsh Restoration Project. Present value calculated by incorporating inflation and return on investment over a 30 year period (Appendix 6).....	52
Table 14.	Estimated costs to implement and provide project maintenance over the proposed 30 year life of the proposed Pointe Mouillee Restoration Project. Present value calculated by incorporating inflation and return on investment over a 30 year period (Appendix 6).....	56
Table 15.	Proposed project scaling information including project overview, amount and type of habitat the project would restore, injury that would be addressed by the project, and discounted service acre years (DSAYs) produced by the proposed restoration. Analysis assumes a 30 year life cycle for each project, inclusive of implementation and maintenance of ecological function.....	59

Table 16. Projected future costs for the Fish and Wildlife Service, acting as Lead Administrative Trustee for the 2002 Rouge River Mystery Oil Spill. Future costs for the Lead Administrative trustee were estimated using the Services NRDA Cost Estimation Tool (CET). Contingency (15%) added as a percentage of present value.....	61
Table 17. Summary of costs to implement the proposed Compensatory Restoration Alternative, consisting of four projects: the Humbug Marsh – Monguagon Creek Restoration; the Gibraltar Wetland Restoration; the Great Lake Marsh restoration; and, Pointe Mouillee Marsh Restoration. Contingency estimated as 15% of estimated present value of project cost. Projects scaled assuming a life cycle of 30 years duration; present value represents the funds needed at initiation, adjusted for inflation and return on investment, to meet future costs.....	63
Table 18. Summary of future Trustee costs related to administration and outcome-based monitoring of the proposed Compensatory Restoration Alternative, consisting of the Humbug Marsh – Monguagon Creek Restoration; the Gibraltar Wetland Restoration; the Great Lake Marsh restoration; and, Pointe Mouillee Marsh Restoration. Contingency estimated as 15% of estimated future costs before inflation. Costs adjusted for inflation (Labor = 1.50%, other costs adjusted by 3.33%). .....	63
Table 19. Examples of types of activities that require a wetlands protection permit.....	69

## List of Figures

Figure 1. Impacted area of the Rouge River Mystery Oil Spill. The color along the shoreline denotes degree of oiling or total hydrocarbon deposition ( $\text{g}/\text{m}^2$ ).....	3
Figure 2. Ruddy duck direct mortality associated with the Spill. Photo: NOAA.....	19
Figure 3. Oiled vegetation and shoreline from the Lake Erie Metropark. Photo: Lisa Williams, USFWS.....	24
Figure 4. Graphic showing the HEA process of injury and restoration scaling represented by discounted service acre years (DSAYs) for NRDA compensation of resources.....	28
Figure 5. Geographic location of restoration projects evaluated by the Trustees for the 2002 Rouge River Mystery Oil Spill. Project names depicted in green represent the four projects that comprise the Compensatory Restoration Alternative evaluated in this draft Damage Assessment and Restoration Plan. The color along the shoreline denotes the degree of oiling or total hydrocarbons resulting from the Spill.....	44
Figure 6. Main land management units of the Pointe Mouillee State Game area.....	55

# Table of Contents

EXECUTIVE SUMMARY .....	I
ABBREVIATIONS .....	III
ACRONYMS.....	III
COMMON AND SCIENTIFIC NAMES .....	IV
LIST OF TABLES .....	VII
LIST OF FIGURES .....	VIII
1.0 INTRODUCTION AND PURPOSE.....	1
1.1. Overview of the Incident .....	2
1.2. Summary of Natural Resource Injuries .....	4
1.3. Summary of Proposed Restoration Projects .....	4
2.0 AFFECTED ENVIRONMENT .....	6
2.1. Physical Environment.....	6
2.1.1. Setting and Climate.....	6
2.1.2. Rouge River .....	7
2.1.3. Detroit River .....	7
2.1.4. Western Lake Erie.....	8
2.2. Biological Environment.....	8
2.2.1. Species of Concern .....	10
2.3. Recreational Services.....	13
3.0 COORDINATION AND COMPLIANCE .....	13
3.1. Federal and State Trustee Agencies .....	13
3.2. Coordination.....	14
3.2.1. Coordination among the Trustees .....	14
3.2.2. Coordination with Response Agencies .....	14
3.2.3. Coordination with the Responsible Party .....	14
3.2.4. Coordination with the Public .....	15
4.0 INJURY QUANTIFICATION .....	16
4.1. Quantification of Injuries .....	16
4.1.1. SIMAP Modeling of Biological Injuries .....	16
4.2. Summary of Injuries .....	17
4.2.1. Birds .....	18
4.2.1.1. Greater and Lesser Scaup.....	18
4.2.1.2. Other Bird Species.....	19
4.2.2. Wildlife: Mammals, Amphibians, and Reptiles .....	21
4.2.3. Fish.....	22
4.2.4. Habitats.....	22
4.2.4.1. Substrate and Invertebrate Injuries .....	23
4.2.5. Recreational Uses.....	25

4.3. Translating Injury to Restoration .....	26
5.0 RESTORATION PLANNING .....	30
5.1. Restoration Strategy .....	30
5.2. Natural Recovery Alternative .....	31
5.3. Restoration Project Selection Criteria .....	32
5.3.1. Tier I Analysis .....	32
5.3.2. Tier 2 Analysis.....	41
5.4. Preferred Restoration Projects.....	46
5.4.1. Humbug Marsh & Monguagon Creek Bank Habitat Improvements .....	46
5.4.2. Gibraltar Wetland Restoration .....	49
5.4.3. Great Lakes Marsh Restoration .....	52
5.4.4. Pointe Mouillee Wetland Restoration .....	54
5.5. Restoration Analysis and Scaling.....	58
5.6. Additional Considerations for Implementation.....	59
5.6.1. Climate Change Project Considerations.....	59
5.7. Summary of Costs .....	61
5.7.1. Project Implementation .....	61
5.7.2. Case and Project Management.....	61
5.7.3. Outcome-based Monitoring.....	63
6.0 COMPLIANCE WITH ENVIRONMENTAL LAW, REGULATION, AND POLICY .....	65
6.1. Federal Laws, Regulation, and Policy .....	65
6.2. State Laws and Regulations .....	69
6.3. Local Laws .....	71
6.4. Policies and Directives .....	71
6.4.1. Federal Policies and Directives.....	71
6.4.2. State and Local Policies .....	73
7.0 REFERENCES.....	74
8.0 PREPARERS .....	78
9.0 APPENDICES .....	80

## 1.0 Introduction and Purpose

The Oil Pollution Act of 1990 (OPA; 33 U.S.C. §§ 2701 *et seq.*), passed by Congress in the wake of the *Exxon Valdez* oil spill, establishes a legal framework and requirements for responding to a discharge of oil into the navigable waters of the United States. Among its provisions, the OPA designates Federal and state natural resource trustees who shall act on behalf of the public to assess natural resource damage resulting from oil spills, and directs the development and implementation of plans for the restoration, rehabilitation, replacement of damaged or injured natural resources under their trusteeship. The OPA also directs the National Oceanic and Atmospheric Administration (NOAA) to develop regulations for conducting natural resource damage assessments (NRDA), and established the Oil Spill Liability Trust Fund (OSLTF) to pay the costs of assessing and restoring natural resource damage in the event the party (or parties) responsible for an oil spill were unwilling or unable to pay such costs.

This draft Damage Assessment and Restoration Plan (DARP) has been prepared by the Rouge River 2002 Mystery Oil Spill Trustee Agencies (Trustees), working with Lighthouse Technical Consultants, Inc. and Applied Science Associates, Inc. It has been completed in accordance with the OPA and the associated NRDA regulations at 15 CFR Part 990. The Trustees consist of the United States Department of the Interior through the U.S. Fish and Wildlife Service (USFWS) and the State of Michigan through the Michigan Department of Natural Resources (MDNR), the Michigan Department of Environmental Quality (MDEQ), and the Michigan Department of the Attorney General (MDAG). These agencies are the duly designated natural resource Trustees under the OPA for their respective jurisdictions. By agreement of the Trustees, the USFWS serves as the Lead Administrative Trustee (LAT) for the Rouge River 2002 Mystery Oil Spill.

The purpose of this DARP is to assess, document, and quantify natural resource injury arising from the 2002 Rouge River Mystery Oil Spill (Spill) and to promulgate a plan for appropriate resource restoration. The goal of restoration is to make the public and the environment whole for natural resource injury and to recover lost services, such as recreational opportunity, resulting from the incident. Restoration will be accomplished by returning injured natural resources and lost services to their baseline condition, the condition they would have been in had the spill not occurred, and by compensating the public for the interim loss of resources and services. To achieve this goal, the Trustees are authorized to restore, rehabilitate, replace, or acquire the equivalent of the damaged natural resources.

The Trustees are seeking public comment on this draft DARP. Comments may be submitted in writing or via e-mail to the U.S. Fish and Wildlife Service during the 30-day public comment period which will begin with the publication of this draft DARP. Availability of the draft DARP will be announced via e-mail using a mailing list compiled for the Detroit River International Wildlife Refuge, by press release provided to local media, and provided on the website of the U.S. Fish and Wildlife Service (<http://www.fws.gov/midwest/es/ec/nrda/RougeRiver/index.html>). The Trustees will consider public comment in preparing and issuing the final DARP for the 2002 Rouge River Mystery Oil Spill.

The Trustees conducted damage assessment and restoration planning activities in accordance with the 2002 Rouge River Mystery Oil Spill Assessment Claim (Assessment Claim; Appendix 1) and the related regulations at 15 CFR Part 990. The United States Environmental Protection

Agency (USEPA), MDEQ, USCG, and the United States Attorney's Office investigated the April 2002 Spill for over two years following the Spill. Investigation of all leads and possible sources for the Spill did not develop sufficient evidence to charge a Responsible Party (RP) or parties, and no party has acknowledged responsibility for the spill. Authorities attempting to identify an RP have closed their investigation, pending receipt of new information. Because no RP has been identified, Trustees submitted the Assessment Claim directly to the U.S Coast Guard's National Pollution Funds Center (NPFC), which administers the OSLTF, rather than presenting it to an RP. In 2006, the NPFC approved the Trustees' Assessment Claim for funding from the OSLTF.

## **1.1. Overview of the Incident**

The Rouge River Mystery Oil Spill was the result of multiple discharges of mixed oils from one or more outfalls into the Rouge River in April of 2002 to which multiple agencies responded.

On April 9, 2002, the USCG was notified of an oil spill in the Rouge River near Detroit, Michigan. The Rouge River is a tributary of the Detroit River. The Detroit River flows from Lake Saint Clair southward to Lake Erie. On April 10, 2002, over-flights and observations identified oil on the surfaces of the Rouge and Detroit Rivers and western portions of Lake Erie. Oil was observed along three miles of the Rouge River from Dix Street Bridge to the Detroit River. Seventeen miles of oil was observed in and along the Detroit River from the Rouge River mouth into western Lake Erie, impacting both U.S. and Canadian waters and shorelines (Figure 1). Since no RP was identified, the USCG accessed the OSLTF to support spill response operations. The USCG informed Canada of the oil spill and coordinated response operations with their counterparts in Canada. Collection and containment booms were placed across the mouth of the Rouge River. Vessel traffic was restricted in the Rouge and Detroit Rivers by the USCG to allow oil collection and containment.

Response agencies, including USCG, NOAA, and the USEPA, collected source oil samples and sent them to their respective laboratories for chemical analysis. Laboratory analyses determined that the source oil appeared to be a mixture of diesel fuel and used motor oil at a ratio of 5:1 (Allen, 2002). Based on the composition of the source oil, vessel traffic information was gathered and vessels in the vicinity of the Spill at the time of the initial spill report were investigated. Outfalls along the Rouge River were also identified and investigated.

On April 13, 2002, an additional discharge of oil was reported in the same location as the April 9 event. This discharge is believed to have occurred on the night of April 12, 2002. Sample analysis confirmed this oil as a match to the oil released during the April 9 oil spill (Weston, 2006). Booming operations already in place on the Rouge River are believed to have contained the majority of the oil from the second spill. A vacuum truck was used to remove free floating oil and cranes removed oiled debris. The shoreline was cleaned using a high volume deluge system. These actions helped to recover the bulk of the oil released during the second spill (Allen, 2002). The USEPA estimated that a total of 322,820 gallons of mixed diesel and waste lubricating oil was released during the two discharges (Allen, 2002). The USCG estimated that recovery efforts removed 66,359 gallons of emulsified oil. Oiled plant materials were removed manually along the U.S. shorelines. Response and cleanup efforts continued through May 3, 2002, at which time the Rouge River was opened to 24-hour continuous operations.



Since there was no vessel traffic on the Rouge River during the second discharge, the source investigation shifted to identifying possible RPs with ties to outfalls and combined sewer outfalls. After extensive investigations, the Spill was believed to be the result of illegal dumping into a nearby sewer system. Increased sewer flow associated with heavy rain caused discharge of the oil mixture into the Baby Creek outfall, a tributary of the Rouge River (Figure 1). No source of the Spill or RP was subsequently identified.

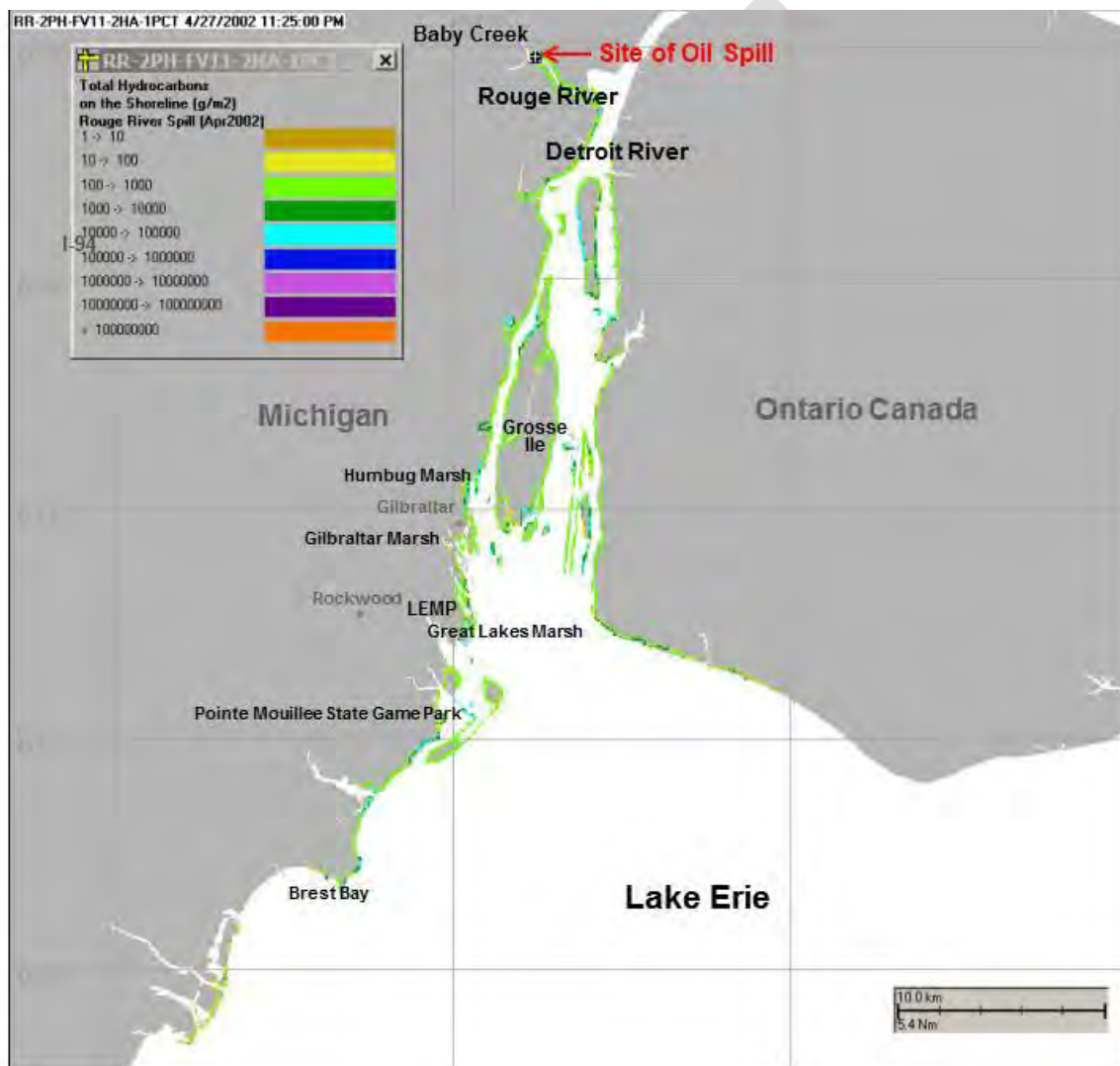


Figure 1. Impacted area of the Rouge River Mystery Oil Spill. The color along the shoreline denotes degree of oiling or total hydrocarbon deposition ( $\text{g/m}^2$ ).

## 1.2. Summary of Natural Resource Injuries

The following is a summary of natural resource injury estimates for animals and their associated habitats. Methodology used for these determinations will be further detailed in Section 4.0 and Appendix 3.

- **Birds:**  
Investigators recovered 11 dead birds. Total avian mortality was estimated to be 5,348 birds, including 4,106 greater and lesser scaup.
- **Mammals:**  
An estimated 308 muskrats were killed.
- **Amphibians and Reptiles:**  
An estimated 78 amphibians and 114 reptiles were killed.
- **Fish:**  
228 kg of fish biomass was estimated to have been lost due to oil associated mortality and decreased future production potential.
- **Shoreline Habitats:**  
24.9 acres of shoreline were impacted; 10.2 acres received a coating of oil 1 mm or greater, the critical threshold for injury to vegetation and animals.

Though there is certainty regarding some loss of public use associated with the 2002 Rouge River Mystery Oil Spill, the available quantitative information is insufficient to produce robust estimates of lost public use of resources impacted by the Spill (Discher et al., 2009). Therefore, the Trustees have chosen to limit damage assessment to consideration of the natural resource injuries noted above.

## 1.3. Summary of Proposed Restoration Projects

The Trustees' authority under OPA (33U.S.C 2706(b)) is to make the environment and public whole for injuries sustained from an oil spill. This is achieved through the restoration, rehabilitation, replacement, or acquisition of equivalent natural resources or services. For a project to be considered there must be a connection between the injuries to the natural resources and the proposed restoration actions.

Restoration actions under OPA are classified as either primary or compensatory. Primary restoration actions are actions which accelerate the return of injured natural resources and related services to their baseline condition. Baseline condition is defined as the condition natural resources would have been in if the oil spill had not occurred. The Trustees may decide to rely on natural recovery if active restoration is not feasible or cost-effective, or if injured resources recover relatively quickly without intervention.

Compensatory restoration is any action taken to compensate for interim losses of natural resources and related services pending the restoration of the resources to baseline conditions. The scale or amount of the compensatory restoration depends upon the severity of the resource injury and how quickly a resource and the associated service return to baseline conditions. In

this case, the Trustees determined that response actions and natural recovery were able to achieve primary restoration. Given the degree and type of injuries which occurred due to the Spill (Section 4.0), the Trustees further determined that compensatory restoration was warranted to make the public whole for lost resources.

The Trustees collected ideas and proposals for 56 projects for initial evaluation. Of these projects, the Trustees identified 14 projects as potential restoration alternatives (Appendix 2). Trustees evaluated these projects for their potential to provide compensatory restoration for natural resource injury caused by the Spill; evaluation of the restoration alternatives are detailed in Section 5.0 of the DARP. Based on criteria developed by the Trustees under OPA regulations at 15 CFR Part 990, four wetland restoration projects are presented as the proposed alternative for compensatory restoration based, in part, on the ability of these projects to address multiple resource injuries. In accordance with OPA regulations, these four proposed projects have been “scaled” in size, such that the benefit of the restoration offsets the injuries caused by the Spill. These wetland restoration projects are expected to cumulatively address all injured wildlife and habitat over time. More details on the projects are provided in Section 5.3 and Appendix 2. Public comment will be considered prior to the finalization of the DARP and project-specific restoration plans. Summaries of the proposed restoration projects are provided below.

#### ***Humbug Marsh/Monguagon Creek Bank Habitat Improvements***

Humbug Marsh habitat improvements and invasive species control would restore and protect over 100 acres of vital marsh habitats designed to promote wildlife recovery. Rehabilitation and stabilization of 2,200 linear feet of frontage along Monguagon Creek would provide erosion control for the creek and associated wetland habitat, while restoring native riparian forest habitat. This project also includes invasive species management over the 30 year duration of the project.

#### ***Gibraltar Wetland Restoration***

This project would provide invasive species management within 70 acres of marsh habitats in the Detroit River International Wildlife Refuge. A hydrology survey will provide managers with knowledge needed for best management practices of this vital habitat. Invasive species management would occur over the 30 year duration of the project.

#### ***Great Lakes Marsh Restoration***

This project would support continued management of invasive plants within 350 acres of emergent marsh and provide invasive species management for an additional 63 acres of coastal marsh edge, Lake Erie shoreline, and interspersed lakeplain prairie habitats. Invasive species management would occur over the 30 year duration of the project.

#### ***Pointe Mouillee Wetland Restoration***

This project would enhance, restore, and provide for invasive species management on up to 925 acres of wetlands associated with the Pointe Mouillee State Game area for 30 years. This project would also include the replacement of an aging pump system and repair of hydrologic control structures to more effectively manage water levels and allow better management of native plants and control of invasive species.

## **2.0 Affected Environment**

This section presents a brief description of the physical and biological environment affected by the Spill with a focus on the areas proposed for restoration actions. The Rouge River, located in southeastern Michigan, flows for 127 miles from its headwaters near Rochester Hills, in Oakland County, through suburban and urban Wayne and Washtenaw Counties terminating at the Detroit River in the town of River Rouge, Michigan. The Detroit River flows for 24 miles from Lake St. Clair through the Detroit, Michigan and Windsor, Ontario metropolitan areas and terminates in western Lake Erie. While portions of this area, particularly along the Rouge River, have been altered by human activity and industrialization, many ecologically diverse areas remain. Emergent marshes along the Detroit River and western Lake Erie provide important habitat for a wide variety of fish and wildlife species and support numerous recreational opportunities. Due to the importance of this area to natural resource conservation, several parks and refuges have been created to protect these vital habitats. These include the Detroit River International Wildlife Refuge (DRIWR), Pointe Mouillee State Game Area, and Lake Erie Metropark (LEMP), among others.

Although the Spill considered in this DARP has affected habitats and resources within Canada, regulations related to the administration of the OSLTF limit the Trustees to consideration of resources within the jurisdiction of the United States. Therefore, this DARP does not address resources and habitats in Canada impacted by the Spill.

### **2.1. Physical Environment**

#### **2.1.1. Setting and Climate**

The Rouge River is tributary to the Detroit River, which is a major connecting waterway between Lake Huron and Lake Erie in the Laurentian Great Lakes. The surface geology in the lower part of the Rouge River and Detroit River watersheds consists primarily of sands and clays laid down in glacial lakes (Beam and Braunscheidel, 1998). The area along the shoreline of the western basin of Lake Erie is relatively shallow with sandy and clay soils which support coastal marshes.

The Rouge River watershed receives an average of 30 inches of rainfall annually (Beam and Braunscheidel, 1998, citing Michigan State University, Center for Remote Sensing). Snow contributes roughly 10 to 15% of annual precipitation in the watershed; seasonal distribution of precipitation is fairly even, with no prominent wet and dry seasons within the state or the watershed (Eichenlaub et al. 1990).

A number of climate-related changes have already been observed in the Great Lakes region, including increases in annual temperatures, increases in summer extreme heat events, increases in the duration of the growing season, shifts in the timing and type of precipitation, increases in intensity of precipitation events, and decreases in the amount and duration of snow cover and lake ice formation (Kling et al., 2003; Hayhoe et al., 2010; NOAA, 2011).

In the future, climate change is expected to affect the region in multiple ways. Various climate change predictions depend on different estimated rates of emissions over time, uncertainty in underlying relationships and various feedback loops, and different assumptions about other model inputs. However, scientists consistently estimate that Michigan will likely experience higher temperatures and increased winter and spring precipitation in the future (Kling et al., 2003; Hayhoe et al., 2010; NOAA, 2011). Summers are expected to be hotter and drier. Models predict that summers in Michigan will feel progressively more like summers experienced by states to the southwest, e.g. similar to Missouri in 30 to 40 years (Hayhoe et al., 2010). Although precipitation is expected to increase over time, Michigan is expected to experience more of its precipitation as rainfall and less as snow (Hayhoe et al., 2010; NOAA, 2011). Between 1961 and 1990, Michigan averaged more than 45 days with snowfall events each year. By the end of the 21st century, snow days are expected to drop to approximately 20 to 30 days per year, depending on emissions (Hayhoe et al., 2010).

### **2.1.2. Rouge River**

The portion of the Rouge River impacted by the oil spill is highly industrialized. Man-made channelization of the Rouge River has created an important waterway for shipping to the Great Lakes. Recreational activities and wildlife use are both limited.

### **2.1.3. Detroit River**

#### *Detroit River International Wildlife Refuge*

In 2001, the DRIWR was established as a result of the binational efforts of politicians, conservation leaders, and local communities to build a sustainable future for the Detroit River and western Lake Erie ecosystems. Because of this collaboration, international status was given to the refuge, making it the first of its kind in North America. At the time of the Spill, DRIWR consisted of approximately 380 acres. Currently, the DRIWR encompasses nearly 6,000 acres that include islands, coastal wetlands, marshes, shoals, and waterfronts extending along 48 miles of shoreline. The DRIWR is located at the intersection of the Atlantic and Mississippi flyways. Waterfowl migrating between summer and winter ranges rely on the area's marshes for resting and foraging. Recreational opportunities include hunting, fishing, hiking and wildlife viewing.

#### *Humbug Marsh*

Humbug Marsh is a wetland along the Detroit River at the boundary between Trenton and Gibraltar, Michigan. The 410 acre parcel was acquired by the DRIWR in 2004. Humbug Marsh represents the last mile of undeveloped shoreline along the U.S. mainland of the Detroit River and contains important habitat for many fish and wildlife species. The site was designated as Michigan's only "Wetland of International Importance" by the Ramsar Convention on Wetlands in 2010 due to its high biodiversity and rare habitats. In the Detroit River watershed, 97% of pre-settlement wetlands have been lost (Manny, 2007), making the Humbug Marsh and its associated lands especially valuable. Unfortunately, invasive plant species, primarily common reed (*Phragmites*), now dominate the marsh, displacing more ecologically valuable natives such as lake sedge and common cattail, thereby lessening the quality of the marsh. Waterfowl hunting by the public is now permitted within the marsh, but the marsh was in private ownership at the time of the Spill.

### *Gibraltar Wetland*

Acquired by the DRIWR in 2010, the Gibraltar Wetland is a 360 acre wetland located within a half a mile of the Humbug Marsh. Together, the two wetlands comprise 770 acres of nearly uninterrupted marsh habitat. As with the Humbug Marsh, this area has been invaded by non-native plant species which have reduced the quality of the habitat available for the numerous fish and wildlife species which rely on the marsh. The Gibraltar Wetlands Unit is situated adjacent to the Gibraltar Carlson High School and is now frequently used by the school's Wetlands Science classes via special use permit.

## **2.1.4. Western Lake Erie**

### *Lake Erie Metropark*

LEMP encompasses 1,600 acres of diverse habitat in the Detroit suburbs of Gibraltar and Rockwood, Michigan. LEMP is owned and managed by the Huron-Clinton Metroparks system, a regional park system in Detroit. Numerous lakes, river backwaters, and coastal wetlands make up this park with nearly three miles of shoreline along the Detroit River and western Lake Erie. The undeveloped marshes found at LEMP support a diverse wildlife community and are important migratory habitats for waterfowl and various bird species. As with other marshes along western Lake Erie, invasive species such as phragmites, flowering rush, and European frogbit have limited the diversity of the marsh, thereby reducing habitat quality. Other areas within the park are highly developed and heavily utilized by the public. Recreational opportunities include boating, fishing, and wildlife viewing.

### *Pointe Mouillee State Game Area*

This state game area is located on a spit of land that projects into Lake Erie by the mouth of the Huron River near the towns of Rockwood and Gibraltar, Michigan. The area encompasses nearly 4,000 acres of diverse habitat and is owned and managed by the Michigan Department of Natural Resources. Pointe Mouillee is one of the largest fresh water marsh restoration projects in the world and consists of wetlands, diked marshes, and river bayous. Infrastructure to manipulate marsh hydrology, including hydraulic pumps, culverts, dikes, and gates, allows management of the marsh for optimal habitat, while providing control of exotics such as phragmites. The ongoing restoration project has created valuable habitat for a diverse wildlife community and provides important migratory habitat for numerous species of waterfowl and birds. The area provides various recreational activities including hiking, wildlife viewing, and waterfowl hunting.

## **2.2. Biological Environment**

### *Habitats*

The heavily industrialized and altered riverbanks of the lower Rouge River gradually progress into the rich wetland habitats of the lower Detroit River and western Lake Erie. Over 90 native plant species are known to occur within the Humbug Marsh complex alone. This area still has some of its pre-settlement character, despite the pressures of development, influx of invasive plants, and other ecosystem alterations (Reznicek et al., 2005). The open waters of the Detroit River have wild celery beds which provide foraging habitat for waterfowl. Coastal wetlands throughout the Detroit River and western Lake Erie, which were once dominated by ecologically

valuable plants such as bulrushes, native grasses, and cattails, have recently been invaded by species such as phragmites, purple loosestrife, and reed canary grass. Two subspecies of phragmites (*Phragmites australis*) occur in Michigan: the native subspecies *P. a. americanus* and the introduced subspecies *P. a. australis*. Due to the aggressive growth of the introduced subspecies, it is frequently found in ditches, urban wetlands, and other disturbed habitats (Reznicek et al., 2011). Phragmites, along with other invasives, has encroached into the marshes of the Detroit River and western Lake Erie and significantly reduced overall habitat diversity and quality.

### *Birds*

The wetlands of the Detroit River and western Lake Erie host a diverse assemblage of birds that includes over 300 species. Major species groups include 30 species of waterfowl, 23 species of raptors, and 31 species of shorebirds. Waterfowl make up a prominent component of the bird community along the Detroit River and western Lake Erie. More than 3 million waterfowl migrate through the Great Lakes area annually. Important game species such as canvasbacks, common goldeneye, redhead, greater and lesser scaup and mergansers (common, hooded and red breasted) utilize this habitat for feeding and resting during their migrations. Wood ducks, mallards, and blue-winged teal nest in these marshes. Raptors such as the sharp-shinned hawk, broad-winged hawk, osprey, and Coopers hawk also rely on the marshes during their migration. Bald eagles now nest regularly within the impacted area. Numerous shorebirds and wading birds, including great blue herons, spotted sandpipers, and short and long billed dowitchers, feed upon the invertebrates and forage fish of the marshes. Consequently, the Lake Erie shoreline has been named a Site of Regional Shorebird Importance in the Western Hemispheric Shorebird Reserve Network. Other bird species that utilize this area during the spring and summer months include various songbirds and belted kingfishers.

### *Mammals*

Mammal species found in the Detroit River and western Lake Erie area include marsh animals such as the mink, muskrat, and raccoon. These marshes provide excellent habitat for these and other species.

### *Fish*

Over 51 species of native fish can be found in and around the marshes of western Lake Erie and the Detroit River (MDNR unpublished data, 2006). Wetland vegetation and shallow waters of these coastal marshes provide refugia for numerous species of minnows and chubs including the state threatened striped shiner and state endangered pugnose minnow. Forage fish inhabit these shallows providing a food source for a wide range of birds and wildlife. Important sport fish such as the yellow perch and muskellunge utilize these areas for spawning and as nurseries (Goodyear et al., 1982). It is estimated that 10% of the walleye population of Lake Erie uses the rocky substrates of the Detroit River to spawn. The young walleye remain in the shallow waters utilizing the wetland vegetation of the coastal marshlands as a nursery (Francis, 2005). Lake whitefish and the lake sturgeon, a state threatened species, also utilize the rocky substrates within the Detroit River for spawning. Opportunities for fishing are abundant throughout the area; sport fisheries include rockbass, smallmouth bass, walleye, white bass, and white perch among other species.

### *Invertebrates*

Invertebrate populations are a vital part of the marsh community in and around the Detroit River and western Lake Erie. A rich assemblage of invertebrates acts as the base of the food web. Species include the Federal and state endangered northern riffleshell mussel. Twelve species of damselflies and 25 species of dragonflies can be found in these marshes. Many of these species are regionally rare.

### *Amphibians and Reptiles*

Amphibians and reptiles which inhabit the marshes of the affected area are diverse and represented by over 25 species. A number of these species are recognized within the DNR Michigan Wildlife Action Plan as Species of Greatest Conservation Need. Among these are state threatened species such as the eastern fox snake, spotted turtle, and small-mouthed salamander. In addition to these rare species, common species such as the chorus frog, bullfrog, and map turtle inhabit these marshes.

## **2.2.1. Species of Concern**

The Migratory Bird Treaty Act (MBTA) of 1918 (16 U.S.C. §§ 703–712) provides protection for all migratory birds, their eggs, nests, and feathers, and prohibits the taking, killing, or possession of migratory birds. The DOI, acting through the USFWS, has trusteeship for birds protected under the MBTA, including all migratory birds impacted by the Spill. Birds recovered during spill response included nine individuals protected under the MBTA; an additional two mortalities of birds protected under the MBTA was reported to the Service. Mortality estimates for bird guilds affected by the Spill are presented in section 4.2.1.

The Endangered Species Act (ESA) of 1973 (16 U.S.C. Section 1531 *et seq.*) and the Michigan Natural Resources and Environmental Protection Act (NREPA) of 1994, Public Act 451, Part 365, Endangered Species Protection, direct the protection and conservation of fishes, plants, and wildlife designated as either federally or state threatened or endangered species, respectively. Consequently, state and Federal agencies dedicate significant resources to the conservation and protection of these species and their associated habitats. For the purposes of the DARP, species that are state or federally listed, as either threatened or endangered, are referred to herein as species of concern.

No species of concern were documented among those collected as dead during the response to Spill; however, several are known to occur, or have historically inhabited, the Rouge and Detroit River watersheds and may have been injured. For example, the remains of the previous year's growth of the American lotus, a state threatened plant species, were found heavily oiled as a result of the Spill. Evidence of oiled seed pods was also noted. Oiling may have impacted growth and propagation of this and other plant species. Additionally, the lake sturgeon, a state threatened fish species, while not directly oiled, may have exhibited altered behavior during its critical spawning period. Radio-tagged sturgeon that had entered the Detroit River to spawn, returned back to Lake Erie during the Spill (unpublished data). They later returned to the Detroit River. The impact of the Spill on these fish and their spawning remain unknown. Table 1 identifies the species of concern which may have inhabited the impacted area at the time of the Spill. Since the Spill, additional species which are known to occur within, or have historically



inhabited, the area affected by the Spill, have been listed as species of concern (Table 2). These species may require additional consideration during restoration planning and implementation. Additionally, the bald eagle has been delisted since the Spill.

Numerous recreationally and commercially valuable fish species can be found in the area affected by the Spill. These species include:

**Fish:** Muskellunge, Northern pike, Steelhead trout, Walleye, Whitefish, and Yellow perch  
**Waterfowl:** Blue-wing teal, Canvasback, Green-wing teal, Pintail, and Redhead

Table 1. Species of concern believed to inhabit the Rouge and Detroit River watersheds at the time of the 2002 Rouge River Mystery Oil Spill.

Common Name	Scientific Name	Status
<b>Invertebrates</b>		
Northern riffleshell	<i>Epioblasma torulosa</i>	Federal and State Endangered
<b>Fish</b>		
Lake sturgeon	<i>Acipenser fulvescens</i>	State Endangered
Striped shiner	<i>Luxilus chrysocephalus</i>	State Threatened
Pugnose minnow	<i>Opsopoeodus emiliae</i>	State Endangered
<b>Amphibians</b>		
Small-mouthed salamander	<i>Ambystoma texanum</i>	State Threatened
<b>Reptiles</b>		
Spotted turtle	<i>Clemmys guttata</i>	State Threatened
Eastern fox snake	<i>Pantherophis gloydi</i>	State Endangered
<b>Birds</b>		
Bald eagle	<i>Haliaeetus leucocephalus</i>	Federal and State Endangered
Common tern	<i>Sterna hirundo</i>	State Threatened
Osprey	<i>Pandion haliaetus</i>	State Threatened
<b>Plants</b>		
American lotus	<i>Nelumbo lutea</i>	State Threatened

Table 2. Current species of concern which may occur in Rouge and Detroit River watersheds.

Common Name	Scientific Name	Status
<b>Invertebrates</b>		
Northern riffleshell	<i>Epioblasma torulosa</i>	Federal and State Endangered
Rayed bean	<i>Villosa fabalis</i>	Federal and State Endangered
Snuffbox	<i>Epioblasma triquetra</i>	Federal and State Endangered
Threehorn wartyback	<i>Obliquaria reflexa</i>	State Endangered
Lilliput	<i>Toxolasma parvus</i>	State Endangered
Black sandshell	<i>Ligumia recta</i>	State Endangered
Eastern pondmussel	<i>Ligumia nasuta</i>	State Endangered
<b>Fish</b>		
Northern madtom	<i>Noturus stigmosus</i>	State Endangered
Lake sturgeon	<i>Acipenser fulvescens</i>	State Endangered
Pugnose minnow	<i>Opsopoeodus emiliae</i>	State Endangered
<b>Amphibians</b>		
Small-mouthed salamander	<i>Ambystoma texanum</i>	State Endangered
<b>Reptiles</b>		
Spotted turtle	<i>Clemmys guttata</i>	State Threatened
Eastern fox snake	<i>Pantherophis gloydi</i>	State Threatened
<b>Birds</b>		
Rufa red knot	<i>Calidris canutus</i>	Federal Threatened
Common tern	<i>Sterna hirundo</i>	State Threatened
Peregrine falcon	<i>Falco peregrinus</i>	State Endangered
Least bittern	<i>Botaurus lentiginosus</i>	State Threatened
King rail	<i>Rallus elegans</i>	State Endangered
<b>Mammals</b>		
Indiana bat	<i>Myotis sodalis</i>	Federal and State Endangered
Northern long-eared bat	<i>Myotis septentrionalis</i>	Federal Threatened
<b>Plants</b>		
Eastern prairie fringed orchid	<i>Platanthera leucophaea</i>	Federal and State Threatened
Arrowhead	<i>Sagittaria montevidensis</i>	State Threatened
Woodland lettuce	<i>Lactuca floridana</i>	State Threatened
Sullivant's milkweed	<i>Asclepias sullivantii</i>	State Threatened
Goldenseal	<i>Hydrastis canadensis</i>	State Threatened
American lotus	<i>Nelumbo lutea</i>	State Threatened

## **2.3. Recreational Services**

The area impacted by the Spill is in a highly urbanized location and offers numerous recreational activities to regional communities. Several urban parks including the LEMP, DRIWR, and Point Mouillee State Game Area are present along the shorelines of the Detroit River and western Lake Erie. These public areas provide recreational opportunities including fishing, hunting, hiking and boating. Fishing for pike, muskellunge, smallmouth and largemouth bass, and perch are popular in and among the streams and marshes of the parks. Fall migration of waterfowl, songbirds, and birds of prey bring opportunities for hunting, wildlife viewing, and photography. Visitor and educational centers, as well as hiking trails, further enrich the public's use of the impacted area.

## **3.0 Coordination and Compliance**

### **3.1. Federal and State Trustee Agencies**

Pursuant to section 1006(b) of OPA (33 U.S.C. § 2706(b)), the following agencies have been designated as Trustees for natural resources that were impacted by the Spill: the United States Department of the Interior, acting through the USFWS (website:<http://www.fws.gov>) and the State of Michigan acting through the MDNR, MDEQ, and MDAG. The USFWS invited the Department of Commerce, acting through the National Oceanic and Atmospheric Administration (NOAA), to consider their trusteeship for the Spill. NOAA deferred to the USFWS, preferring to act as consultants to the Trustees, if needed. The Trustees are responsible for assessing the damages to natural resources that have resulted from the Spill, developing a plan for the restoration of the injured resources, and pursuing funding from responsible parties, if identified, for implementation of that plan. The USFWS is the Lead Administrative Trustee (LAT) for this incident. The LAT was selected by the Trustees to coordinate the NRDA.

While the Spill was observed to have impacted Canadian coastline, Canada has not contacted the Trustees regarding a claim for possible injuries to its natural resources as a result of the Spill. Pursuant to the OPA, Canada would be considered a foreign claimant and, in addition to the other requirements of the OPA, would need to satisfy the requirements of 33 U.S.C. § 2707. The Trustees do not have the authority to make claims for injuries which occurred in Canada.

The Trustees have determined, pursuant to 15 CFR § 990.41, that they have jurisdiction to pursue restoration under OPA for the 2002 Rouge River Mystery Oil Spill. Specifically:

1. The discharges of oil products into a navigable waterway (Rouge River, Detroit River, and Lake Erie) constitute an incident under the OPA, as defined at 15 CFR § 990.30.
2. The discharges were not permitted under Federal, state, or local law.
3. The discharges were not from a public vessel.
4. The discharges were not from an onshore facility subject to the Trans-Alaska Pipeline Authority Act, 43 U.S.C. § 1651, *et seq.*
5. Natural resources under the trusteeship of the Trustees may have been injured as a result of the Spill.

The Trustees have determined, pursuant to 15 CFR § 990.42(a), that the necessary conditions prerequisite to restoration planning have been met. Specifically:

1. Injuries to natural resources, as defined at 15 CFR § 990.30, have resulted or are likely to have resulted from the Spill.
2. Response actions have not adequately addressed the injuries resulting from the Spill.
3. Feasible primary and/or compensatory restoration actions exist to address the potential injuries.

## **3.2. Coordination**

### **3.2.1. Coordination among the Trustees**

Federal regulations concerning the OPA provide that where an oil spill affects the interests of multiple Trustees, they should act in coordination to ensure full restoration occurs without double recovery (15 CFR § 990.14(a)). The Trustees in this Spill have worked together to determine the full extent of resource injuries and to identify the appropriate restorative actions that are required to make resources and the public whole. The USFWS is serving as the LAT, pursuant to 15 CFR § 990.14(a).

### **3.2.2. Coordination with Response Agencies**

Pursuant to 15 CFR § 990.14(b), the Trustees coordinated with state and Federal response agencies in a manner consistent with the National Contingency Plan (NCP). The NCP may be accessed at: <http://www2.epa.gov/emergency-response/national-oil-and-hazardous-substances-pollution-contingency-plan-ncp-overview>.

The USFWS provided technical assistance to the USCG during the spill response. This included documenting locations and occurrences of wildlife observed to be oiled and killed, suggesting deterrence measures to prevent additional wildlife from being oiled, arranging for rehabilitation of live oiled wildlife, planning for vegetation removal, and other actions to reduce ongoing exposure to oil. Information gained from these efforts was subsequently used by the Trustees in the NRDA.

### **3.2.3. Coordination with the Responsible Party**

The NRDA regulations (15 CFR §990.14(c)) require that Trustees invite responsible parties to participate in the NRDA, to document in the administrative record and the DARP the invitation to the RP to participate, and to briefly describe the nature and extent of the RP's participation.

The USEPA, MDEQ, USCG, and the United States Attorney's Office investigated the April 2002 Rouge River Mystery Oil Spill for over two years. Over 200 samples were collected and analyzed between April 2002 and late June 2002 alone. Despite the intensive investigation of all leads and possible sources for the Spill, sufficient evidence was not developed to charge a RP or parties, and no party has acknowledged responsibility for the Spill. Having exhausted all known leads, the investigation has closed pending receipt of new information (Appendix 1).

Consequently, no RP has had a role or participated in restoration planning for the 2002 Rouge River Mystery Spill. Accordingly, the Trustees shall submit this restoration claim to the NPFC for payment, in accordance with the OPA and the damage assessment regulations at 15 CFR § 990. If the costs of restoration, as described in the Final DARP, are paid from the OSLTF, any RP that is identified in the future shall be held liable for assessment and restoration cost recovery plus the government's administrative costs incurred, pursuant to all applicable laws and regulations.

### **3.2.4. Coordination with the Public**

On December 28, 2005, the USFWS notified the public of their request to seek funds to assess injuries incurred due to the Spill by issuing a press release. Newspapers including the Detroit News Herald (February 5, 2006), Detroit Free Press (February 7, 2006), and the Detroit News (February 10, 2006) published the release. Notices were sent to over 350 individuals and organizations which were part of a DRIWR mailing list as well as over 100 individuals from the mailing list of the Friends of the Detroit River. These same individuals and groups were provided the Notice of Intent to Conduct Restoration Planning. This was posted to the USFWS website and posted to the Marine Incidents webpage. All notices can currently be found at: <http://www.fws.gov/midwest/es/ec/nrda/RougeRiver/index.html>.

The Trustees also coordinated with numerous groups for public input on the restoration planning process including the City of Detroit, City of Dearborn, Huron/Clinton Metro Authority, Wayne County, Henry Ford Estate, Ducks Unlimited, United States Geological Survey, Friends of the Rouge, Detroit River Canadian Cleanup, The Nature Conservancy, and Friends of Detroit River. OPA Section 1006(c)(5) requires that restoration plans be developed and implemented only after adequate public notice, opportunity for a hearing, and consideration of all public comment. The NRDA regulations further require that the Final DARP include responses to public comments on the Draft DARP, as applicable.

The Trustees are providing the public an opportunity to comment on this Draft DARP, in writing, during a 30-day public comment period commencing on the date of release of this Draft DARP. Once the public review is complete, all public comments received will be reviewed and considered, and any appropriate responses and/or changes to the Draft DARP in response to public comments will be incorporated into the Final DARP.

The Draft DARP can be viewed on the USFWS website that is dedicated to the 2002 Rouge River Mystery Oil Spill (<http://www.fws.gov/midwest/es/ec/nrda/RougeRiver/index.html>). Members of the public who wish to submit their comments in writing, should forward those comments to the USFWS at:

Dr. Clark McCreedy  
U.S. Fish and Wildlife Service  
East Lansing Field Office  
2651 Coolidge Road, Suite 101  
East Lansing, MI 48823  
Phone: (517) 351-8273  
Email: [clark\\_mccreedy@fws.gov](mailto:clark_mccreedy@fws.gov)

To assist the work of the Trustees, comments should be as specific as possible and should be relevant to the assessment of damage and the effort to recover resources injured as a result of the 2002 Rouge River Mystery Oil Spill.

## **4.0 Injury Quantification**

The overall goal of injury assessment under the OPA is to delineate the nature and extent of any injuries to natural resources and resource services resulting from a discharge of oil or spill response. This information is necessary to provide a technical, quantitative basis for evaluating the need, type, and scale of restoration actions. Determination of injury requires that Trustees demonstrate that the incident caused an observable or measurable adverse effect to natural resources or resulted in the loss of resource-related services. Injury quantification involves measuring or calculating the severity, extent, and duration of the adverse effect.

Trustees have determined that injuries occurred to a variety of biological resources, and to public use of natural resource services, as a result of the Spill. The nature of injuries to these resources included mortality, losses in growth and reproduction, physical and chemical degradation of habitats, losses or reductions in ecological services and functions of resources and habitats, and loss of public resource services.

### **4.1. Quantification of Injuries**

The injury assessment evaluated the severity and nature of the injury and the amount of time required for full resource recovery. At the time that the Trustees developed their Assessment Claim, a claim for funding to conduct damage assessment and restoration planning (Appendix 1), they realized that the amount of time that had passed since the Spill would limit the feasibility and usefulness of any additional analyses, including field and laboratory studies. Consequently, comprehensive oil spill impact modeling was judged to be the most cost-effective approach to damage assessment. Therefore, incident-specific data already available were utilized to assess biological resource injury for the Spill.

The Spill Impact Modeling Analysis Package (SIMAP) has been successfully used to quantify invertebrate, fish, bird, reptile, mammal and plant resource injuries from past oil spills, and is considered the current industry standard for modeling biological natural resource damage (French McCay, 2003, 2004, 2009). This fish and wildlife mortality model has been validated with more than 20 case histories, including the *Exxon Valdez* and other large spills, verifying that resulting injury estimations are reasonable. SIMAP modeling was used to estimate injuries to habitat, fish, wildlife, and birds resulting from the Spill.

#### **4.1.1. SIMAP Modeling of Biological Injuries**

SIMAP provides detailed predictions of oil trajectory, physical fate, impacts and biological effects of spilled oil (French McCay 2003, 2004, 2009). Losses are estimated by species or species group for wildlife, fish, and invertebrates by multiplying percent loss by species density. Observations and data collected during and after the Spill were used as much as possible as

inputs to calibrate the model. Where data from the event were not available, related site-specific data or historical information were used to make the assessment as accurate as possible. Oil dispersal models developed using data collected from the Spill closely mirrored aerial and ground observations noted by Shoreline Cleanup and Assessment Teams (SCAT), further validating the SIMAP modeling approach. Detailed reports of all modeling activities and inputs are included as Appendix 3 to this Draft DARF.

## **4.2. Summary of Injuries**

The following section summarizes the injuries resulting from the Spill. Injuries related to the 2002 Rouge River Mystery Oil Spill, and used in the NRDA and restoration planning effort, are reported for the following:

Birds (greater and lesser scaup, waterfowl, shorebirds and wading birds, seabirds)  
Wildlife (mammals, amphibians, and reptiles)  
Fish  
Habitat (substrates and invertebrates)  
Human Recreational Uses

The narrative below summarizes the various data collection tasks and analyses used in the SIMAP evaluation of bird, wildlife, fish, and invertebrate injuries. A detailed report of data collection and injury estimates can be found in Appendix 3.

### *Live and Dead Intake Data*

These data are collected as a normal part of a spill response. The data include descriptions of the collection of each animal, with such information as date, location, condition, and degree of oiling. Factors such as scavenging, lost or hidden bodies, and the inability to survey some habitats limit accurate mortality and animal oiling counts. Data collected from these surveys are utilized by SIMAP modeling to create more accurate mortality estimates.

### *Injury Analysis*

The duration of the impact of the Spill on the various species' populations was also estimated, taking into account the likely rate at which the remaining populations would reproduce and survive. This information is used to calculate interim losses which are injuries sustained in future years, pending recovery to baseline. These are the resources not yet available in the future, pending recovery, that would have been available had the spill not occurred. Calculated in animal years, this analysis provides an estimate of the number of animal years lost because of the injury. Interim losses potentially include:

- Lost future ecological use and human services of the killed organisms
- Lost future growth of the killed organisms which provides additional services
- Lost future reproduction, which would otherwise survive and be added (recruited) to the next generation

### *Literature Review*

Extensive literature review was conducted to determine baseline population values of species within the impacted location. Reproductive potential and species growth rates were also obtained via review of the scientific literature.

#### **4.2.1. Birds**

Birds are particularly vulnerable to oil spills. Feathers provide birds buoyancy and insulation, both of which are compromised when feathers become fouled by oil. Death can result as a consequence of hypothermia. Oil can impact the ability of birds to move and forage, leading to death by way of starvation. The natural tendency of birds is to preen their feathers to rid them of contaminants resulting in exposure by ingestion. Once ingested, oil can be lethal in very small amounts. Because the Spill and the response to it occurred in April and early May, many species of birds, including waterfowl, were migrating through the area in large numbers and came in contact with oil during resting and feeding activities. Some species, like Canada geese, had started to nest in the area. Nesting birds can transfer oil to their eggs causing death of embryos.

All the species noted below are protected under the MBTA.

##### **4.2.1.1. Greater and Lesser Scaup**

###### *Background*

The greater and lesser scaup were analyzed separately from other waterfowl due to the unique habitat requirements of these species and the related high density of populations around impacted shorelines. Lesser and greater scaup are diving ducks that feed on invertebrates and marsh vegetation in the moderately shallow water of the Detroit River and western Lake Erie as they migrate north to Canada for breeding. Their high density in and around Pointe Mouillee during the pre-breeding period of April (Souillere et al. 2007b), when the Spill occurred, resulted in a large number of mortalities for this group.

Scaup species accounted for 77% of the estimated bird mortality that occurred as a result of the Spill; an estimated 4,106 individuals were lost. An estimated 19% of the western Lake Erie population was affected.

###### *Injury Assessment*

The table below summarizes the injury to greater and lesser scaup. Estimates of injury include direct mortality, estimated loss of fledgling equivalents, and estimated interim or lost animal years (Appendix 3, Tables 1, 2, and 3).



Table 3. Injury assessment for greater and lesser scaup resulting from the 2002 Rouge River Mystery Oil Spill.

Greater and Lesser Scaup	Estimated Individuals Lost (Direct Loss in Animals)		Estimated Fledgling Equivalents Lost (Direct and Reproductive Loss in Animals)		Estimated Interim Loss All Year Classes (Loss in Animal Years)	
	Rouge River	Detroit River and Lake Erie	Rouge River	Detroit River and Lake Erie	Rouge River	Detroit River and Lake Erie
	0	4,106	0	14,332	0	8,855
<b>Totals</b>	<b>4,106</b>		<b>14,332</b>		<b>8,855</b>	

#### 4.2.1.2. Other Bird Species

##### *Waterfowl*

Western Lake Erie and the Detroit River marshes are an important migratory stop along the Mississippi and Atlantic Flyways and are utilized by a host of waterfowl throughout the year. Among them are the common merganser, bufflehead, mallard, ruddy ducks, pintails, American coots, and Canada geese. The impacted area provides diverse foraging habitats that support fish and invertebrates used by many of the diving ducks, and various plant species used by the dabbling ducks. These habitats also provide substantial areas for nesting as well. Over 400 individual waterfowl (other than the greater and lesser scaup) were estimated to have been killed. Among these, mortality was highest for the common merganser with an estimated loss of over 100 individuals.



Figure 2. Ruddy duck direct mortality associated with the Spill. Photo: NOAA.

### *Seabirds*

This diverse group includes the double-crested cormorant, herring gull, and ring-billed gull. These species are abundant throughout the impacted area and can be found in large congregations foraging for fish and invertebrates. The feeding behavior of the seabirds makes them particularly vulnerable to oil spills. An estimated 700 seabirds were killed as a result of exposure to oil associated with the Spill.

### *Shorebirds and Wading Birds*

The marshes and shorelines along the Detroit River and western Lake Erie support a diverse shorebird and wading bird population. Great blue herons and great egrets (wading birds) can often be found fishing in the shallows of the marshes. Dunlins, spotted sandpipers, lesser and greater yellowlegs, and short- and long-billed dowitchers (shorebirds) utilize soft substrates for invertebrate foraging. This dependence upon marshes associated with the Spill may have contributed to mortality among these bird groups.

### *Injury Assessment*

The table below summarizes the injury to all birds, other than the greater and lesser scaup. Assessment of injury includes estimated direct mortality, estimated loss of fledgling equivalents, and estimated interim or lost animal years (Appendix 3: Tables 1, 2, and 3).

Table 4. Injury assessment for birds other than the greater and lesser scaup resulting from the 2002 Rouge River Mystery Oil Spill.

Bird Group	Estimated Individuals Lost (Direct Loss in Animals)		Estimated Fledgling Equivalents Lost (Direct and Reproductive Loss in Animals)		Estimated Interim Loss All Year Classes (Loss in Animal Years)	
	Rouge River	Detroit River and Lake Erie	Rouge River	Detroit River and Lake Erie	Rouge River	Detroit River and Lake Erie
Waterfowl (other than Scaup)	25	410	84	1,401	78	1,057
	435		1,485		1,135	
Shorebirds	0	58	0	200	0	351
	58		200		351	
Wading Birds	0	10	0	34	0	31
	10		34		31	
Seabirds	1	737	4	2,753	16	11,977
	738		2,757		11,993	

#### 4.2.2. Wildlife: Mammals, Amphibians, and Reptiles

##### *Mammals*

The muskrat was the only mammal known to be impacted by the Spill. Mammals like the muskrat forage on water plants and extensively use habitats characterized by emergent vegetation. Consequently, the muskrat may be particularly vulnerable to oil spills. Much like birds, if exposed to oils these animals lose the ability to thermoregulate and succumb to hypothermia. Lost and oiled food sources cause starvation and may be toxic. A large population of muskrats inhabits the marshes of the Detroit River and western Lake Erie, which were heavily impacted by the Spill. Consequently, substantial muskrat mortality occurred as a result of the Spill. The timing of the Spill may have further contributed to mortality as it occurred during the breeding season when females and young are particularly vulnerable.

##### *Amphibians and Reptiles*

The marshes of the Detroit River and Western Lake Erie host a diverse amphibian and reptile assemblage including state threatened species such as the small-mouthed salamander, spotted turtle, and the state endangered eastern fox snake. Information regarding the impact of the Spill on amphibians and reptiles including species of concern is limited as few dead animals were recovered. However, the timing and extent of the Spill, particularly in the marsh habitats of the Detroit River and Lake Erie, suggests that injuries occurred. Amphibian and reptile food requirements, habitat needs, and reproduction make avoiding impacted water and shorelines difficult, increasing the potential injury to these animals. Past baseline population data was utilized in the SIMAP modeling to generate estimated mortality among this species group.

##### *Injury Assessment*

The table below summarizes resource injury to reptiles, amphibians, and muskrats. Assessment of injury includes estimated direct mortality, estimated loss of reproduction as young equivalents, and estimated interim or lost animal years (Appendix 3 Tables 1, 2, and 3).

Table 5. Injury assessment for wildlife (mammals, reptiles, and amphibians) resulting from the 2002 Rouge River Mystery Oil Spill.

Wildlife Group	Estimated Individuals Lost (Direct Loss in Animals)		Estimated Young Equivalents Lost (Direct and Reproductive Loss in Animals)		Estimated Interim Loss All Year Classes (Loss in Animal Years)	
	Rouge River	Detroit River and Lake Erie	Rouge River	Detroit River and Lake Erie	Rouge River	Detroit River and Lake Erie
Reptiles	0	114	0	1,700	0	1,238
	114		1,700		1,238	
Amphibians	0	78	0	143,600	0	9,448
	78		143,600		9,448	
Muskrats	0	308	0	940	0	398
	308		940		398	

#### 4.2.3. Fish

##### *Background*

While no dead fish were collected during the period directly following the Spill, the timing, nature, and extent of the Spill, particularly in the vital nursery and foraging habitat of the Detroit River and Lake Erie marshes, suggests that injuries occurred. Observations by MDNR fisheries biologists suggest northern pike spawning had occurred just prior to the Spill, potentially affecting fry. As noted above, in apparent response to the Spill, lake sturgeon moved out of the Detroit River and returned later for spawning. The full effects of this disrupted movement on lake sturgeon spawning remain unknown. SIMAP analyses were utilized to estimate mortality based on known species densities of fish within the Spill area. The most heavily impacted fish species, those that incurred losses of at least 35 kg, include the large- and smallmouth bass group and a group identified as “large forage fish” that included species such as the black buffalo and common carp.

##### *Injury Assessment*

The table below summarizes the injury to fish that occurred as a result of the Spill. Assessment of injury includes estimated direct mortality, estimated forgone production, and estimated total loss (Appendix 3 Table 4).

Table 6. Injury assessment for fish resulting from the 2002 Rouge River Mystery Oil Spill.

<b>Fish</b>	<b>Direct Injury (Individuals)</b>	<b>Direct Injury (kg)</b>	<b>Forgone Production (kg)</b>	<b>Total Loss (kg)</b>
	3,920	119	110	228

#### 4.2.4. Habitats

The area impacted by the Spill acts as a vital wildlife refuge in the highly industrialized urban location around Detroit, Michigan. The marshes of the Detroit River and western Lake Erie are an important source of habitat that includes foraging, refugia, nesting, and nursery habitats for a diverse assemblage of wildlife and aquatic animals.

The habitat injury assessment focused on the marshes of the Detroit River and western Lake Erie. The impacted areas of the Rouge River are primarily man-made or substantially altered with substrates of limited ecological value. The marshes and soft substrates along the Detroit River and western Lake Erie are rich habitats for invertebrate and plant life and are of high ecological and biological value. Therefore, injury assessments and restoration actions focus on these areas. Full descriptions of the degree and location of the oiling of all substrates can be found in Appendix 3.

The list below summarizes the data or criteria used in the SIMAP assessment of habitat injury. Detailed description of data collection and SIMAP modeling can be found in Attachments B, C, D, and E of Appendix 3.

**Baseline Condition.** Baseline represents the ecological services that would be present if the oil spill had not occurred, including abundance, diversity, and age distribution of species. Trustees relied primarily on extensive literature reviews for information used to determine baseline conditions.

**Literature Review.** Extensive literature review was conducted to determine factors pertinent to oil spill movement, weathering, and lethal concentrations of oil for various plant and invertebrate species.

**Area of Impact.** The area of affected shoreline, in square meters and acres, was calculated for each degree of oiling and each habitat type.

**Compilation of Oiled Shoreline Data.** Shoreline Cleanup Assessment Teams (SCAT) dispatched after the Spill documented the severity, thickness and location of the oil. This information was used to prioritize cleanup decisions, evaluate habitat injury, and to verify SIMAP dispersal estimations. SCAT oil observations were supplemented by observations from MDNR and USFWS field teams including shoreline searches and helicopter flights over impacted areas.

**Degree of Injury.** Degree of injury was correlated to the thickness of oiling with oiling levels over 1 mm impacting marsh plants and levels greater than 0.1 mm considered lethal to invertebrates.

**Recovery.** Recovery to baseline is considered to be restoration of 100% of the ecological services that would have been present if not for the oil spill. Equivalent species abundance, diversity, and age classes must be present in the affected habitats for complete recovery. Recovery is assumed to begin upon completion of clean-up. Time to recovery is dependent upon the life histories of each affected species in each habitat type, as well as the degree of the initial injury.

#### **4.2.4.1. Substrate and Invertebrate Injuries**

##### *Background*

Several types of shoreline habitats along the impacted area were oiled during the Spill including both soft and hard substrates. Soft substrates of wetlands are particularly vulnerable to oiling due to the sensitivity of plants and invertebrate communities. Based on observations from other oil spills (French McCay, 2009, Appendix 3), exposure to more than 1 mm of oil at the beginning or during the growing season, as in the case of the Rouge River oil spill, can adversely impact marsh plants. Thus, 1 mm is the assumed lethal threshold for wetland vegetation.

Direct invertebrate injuries are not reported due to the limited knowledge of densities and species composition for the areas impacted. However, based on prior oil spill observations (French McCay, 2009, Appendix 3), exposure to more than 0.1 mm (100 g/m<sup>2</sup>) of oil is assumed to be the

lethal threshold for invertebrates on all substrates. While oil coverage is quantified for all substrates, man-made rocky substrates, such as riprap, are believed to have limited invertebrate densities. For the purposes of the DARP, significant invertebrate densities were assumed to occur only in soft-sediment shorelines. See Appendix 3 for detailed substrate and invertebrate injury evaluations.

#### *Injury Assessment*

Modeled estimates of oil thickness were used to calculate the area of each substrate impacted by oil ranging in thickness from 0.0001-0.001 mm to >1 mm (Table 3). Critical thickness thresholds for injury are 1 mm or greater for plant injury and 0.1 mm or greater for animal injury. Oil coverage of 1 mm or greater causes a loss of both plant and invertebrate life (French McCay, 2009, Appendix 3) limiting the functionality of habitat. Therefore, for the purposes of scaling habitat loss, acreage associated with the injury threshold for vegetation was used.



Figure 3. Oiled vegetation and shoreline from the Lake Erie Metropark. Photo: Lisa Williams, USFWS.

Table 7. Estimated area (m<sup>2</sup>) of each substrate type impacted by different thicknesses of oil and total shoreline effected (m<sup>2</sup> and acres) (Appendix 3 Table 6-2).

Shore Type	Vegetation Threshold >1 mm	Animal Threshold >0.1 mm	>0.01 Mm	>0.001 mm	>0.0001 mm
Rocky Shoreline	3,066	6,132	7,929	8,352	8,352
Gravel Beach	1,692	8,775	13,955	14,695	14,801
Sand Beach	3,912	12,476	15,647	17,127	17,127
Mud Shore	26,959	40,386	44,192	45,672	45,672
Fringe Marsh	5,498	10,150	12,052	12,792	12,792
Artificial Shoreline	0	0	740	1,163	2,115
Total Shoreline (m <sup>2</sup> )	41,127	77,919	94,515	99,801	100,859
Total Shoreline (acres)	10.2	19.3	23.4	24.7	24.9

#### 4.2.5. Recreational Uses

The areas impacted by the Spill offer many public use and recreational options, including sport fishing, recreational boating, hiking, bird and nature viewing, and picnicking along the lower Detroit River and western Lake Erie. The Rouge River was closed to navigation for several weeks, but that part of the Rouge River is not known to be used for recreation to any significant extent. The parks along the Detroit River and western Lake Erie within the area of impact offer many opportunities for public use, both along the shoreline and throughout the parks themselves. In the case of the Spill, the parks and public areas did experience shoreline impacts with some unquantified restrictions in shoreline use during response and cleanup operations (Appendix 1). However, based on interviews with park managers and other inquiries that the Trustees made, it does not appear there was any significant decline in recreational use of the public areas along this section of the Detroit River as a whole, as people seemed to be able to shift their activities within parks or to other nearby areas. Additional studies or surveys might identify lost recreation visits to the area; however, the cost of additional study would likely surpass the value of lost public use associated with the Spill.

After careful consideration of these factors, the Trustees determined that the effort to quantify lost use was not reasonable or cost effective. Therefore, the Trustees have decided not to quantify lost use or to pursue restoration options to compensate for lost recreational use or resource services.

### 4.3. Translating Injury to Restoration

Injury scaling was based on first calculating lost fish and wildlife production and then determining the amount of emergent marsh wetland restoration that would be required to provide the resources to support that production of fish and wildlife. Emergent marsh restoration was selected for the analysis because it is one of the primary habitats directly injured by the Spill, it has high productivity, and many restoration opportunities exist for it in the area. Emphasis upon this habitat type is consistent with the program priorities and goals of the Trustees, as discussed further in Section 5.3. Also, emergent marsh is one of the habitat types most frequently used for NRDA compensation calculations.

To calculate restoration costs that address service losses resulting from injured natural resources, the Trustees used an approach called a Habitat Equivalency Analysis (HEA). HEA is a restoration-based approach to natural resource valuation that can account for changes in the baseline condition while estimating the amount of past and future interim losses (i.e., losses to the public while the natural resources were unavailable). A HEA addresses the question, “what services would the habitat have provided if not for the discharge of oil?”. The fundamental concept is that compensation for lost ecological services can be accomplished by restoration projects that provide comparable services (compensatory restoration). A HEA has three steps:

- (1) assess the present value of lost services until the injured resource is restored to its baseline condition,
- (2) select appropriate compensatory restoration projects, and
- (3) identify the size of the project, i.e., scaling, that will equate the total discounted quantity of lost services to the total discounted quantity of replacement services.

The HEA is a commonly used tool that helped the Trustees identify the type, size, and cost of restoration projects.

Inputs to the HEA for this spill were the areas of impact or acres of shoreline habitat impacted due to the initial injury or the reduction in ecological services as a result of the Spill, injuries to habitat resulting from initial clean-up effort, and time for recovery or the return to baseline. Containment and clean-up protocols were developed to minimize overall impact on the habitat. Oiled emergent vegetation, consisting primarily of the previous year's growth, was cut at the oil line and removed by laborers working from small boats. Efforts were made to limit disruption of root masses, seed beds, and associated substrates minimizing cleanup related injuries.

The Trustees used HEA to estimate the amount of restored habitat required to compensate for the injuries, taking into account the amount of injuries, the time before the project begins (lag time after the spill and injuries occur), the time for development of the restored habitat, the ultimate productivity of services in the new habitat as compared to that of injured habitats, the duration of the restoration project life, and discounting of future habitat services (3% per year). The selected restoration projects are scaled so that the quantity of replacement services equals the quantity of lost services in terms of present value. The approach and equations are described in NOAA (1997, 1999), LA DEQ et al. (2003), and French-McCay and Rowe (2003) (Appendix 3, Attachment A; Figure 4).



Scaling of the injuries to birds, mammals (i.e., muskrat), amphibians, reptiles, and fish to the appropriate compensatory habitat first utilized the injury quantification from the SIMAP modelling to estimate the initial loss of animals of all ages plus their lost reproduction, all converted to lost “fledgling equivalents” for birds, or, more generally “young equivalents”. Then, the compensatory marsh habitat required to replace those losses was calculated using a bioenergetics model to determine the amount of food (marsh biomass) required to replace the lost fledgling or young equivalents and, finally, using a trophic HEA model to determine the amount of habitat needed to produce enough food for that many fledgling or young equivalents.

Published bioenergetic models of species typical of those in the area of the Spill provided the necessary bioenergetic information including the amount of food required per offspring until fledging (or weaning) plus the amount of additional food required by a parent per offspring reared. Then, the total kilograms of food needed per fledgling (or young) were multiplied by the estimated number of fledgling (or young) equivalents lost to get the biomass (kilograms) of food (plant, fish or invertebrate) that needed to be restored. The biomass of food needed to be restored was then used in a trophic HEA model to calculate the area of wetland required to produce the food for the fledgling (or young), with appropriate discounting. For example, these two steps for piscivorous birds are as follows:

(a)  $\text{kg fish needed/fledgling} * \text{fledgling equivalents lost} = \text{kg fish to restore}$

(b)  $\text{kg fish to restore} \rightarrow \text{trophic HEA with marsh productivity} \rightarrow \text{marsh needs}$

More details on the modeling approach are provided in Appendix 5.

Because losses occur over time and restoration projects provide increasing benefits over time as they mature, the metric of Discounted Service Acres Years (DSAYs) is used to describe both the level of functionality (i.e., services) lost (DSAYs needed) and the level of functionality gained by restoration (DSAYs produced). DSAYs are used for both scaling the natural resource injuries and the restoration projects. These DSAYs determine the amount of restoration necessary to compensate the public for the loss of services caused by the injuries to the natural resources. In order to compare the value of services lost in the past to services gained by restoration in the future, a discount rate is applied to calculations to account for change in economic value over time. This allows for a more accurate present-day comparison of resource values lost in the past to resource values gained by restoration in the future. For purposes of scaling the restoration to injuries over time, the Trustees assumed that implementation of restoration would begin in 2016. A discount rate of 3% is commonly used in HEAs for NRDA and is the rate used in this analysis. The process of balancing the DSAYs representing the level of functionality lost with the DSAYs which can be produced by restoration projects is illustrated in Figure 4.

The determination of restoration required to address spill-related injuries began by estimating the resources that had been lost during the Spill (e.g., fish and birds) and then calculating the marsh habitat acres that would be necessary to produce those resources. The calculation of DSAYs needed for restoration was then calculated by scaling a hypothetical restoration, using the above calculated marsh habitat acres, where this acreage was assumed to be of 0% functionality as restoration began and reached 100% natural habitat functionality after 15 years, with a project

life of an additional 20 years of project maintenance (Appendix 4). This was the most direct method of translating the injuries that occurred from the units of marsh acres into the common units of DSAYS, while taking into the account the time necessary to develop and maintain a coastal marsh restoration. The resulting DSAYS (DSAYS needed) represent the amount of productivity or ecological services (birds, fish, wildlife, and habitat) required, through compensatory restoration, to address spill-related injuries.

As Great Lakes marshes typically contain a mix of both lake sedge and common cattail, the estimate of DSAYS needed was further refined to take into account the relative productivity of these two marsh types. DSAYS needed for a co-dominant 50:50 lake sedge and common cattail marsh was subsequently calculated, in addition to DSAYS for either lake sedge- or common cattail-dominated marshes. Table 8 summarizes these findings. Complete details of the scaling analyses and their results can be found in Appendices 4 and 5.

Related calculations for the DSAYS gained by the proposed restoration projects are detailed in Section 5.5 of the DARP. These analyses take into account the acreage available, their existing estimated functionality, the estimated time to achieve 90% functionality (which takes into account the on-going treatment of invasives), project maintenance required to maintain ecological benefits over time, and a total project life of 30 years.

# Injury and Restoration Scaling

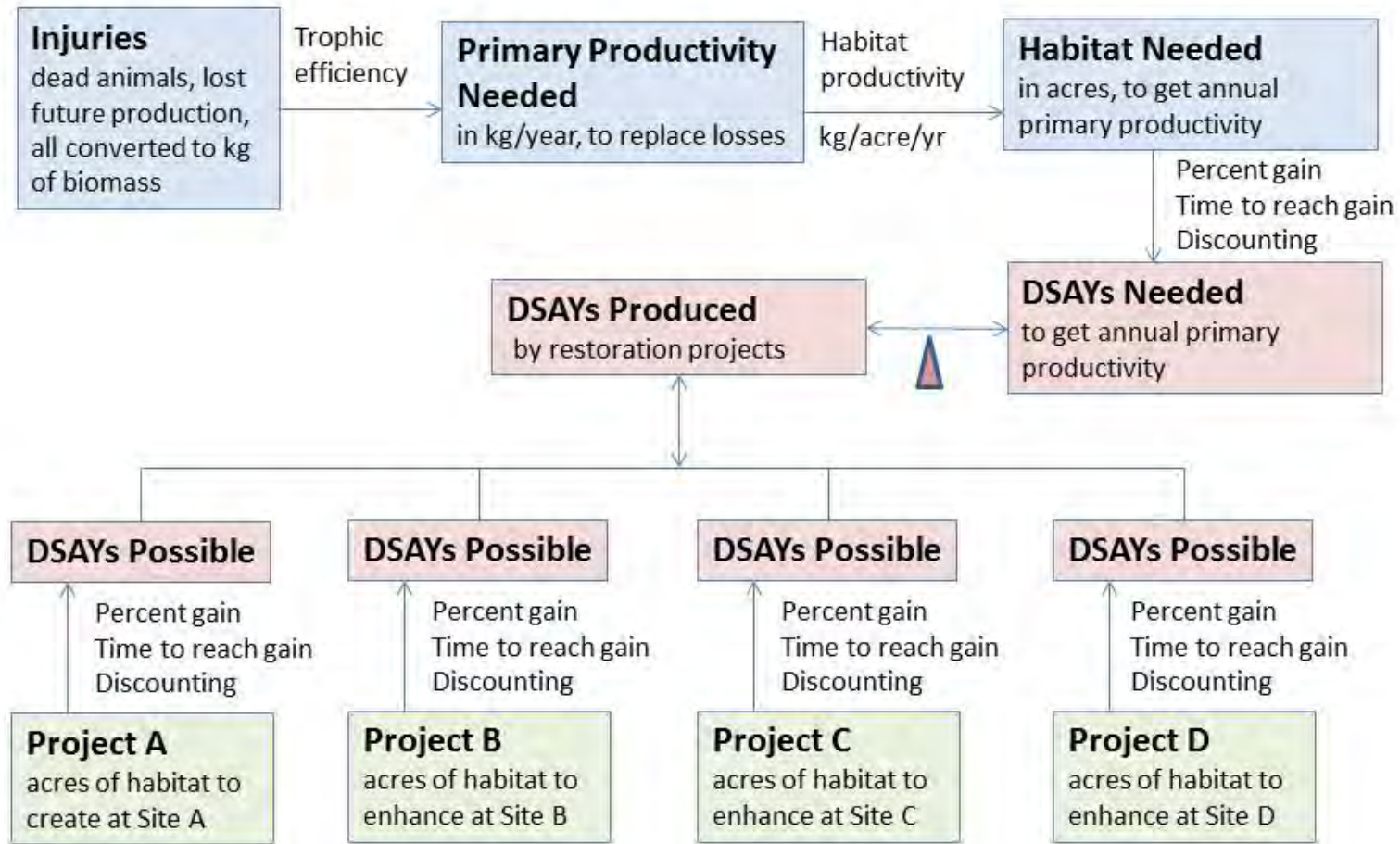


Figure 4. Graphic showing the HEA process of injury and restoration scaling represented by discounted service acre years (DSAYs) for NRDA compensation of resources.

Table 8. Summary of wildlife, fish and habitat injuries, estimated as the interim loss of animals and the equivalent loss of young (Appendix 3: Tables 2 - 4), with compensatory restoration of marsh habitat needed to address each injury. Example compensatory marsh discounted service acre years (DSAYs) are based on the productivity gains from complete restoration of cattail marshes, sedge marshes, or co-dominant cattail-sedge marshes (Appendix 4).

Resource	Interim Loss (Lost Animal Years or Mass in kg)	Estimated Young Equivalents Lost (Direct and Reproductive Loss in Animals or kg)	DSAYs Needed for Sedge Restoration	DSAYs Needed for Cattail Restoration	DSAYs Needed 50%:50% Mix Restoration
Birds	22,365	24,156	3,874	2,974	3,424
Muskrats	398	940	2,784	2,127	2,456
Reptiles and Amphibians	10,686	145,300	1.4	1.07	1.23
Fish	110 kg	228 kg	9.2	7.04	8.1
Marsh Habitat	NA	NA	3.9	3.9	3.9
<b>Totals</b>			<b>6,672</b>	<b>5,113</b>	<b>5,893</b>

## 5.0 Restoration Planning

### 5.1. Restoration Strategy

The goal of restoration under the OPA is to compensate the public for injuries to natural resources and services resulting from an oil spill. The OPA requires that this goal be achieved by returning injured natural resources to their baseline condition, and, if possible, by compensating for any interim losses of natural resources and services during the period of recovery to baseline.

Restoration actions under the OPA regulations are primary, compensatory, or both. Primary restoration is an action taken to return injured natural resources and services to baseline. Primary restoration activities can range from natural recovery to actions that prevent interference with natural recovery to more intensive actions expected to return injured natural resources and services to baseline faster or with greater certainty than natural recovery.

Compensatory restoration is an action taken to compensate for the interim losses of natural resources or services pending return to baseline. The type and scale of compensatory restoration may depend on the nature of the primary restoration action and the level (function achieved) and rate of recovery of the injured natural resources or services. When identifying compensatory restoration alternatives, the Trustees must first consider compensatory restoration actions that provide services of the same type, quality, and value to those lost (15 CFR §990.53(c)(2)). If compensatory actions of the same type, quality, and comparable value cannot provide a reasonable range of alternatives, the Trustees then consider other compensatory restoration actions that will provide services of at least comparable type and quality to those lost (15 CFR §990.53(c)(2)).

In considering restoration actions for injuries resulting from the Spill, the Trustees first considered the degree to which affected areas had returned to their pre-Spill, baseline condition. Based on that assessment, the Trustees determined that no additional primary restoration, other than continuing natural recovery, was necessary. Thus, only compensatory restoration projects are presented below.

## **5.2. Natural Recovery Alternative**

OPA regulations at 15 CFR §990.53(b)(2) require consideration of a “natural recovery alternative” for primary restoration. In this alternative, the Trustees would take no direct action to restore injured resources. Instead, natural processes would be relied upon to restore injured natural resources without intervention. This is equivalent to a ‘no action’ alternative considered as part of analyses conducted under the National Environmental Policy Act (NEPA; 42 U.S.C. § 4321 *et seq.*; see section 6.1, below). A natural recovery alternative is easily and inexpensively implemented. While natural recovery of the injured natural resources may occur over time, compensation for significant interim losses would not be provided under the natural recovery alternative for compensatory restoration.

The OPA regulations clearly allow the Trustees to seek compensation for interim losses incurred pending natural resource recovery. Losses were suffered during the period of recovery from this Spill and technically feasible, cost-effective alternatives exist to compensate the public for these interim losses. Together, the preferred projects described below comprise a feasible alternative that would compensate for these interim losses and are designed to fully restore the injuries which occurred due to the Spill.

Compensatory restoration actions must be scaled to ensure that the size or extent of the proposed project reflects the magnitude (scale) of the injuries resulting from the Spill. The Trustees relied on the OPA regulations to select the scaling approach for compensatory restoration actions. The restoration alternatives included in this section are based on proven technologies and practices consistent with existing land management plans. Restoration project designs may change to reflect public comments and further Trustee analysis as well as to meet any specific permitting requirements or to avoid or minimize any potential adverse effects on species of concern.

### **5.3. Restoration Project Selection Criteria**

#### **5.3.1. Tier I Analysis**

To determine potential restoration projects, Trustees reviewed existing watershed plans; agency land management plans (such as the DRIWR Comprehensive Conservation Plan 2005); consulted local state, and Federal agencies; and, sought public input through outreach efforts such as press releases (see Section 3.0). This resulted in 56 potential restoration projects which the Trustees determined to be potentially capable of providing compensatory restoration for injuries resulting from the Spill (Appendix 2). These proposed projects addressed a wide range of actions that included proposals for land acquisition, shoreline softening, invasive species management, and others. All 56 projects underwent an initial Tier 1 evaluation to determine if the proposed project should be retained for further analyses based on the following criteria:

1. Does the project have the potential to result in a quantifiable increase in one or more of the injured resources?
2. Is there sufficient information about the project to allow evaluation against the OPA criteria (See Section 5.1)?
3. Does the project have the potential to restore resources that were injured by the Spill?

A summary of all alternative proposed projects in Tier 1 can be found in Table 9, and more complete descriptions of all of these projects can be found in Appendix 2.

Table 9. Summary of the initial analyses (Tier 1) of all proposed restoration projects under the criteria proposed in Section 5.3.1. Highlighted projects were retained for Tier 2 analysis.

Project Name	Brief Project Description	Compensation for One or More Injured Resources?	Sufficient Information Available?	Meet Criteria to Restore Injured Resources?
Manhattan Marsh Preservation, Restoration and Enhancement	Enhancement through debris removal and water management for phragmites control.	Yes	No	No
Lake Erie Marsh Preserve Wetland Restoration and Enhancement	A restoration plan has been submitted for NOAA funding/grant. USFWS supports the plan.	Yes	Yes	Yes
Managed Coastal Wetland Restoration	Long-term invasive species management of 20-30 acres of managed coastal wetland with the remaining being planted as native prairie.	Yes	Yes	Yes
Detroit River (former Chrysler site) Coastal Shoreline Restoration	Soft shore engineering and, architectural and engineering drawings for wetland and shoreline restoration at the Refuge Gateway.	Yes	No	No
Lady of the Lakes Wetland Enhancement	This site is currently in the process of being surveyed for restoration design. Currently the site has no water level management and restoration design will likely have a management component.	Yes	Yes	Yes
Eagle Island Marsh Wetland Enhancement	Currently no restoration survey or design work has been done.	Yes	Yes	Yes

<b>Project Name</b>	<b>Brief Project Description</b>	<b>Compensation for One or More Injured Resources?</b>	<b>Sufficient Information Available?</b>	<b>Meet Criteria to Restore Injured Resources?</b>
Bay Creek Hunt Club Land Acquisition:	Owner had been in negotiation with USFWS for acquisition, wasn't interested. No plans for USFWS ownership or for a cooperative agreement.	Yes	No	No
Strong Property Shoreline Enhancements	The project would repair/reconstruct the northern dike so that area can be burned for invasive control and provide vehicle access.	Yes	Yes	Yes
Gibraltar Wetlands Habitat Improvement	Management for invasive species.	Yes	Yes	Yes
Humburg Marsh Habitat Improvement	This marsh needs habitat improvement and invasive species control. Invasive species control has been undertaken in the past.	Yes	Yes	Yes
Detroit River International Wildlife Refuge Educational/Outreach Activities:	Expanding Refuge educational/outreach activities, such as guided tours of Hamburg Marsh Unit and interpretive programs	Yes	No	No
Brancheau Tract Invasive Species Control	Invasive species control to augment restoration plan currently being implemented	Yes	Yes	Yes
Belle Isle Fish habitat construction: Augment Existing Spawning Reef	Project would augment an already existing artificial spawning reef. Research has shown that the spawning reef is working in that area	Yes	No	No



Project Name	Brief Project Description	Compensation for One or More Injured Resources?	Sufficient Information Available?	Meet Criteria to Restore Injured Resources?
Fighting Island (Canada) Fish habitat construction	Project would add spawning substrates on which lake sturgeon and other high-value native fish prefer to spawn - this project builds on existing Belle Isle work.	Yes	No	No
Grassy Isle Fish habitat construction	Construct fish spawning beds at NE Grassy Island and immediately south of Grassy Island on Mamajuda Island Shoal to restore historic, reputed spawning runs of lake sturgeon and lake whitefish, respectively, to the Grassy Island area	Yes	No	No
Belle Isle Fish habitat construction: Spawning Beds	Construct fish spawning beds of rounded rock at the head of Belle Isle to augment and increase natural reproduction of walleye and white sucker at that location	Yes	No	No
Belle Isle Fish Rearing and Stocking Facility	Build and operate a stream-side lake sturgeon egg and larvae facility on Belle Isle for the culture and subsequent release of young of the year lake sturgeon originating from Detroit River lake sturgeon adults back into the Detroit River.	Yes	No	No
Rouge River Early Warning Detection System	This project would install an early warning system in the several outfalls along the Rouge that seem to be sources for ongoing release episodes.	Yes	No	No
Grassy Island Shoal Restoration	Reconstruction of dike system would recreate the protective bay and allow the re-emergence of wetlands and the regeneration of emergent shoreline plants to this area.	Yes	Yes	Yes
N. Hennepin Marsh restoration	Reduce wave action erosion through construction of a series of several long and narrow emergent shoal with invasive species management.	Yes	No	No

Project Name	Brief Project Description	Compensation for One or More Injured Resources?	Sufficient Information Available?	Meet Criteria to Restore Injured Resources?
S. Hennepin Marsh Land Acquisition	Acquisition of undeveloped property along Grosse Isle to assure no further development and potential shoreline hardening in this area.	Yes	No	No
S. Hennepin Marsh Construction	Reconstruction of islands for marsh protection and management of <i>Phragmites</i>	Yes	No	No
Stoney island shoal reconstructions	Reconstruction of shoals to provide desirable protection to Stony Island and associated wetlands.	Yes	No	No
Round Island acquisition	Acquisition of this island from its current private owner or at a minimum, the creation of wetland setbacks and conservation easements	Yes	No	No
Sugar Island acquisition	Purchase of the island to protect it and its beaches against public access to maintain productive fish and bird habitat.	Yes	No	No
Sugar Island Restoration	Restoration of the island through installation of infrastructure to limit erosion	Yes	No	No
Celeron Island Shoal construction	Creation of a shoal to protect the island and associated marshes providing additional bird and fish habitat.	Yes	No	No

<b>Project Name</b>	<b>Brief Project Description</b>	<b>Compensation for One or More Injured Resources?</b>	<b>Sufficient Information Available?</b>	<b>Meet Criteria to Restore Injured Resources?</b>
Fort Wayne Shoreline Restoration	Enhancement of Detroit River banks through removal of man-made riprap, creation of intermittent connection to the Detroit River and native plant restoration.	Yes	Yes	No
US Steel Shoal Restoration	Shoal reconstruction work to protect the shoreline habitat	Yes	No	Yes
Rouge River Watershed - Rouge River National Wet Weather Demonstration Project: Augmenting Existing Alliance of Rouge Community Pass-Through Mini Grants Program	Design and construction of combined sewer overflow controls, sanitary sewer overflow controls, storm water management; habitat restoration; public education; support to Alliance of Rouge Communities to support Community Grants for local municipalities, with an emphasis on Grow Zones and other habitat-focused restoration	Yes	No	No
Rouge Gateway Partnership: Spillway Feasibility Study:	Implementation of Rouge River Gateway Partnership Master Plan Specifically the Spillway project to incorporate swales, a wetland and access to the River at an existing spillway cut through the concrete channel	Yes	No	No
Rouge Gateway Partnership: Fordson Island Planning/Feasibility Study	Implementation of Rouge River Gateway Partnership Master Plan: Specifically the Fordson Island project to dredge debris from the channel and to enhance the riverine habitat	Yes	No	No
Rouge Gateway Partnership: Detroit, and River Rouge Fish Habitat Enhancements Segment 1	Rouge River corridor improvements (upstream of spill site: Rotunda Dr. to I-94, MI): The project will provide for environmental enhancement of the Rouge River channel by partial removal of the existing concrete lining, widening of the river channel / cross section, providing fish habitat and restoring the river banks to a more natural condition with plantings instead of concrete	Yes	Yes	No

Project Name	Brief Project Description	Compensation for One or More Injured Resources?	Sufficient Information Available?	Meet Criteria to Restore Injured Resources?
Rouge Gateway Partnership: Detroit, and River Rouge Fish Habitat Enhancements Segment 2	Rouge River corridor improvements (upstream of spill site: Michigan Ave to Rotunda Dr., MI): The project will provide for environmental enhancement of the Rouge River channel by partial removal of the existing concrete lining, widening of the river channel / cross section, providing improved fish habitat and restoring the river banks to a more natural condition with plantings instead of concrete	Yes	Yes	No
Restoration of Hines Park Wetland Mitigation Bank (Wayne County)	Restoration of Wayne County Wetland Mitigation Bank: Analysis, design: restoration and construction of wetlands in Hines Park	Yes	No	No
Bennett Arboretum: Habitat Preservation and Enhancement	Implementation of master plan for restoration of Bennett Arboretum,	Yes	Yes	No
Rouge River Watershed Grow Zones: Habitat Restoration and Enhancement	Continue implementing "Grow Zones" across Wayne County: through restoration of native plants in urban areas.	Yes	Yes	Yes
North Branch Ecorse Creek Drainage District: Wetland Creation and Habitat Rehabilitation: Augmenting Existing Mini Grants Program	Design and construction of improvements to North Branch Ecorse Creek	Yes	No	No
Cook and Gladding Drain Petition Project within the Alliance of Downriver Watersheds	Drain improvement projects in various Downriver communities, to improve storm water management and eliminate E. Coli contamination from urban waterways	Yes	Yes	No

Project Name	Brief Project Description	Compensation for One or More Injured Resources?	Sufficient Information Available?	Meet Criteria to Restore Injured Resources?
Rouge River watershed, Ecorse Creek watershed, Combined Downriver watershed, Detroit River watershed, Lake St Clair watershed: Habitat Rehabilitation	Illicit discharge elimination, storm water management, public education, riverine habitat rehabilitation, support to community-based Watershed Alliances	Yes	Yes	No
Henry Ford Estate Dam Fish Passage Feasibility/Planning Study	Modification of the Henry Ford Estate Dam to include a fish passage	Yes	No	No
Wayne Road Dam Removal: Planning and Design	Modification of the Wayne Road Dam	Yes	No	No
Concrete Channel Modifications: For Habitats and Fish Populations	Assorted projects restoring the natural riverine habitat and flow	Yes	No	No
<b><u>Pte. Mouillee Wetland Restoration</u></b>				
Pte. Mouillee State Game Area Zone 13	Construct a new 1500 foot long dike in Zone 13.	Yes	Yes	Yes
Pte. Mouillee State Game Area Sump Dike	Complete the sump dike and raise it 2 feet.			
Pte. Mouillee State Game Area Bad Creek Unit	Repair the Bad Creek Unit dikes and return them to fully functioning dikes for habitat enhancement.			
Pte. Mouillee State Game Area Walpatich Repair	Repair the east/west dikes to connect to each other for better water control within the Walpatich Unit and for habitat enhancement.			
Pte. Mouillee State Game Area Water Control Structures	Purchase of water control structures to enhance water control and habitat enhancement			

Project Name	Brief Project Description	Compensation for One or More Injured Resources?	Sufficient Information Available?	Meet Criteria to Restore Injured Resources?
Pte. Mouillee State Game Area Zone 13 and Lautenschlager Unit: Project completed 2009	Phragmites control project covering 100 acres using aerial application	Yes	Yes	Yes
Erie State Game Area North Maumee Bay	Conduct a feasibility study in North Maumee Bay to look at restoration potential	Yes	No	Yes
Great Lake Marsh Restoration	This project will facilitate the follow up treatment for the eradication of phragmites and restoration of native coastal wetland vegetation	Yes	Yes	Yes
Lakeplain Prairie Restoration	Manage for invasive species and restoration of native prairie plants	Yes	Yes	Yes
Sturgeon Bar Restoration	To armor the existing shoreline of small barrier island which acts to protect large lotus beds located along the parks shoreline and serves as roosting areas for various species of birds including bald eagle and osprey	Yes	Yes	Yes
Rouge River Watershed Stream bank Stabilization and In-Stream Habitat Restoration: Targeted Wood Debris BMP Implementation	Stabilization and restoration of Rouge River through wood y debris removal.	Yes	No	No
Friends of the Rouge Frog and Toad and Volunteer Monitoring Programs	Monitoring amphibians in the Rouge River Watershed.	Yes	No	No
Rouge River Watershed Targeted Fisheries Monitoring	Fish monitoring in the Rouge River Watershed.	Yes	No	No

### 5.3.2. Tier 2 Analysis

Initially, 18 projects were retained after Tier 1 evaluations. Due to the similar nature and geographic location of the four Pointe Mouillee State Game Area projects retained (Zone 13, Sump Dike, Bad Creek Unit, and Walpatich Repair) Trustees decided to combine these projects into one project – the Pointe Mouillee Wetland Restoration. Therefore, 14 projects were retained for Tier 2 evaluation (Table 10, Figure 5). The OPA regulations require that once the Trustees have developed a reasonable range of restoration alternatives, the Trustees must consider six criteria when evaluating those restoration alternatives (15 CFR § 990.54(a) and (b)):

- 1. Relation to natural resource injuries and services losses.** This criterion is used to judge the degree to which a project helps to return injured natural resources and services to at least baseline conditions that were present prior to the Spill or compensate for interim service loss. Projects should demonstrate a clear relationship to the resources and services injured. Projects located within the area affected by the Spill are preferred, but projects located within the Rouge River Watershed that provide benefit to the resources injured in the affected area will also be considered. The Trustees will aim for a diverse set of restoration projects and project locations, addressing an array of resource injuries.
- 2. Avoidance of Adverse Impact.** Projects will be evaluated for the extent to which they prevent future injury as a result of the Spill and avoid collateral injury as a result of implementing the alternative. All projects shall be lawful and likely to receive any necessary permits or other approvals prior to implementation.
- 3. Project cost and cost effectiveness.** The cost of a project, both initial cost and long term maintenance, will be considered against the relative benefits of a project to natural resources and service losses. Projects that return the greatest and longest lasting benefits for the cost will be preferred. The Trustees will also consider the time necessary before project benefits are achieved, and the sustainability of those benefits. Projects will be reviewed for their public acceptance and support, and consideration given to projects that leverage the financial resources of partner organizations.
- 4. Likelihood of Success.** This criterion considers the technical feasibility of achieving the restoration project goals and will take into account the risk of failure or uncertainty that project goals can be met and sustained. This criterion will also consider the availability and ease of implementing corrective measures in the event that the restoration project fails or does not initially meet its goals, to ensure project benefits are achieved. The Trustees will generally not support projects or techniques that are unproven or projects that are designed primarily to test or demonstrate unproven technology.

- 5. Multiple Resource and Service Benefits.** Projects that provide benefits that address multiple resource injuries or service losses, or that provide ancillary benefits to other resources or resource uses are preferred. Restoration projects should not substitute for legally mandated requirements and restoration projects that would otherwise occur.
- 6. Public Health and Safety.** This criterion is used to ensure that the project will not pose an unacceptable risk to public health and safety.

In addition to the selection criteria outlined under OPA, the Trustees developed six additional evaluation criteria to further analyze the 14 proposed alternative restoration projects retained after Tier 1 analysis. These criteria provide additional specificity relevant to the Spill:

1. The degree to which the project is consistent with the long term restoration needs and final restoration plans for the Rouge River, Detroit River, and western Lake Erie.
2. Feasibility and cost effectiveness of the project to achieve the desired restoration.
3. The degree to which the project will result in environmental benefits.
4. The degree to which the project addresses a wide variety of injured resources.
5. The degree to which the project personnel have experience with the proposed project.
6. The speed and ease with which the project can be implemented.

The Trustees used the above criteria to focus and maximize the value of restoration efforts to achieve recovery of natural resources and services lost as a result of the Spill. If the Trustees concluded that two or more projects were equally preferable based on these factors, they selected the most cost-effective project. Table 10 summarizes the Tier 2 analysis (as outlined above) of all 14 restoration projects carried forward from the initial Tier 1 evaluation. Further details of the projects and their analysis are provided in Appendix 2.



Table 10. Evaluation & ranking of Rouge River proposed restoration projects: Each project is numerically ranked (3 = strong; 2 = moderate; 1 = weak; 0 = not applicable) with respect to each Tier 2 evaluation criterion. Highlighted proposed projects were retained for restoration scaling.

RESTORATION PROJECT	OPA RESTORATION REQUIREMENTS							ADDITIONAL TRUSTEE ADOPTED CRITERIA						SUMMARY OF EVALUATION
	Restore Injured Resources	Prevent Future Injury	Cost	Likelihood of Project Success	Multiple Benefits	Public Health and Safety	Consistent Final Restoration Plan	Feasibility - Cost Effectiveness	Speed of Resulting Benefit	Effects Variety of Resources	Experience with Project	Readiness for Implementation	Total Score	
Lake Erie Marsh Preserve Wetland Restoration and	0	0	0	0	0	0	0	0	0	0	0	0	0	Project already funded and underway
Managed Coastal Wetland Restoration	0	0	0	0	0	0	0	0	0	0	0	0	0	Project definition is vague and unable to further evaluate.
Lady of the Lakes Wetland Enhancement	0	0	0	0	0	0	0	0	0	0	0	0	0	Site is outside of impact zone.
Eagle Island Marsh Wetland Enhancement	0	0	0	0	0	0	0	0	0	0	0	0	0	Enhancement is fully funded.
Strong Property Shoreline Enhancements	0	0	0	0	0	0	0	0	0	0	0	0	0	Project description, goals and objectives are unclear.
Gibraltar Wetlands Habitat Improvement	1	2	1	2	2	2	3	2	2	2	2	0	21	Retained due to potential benefits, needs additional planning.
Humbug Marsh/Monguagon Creek Habitat	3	3	3	3	3	2	3	3	2	3	3	3	34	Retained due to potential restoration of multiple injuries, and status as Ramsar Wetland of Importance. Additional planning needed.

RESTORATION PROJECT	OPA RESTORATION REQUIREMENTS							ADDITONAL TRUSTEE ADOPTED CRITERIA					SUMMARY OF EVALUATION	
	Restore Injured Resources	Prevent Future Injury	Cost	Likelihood of Project Success	Multiple Benefits	Public Health and Safety	Consistent Final Restoration Plan	Feasibility - Cost Effectiveness	Speed of Resulting Benefit	Effects Variety of Resources	Experience with Project	Readiness for Implementation		Total Score
Brancheau Tract Invasive Species Control	0	0	0	0	0	0	0	0	0	0	0	0	0	Project already implemented.
Grassy Island Shoal Restoration	1	2	1	2	2	2	2	1	1	1	2	2	19	Disproportionate financial costs relative to limited fish injuries
Rouge River Watershed Grow Zones: Habitat	1	1	3	3	0	2	1	3	2	0	2	3	21	Limited benefit to injured resources..
Pte. Mouillee Wetland Restoration	3	2	2	3	3	2	3	3	3	3	3	3	33	Retained for the ability to address multiple injuries.
Great Lake Marsh Restoration	3	2	3	3	3	2	3	3	3	3	3	3	34	Retained as cost effective, addresses multiple injuries and can be quickly implemented.
Lakeplain Prairie Restoration	1	2	3	2	1	2	2	3	2	1	2	2	23	Does not address injuries associated with spill.
Sturgeon Bar Restoration	1	3	1	2	1	2	2	1	2	1	2	2	20	Does not address injuries associated with the spill.
Common Tern Project	3	2	3	3	1	2	3	3	2	2	3	3	30	Does not respond to multiple injuries.

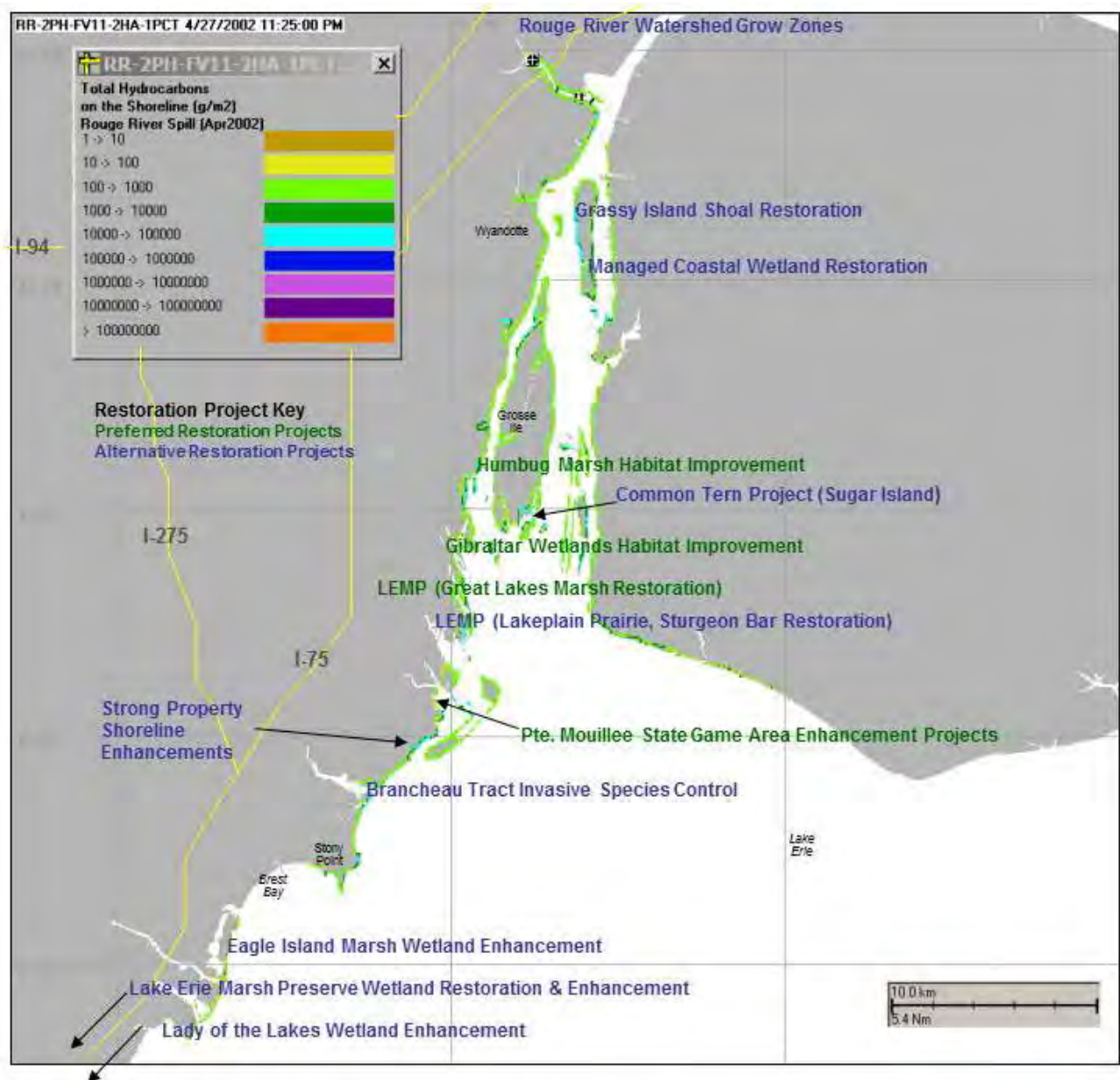


Figure 5. Geographic location of restoration projects evaluated by the Trustees for the 2002 Rouge River Mystery Oil Spill. Project names depicted in green represent the four projects that comprise the Compensatory Restoration Alternative evaluated in this draft Damage Assessment and Restoration Plan. The color along the shoreline denotes the degree of oiling or total hydrocarbons resulting from the Spill.

## 5.4. Preferred Restoration Projects

After analyzing the 14 projects carried forward for Tier 2 assessment, the Trustees identified four preferred restoration projects; these four projects comprise the Preferred Compensatory Restoration Alternative of the DARP. Given the length of time between the Spill and the drafting of the DARP, some project details for the preferred projects have changed. Project funding from other sources has necessitated modification of the originally proposed projects. The incorporated changes were carefully selected by the project managers and the Trustees to be similar to the intent of the original projects. The Trustees feel that these changes provide similar benefit to restoration of injured resources and do not substantively change the overall proposed project or its goals. These revisions have therefore been accepted as amendments to the original proposed projects which underwent Tier 1 and Tier 2 evaluations. The proposed projects and their amendments are clearly outlined in the following section. Details of the original proposed projects are detailed in Table 9 and Appendix 2. The remaining ten projects (alternate projects) may be further evaluated if any of the four preferred projects become infeasible or additional funds become available. The Preferred Compensatory Restoration Alternative is intended to achieve the compensatory restoration necessary to provide, restore, and enhance habitat equivalent to that which was lost or degraded due to the Spill. These four proposed projects will provide functional wetland habitats within the landscape area of the Detroit River and western Lake Erie where the majority of the injuries occurred (Figure 5). These four preferred projects and their amendments satisfy OPA restoration requirements and the Trustees have determined that these would appropriately compensate the public for the natural resource injuries associated with the Spill.

The four preferred projects and their amendments described in this section are derived from existing habitat management plans and the experience and working knowledge of cooperators familiar with the landscape of the Rouge and Detroit River watersheds. If accepted as the alternative to be implemented, the Trustees assume that the specific projects may require additional refinements or adjustments to reflect site conditions or unforeseen circumstances at the time of implementation. Project design may also change to reflect additional input by the Trustees and consideration of public comment between the draft and final DARPs.

### 5.4.1. Humbug Marsh & Monguagon Creek Bank Habitat Improvements

#### *Project Description*

This project would integrate wetland and forest management to enhance or restore habitats within the 410 acre Humbug Marsh and along Monguagon Creek. Multiple stressors have led to the severe encroachment of invasive species in the marsh and on adjacent creek banks. Creek banks have eroded where invasive shrubs have reduced herbaceous cover. The proposed project would result in the control of invasive species as well as rehabilitate and stabilize creek banks consistent with the goals and objectives of the DRIWR Comprehensive Conservation Plan (<http://www.fws.gov/midwest/planning/detroitriver/>). Project actions would include, but may not be limited to, the management of invasive species by mechanical removal, herbicides, and emulation of natural disturbance (wind-throw and fire) to ensure lasting ecological rehabilitation. Invasive species management would continue over the 30 year life of the project to maintain long-term habitat quality.

### ***Restoration Objectives***

This project is designed to enhance or restore 102.5 acres of marsh habitat and approximately 2,200 linear feet of creek bank currently degraded by non-native invasive plant species. Land managers would integrate management actions for long-term improvement in native plant and animal communities across habitats. This restoration would provide diverse, high quality habitat and improve water quality in Monguagon Creek and wetlands of the Humbug Marsh. Removal of invasive tree species would further enhance the quality of the riparian forest along Monguagon Creek. This proposed project would provide high quality riparian and marsh habitats to benefit native plant communities, fish, birds, and other wildlife.

### ***Probability of Success and Monitoring***

The probability of success is high. The proposed project would provide land managers the capacity to implement integrated management of Humbug Marsh, addressing an existing land management concern. DRIWR personnel, experienced in ecological restoration, would implement and monitor the results of the restoration effort. Prior to implementation, land managers would develop, and the Trustees review, a monitoring plan incorporating a reporting schedule for the proposed project monitoring activities.

While currently not part of this proposed project, project monitoring may inform the future need to develop and implement a deer management plan. This may aid DRIWR managers in maintaining diverse native plant communities on the Humbug Marsh.

### ***Environmental and Socio-Economic Impact***

Adverse impacts to the environment would likely be limited. Invasive species management is an ongoing activity in the marsh; the impact of additional restoration activities on the environment and visitors to the marsh is likely to be minimal. Some individual native plants might be harmed by management activities, but implementation would be most likely to occur where habitats are already compromised by non-native species. Management actions would be expected to produce significant net benefit to native plant communities. Increased habitat quality in the project area would increase educational, and wildlife and bird viewing opportunities for the public. Limited disruptions would be expected during management, but the benefits of restoration include increased water quality for the creek and associated wetlands, resulting in the intended compensatory restoration to recover resources injured by the Spill.

### ***Evaluation***

Humbug Marsh is a newly acquired unit within the DRIWR which, together with the Gibraltar Marsh, provides nearly 770 acres of uninterrupted wetlands along Lake Erie. The ecological significance of these habitats is highlighted by their Ramsar Convention designation as a Wetland of International Importance (<http://www.ramsar.org>) and designation as an *Important Bird Area* by The Audubon Society. The restoration would create high quality habitat for fish, amphibians, reptiles, muskrats, and birds. Removal of phragmites, a non-native and invasive plant, and restoration of native plant species would enhance these important habitats. The proposed project would provide additional habitat benefit with the rehabilitation of banks along Monguagon Creek. Consequently, the proposed project would be readily implemented and would likely result in the addition of high quality habitat for aquatic animals, wildlife and birds.

Restoration of this wetland and Monguagon Creek would support the goals of the DRIWR and would be likely to achieve the intended compensatory restoration to recover resources injured by the Spill.

***Estimated Cost for Project:***

Table 11. Estimated costs to implement and provide project maintenance over the 30 year life of the proposed Humbug Marsh & Monguagon Creek Bank Habitat Improvements Project. Present value calculated by incorporating inflation and return on investment over a 30 year period (Appendix 6).

Project Components	Cost / Year	Years	Extended Cost
<b>Materials:</b>			
Herbicides	\$1,300	30	\$39,000
Expendable Equipment/supplies	\$750	30	<u>\$22,500</u>
<b>Subtotal</b>			<b>\$61,500</b>
<b>Labor:</b>			
Staff Biologist	\$2,400	30	\$72,000
Admin Staff Support	\$480	30	\$14,400
Contract – Herbicide Application	\$2,000	30	\$60,000
Contract - Technicians	\$7,500	30	\$225,000
Staff Technicians	\$3,840	30	\$115,200
Training	\$1,000	30	<u>\$30,000</u>
<b>Subtotal</b>			<b>\$516,600</b>
<b>Maintenance</b>			
Equipment Maintenance	\$1,500	30	\$45,000
Levee/Access Maintenance	\$2,500	30	<u>\$75,000</u>
<b>Subtotal</b>			<b>\$120,000</b>
<b>Implementation Monitoring</b>			
Staff Biologist	\$576	30	\$17,280
Project Leader	\$768	30	<u>\$23,040</u>
<b>Subtotal</b>			<b>\$40,320</b>
<b>Total</b>			<b>\$738,420</b>
<b>Present Value – Adjusted for Inflation and Investment</b>			<b>\$661,663</b>
<b>Contingency (15%)</b>			<b>\$99,249</b>
<b>Adjusted Total</b>			<b>\$760,912</b>

#### **5.4.2. Gibraltar Wetland Restoration**

##### ***Project Description***

This proposed project is designed to enhance emergent marsh habitats through the removal of invasive plant species and emulation of natural disturbances (wind-throw and fire). Current knowledge of the marsh's hydrology is limited. Consequently, this proposed project was amended to include a basic hydrology survey that should inform future best management practices for the marsh. This should enable managers to develop and implement a management plan specific to the hydrological attributes of the Gibraltar wetland. Invasive species management would continue for 30 years to maintain long-term habitat quality.

##### ***Restoration Objectives***

This project is intended to enhance 70 acres of emergent marsh to achieve long-term improvement in native plant and animal communities across habitats in the project area. The amended project is also intended to provide fundamental hydrology data that should inform future management. Restoration of a diverse native plant community would provide high quality habitat for fish, amphibians, reptiles, muskrats, and birds.

##### ***Probability of Success and Monitoring***

The probability of success is high. The proposed project would provide land managers with the capacity to implement integrated management of Gibraltar Marsh, addressing an existing land management concern. Refuge personnel experienced in ecological restoration would implement and monitor the results of the restoration effort. Prior to implementation, land managers would develop, and the Trustees review, a monitoring plan incorporating a reporting schedule of the proposed project monitoring activities.

Knowledge gained through the addition of a hydrology survey would inform future management of the marsh resulting in improved control of invasives through hydrologic manipulation.

As with the Humbug Marsh and the Monguagon Creek unit, a large population of white tailed deer inhabit the area, so this may necessitate the development of a scientifically defensible deer management plan to aid DRIWR managers in maintaining high quality marsh habitats. While currently not part of this proposed project, project monitoring may inform the future need to develop and implement a deer management plan.

### ***Environmental and Socio-Economic Impact***

Adverse impacts to the environment would likely be limited. Invasive species management is an ongoing activity for the marsh; the impact of additional restoration activities on the environment and visitors to the marsh is likely to be minimal. Some individual native plants might be harmed by management activities, but implementation would be most likely to occur where habitats are compromised by non-native species. Management actions would be expected to produce significant net benefit to native plant communities. Increased habitat quality in the project area would increase educational, and wildlife and bird viewing opportunities for the public. Limited disruptions would be expected during management, but the benefits of restoration include increased water quality for the creek and associated wetlands.

### ***Evaluation***

The Gibraltar Unit is over 350 acres of marsh situated near Humbug Marsh, a unit of the DRIWR, a Ramsar designated Wetland of International Importance, and a designated *Important Bird Area* by The Audubon Society. Together, these marshes provide 770 acres of uninterrupted emergent marsh habitats within a highly developed, predominantly urban, environment. Restoration of the Gibraltar Marsh through native plant restoration, and integrated wetland management actions, would increase the quality of the marsh providing habitat for fish, birds, and terrestrial wildlife resulting in the intended compensatory restoration to recover resources injured by the Spill.

A hydrological survey would determine if additional infrastructure would improve the ability of land managers to maintain native plant and animal communities, while limiting invasive species encroachment.

Invasive species management is an ongoing activity in other units of the DRIWR. Consequently, it is likely that the proposed project would be readily implemented. Restoration of this wetland would support the DRIWR goals of providing quality marsh habitat along Lake Erie and the Detroit River.



**Estimated Cost for Project:**

Table 12. Estimated costs to implement and provide project maintenance over the 30 year life cycle of the proposed Gibraltar Wetland Restoration Project. Present value calculated by incorporating inflation and return on investment over a 30 year period (Appendix 6).

Project Components	Cost / Year	Years	Extended Cost
<b>Materials:</b>			
Herbicides	\$1,500	30	\$45,000
Expendable Equipment/Supplies	\$750	30	<u>\$22,500</u>
<b>Subtotal</b>			<b>\$49,394</b>
<b>Labor:</b>			
Contract Hydrology			\$40,000
Staff Biologist	\$2,400	30	\$72,000
Admin Staff Support	\$480	30	\$14,400
Contractor – Herbicides	\$2,000	30	\$60,000
Contract Technicians	\$7,500	30	\$225,000
Staff Technicians	\$3,840	30	\$115,200
Training	\$1,000	30	<u>\$30,000</u>
<b>Subtotal</b>			<b>\$556,600</b>
<b>Maintenance</b>			
Equipment Maintenance	\$1,500	30	\$45,000
Levee / Access Maintenance	\$2,500	30	<u>\$75,000</u>
<b>Subtotal</b>			<b>\$120,000</b>
<b>Implementation Monitoring</b>			
Staff Biologist	\$576	30	\$17,280
Project Leader	\$768	30	<u>\$23,040</u>
<b>Subtotal</b>			<b>\$40,320</b>
<b>Total</b>			<b>\$784,420</b>
<b>Present Value – Adjusted for Inflation and Investment</b>			<b>\$707,039</b>
<b>Contingency (15%)</b>			<b>\$106,056</b>
<b>Adjusted Total</b>			<b>\$813,095</b>

### **5.4.3. Great Lakes Marsh Restoration**

#### ***Project Description***

This project is designed to further the ongoing restoration of coastal marsh habitat along western Lake Erie in the Lake Erie Metropark (LEMP). Marsh restoration began in 2012 with the initiation of invasive species control, but currently no maintenance of treated habitats is planned or funded. Repeated treatments will be needed to prevent the re-establishment of invasive plant species such as buckthorn, European alder, honeysuckle, flowering rush, Japanese barberry, phragmites, privet, and reed canary grass. Originally, the project was intended to benefit only native coastal marsh (Table 9, and Appendix 2), but has been amended to include coastal marsh edge, Lake Erie shoreline, and lakeplain prairie plant communities as well. Extending treatment into the immediately adjacent lakeplain prairie, where species such as phragmites, reed canarygrass, and flowering rush occur in interspersed moist soil habitats, would ensure that adjacent wetland areas will retain their ecological value to the greatest extent possible. Furthermore, species injured during the Spill such as waterfowl frequently use lakeplain prairie habitats as nesting areas. Therefore, conserving these lakeplain prairie habitats serves to restore resources injured during the Spill.

#### ***Restoration Objectives***

The proposed project is designed to advance the restoration of 350 acres of coastal marsh habitat. The project has been amended to include an additional 63 acres of treatments that would occur in coastal marsh edge, Lake Erie shoreline, and lakeplain prairie habitats. To achieve their objectives, LEMP managers would continue the removal of invasive species and re-establishment of native plant species in these habitats. The restoration would provide high quality wetland and lakeplain prairie habitat along the west coast of Lake Erie, enhancing habitats for terrestrial and aquatic species of plants and wildlife.

#### ***Probability of Success and Monitoring***

LEMP protocols for the eradication of invasive species are well-established and have been developed to limit negative impacts on the marsh and its surrounding environment (MDNR, 2009). Invasive species management has already been initiated within LEMP. Consequently, implementation of the proposed project would be likely to result in substantial restoration of coastal marsh, Lake Erie shoreline, and lakeplain prairie habitats. Prior to implementation, land managers would develop, and the Trustees review, a monitoring plan incorporating a reporting schedule of the proposed project monitoring activities.

#### ***Environmental and Socio-Economic Impact***

Environmental impacts would be limited while the benefits of invasive plant removal and the reestablishment of native plants of high ecological value would be substantial. Emergent marsh, Lake Erie shoreline, and lakeplain prairie habitats within the LEMP provide important wildlife and bird watching opportunities within a highly developed, predominantly urban, environment. The proposed project would enhance this area and increase the outdoor experience for visitors, while improving quality and availability of habitats for terrestrial and aquatic species.

### ***Evaluation***

The Great Lakes Marsh Restoration Project would improve and maintain approximately 413 acres of high quality native habitats in the LEMP. Treatment protocols for invasive species have been previously implemented, facilitating the implementation of this project and acceptance by local stakeholders. Continued management of invasive plant species and restoration of ecologically valuable native plants would maintain diversity of the wetland, providing additional habitats for the many species which use this marsh. Enhancement of the marsh, shoreline, and lakeplain prairie would increase wildlife viewing and educational experiences of urban visitors; marsh restoration would provide additional habitat for fish, birds, and terrestrial wildlife resulting in the intended compensatory restoration to recover resources injured by the Spill.

### ***Estimated Cost for Project:***

Table 13. Estimated costs to implement and provide project maintenance over the 30 year life of the proposed Great Lakes Marsh Restoration Project. Present value calculated by incorporating inflation and return on investment over a 30 year period (Appendix 6).

<b>Project Components</b>	<b>Cost / Year</b>	<b>Years</b>	<b>Extended Cost</b>
<b>Materials:</b>			
Herbicides	\$1,000	30	\$30,000
Expendable Equipment / Supplies	\$750	30	<u>\$22,500</u>
<b>Subtotal</b>			<b>\$52,500</b>
<b>Labor:</b>			
Staff Supervision Invasive Control	\$1,857	30	\$55,716
Admin Staff Support	\$894	30	\$26,820
Supervisor, Marsh Edge Invasive Control	\$1,114	30	\$33,430
HCMA NRD Technician	\$253	30	\$7,584
Supervisor, Lake Erie Shore Invasive Control	\$743	30	\$22,286
Supervisor, Lake Plain Prairie Invasive Control	\$743	30	\$22,286
HCMA NRD Technician	\$126	30	\$3,792
LEMP Technician	\$632	30	\$18,960
Staff – GIS Project Planning	\$743	30	<u>\$22,286</u>
<b>Subtotal</b>			<b>\$213,161</b>
<b>Maintenance</b>			
Equipment maintenance	\$1,500	30	\$45,000
Levee / Access maintenance	\$2,000	30	<u>\$60,000</u>
<b>Subtotal</b>			<b>\$105,000</b>
<b>Implementation Monitoring</b>			
Staff Biologist	\$1,857	30	<u>\$55,716</u>
<b>Subtotal</b>			<b>\$55,716</b>
<b>Total</b>			<b>\$426,377</b>
<b>Present Value – Adjusted for Inflation and Investment</b>			<b>\$382,056</b>
<b>Contingency (15%)</b>			<b>\$57,308</b>
<b>Adjusted Total</b>			<b>\$439,364</b>

#### **5.4.4. Pointe Mouillee Wetland Restoration**

##### ***Project Descriptions***

The Pointe Mouillee Marsh is one of the largest freshwater marsh restoration projects in the world, encompassing more than 4,000 acres of managed wetlands. Hydrology of the marshes is managed to provide optimal water levels for invertebrates, fish, birds, and other wildlife, and to limit encroachment of invasive species such as phragmites. The amended preferred project would replace or rebuild the infrastructure necessary to improve management of hydrology in multiple units of the larger wetland complex. Project goals remain consistent with the original proposal considered by the Trustees (Section 5.3 and Appendix 2); acreage has declined due to completion of proposed actions in the time between the original proposal and implementation.

Trustees propose to implement the following amended structural improvements to enhance ability and capacity to control and manipulate water levels in multiple units of the wetland complex (Figure 6):

- Repair of the Bad Creek South Unit dikes and installation of an agri-drain water control structure, restoring the wetland to full function. This amendment acts as a substitute for the recently restored Bad Creek North Unit originally proposed by the Trustees (Section 5.3 and Appendix 2).
- In lieu of recently completed infrastructure improvements that were originally proposed (Section 5.3 and Appendix 2.), installation of two 20,000 gallon per minute vertical electric pumps that would allow land managers to more effectively manipulate water levels in the affected management units.

Multiple pumps should allow managers the ability to more accurately time wetland drawdown to improve regeneration of emergent vegetation and control invasive species such as phragmites. To maintain the quality of emergent wetlands, funding would be provided to implement invasive species management over the 30 year life cycle of the project.

##### ***Restoration Objectives***

The project has been amended to include the construction, repair, or modification of dikes that serve as water control structures as noted above; installation of an agri-drain water control structure within the Bad Creek Unit; and, the replacement of a single, aging, inefficient pump with two vertical electric 20,000 gallon/min pumps. Land managers also propose to implement control of non-invasive species.

Implementation of the proposed project should result in improved wetland quality in multiple units of the wetland complex:

- Restoration of a 30 acre wetland in the Bad Creek South Unit
- 650 acres of wetland enhanced in the Humphries Unit
- 70 acres of wetland enhanced in the Lautenschlager Unit
- 175 acres of wetland enhanced in the Vermet Unit

### ***Probability of Success and Monitoring***

Management of the Pointe Mouillee wetlands has been an ongoing priority since the purchase of the area by the State of Michigan in 1945. The proposed actions would be consistent with both historic and ongoing management practices implemented by Pointe Mouillee personnel. Well-established protocols for the management of invasive species and manipulation of water levels to enhance habitats are in-place. The State of Michigan has continued to recognize the importance of the wetland complex as a waterfowl production area and as habitat for numerous migratory shorebirds. Consequently, as part of the ongoing management of the Pointe Mouillee State Game Area, the Trustees believe that the proposed project has a high probability of success.

The State of Michigan provides on-site staffing of the Pointe Mouillee State Game Area to monitor the area's use and environmental condition. Prior to implementation, land managers would develop, and the Trustees review, a monitoring plan that incorporates a reporting schedule of the proposed project monitoring activities.

### ***Environmental and Socio-Economic Impact***

Little negative environmental impact is anticipated as a consequence of implementing the proposed project. Water management would be likely to improve with the installation of pumps and the improvement of dikes. Both of these proposed management actions would occur within areas of prior disturbance of reduced ecological value that receive regular visitation (e.g., existing infrastructure such as dikes). The replacement of an aging diesel-fueled water pump with electrical pumps would eliminate the possibility of fuel spills as a source of environmental impact to the adjacent wetlands. These improvements would result in the enhancement of substantial wetland areas in proximity to the improved infrastructure. Disturbance would be likely to be short-term relative to the long-term enhancement of wetland habitats. Treatment of non-native and invasive plant species such as phragmites would be likely to substantially improve wetland habitat quality.

The Pointe Mouillee State Game Area receives, and is managed to produce, substantial wildlife-related recreational use. The proposed management actions would be likely to enhance and increase wildlife-related recreational opportunity on the Pointe Mouillee State Game Area.

### ***Evaluation***

The proposed infrastructure improvements and repairs would substantially increase the quantity and quality of wetland habitats available to aquatic species and terrestrial wildlife, including waterfowl and shorebirds, on the Point Mouillee State Game Area. Numerous species would benefit from management actions associated with the installation or repair of water control structures and installation of pumps. The resulting improved wetland habitat would benefit all those species and species groups identified as injured during the Spill (muskrats, waterfowl, shorebirds, wading birds, amphibians, reptiles, fish and invertebrates). The Point Mouillee State Game Area receives substantial recreational use for wildlife viewing, photography, and hunting. Restoration of marsh habitat would support the goals and operational plan of the area. The proposed project is consistent with the Department of Natural Resources Waterfowl Legacy program as well as the Wildlife Division's Strategic Wildlife Action Plan (Eagle et al., 2005).



**Estimated Cost for Project(s):**

Table 14. Estimated costs to implement and provide project maintenance over the 30 year life of the proposed Pointe Mouillee Restoration Project. Present value calculated by incorporating inflation and return on investment over a 30 year period (Appendix 6).

Project Components	Cost / Year	Years	Extended Cost
<b>Materials:</b>			
Vertical Electric Pumps (2)			\$400,000
Gravel – Pump Pad			\$2,000
Expendable Equipment / Supplies	\$1,000	30	\$30,000
Herbicides	\$2,000	30	\$60,000
<b>Subtotal</b>			<b>\$492,000</b>
<b>Labor:</b>			
Admin Staff Support	\$960	30	\$28,800
Contract – Dike Reconstruction			\$130,000
Contract – Electrical - Pumps			\$80,000
Contract – Concrete - Pumps			\$75,000
Contract – Helicopter - Herbicides			\$50,000
Installation Agri-drain & Culverts			\$4,000
<b>Subtotal</b>			<b>\$367,800</b>
<b>Maintenance</b>			
ASV Mulcher Rental	\$3,000	30	\$90,000
Equipment Maintenance	\$1,500	30	\$45,000
Levee / Access Maintenance	\$3,000	30	\$90,000
Maintenance Staff	\$1,200	30	\$36,000
<b>Subtotal</b>			<b>\$261,000</b>
<b>Implementation Monitoring</b>			
Staff Biologist	\$1,200	30	\$36,000
<b>Subtotal</b>			<b>\$36,000</b>
<b>Total</b>			<b>\$1,156,800</b>
<b>Present Value – Adjusted for Inflation and Investment</b>			<b>\$1,116,824</b>
<b>Contingency (15%)</b>			<b>\$167,524</b>
<b>Adjusted Total</b>			<b>\$1,284,347</b>



## 5.5. Restoration Analysis and Scaling

Compensatory restoration projects must be scaled to ensure that the ecological benefits produced by the projects balance the losses incurred as a result of the Spill (Section 4.3, Table 8). Trustees scaled the preferred restoration projects to determine restored acres and DSAYs produced if the projects were to be fully implemented. The four preferred projects would result in highly functional wetlands with a mix of areas dominated by either cattail or sedge species (assumed 50:50 distribution for calculating productivity of the wetlands). The areas proposed for restoration currently provide varying degrees of habitat quality and wetland functionality, so the benefits to be gained for each project were based on the current functionality of the existing habitat, the level of function expected to be gained, and the time over which restoration will occur and be maintained.

Calculations for the four proposed restoration projects were based on implementation starting in 2016. Current functionality and time to achieve functionality at completion of restoration varied by project, but all projects were scaled to a total of 30 years. This was based on a reasonable estimate of certainty of being able to monitor and maintain natural resource functionality and the services provided by those resources. Calculations were based on the following:

### Humbug and Gibraltar Marsh Restorations

Current wetland functionality of 33%  
Wetland functionality of 90% in 10 years  
Invasive species management to year 30 to maintain 90% function

### The Pointe Mouillee Marsh Restoration Project

Humphries Unit: Current wetland functionality of 80%  
Wetland function of 90% achieved in 3 years  
Invasive species management to year 30 to maintain 90% function

Vermet Unit: Current wetland functionality of 50%  
Wetland function of 90% achieved in 7 years  
Invasive species management to year 30 to maintain 90% function

Lautenschlager Unit: Current wetland functionality of 50%  
Wetland functionality of 90% in 7 years  
Invasive species management to year 30 to maintain 90% function

Bad Creek Unit: Current wetland functionality of 10%  
Wetland function of 90% achieved in 14 years  
Invasive species management to year 30 to maintain 90% function

### Great Lakes Marsh Restoration

LEMP: Current wetland functionality of 80%  
Wetland functionality of 90% in 3 years  
Invasive species management to year 30 to maintain 90% function



Coastal Marsh:	Current wetland functionality of 30% Wetland functionality of 90% in 11 years Invasive species management to year 30 to maintain 90% function
Lake Erie Shore:	Current wetland functionality of 60% Wetland functionality of 90% in 6 years Invasive species management to year 30 to maintain 90% function
Lakeplain prairie:	Current functionality of 50% Functionality of 90% in 8 years Invasive species management to year 30 to maintain 90% function

Under the OPA, Trustees must compare the DSAYs needed to compensate for interim resources lost and DSAYs that could be produced if the proposed projects were to be implemented. DSAYs produced (Table 15, Appendix 4) must be roughly equal to DSAYs needed (Table 8). As described, the four preferred projects provide approximately 99.9% of DSAYs needed to compensate the public for resources lost during the Spill (Table 15). The Trustees consider this to be within a margin of error and therefore sufficient to satisfy compensatory restoration.

## **5.6. Additional Considerations for Implementation**

### **5.6.1. Climate Change Project Considerations**

As mentioned in Section 2.1, climate change is projected to have an impact within the larger landscape encompassing the proposed projects. Increased annual temperatures and disrupted precipitation patterns may alter emergent marsh plant and animal communities over the duration of the proposed restoration projects. Currently established protocols for invasive species management may need to be adapted to meet changes in local climates. Climate change may result in conditions which favor the establishment of additional invasive species that may subsequently necessitate additional control. Additional water level management and associated infrastructure may eventually be required to maintain water levels that ensure the maintenance of diverse habitats while limiting invasive encroachment. Nonetheless, the Trustees think that the proposed project designs and funding levels are sufficiently robust to provide the necessary compensatory benefits over the 30 year project life used in the benefits calculations and funding estimates.

Table 15. Proposed project scaling information including project overview, amount and type of habitat the project would restore, injury that would be addressed by the project, and discounted service acre years (DSAYs) produced by the proposed restoration. Analysis assumes a 30 year life cycle for each project, inclusive of implementation and maintenance of ecological function.

Project	Description	Restored Habitat (Acres)	Injury Addressed	DSAYs Produced
<b>Humbug Marsh / Monguagon Creek Restoration</b>	Invasive species control and coastal wetland vegetation and riparian habitat restoration.	102.5 Marsh 0.4 Riparian	Waterfowl Shore, Sea, and Wading birds Muskrats Amphibians/Reptiles Fish Marsh and Riparian Habitats	913
<b>Gibraltar Wetland</b>	Enhance hydrology, invasive species control and coastal wetland restoration.	70 Marsh	Waterfowl Shore, Sea, and Wading birds Muskrats Amphibians/Reptiles Fish Marsh Habitats	621
<b>Great Lakes Marsh Restoration</b>	Invasive species control and coastal and lakeplain prairie vegetation restoration.	350 Marsh 16 Marsh Edge 9 Lake Erie Shore 38 Lakeplain Prairie	Waterfowl Shore, Sea, and Wading birds Muskrats Amphibians/Reptiles Fish Marsh Habitats	1,122
<b>Pointe Mouillee Marsh Restoration</b>	Enhance and implement hydrology control for wetland production and invasive species control.	895 Marsh (Lautenschlager, Vermet, Humphries units) 30 Moist Soil Marsh (Bad Creek)	Waterfowl Shore, Sea, and Wading birds Muskrats Amphibians/Reptiles Fish Marsh Habitats	3,230
<b>Totals Restored</b>		<b>1,511</b>		<b>5,886</b>
<b>Total DSAYs needed to compensate for resource injuries:</b>				<b>5,893</b>

## **5.7. Summary of Costs**

### **5.7.1. Project Implementation**

Project costs are summarized below in tabular form (Tables 16, 17). Implementation costs are broken down to indicate the initial costs of implementation and project-based monitoring, maintenance costs, and contingency funds to address unforeseen circumstances (Table 17).

### **5.7.2. Case and Project Management**

The Trustees will provide administrative oversight for the implementation of each restoration project; the respective land managers will be responsible for implementation of restoration projects, obtaining any necessary permits, writing statements of work, selecting contractors, approving final project design and work plans, conducting required monitoring, ensuring that final projects achieve the intended ecological benefit so as to compensate for losses as scaled, and certifying the completion of each project. If at any point a proposed project becomes infeasible, the Trustees may implement any of the alternative restoration projects outlined in Table 9. If required, these alternative projects would be scaled to meet the restoration requirements of the injured resources.

Future costs incurred by the Fish and Wildlife Service, as the LAT, will include costs related to outcome-based monitoring designed to assess benefit to ecological communities; staff time related to coordination of public involvement, administrative oversight of contracts and agreements; and, facilitation of Trustee communications, accomplishment reporting, and maintenance of the administrative record for the 2002 Rouge River Mystery Oil Spill. Initial estimated administrative costs for the LAT encompasses three years following receipt of NPFC funding or the initial three field seasons of restoration implementation.

#### **FWS Personnel:**

Dr. Lisa Williams serves the East Lansing Ecological Services Field Office as their Contaminants Branch Chief. Dr. Williams will provide supervisory support and document review for the Case Manager. Dr. Williams will participate in person or by telephone in various activities including, but not limited to, Trustees' meetings that address technical or legal subject matters. Dr. Williams serves as a liaison between field staff and upper management, and will provide briefings and seek approval signatures from the DOI Authorized Official, as needed.

Dr. Clark McCreedy will serve as the Service's Case Manager for the 2002 Rouge River Mystery Oil Spill. Dr. McCreedy is a Contaminant Specialist at the Service's East Lansing Ecological Services Field Office. Dr. McCreedy will coordinate and participate in Trustee conference calls and meetings. He will assist with the development of monitoring plans, documenting budgets, accomplishment reporting, and will maintain administrative and financial records.

Travel:

Travel costs are estimated on the basis of annual day trips by Service staff within Michigan to meet with the Trustees or to meet with proponents of projects identified by the Trustees as compensatory restoration projects. In addition, the following budget includes two annual overnight trips via air for the purpose of briefing Fish and Wildlife Service leadership.

The Service anticipates that administrative oversight for the 2002 Rouge River Mystery Oil Spill will require additional support in the amount of \$149,111 (Table 16). The Service and the Michigan Department of the Attorney General have included estimates of costs associated with administrative oversight of project implementation throughout the first three years of restoration implementation (Table 16). Administrative oversight by the Trustees would be approximately 5.1% of implementation costs, slightly less than that reported elsewhere (LA DEQ 2003).

Table 16. Projected future costs for the Fish and Wildlife Service, acting as Lead Administrative Trustee for the 2002 Rouge River Mystery Oil Spill. Future costs for the Lead Administrative trustee were estimated using the Services NRDA Cost Estimation Tool (CET). Contingency (15%) added as a percentage of present value.

<b>Cost Category</b>	<b>Amount</b>
Labor and Benefits	<b>\$316,354</b>
Travel	<b>\$7,570</b>
Contracts	<b>\$0</b>
Supplies and Equipment	<b>\$0</b>
Land and Structures	<b>\$0</b>
Vehicles	<b>\$4,891</b>
FWS Indirect Support	<b>\$275,228</b>
DOI Indirect Support	<b>\$53,274</b>
<b>Total Costs with inflation</b>	<b>\$657,317</b>
<b>Present Value</b>	<b>\$440,773</b>
<b>Contingency (15%)</b>	<b>\$66,116</b>
<b>Total with Contingency</b>	<b>\$506,888</b>

### 5.7.3. Outcome-based Monitoring

In addition to the monitoring and reporting of the near-term efficacy of project implementation, the Trustees propose to implement outcome-based resource monitoring. This would be designed to assess the outcome of restoration in metrics related to Great Lakes coastal marsh ecological communities. Outcome-based monitoring is a component of the Service's vision of Strategic Habitat Conservation (USFWS 2008). Strategic Habitat Conservation is intended to focus the resources of the agency in such a way as to enhance the efficacy of the conservation of trust resources at landscape levels. Monitoring the outcomes of conservation delivery is regarded as an essential component of accountability and a necessity to inform future adaptive management.

The proposed outcome-based monitoring would be designed to assess the efficacy of restoration in terms of metrics that measure the structure and functioning of natural resources addressed in the methodology used to assess and scale injuries resulting from the 2002 Rouge River Mystery Oil Spill: native marsh plant communities; macroinvertebrate communities; and, the guilds of avian species (e.g., shorebirds, waterbirds, and waterfowl) that depend upon these resources for resident and migratory foraging habitats.

The Upper Mississippi and Great Lakes Region Joint Venture has identified focal species and defined regional objectives for the management of waterfowl, waterbird, and shorebird conservation (Potter et al. 2007; Soulliere et al. 2007a, 2007b; UMRGLR JV 2007). A protocol for the systematic survey of Great Lakes marsh birds has been recently implemented (Monfils 2014) and substantial effort has gone into the development of indices of biotic integrity (IBI) to assess the health of Great Lakes marsh plant communities (Albert and Minc 2004, Croft and Chow-Fraser 2007, Seilheimer et al. 2009, Simon et al. 2001) and macroinvertebrate communities (Burton et al., 1999, Kashian and Burton 2000, Uzarski et al. 2004). The Trustees propose to incorporate, as appropriate, this existing body of work related to the monitoring of Great Lakes Ecosystem health into an outcome-based monitoring plan for the preferred restoration projects described within the DARP.

The Trustees would review and grant final approval to an outcome-based monitoring plan to be developed should the DARP receive funding from the NPFC. Monitoring of project implementation would occur annually in years 1-3; monitoring of the outcome of restoration effort would be assessed concurrently in years 1-3, and in years 6, 9, 12, and 15. Outcome-based monitoring would include evaluation of reference sites to control for environmental variation to the extent possible. A 15 year period over which monitoring would occur should encompass sufficient time to achieve restoration of functional wetlands (LA DEQ 2003).

Outcome-based monitoring costs are estimated on the basis of a Master's student level stipend plus contingency (15 years of salary support @ \$25,000 /year); 15 years of travel support plus contingency (@ \$3,000 / year); and 55% indirect cost support (Table 18). Total outcome-based monitoring costs would be approximately 17.4% of implementation costs, similar to monitoring costs reported by the LA DEQ (2003).

Table 17. Summary of costs to implement the proposed Compensatory Restoration Alternative, consisting of four projects: the Humbug Marsh – Monguagon Creek Restoration; the Gibraltar Wetland Restoration; the Great Lake Marsh restoration; and, Pointe Mouillee Marsh Restoration. Contingency estimated as 15% of estimated present value of project cost. Projects scaled assuming a life cycle of 30 years duration; present value represents the funds needed at initiation, adjusted for inflation and return on investment, to meet future costs.

Project	Total Costs	Present Value	Contingency	Estimated Cost
<b>Humbug Marsh Restoration</b>	\$738,420	\$661,663	\$99,249	<b>\$760,912</b>
<b>Gibraltar Wetland Restoration</b>	\$784,420	\$707,039	\$106,056	<b>\$813,095</b>
<b>Great Lakes Marsh Restoration</b>	\$426,377	\$382,056	\$57,308	<b>\$439,364</b>
<b>Pointe Mouillee Marsh Restoration</b>	\$1,156,800	\$1,116,824	\$167,524	<b>\$1,284,347</b>
<b>Total</b>	<b>\$3,297,718</b>			

Table 18. Summary of future Trustee costs related to administration, over-sight, and outcome-based monitoring of the proposed Compensatory Restoration Alternative, consisting of the Humbug Marsh – Monguagon Creek Restoration; the Gibraltar Wetland Restoration; the Great Lake Marsh restoration; and, Pointe Mouillee Marsh Restoration.

Trustee	Total Costs	Present Value	Contingency	Estimated Cost
<b>USFWS</b>	\$657,317	\$440,773	\$66,116	<b>\$506,888</b>
<b>Outcome-Based Monitoring</b>	\$520,800	\$490,426	\$73,564	<b>\$563,990</b>
<b>MDEQ</b>	\$106,474	\$96,952		<b>\$96,952</b>
<b>MDNR</b>	\$106,474	\$96,952		<b>\$96,952</b>
<b>MDAG</b>	\$198,271	\$177,661		<b>\$177,661</b>
<b>Total Cost</b>	<b>\$1,406,728</b>			

## 6.0 Compliance with Environmental Law, Regulation, and Policy

The following Federal, state, and local laws, regulations, and policies may affect completion of the restoration projects. All project sponsors that receive natural resource damage funding will be responsible for obtaining any necessary permits and complying with relevant local, state, and Federal laws, policies, and ordinances.

### 6.1. Federal Laws, Regulation, and Policy

**National Environmental Policy Act (NEPA; 42 U.S.C. § 4321 *et seq.*).** The NEPA requires that Federal agencies determine whether or not their proposed actions will have a significant effect on the human environment. After careful consideration, the four preferred projects, as described in Section 5.3, were determined by the Trustees to be actions that would not directly, indirectly, or cumulatively have a significant effect on the human environment pursuant to the NEPA. That is, because of their minimal impact on the human environment, the restoration actions considered here are addressed by Categorical Exclusions under the NEPA (40 CFR §1508 and 43 C.F.R. §46.205). As such, by regulation, they are excluded from the need to conduct additional analyses such as an Environmental Assessment or Environmental Impact Statement. The following U.S. Fish and Wildlife Service Categorical Exclusions (Part 516 DM Chapter 8, Appendix 7) apply to the proposed restoration projects for the Spill:

1. Research, inventory, and information collection activities directly related to the conservation of fish and wildlife resources which involve negligible animal mortality or habitat destruction, no introduction of contaminants, or no introduction of organisms not indigenous to the affected ecosystem. 516 DM Chapter 8.5 B.(1)  
**Gibraltar Wetland Restoration**
2. The operation, maintenance, and management of existing facilities and routine recurring management activities and improvements, including renovations and replacements which would result in no or only minor changes in the use, and would have no or negligible environmental effects on-site or in the vicinity of the site. 516 DM Chapter 8.5 B.(2)  
**Gibraltar Wetland Restoration**  
**Pointe Mouillee Wetland Restoration**
3. The construction of new, or the addition of, small structures or improvements, including structures and improvements for the restoration of wetland, riparian, in stream, or native habitats, which would result in no or only minor changes in the use of the affected local area. 516 DM Chapter 8.5 B. (3)  
**Humbug Marsh/Monguagon Creek Bank Habitat Improvements**  
**Gibraltar Wetland Restoration**  
**Pointe Mouillee Wetland Restoration**

4. The reintroduction of native, formerly native, or established species into suitable habitat within their historic or established range, where no or negligible environmental disturbances would be anticipated. 516 DM Chapter 8.5 B. (6)

**Humbug Marsh/Monguagon Creek Bank Habitat Improvements**

**Gibraltar Wetland Restoration**

**Great Lakes Marsh Restoration**

**Pointe Mouillee Wetland Restoration**

5. Natural resource damage assessment restoration plans, prepared under sections 107, 111, and 122(j) of the Comprehensive Environmental Response Compensation and Liability Act (CERCLA); section 311(f)(4) of the Clean Water Act; and the Oil Pollution Act; when only minor or negligible change in the use of the affected areas is planned. 516 DM Chapter 8.5 B. (11).

**Humbug Marsh/Monguagon Creek Bank Habitat Improvements**

**Gibraltar Wetland Restoration**

**Great Lakes Marsh Restoration**

**Pointe Mouillee Wetland Restoration**

Appendix 7 contains the text of 516 DM Chapter 8.5 with the relevant exclusions highlighted and other NEPA compliance documentation including a categorical exclusion checklist and verification form (FWS Form 3-2185).

**Federal Water Pollution Control Act (CWA; 33 U.S.C. § 1251 *et seq.*).** The CWA is intended to protect surface water quality, and regulates discharges of pollutants into waters of the United States. All proposed restoration projects will comply with CWA requirements, including obtaining any necessary permits for proposed restoration actions. Restoration projects that move material in or out of waterways and wetlands, or result in alterations to a stream channel, typically require CWA Section 404 permits. Dam removal actions also require 404 permits. Project sponsors will be required to obtain the appropriate permits before restoration work begins, as necessary.

As part of the Section 404 permitting process, consultation under the Fish and Wildlife Coordination Act (16 U.S.C. § 661 *et seq.*) generally occurs. This act requires that Federal agencies consult with the USFWS, the National Marine Fisheries Service (NMFS), and state wildlife agencies to minimize the adverse impacts of stream modifications on fish and wildlife habitat and resources. Consultation with NMFS is not applicable to this DARP for an inland watershed in Michigan.

Compliance with the Rivers and Harbors Act (33 U.S.C. § 401 *et seq.*) generally occurs as part of the Section 404 permitting process. The Rivers and Harbors Act prohibit unauthorized obstruction or alteration of navigable waters. Any required permits under the Rivers and Harbors Act are generally included with the Section 404 permitting process.

**Clean Air Act of 1970, as amended, (CAA; 42 U.S.C. § 7401 *et seq.*).** The CAA regulates air emissions from stationary and mobile sources to protect human health and the environment. Any activities associated with the restoration projects that result in air emissions (such as construction projects) will be in compliance with the CAA and any local air quality ordinances.



**Federal Endangered Species Act of 1973, as amended (ESA; 16 U.S.C. §§ 1531 *et seq.*).** The purpose of the ESA is to conserve federally endangered and threatened species and the ecosystems upon which they depend. Pursuant to Section 7 of the ESA, Federal agencies shall, in consultation with the Secretaries of the Interior or Commerce, ensure that any action that they authorize, fund, or carry out is not likely to jeopardize the continued existence of any federally endangered or threatened species, or result in the destruction or adverse modification of designated critical habitat. Before initiating an action, the Federal agency, or its non-Federal permit applicant, first determine if any threatened, endangered, proposed, and candidate species and designated critical habitat may be present in the project area (Section 2.2.1, Table 2). In the case of the Rouge River Mystery Oil Spill two mammal species (Indiana bat and the northern long-eared bat), one bird species (rufa red knot), three species of mussel (northern riffleshell, rayed bean and snuffbox) and one species of plant (eastern prairie fringed orchid) have historically been found in the Rouge and Detroit River watersheds. Currently, only the eastern prairie fringed orchid is known to occur in proximity to areas of proposed restoration (Great Lakes Marsh Restoration). The proposed Great Lakes Marsh Restoration will be implemented so as to have no effect on the eastern prairie fringed orchid. A formal Section 7 review of the species of concern and any associated critical habitat will be performed prior to implementation of the final restoration projects to ensure ESA compliance.

**Fish and Wildlife Conservation Act (16 U.S.C. § 2901 *et seq.*).** The Fish and Wildlife Conservation Act authorizes financial and technical assistance to state governments to develop, revise, and implement conservation plans and programs for nongame fish and wildlife. The Trustees will seek to coordinate their restoration efforts with relevant conservation plans and programs in the State of Michigan.

**Fish and Wildlife Coordination Act (16 U.S.C. § 661 *et seq.*).** The Fish and Wildlife Coordination Act authorizes the involvement of the USFWS in evaluating impacts to fish and wildlife from proposed water resource development projects. Federal agencies that construct, license, or permit water resource development projects are required to consult with the USFWS, and in some instances with NMFS, concerning the impacts of a project on fish and wildlife resources and potential measures to mitigate these impacts. The Trustees will engage in coordination if relevant to any of their projects.

**Information Quality Act of 2001 (guidelines issued pursuant to Public Law 106-554).** As the lead Federal natural resources Trustee for this document, USFWS confirms that this information product meets its Information Quality Act guidelines, which are consistent with those of the DOI and the Office of Management and Budget.

**Magnuson-Stevens Act Fishery Conservation and Management Act, as amended (16 U.S.C. 1801 *et seq.*).** Coordination with the National Marine Fisheries Service and preparation of an Essential Fish Habitat (EFH) Assessment signifies compliance with the EFH provisions of the Magnuson-Stevens Act. This consultation does not apply to this Draft DARP for waters in Michigan.

**Marine Mammal Protection Act (16 U.S.C. 1361-1326, 1371-1384 note, 1386-1389, 1401-1407, 1411-1418, 1421-1421h).** Activities associated with these projects will not have an

adverse effect on marine mammals. The Marine Mammal Protection Act does not apply to this Draft DARP for waters in Michigan.

**Migratory Bird Treaty Act of 1918, as amended (MBTA; 16 U.S.C. §§ 703–712).** The MBTA protects all migratory birds and their eggs, nests, and feathers and prohibits the taking, killing, or possession of migratory birds. The proposed restoration actions are unlikely to result in the taking, killing, or possession of any migratory birds.

**Migratory Bird Conservation Act (16 U.S.C. § 715 *et seq.*).** The Migratory Bird Conservation Act established a commission and conservation fund to promote the conservation of migratory waterfowl and offset or prevent serious loss of important wetlands and other waterfowl habitat. The Migratory Bird Conservation Fund could potentially provide a source of additional funding to expand on Trustee efforts to conserve or restore migratory waterfowl habitat.

**National Historic Preservation Act of 1966, as amended (NHPA; 16 U.S.C. §§ 470 *et seq.*).** The NHPA is intended to preserve historical and archaeological sites. Compliance with the NHPA would be undertaken through consultation with the Michigan State Historic Preservation Office. The Trustees do not believe that historic properties occur within the areas that would be restored, but if an eligible historic property is found to be within the area of the proposed restoration project, then an analysis will be made to determine whether the project would have an adverse effect on this historic property. If the project will have an adverse effect on historic properties, then the agency or organization proposing the restoration project will consult with the State Historic Preservation Office to minimize the adverse effect.

**Occupational Safety and Health Act of 1970, as amended (OSHA; 29 U.S.C. §§ 651 *et seq.*).** The OSHA governs the health and safety of employees from exposure to recognized hazards, such as exposure to toxic chemicals, excessive noise, mechanical dangers, and unsanitary conditions. All work conducted on the proposed restoration actions will comply with OSHA requirements.

**Oil Pollution Act of 1990 (OPA; 33 U.S.C. 2701-2706, *et. seq.*, and 15 CFR Part 990).** The OPA establishes a liability regime for oil spills that injure or are likely to injure natural resources and/or the services that those resources provide to the ecosystem or humans. The OPA and the regulations at 15 CFR Part 990 provide a framework for conducting sound natural resource damage assessments that achieve restoration. The process emphasizes both public involvement and participation by the Responsible Parties. The Trustees have conducted this assessment in accordance with OPA regulations.

**Watershed Protection and Flood Prevention Act as amended (16 U.S.C. 1001 *et seq.*).** Floodplain impacts will be considered prior to selection of final projects plans and during the permit process.

## 6.2. State Laws and Regulations

**The Natural Resources and Environmental Protection Act of 1994, Public Act 451, as amended (NREPA).** Michigan's environmental protection and natural resource management authorities have been codified in the NREPA. Several parts of the NREPA would be applicable to restoration work undertaken by the Trustees. The most significant parts are described below. Permits, where required, are administered by the MDEQ, and permit application and review requirements would be consolidated whenever possible. All restoration actions undertaken by the Trustees would comply with relevant provisions of this Act and applicable rules promulgated under the Act.

**Part 31, Water Resources Protection,** requires that a permit be obtained prior to any alteration or occupation of the stream bed, channel, or floodplain of a river, stream, or drain. Part 31 also governs discharges to waters of the State, including wetlands and groundwater and provides for the recovery of natural resource damages attributable to discharges that are injurious to designated uses of waters of the State.

**Part 33, Aquatic Nuisance Control,** regulates the chemical control of aquatic nuisance species. Aquatic nuisance species may include various forms of algae (planktonic, filamentous, and macroalgae such as Chara and starry stonewort), submersed plants (i.e., those located underwater, such as coontail, pondweeds, milfoils), floating-leaf plants (e.g., lilies), and emergent plants (e.g., cattails, rushes, Phragmites). Permits to control these species are issued by the Michigan Department of Environmental Quality (MDEQ).

**Part 55, Air Pollution Control,** provides authority to the MDEQ to engage in a variety of activities to protect air quality, including the regulation of fugitive dust sources and emissions, in accordance with the provisions of M.C.L. 324.5524.

**Part 91, Soil Erosion and Sedimentation Control,** requires that a permit be obtained to protect against the loss of soil to surface waters, including wetlands. A permit is generally required for any activities that disturb one or more acres, or is within 500 feet of a lake or stream. Counties have the primary responsibility for issuing permits. In some cases, cities, villages, and townships have assumed permitting responsibility within their jurisdictions. Permit applications can be obtained from the respective county or municipal agencies.

**Part 115, Solid Waste Management,** regulates companies and businesses that dispose of solid waste. The solid waste program performs inspection, evaluation, permitting, and licensing of solid waste disposal areas in the state, including evaluation of groundwater monitoring data and corrective actions associated with releases from solid waste landfills.

**Part 201, Environmental Remediation,** provides legislative authority for Michigan's cleanup program for hazardous waste sites. The purpose of this authority is "to provide for appropriate response activity to eliminate unacceptable risks to public health, safety, or welfare, or to the environment from environmental contamination at facilities within the state" (M.C.L. 324.20102). The authority also includes "additional administrative and judicial remedies to supplement existing statutory and common law remedies" (M.C.L. 324.20102), including making claims against liable parties for "the full value of injury to,

destruction of, or loss of natural resources, including the reasonable costs of assessing the injury, destruction, or loss resulting from the release” (M.C.L. 324.20126a).

**Part 301, Inland Lakes and Streams**, requires a permit for certain construction activities on inland lakes and streams. The Inland Lakes and Streams Program is responsible for the protection of the natural resources and public trust waters of the inland lakes and streams of the State. The program oversees the following activities: dredging, filling, constructing, or placing a structure on bottomlands; constructing or operating a marina; interfering with the natural flow of water; and connecting a ditch or canal to an inland lake or stream.

**Part 303, Wetlands Protection**, requires that a person obtain a permit to perform certain activities in a wetland (Table 18).

The programs in MDEQ that administer these parts have the objective of protecting human health and the environment in Michigan.

A joint state and federal permit process has been established between the MDEQ and the U.S. Army Corps of Engineers for proposed projects in areas that have both state and Federal jurisdiction.

Table 19. Examples of types of activities that require a wetlands protection permit.

Activity	Example (partial list only)
Deposit or permit the placing of fill material	Bulldozing, grading, dumping
Dredge, remove, or permit the removal of soil or minerals	Removing tree stumps, bulldozing, digging a pond
Construct, operate, or maintain any use or development	Constructing buildings, structures, boardwalks; mining peat, treating water
Drain surface water	Diverting water to another area via ditch, pump, or drain

**Part 365, Endangered Species Protection**, requires that no state endangered or threatened plant or wildlife be taken or harmed. Numerous species of state threatened or endangered plants and animals (Table 2, Section 2.2.1) are currently or historically found within the Rouge and Detroit River watersheds and may be present in proposed restoration locations. To comply with NREPA Part 365, the Trustees, upon finalization of the DARP, will work closely with the MDNR through the Michigan Natural Features Inventory to determine if state species of concern are present in the preferred restoration locations and if the preferred restoration projects will impact these species. If any species of concern are found to be present and may be harmed by a proposed restoration project or projects, the Trustees will work with the MDNR to secure any required permits necessary. All possible precautions will be taken to ensure that the timing, location, type and duration of the restoration activities will limit any impacts to these species, as well as others which inhabitant the preferred restoration project sites.

**Michigan Occupational Safety and Health Act of 1974, Public Act 154.** The Michigan OSHA (Public Act 154 of 1974) is an act to prescribe and regulate working conditions, and places and conditions of employment to provide for occupational health and safety. The Departments of Labor and Public Health are responsible for implementing the provisions of this act. All activities conducted under this DARP would comply with provisions of this act.

### **6.3. Local Laws**

As appropriate, restoration actions will consider and comply with local plans and ordinances. Relevant local plans could include shoreline and growth management plans. Relevant ordinances could include, but not be limited to, zoning, construction, noise, and wetlands.

### **6.4. Policies and Directives**

#### **6.4.1. Federal Policies and Directives**

The following Federal policies and Presidential Executive Orders may be relevant to the proposed restoration projects in the proposed alternative:

**USFWS Mitigation Policy (Fish and Wildlife Service Manual, 501 FW 2).** This policy of the USFWS seeks to ensure “no net loss” of fish and wildlife habitat as a result of USFWS actions. The Trustees do not anticipate that any of the proposed projects will result in adverse impacts to habitat.

**Executive Order 11514 – Protection and Enhancement of Environmental Quality, as Amended by Executive Order 11911 Relating to Protection and Enhancement of Environmental Quality.** These Executive Orders require Federal agencies to monitor, evaluate, and control their activities to protect and enhance the quality of the Nation’s environment. These Executive Orders also require agencies to inform the public about these activities and to share data on environmental problems or control methods, as well as to cooperate with other governmental agencies. The actions described in this DARP address the intent of these Executive Orders.

**Executive Order 11593 - Protection and Enhancement of the Cultural Environment.** Coordination with the State Historic Officer will signify compliance. Consultation is incorporated into the CWA Section 404 and 401 permitting process.

**Executive Order 11988, 24 May 1977 amended by Executive Order 12148, 20 July 1979 – Floodplain Management.** This Executive Order directs Federal agencies to avoid the occupancy, modification, and development of floodplains, when there is a practical alternative. For all projects, the Trustees will work to ensure that any floodplain impacts are minimized. Public notice of the availability of this report or public review fulfills the requirements of Executive Order 11988, Section 2(a) (2). Consultation is incorporated into the CWA Section 404 and 401 permitting process.

**Executive Order 11990 – Protection of Wetlands.** This Executive Order instructs Federal agencies to avoid adverse impacts associated with destruction or modification of wetlands.

The Trustees will work to ensure that projects minimize any wetlands impacts. Public notice of the availability of this report for public review fulfills the requirements of Executive Order 11990, Section 2 (b). Consultation is incorporated into Sec. 404 and 401 permitting process.

**Executive Order 12898 – Environmental Justice.** This Executive Order instructs Federal agencies to assess whether minority or low-income populations would be disproportionately impacted by agency actions. The proposed projects are not expected to adversely affect the environment or human health for any environmental justice populations in the vicinity of the proposed projects.

**Executive Order 12962 – Aquatic Systems and Recreational Fisheries.** This Executive Order requires that Federal agencies, where practicable and permitted by law, work cooperatively to improve the quantity, function, sustainable productivity, and distribution of aquatic resources for increased recreational fishing opportunities. The Trustee agencies worked cooperatively to identify potential projects that would benefit aquatic resources and recreational fishing opportunities, in compliance with the intent of this Executive Order.

**Executive Order 13007 - Accommodation of Sacred Sites.** This Executive Order is not applicable unless activities occur on Federal lands, in which case agencies must accommodate access to and ceremonial use of Indian sacred sites by Indian religious practitioners, and avoid adversely affecting the physical integrity of such sacred sites.

**Executive Order 13045 - Protection of Children from Environmental Health Risks and Safety Risks.** The proposed projects in this Draft DARP would not create a disproportionate environmental health or safety risk for children.

**Executive Order 13112 – Invasive Species.** This Executive Order requires that Federal agencies, where practicable and permitted by law, should identify any actions that may affect the status of invasive species and take actions to address the problem within their authorities and budgets. Agencies also are required not to authorize, fund, or carry out actions that they believe are likely to cause or promote the introduction or spread of invasive species, unless a determination is made that the benefits of actions outweigh potential harms and measures are taken to minimize harm. None of the proposed preferred restoration projects would promote the introduction or spread of invasive species and several will reduce invasive species.

**Executive Order 13186 – Protection of Migratory Birds.** This Executive Order requires Federal agencies to evaluate the effects of their actions on migratory birds, to take actions to avoid or minimize the impacts of their actions on migratory birds, and to help promote conservation of migratory birds if actions are likely to have a measurable negative effect on migratory bird populations. None of the projects proposed here are expected to have a negative effect on migratory bird populations.

**Executive Order 13653 – Preparing the United States for the Impacts of Climate Change.** This Executive Order requires Federal agencies to manage lands and waters under their authorities for climate preparedness and resilience. Federal agencies are directed to assess “their land- and water-related policies, programs, and regulations necessary to make the Nation’s watersheds, natural resources, and ecosystems, and the communities and economies that depend on them, more resilient in the face of a changing climate.” The

proposed outcome-based monitoring described within the DARP is designed to inform an adaptive management process that allows land managers and the Trustees to adjust treatment protocols in response to climate-related environmental change.

**Executive Memorandum on the Analysis of Impacts on Prime or Unique Agricultural Lands in Implementing NEPA (11 August, 1980).** The proposed projects do not involve or impact agricultural lands; therefore this executive memorandum is not applicable.

**DOI Departmental Manual, Parts 517 and 609 – Pesticides and Weed Control.**

Implementation of any of the projects described in this DARP will be consistent with DOI policy to use integrated pest management strategies for control of insect and weed pests. Pesticides or herbicides will only be used after a full consideration of other control alternatives; the material selected and method of application will be the least hazardous of available options.

**DOI Departmental Manual, Part 518 – Waste Management.** If implementation of any alternatives generates waste, the Trustees will comply with all relevant DOI directives and policies.

**DOI Departmental Manual, Part 602 – Land Acquisition, Exchange, and Disposal.** If the Federal government acquires any real property through implementation of these restoration projects, appropriate pre-acquisition standards – particularly the American Society for Testing and Materials standard for Environmental Site Assessments for Commercial Real Estate – will be complied with. No land acquisition is anticipated.

#### **6.4.2. State and Local Policies**

Proposed restoration projects will consider and comply with other relevant state and local policies and directives.

## 7.0 References

- Albert, D.A. and L.D. Minc. 2004. Plants as regional indicators of Great Lakes coastal wetland health. *Aquatic Ecosystem Health and Management* 7(2):233-247
- Allen, A., 2002. Detroit River “Mystery Oil Spill” – April, 2002. Surface Volume Estimates. Prepared for U.S. Environmental Protection Agency, Region V, May 10, 2002.
- Beam, J. D. and J.J. Braunscheidel. 1998. Rouge River Assessment. Michigan Department of Natural Resources, Fisheries Division, Special Report 22. Ann Arbor, Michigan.
- Burton, T.M., D.G. Uzarski, J.P. Gatham, J.A. Genet, B.E. Keas, and C.A. Stricker. 1999. Development of a preliminary invertebrate index of biotic integrity for Lake Huron coastal wetlands. *Wetlands* 19(4):869-882.
- Croft, M.V. and P. Chow-Fraser. 2007. Use and development of the wetland macrophyte index to detect water quality impairment in fish habitat of Great Lakes coastal marshes. *Journal of Great Lakes Research* 33(3):172-197.
- Eichenlaub, V.L., J.R. Harman, F.V. Nurnberger, and H.J. Stolle,. 1990. The Climatic Atlas of Michigan, University of Notre Dame. Press, Notre Dame, Indiana. 160pp.
- Detroit/Rouge River Oil Spill Unified Command. 2002. Detroit River and River Rouge Oil Spill Synopsis. Detroit/Rouge River Oil Spill Unified Command News Release [Document 101, page 25].
- Discher, J.M., J.R. Grant, and T.J. Reilly. 2009. Rouge River 2002 Mystery Oil Spill NRDA: Loss of Public Use Technical Memorandum. Interim Draft. Lighthouse Technical Consultants, Rockport, MA. 10pp.
- DOI. 2004. Department of the Interior Departmental Manual , Series Environmental Quality Programs Part 516, USFWS. <http://elips.doi.gov/ELIPS/DocView.aspx?id=1739>. Accessed February 9, 2014.
- Eagle, A.C., E.M. Hay-Chmielewski, K.T. Cleveland, A.L. Derosier, M.E. Herbert, and R.A. Rustem, eds. 2005. Michigan's Wildlife Action Plan. Michigan Department of Natural Resources. Lansing, Michigan. 1592 pp. <http://www.michigan.gov/dnrwildlifeactionplan>
- Eichenlaub, V., J. Harman, F. Nurnberger, & H. Stolle. (1990). *The Climatic Atlas of Michigan*. Notre Dame, Indiana: University of Notre Dame Press. 160pp
- Francis, J.T., Michigan Department of Natural Resources. 2005. Fisheries Technical Report 2005-1. The Walleye Fishery of the Detroit River, 2000.



- French McCay, D.P., 2003. Development and Application of Damage Assessment Modeling: Example Assessment for the North Cape Oil Spill. *Marine Pollution Bulletin* 47 (9-12): 341-359.
- French McCay, D.P., 2004. Oil spill impact modeling: development and validation. *Environmental Toxicology and Chemistry* 23(10): 2441-2456.
- French McCay, D.P., 2009. State-of –the-Art and Research Needs for Oil Spill Impact Assessment Modeling. In Proceedings of the 32<sup>nd</sup> AMOP Technical Seminar on Environmental Contamination and Response, Emergencies Science Division, Environment Canada, Ottawa, ON, Canada, pp. 601-653.
- French McCay, D.P. and J.J. Rowe. 2003. Habitat Restoration as Mitigation for Lost Production at Multiple Trophic Levels. *Marine Ecology Progress Series*, 264:235-249.
- Goodyear, C. S., T. A. Edsall, D. M. Ormsby Dempsey, G. D. Moss, and P. E. Polanski. 1982. Atlas of the spawning and nursery areas of Great Lakes fishes. 14 vols. U. S. Fish and Wildlife Service, Washington, DC. FWS/OBS-82/52.
- Grant, J.R., Reilly, T.J., French-McCay, D., Rowe, J., and E. Graham. 2011. Rouge River 2002 Mystery Oil Spill SIMAP Injury Report: Restoration Scaling Model and Results (Draft for Trustee Review). LTCI, Rockport, MA; and ASA, Narragansett, RI. 15 pp.
- Hayhoe, K., J. VanDorn, T. Croley II, N. Schlegal, and D. Wuebbles. 2010. Regional climate change projections for Chicago and the US Great Lakes. *Journal of Great Lakes Research* 36(2):7–21.
- Kashian, D.R. and T.M. Burton. 2000. A comparison of macroinvertebrates of two Great Lakes coastal wetlands: Testing potential metrics for an index of ecological integrity. *Journal of Great Lakes Research* 26(4):460-481.
- Kling, G.W., K. Hayhoe, L.B. Johnson, J.J. Magnuson, S. Polasky, S.K. Robinson, B.J. Shuter, M.M. Wander, D.J. Wuebbles, D.R. Zak, R.L. Lindroth, S.C. Moser, and M.L. Wilson. 2003. Confronting Climate Change in the Great Lakes Region: Impacts on our Communities and Ecosystems. Union of Concerned Scientists, Cambridge, Massachusetts, and Ecological Society of America, Washington, DC. Available: [http://www.ucsusa.org/assets/documents/global\\_warming/greatlakes\\_final.pdf](http://www.ucsusa.org/assets/documents/global_warming/greatlakes_final.pdf). Accessed February 28, 2013.
- Louisiana Department of Environmental Quality (LA DEQ). 2003. The Louisiana Regional Restoration Planning Program. Draft Regional Restoration Plan, Region 2. Louisiana Department of Wildlife and Fisheries, Louisiana Oil Spill Coordinator's Office, National Oceanic and Atmospheric Administration, U.S. Department of the Interior, September 2003.

- MDNR. 2009. Phragmites: A Guide to the Control and Management of invasive phragmites. Second Ed. [http://www.michigan.gov/deq/0,4561,7-135-3313\\_8314-178183--,00.html](http://www.michigan.gov/deq/0,4561,7-135-3313_8314-178183--,00.html). Accessed February 9, 2014.
- Manny, B. 2007. Detroit River coastal wetlands. In, State of the Strait: Status and Trends of Key Indicators. J.H. Hartig, M.A. Zarull, J.J.H. Ciborowski, J.E. Gannon, E. Wilke, G. Norwood, and A. Vincent (Eds.), pp. 172-176, Great Lakes Institute for Environmental Research, Occasional Publication No. 5, University of Windsor, Ontario, Canada.
- Monfils, M. J. 2014. Expanding the Michigan Marsh Bird Survey to facilitate conservation at multiple scales. Michigan Natural Features Inventory, Report Number 2014-25, Lansing, MI, USA.
- National Oceanic and Atmospheric Administration (NOAA). 1997. Natural resource damage assessment guidance document: scaling compensatory restoration actions (Oil Pollution Act of 1990), NOAA Damage Assessment Center, Silver Spring, MD
- NOAA. 1999. Discounting and treatment of uncertainty in Natural Resource Damage Assessment. Technical Paper 99-1. NOAA Damage Assessment Center, Silver Spring, MD
- NOAA. 2011. Adapting to Climate Change: A Planning Guide for State Coastal Managers – A Great Lakes Supplement. National Oceanic and Atmospheric Administration Office of Ocean and Coastal Resource Management. Available: <http://coastalmanagement.noaa.gov/climate/docs/adaptationgreatlakes.pdf>. Accessed February 28, 2013.
- Penn, T. and T. Tomasi. 2002. Environmental Assessment: Calculating Resource Restoration for an Oil Discharge in Lake Barre, LA. USA Environmental Management Vol. 29, No. 5. Springer-Verlag. Pp. 691-702.
- Potter, B.A., R.J. Gates, G.J. Soulliere, R.P. Russell, D.A. Granfors, and D.N. Ewert. 2007. Upper Mississippi River and Great Lakes Region Joint Venture Shorebird Conservation Strategy. U.S. Fish and Wildlife Service, Fort Snelling, MN. 101pp.
- Reznicek, A., M. Penskar, B. Walters and S. Campbell. 2005. Floristic Quality Assessment for the Humbug Marsh Unit of the Detroit River International Wildlife Refuge. Michigan Natural Features Inventory.
- Reznicek, A.A., E.G. Voss, and B.S. Walters. 2011. Michigan Flora Online. University of Michigan. Available: <http://michiganflora.net/photos.aspx>. Accessed February, 12, 2014.
- Selheimer, T.S., T.P. Mahoney, and P. Chow-Fraser. 2009. Comparative study of ecological indices for assessing human-induced disturbance in coastal wetlands of the Laurentian Great Lakes. *Ecological Indicators* 9:81-91.

- Simon, T.P., P.M. Stewart, and P.E. Rothrock. 2001. Development of multimetric indices of biotic integrity for riverine and palustrine wetland plant communities along southern Lake Michigan. *Aquatic Ecosystem Health and Management* 4:293-309.
- Soulliere, G.J., B.A. Potter, D.J. Holm, D.A. Granfors, M.J. Monfils, S.J. Lewis, and W.E. Thogmartin. 2007a. Upper Mississippi River and Great Lakes Region Joint Venture Waterbird Habitat Conservation Strategy. U.S. Fish and Wildlife Service, Fort Snelling, MN. 68pp.
- Soulliere, G.J., B.A. Potter, J.M. Coluccy, R.C. Gatti, C.L. Roy, D.R. Luukkonen, P.W. Brown, and M.W. Eichholz. 2007b. Upper Mississippi River and Great Lakes Region Joint Venture Waterfowl Habitat Conservation Strategy. U.S. Fish and Wildlife Service, Fort Snelling, MN. 117pp.
- US Fish and Wildlife Service. 2008. Strategic Habitat Conservation Handbook. A Guide to Implementing the Technical Elements of Strategic Habitat Conservation (Version 1.0). Report from the National Technical Assistance Team February 11, 2008. U.S. Fish and Wildlife Service, Fort Snelling, MN. 22pp.
- UMRGLR JV. 2007. Upper Mississippi River and Great Lakes Region Joint Venture Implementation Plan (compiled by G.J. Soulliere and B.A. Potter). U.S. Fish and Wildlife Service, Fort Snelling, MN. 75pp.
- Uzarski, D.G., T.M. Burton, and J.A. Genet. 2004. Validation and performance of an invertebrate index of biotic integrity for Lakes Huron and Michigan fringing wetlands during a period of lake level decline. *Aquatic Ecosystem Health and Management*, 7:269-288.
- Weston Solutions of Michigan, Inc. (Weston). Phase II Summary Report (draft), Downriver Soil Assessment Project, Cities of River Rouge and Ecorse, Wayne County, Michigan. Detroit: Weston Solutions of Michigan, Inc.; 2006 July. W. O. No. 20083.064.001.
- Williams, L.L. 2002a. Preliminary Summary of Impacts to Fish and Wildlife from the Rouge /Detroit Rivers Oil Spill of April 2002. Memorandum from Lisa L. Williams, USFWS East Lansing Field Office to Robert Ladue, USFWS Law Enforcement, dated June 13, 2002. 5pp.
- Williams, L.L. 2002b. Accomplishments Report: Mystery Oil Spill Impacts Wildlife in the Detroit River. Filed on May 10, 2002. USFWS, East Lansing Field Office. East Lansing, Michigan. 4 pp.

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## **9.0 Appendices**

### **Appendix 1: 2002 ROUGE RIVER MYSTERY SPILL ASSESSMENT CLAIM**

- Attachment A: Trustee Designation Documentation
- Attachment B: Correspondence
- Attachment C: Trustee Coordination Documentation

### **Appendix 2: ROUGE RIVER 2002 MYSTERY OIL SPILL NRDA: SELECTION OF PREFERRED RESTORATION ALTERNATIVES MEMORANDUM**

### **Appendix 3: ROUGE RIVER 2002 MYSTERY OIL SPILL REVISED SIMAP INJURY REPORT**

- Attachment A: State-of-the-Art and Research Needs for Oil Spill Impact Assessment Modeling
- Attachment B: Rouge River 2002 Mystery Oil Spill SIMAP Injury Report: Sensitivity Analysis for Trajectory
- Attachment C: Rouge River 2002 Mystery Oil Spill SIMAP Injury Report: Fates Model Results
- Attachment D: Rouge River 2002 Mystery Oil Spill SIMAP Injury Report: Biological Data
- Attachment E: Rouge River 2002 Mystery Oil Spill SIMAP Injury Report: Biological Model Results

### **Appendix 4: ROUGE RIVER 2002 MYSTERY OIL SPILL SIMAP INJURY REPORT: Injury Scaling Model and Results – Trophic Habitat Equivalency Analysis**

### **Appendix 5: 2002 ROUGE RIVER MYSTERY OIL SPILL – Restoration scaling, calculation of Discounted Service Acre Years (DSAYs) assuming a 30 year project life cycle, including both implementation and maintenance.**

### **Appendix 6: NEPA Categorical Exclusions - U.S. Department of the Interior Departmental Manual 6, Section 516, Chapter 8.5 (516 DM 8.5)**

- Attachment A: Department of Interior NEPA Categorical Exclusions
- Attachment B: NEPA Compliance Checklist

### **Appendix 7. Project cost summaries and calculation of present value for restoration funds.**